Author/s:
Faeth, Isabel

Title:
Foreign Direct Investment in Australia: determinants and consequences

Date:
2005-12

Citation:
Faeth, I. (2005). Foreign Direct Investment in Australia: determinants and consequences. PhD thesis, Department of Economics, University of Melbourne.

Publication Status:
Unpublished

Persistent Link:
http://hdl.handle.net/11343/39043

File Description:
Foreign Direct Investment in Australia: determinants and consequences

FOREIGN DIRECT INVESTMENT IN AUSTRALIA: DETERMINANTS AND CONSEQUENCES

ISABEL FAETH

Submitted in Partial Fulfilment of the
Requirements of the Degree of
Doctor of Philosophy
(with Coursework Component)

December 2005

DEPARTMENT OF ECONOMICS
THE UNIVERSITY OF MELBOURNE

ABSTRACT

Increased globalisation over the last two decades has led to strong growth of international business activity and FDI. Despite the considerable amount of research that has been undertaken to analyse the determinants and consequences of FDI, Australia represents a country with a substantial share of foreign ownership whose FDI experience has been largely overlooked in terms of a comprehensive economic analysis. Not only has Australia received a large amount of foreign investment so far, it is also competing for more FDI. Invest Australia, Australia's national inward investment agency, is actively promoting Australia as a location for FDI, claiming that foreign investment has made a major contribution to Australia's economic growth and living standards of all Australians. Instantly, two key issues arise. Firstly, assuming that FDI has positive effects, what causes the inflow of FDI, i.e. what are the determinants of FDI in Australia? Secondly, given the inflow of FDI, what is its actual effect on the Australian economy, i.e. what are the consequences of FDI in Australia?

In order to analyse those questions, new and previously unused data on FDI inflows in Australia were explored by applying time-series and panel-data analysis. The time period ranges from 1981 to 2002, with differing coverage for the individual samples. A further contribution of the thesis is the search for new FDI data, bringing together and analysing datasets provided by the ABS and other statistical agencies (from the US, the UK, Japan and Germany). A detailed description of Australian FDI data was given to gain a better understanding of the Australian FDI experience and because no such comprehensive summary has been available.

The first part of the analysis focused on the determinants of FDI. Determinants of FDI according to different theoretical models were discussed and tested using five types of datasets: aggregate quarterly data, country-specific annual data, industry-specific annual data, country- and industry-specific data (from the US, the UK, Japan and Germany and US) and US form-specific data. Australian FDI inflows were found to be driven by economic growth and market size, wages and labour supply (though the signs varied across models), trade and openness (though customs duties encouraged Japanese industry-specific FDI), interest rates, exchange rate appreciation, inflation rate (which had a unexpected positive effect) and the investing country's overall FDI outflows. Corporate tax rates were only significant in the quarterly FDI model, but they had an unpredicted positive sign. Australian FDI was driven by longer term considerations and its determinants could not be fully explained by any single theory, but a variety of theoretical models. Furthermore investment decisions depend on factors such as investment origin, the industry in which the investment takes place and the form of the investment, making aggregation difficult.

The second part of the analysis focused on consequences of FDI. Consequences of FDI according to different theoretical models were discussed and tested using two types of datasets: aggregate quarterly data and industry-specific annual data. FDI inflows had positive effects on economic growth and domestic investment, supporting the Australian government's view that FDI is a favourable source of capital. However, the claim that FDI is favourable for Australia's balance of payments position could not be supported by this analysis. FDI led to a reduction in export growth and no direct effect on import growth, though the effect of FDI on GDP growth led to increased import growth. Furthermore, industry-specific FDI in Australia had significant effects on employment growth (negative) and labour productivity growth (positive), while FDI growth had significant effects on real wage growth (negative) and industry concentration (positive). However, effects may differ depending on the FDI form, and Australia should focus more on attracting beneficial FDI (such as export-oriented or import-substituting FDI) rather than FDI in general.

DECLARATION

This is to certify that:

(i) the thesis comprises only my original work towards the PhD,

(ii) due acknowledgement has been made in the text to all other material used,

(iii) the thesis is less than 100,000 words in length, exclusive of tables, maps, bibliographies and appendices.

Melbourne, 15.12.2005

(Isabel Faeth)

ACKNOWLEDGEMENTS

First and foremost, I would like to thank Assoc. Prof. Donald MacLaren and Dr. David Harris for their constructive comments, advice, encouragement, help and support. They have been fantastic PhD supervisors for the past three years and they were also an inspiration as advisors for my Masters research report. I never thought that doing research for a PhD could be so enjoyable and stress-free. Special thanks go to Donald for being so motivating and organised. He gave me excellent editorial advice and was helpful with discussions of the theoretical models. He also gave me the opportunity to present my research in his Honours international trade class. Thanks also to David who was an indispensable resource for the econometric methods.

Discussion with other members of the Department of Economics has enriched this work. In particular I wish to express my thanks to Assoc. Prof. Sisira Jayasuriya for his temporary supervision and his encouragement, comments and editorial suggestions while preparing working papers.

I wish to thank the Department of Economics at the University of Melbourne, the PhD coordinators (Prof. Ian McDonald and Assoc. Prof. Ólan Henry) and support staff (in particular Alison Banford) for their reliable assistance. I also wish to express my thanks to the University of Melbourne and the Department of Economics at the University of Melbourne for the generous provision of various scholarships which financed this research.

I am grateful to Dr. Hsiao-Chuan Chang and Dr. Russell Hillberry for giving me the opportunity to tutor ‘International Trade Policy’ for four consecutive years. I appreciate the insights I have received from the experience which I enjoyed immensely.

Not only teaching, but also practical work experience has been invaluable for my research. The six years that I have worked at Invest Victoria in Frankfurt and Melbourne have given me many practical insights into the work of an investment promotion agency, stimulated my interest in FDI and inspired me in formulating the topic of my thesis. Most importantly, it helped me to stay sane and motivated! Special thanks go to the team at Invest Victoria (Elizabeth Joldeski, Crystal Johnston, Peter Collens and others) for their support.

I thank Kelly Jarvis, who I shared an office with during this study, and from whom I have learned all I will ever need to know about wedding planning, for always being cheerful, entertaining and motivating. It made working on my thesis so much more enjoyable. I am looking forward to seeing you and Australia at the 2006 World Cup in Germany!

Above all, I would like to thank my family in Australia (Ken, Lola and Alba) for their encouragement, love and care and my family and friends in Germany for their sacrifice and support during all the years away from home. Thanks Mum for all the phone calls and emails and for being so understanding of me being away for so long and for missing so many Christmases and birthdays. Thanks Irma for always thinking about me. And I am sorry to my little cousins (Leon, Rosalie, Konstantin and Anton) for missing them growing up. Special thanks go to my brother Matthias, the first Economist in our family, without whom I would have never considered studying Economics in the first place and may have stayed a Sociologist for life – however surprising it may seem that he did not choose to stay an Economist after all… And very special thanks to Ken who convinced me to stay in Melbourne and who inspired me to do this PhD in the first place. It has been quite a journey, but it has all been worth it!

TABLE OF CONTENTS

List of Tables

LIST OF FIGURES

CHAPTER 1

GENERAL INTRODUCTION AND OVERVIEW

1.1 STATEMENT OF THE ISSUES AND MOTIVATION

Lower trade barriers, progressive liberalisation of foreign investment regimes, advances in technology, increasing specialisation and access to new markets have helped to promote globalisation over the last two decades, including the rise of firms' international operations.[1] To understand the impact of Multinational Enterprises (MNEs), defined as companies large in size, with worldwide operations and activities, and centrally controlled by a parent company, on the world economy, here some interesting facts: In 2000, the world's 100 largest MNEs accounted for 4.3% of the world's GDP[2] and had combined assets of US$ 6.3 trillion, combined foreign sales of US$ 2.4 trillion, employed 7.1 million people in their foreign operations and another 7.1 million people in their domestic operations (Table 1.1).

Table 1-1

Snapshot of the World's Top 100 TNCs, 1999 and 2000				
A$ billion, number of employees & percentage		**1999**	**2000**	**Change 1999 vs. 2000**
Assets	**Foreign**	2,115	2,554	+ 20.8 %
	Total	5,101	6,293	+ 23.4 %
Sales	**Foreign**	2,129	2,441	+ 14.6 %
	Total	4,318	4,797	+ 11.1 %
Employment	**Foreign**	6,057,557	7,132,946	+ 17.8 %
	Total	13,385,861	14,257,204	+ 6.5 %
Source: UNCTAD (2002), p. 86, Table IV.2 (based on UNCTAD / Erasmus University database).				

[1] Department of Foreign Affairs and Trade (1999), p.7.
[2] Measured as MNEs' value-added as a percentage of the world's GDP. UNCTAD (2002), p.91, Box Table IV.1.2 (based on: UNCTAD, database of the largest TNCs).

Comparing value added and GDP shows the influence that MNEs have in the world economy[3]: 29 of the top 100 of a combined country-company list for 2000 were MNEs. ExxonMobil's or General Motor's sales, for instance, were larger than New Zealand's or Peru's economies.[4] Sales of foreign affiliates (worth US$ 14 trillion) were almost twice as much as global exports[5], implying that not only MNE activity in general but also the location of MNE operations matters.

The key indicator of MNE activity used to analyse the location decision is Foreign Direct Investment (FDI), defined as "investment in which the investor acquires a substantial controlling interest in a foreign firm or sets up a subsidiary in a foreign country"[6]. Since FDI is linked to MNE activity, it is used interchangeably with MNEs in much of the economics literature. In line with the growing impact of MNEs, global FDI inflows increased substantially in the last decade: while average annual inflows between 1990 and 1995 were US$ 225.3 billion[7], they increased steadily after that and reached a maximum of US$ 1,364.1 billion in 2000, before dropping to US$ 745.5 billion in 2001 and US$ 580.3 billion in 2002 (Table 1-2 and Figure 1-1), reflecting sluggish economic growth in major industrial economies and a sharp decrease in their stock market activities. However, FDI inflows were expected to pick up again due to increased FDI in developing countries.

Table 1-2

Global and Australian FDI Annual Inflows and Projections, 1993 to 2007

US$ billion	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003*	2004*	2005*	2006*	2007*
Global FDI Inflows	231.5	254.7	334.9	393.0	482.2	704.5	1,108.5	1,364.1	745.5	580.3	654.6	833.5	965.4	1,059.9	1,154.9
Australian FDI Inflows	4.3	5.0	12.0	6.2	7.6	6.0	5.7	11.5	4.1	14.0	*Annual Average: 9.1*				

** Projections*

Source: Economist Intelligence Unit (2003) and UNCTAD (2002), p. 303, Annex table B.1.

The strong growth of FDI has led to extensive research on its determinants and consequences, looking at developed countries, developing countries or country groups using cross-section, time-series or panel data. Despite the considerable amount of research that has been undertaken, Australia – the second largest net importer of FDI in the developed world[8] – represents a major FDI recipient and a country with a substantial share of foreign ownership, whose FDI experience has been largely overlooked in terms of a comprehensive economic analysis.

[3] Value added (rather than sales) was used as a measurement for firms because GDP is also a value-added measure. For firms, value added was estimated as the sum of salaries and benefits, depreciation and amortisation and pre-tax income.
[4] UNCTAD (2002), p.90, Box Table IV.1.1.
[5] UNCTAD (2000), cited in: Mudambi (2001), p.2.
[6] Markusen et al. (1995), p.394.
[7] UNCTAD (2002), p.303, Annex table B.1.
[8] Australia's net imports of FDI between 1995 and 2004 were US$ 44.4 billion, only behind Ireland with US$ 92.7 billion. OECD (2005), p.8.

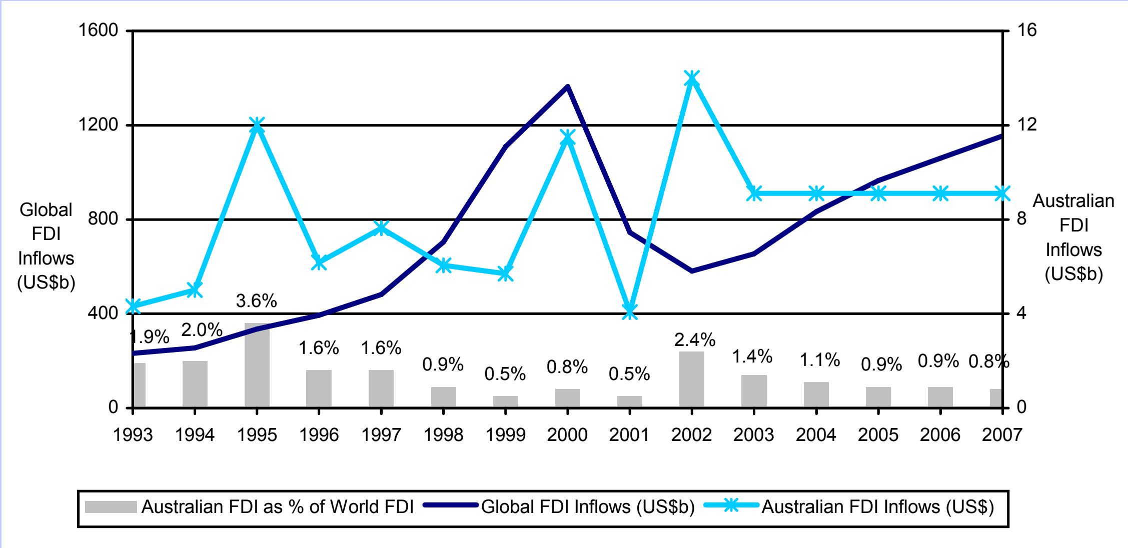


Figure 1-1: Global and Australian Annual FDI Inflows and Projections, 1993 to 2007

Empirical work on Australian FDI, its determinants and consequences, is still limited, although Australia's FDI[9] stock in 2001 was worth US$ 111.1 billion (or 1.6% of the global FDI stock), the twelfth largest in the world[10], and Australia ranked tenth worldwide in terms of most attractive investment destination in 2002.[11] Between 1993 and 2002, Australia received US$ 7.6 billion in average annual FDI inflows (an average of 1.6% of global FDI, compared with Australia's 1.3% share of global GDP[12]), though this ranged from as little as US$ 4.3 billion in 1993 and US$ 4.1 billion in 2001 to US$ 12 billion in 1995 and US$ 11.5 billion in 2000 (Table 1-2 and Figure 1-1).

Between 2003 and 2007, Australian annual FDI inflows are projected to be around US$ 9.1 billion (1.0% of global FDI inflows), making Australia the twentieth largest FDI recipient in the world.[13] However, as FDI in other destinations is predicted to grow by more than Australian FDI, its relative importance on a global scale is decreasing slightly, while its relative importance for the Australian economy is still increasing. Inward FDI flows accounted for 14.1% of gross fixed capital formation in Australian in 2000[14], while Australia's inward FDI stock was 29.2% of its GDP in 2000 – larger than the average for developed economies at 17.1%.[15]

[9] Australian FDI is defined as investment in overseas enterprises in which the Australian organisation has a significant influence and owns not less than 10 % of the ordinary shares or equivalent. Until 30 June 1985, the Australian Bureau of Statistics (ABS) used a minimum ownership level of 25 % of the ordinary shares of voting stock (or equivalent equity interest) for investment to be classified as direct. Since 1985 the minimum ownership level has been 10 %, in line with international practice. Source: www.abs.gov.au, Statistical Concepts Library.
[10] UNCTAD (2002), p.310, Annex table B.3.
[11] A.T. Kearney and Global Business Policy Council (2002)
[12] In contrast to the large fluctuation of Australian FDI as a share of global FDI, Australia's share of global GDP remained relatively constant at between 1.2% and 1.4% of global GDP (1.3% on average) between 1993 and 2002. On average, Australia's share of global FDI has been above its share of global GDP (1.6% between 1993 and 2002). GDP data: World Bank, World Development Indicators, "GDP (current US$)", Australia and World, 1993 to 2002.
[13] Economist Intelligence Unit (2003).
[14] UNCTAD (2002), pp.327-328, Annex table B.5.
[15] UNCTAD (2002), p.320, Annex table B.6.

The significance of MNE activity in Australia also becomes apparent when looking at the foreign presence in Australian industry. In 2000, Australian enterprises had equity on issue of A$ 1,181 billion, of which non-residents owned A$ 336 billion (28%), including A$ 175.3 billion (52%) of FDI (Table 1-3). The majority of FDI, A$ 162.7 billion, fell into the 'over 50% owned by direct foreign investor' category, while only A$ 12.6 billion fell into the '10-50% ownership' category.[16] Overall, 14% of Australia's total equity was held as FDI.

Table 1-3

Ownership of Equity by Enterprise Group, June 2002					
A$ billion	**Total**	**Foreign owned**			**Percentage in foreign ownership**
		Total	**Direct**	**Portfolio**	
All sectors	1,181.4	336.0	175.3	160.7	28%
Corporate Trading Enterprises	765.6	253.1	150.3	102.8	33%
Banks	189.3	48.5	7.7	40.8	26%
Non Bank Deposit taking Institutions	23.6	4.4	4.4	0	19%
Other Financial Sub-sectors	191.5	30.0	12.9	17.1	16%
Central Bank	11.4	---	---	---	---
Source: ABS (2000), Feature Article, p.14, Table F1 and p.16, Table F3.					

1.2 AIMS AND CONTRIBUTIONS OF THE THESIS

Not only has Australia received a large amount of foreign investment so far, it is also competing for more FDI. Invest Australia[17], Australia's national inward investment agency and one of over 500 competing agencies worldwide, is actively promoting Australia as a location for FDI, claiming that foreign investment has made a major contribution to Australia's economic growth and living standards of all Australians.[18] Instantly, two key issues arise. Firstly, assuming that FDI has positive effects, what causes the inflow of FDI, i.e. what are the determinants of FDI in Australia? Secondly, given the inflow of FDI, what is its actual impact on the Australian economy, i.e. what are the consequences of FDI in Australia?

This leads to a first set of questions about the determinants of FDI in Australia. What makes MNEs invest in Australia? Do microeconomic factors, macroeconomic factors or the MNE's business strategy matter? Over the past decade, the Australian economy has undergone a series of structural reforms, including the ongoing reduction of tariffs and trade barriers, enterprise bargaining, a new tax system, and a macroeconomic framework aimed at reducing underlying inflation. Has the combination of a sound macroeconomic policy and ongoing structural reform, which has improved the productivity of the Australian economy by creating a more dynamic and competitive environment, contributed to Australia's attraction as a FDI

[16] ABS (2000), Feature Article, p.16, Table F3.
[17] Invest Australia is the Australian Government's inward investment agency. Established in 1997, Invest Australia has helped a wide range of companies invest an estimated A$ 13 billion and is currently working with companies on projects with potential investment in Australia of more than A$50 billion. Source: Invest Australia (2003a).
[18] Invest Australia (2003a).

destination? Do the factors stated by Invest Australia as the ten decisive factors for investing in Australia (economic credentials, such as resilience and GDP growth, stability, skilled and multicultural workforce, low costs, ICT infrastructure, innovation and research and development, regulatory environment, time zone, quality of life and investment attitude)[19] really matter? Press releases by investing firms suggest that firms mainly invest as part of their overall expansion plan, due to increased demand and to be located near customers, though Australia's skilled workforce, research talent, infrastructure, business culture, political stability, time zone and strategic location were also quoted as decisive factors.[20] Can those findings be supported? Furthermore, is there a difference in the determinants of FDI for different industries, from different countries, or whether foreign affiliates are set up to facilitate trade or production in Australia. How do MNEs respond to tax and investment incentives (such as corporate tax rates) or to trade barriers (in particular considering Australia's new trend of signing free trade agreements)? Finally, from an economic perspective, it is also important to analyse what has led to reduced FDI inflows or disinvestments.

The second set of questions is about the consequences of FDI in Australia. How does MNE activity or the inflow of FDI affect Australia's welfare overall? What are the effects on economic growth, domestic investment, trade, employment, wages, productivity growth and market structure? And do consequences differ according to the industry in which FDI takes place? The Department of Foreign Affairs and Trade (DFAT), for instance, uses case studies to claim that FDI in Australia, "contributes to growth and development, provides jobs, builds exports, provides additional sources of finance, facilitates technology transfer and innovation, increases opportunities for global networking"[21] – arguments that demand further evidence.

To analyse MNE activity in Australia empirically and answer these questions, three different research approaches can be chosen: original field studies or company surveys using questionnaires or interviews, the analysis of company information, such as annual reports or press releases, or the analysis of secondary statistics and FDI data.[22] The preference for each method depends on the question analysed, but their advantages and disadvantages can be summarised as follows: While the first two methods have advantages in terms of detail and focus, especially when it comes to the analysis of individual firms' behaviour,[23] their disadvantages are that they are time-consuming, possibly subjective, as they are produced with a hypothesis already in mind, and they might lack significance if the sample is too small. Moreover, comparisons with results from other studies are problematical due to a difference in samples and conditions. Time-series analysis is impossible in most cases due to varying conditions when repeated at a later point in time. Using secondary statistics has the advantage that data are readily available, datasets are complete (observations are aggregated to portray

[19] Invest Australia (2003b).
[20] Invest Victoria, International Investment Monitor database (unpublished data, created by the author), based on press releases published through IPA World (www.ipaworld.com) and Axiss Australia (www.axiss.com.au) between 01/2005 and 05/2005.
[21] DFAT (1999), p.22.
[22] Dunning (1993), p.137.
[23] Questionnaires and interviews are specifically produced to answer a certain question. Press releases can be selected with respect to the information they provide regarding a certain question.

the whole economy), internationally comparable[24] and available as continuous time-series, while a disadvantage is that one has to use what is given and that details are lost through aggregation, i.e. one cannot analyse the behaviour of individual firms but that of a "representative firm".[25] Furthermore, the danger exists that the analysis becomes a purely statistical exercise without theoretical foundation. However, due to its many advantages, the analysis of secondary statistics is the predominant approach for the analysis of FDI – in particular for more recent research where a variety of econometric techniques are applied to test for determinants and consequences of FDI.

The approach to use secondary statistics was also chosen for this study. In order to analyse FDI in Australia, inward FDI data published by the Australian Bureau of Statistics (ABS) and outward FDI data published by other countries' statistical agencies, including data on US FDI in Australia published by the US Department of Commerce, Bureau of Economic Analysis (BEA), data on UK FDI in Australia published by the UK National Statistics, data on Japanese FDI in Australia published by the Japanese Ministry of Economy, Trade and Industry, and data on German FDI in Australia published by the Deutsche Bundesbank can be used.[26]

In order to examine aggregate FDI inflows, the data published by the ABS were chosen since they are comprehensive and available in quarterly form from 1985 onwards[27] and in country-specific form from 1992 onwards. However, when it comes to industry-specific FDI, datasets published by the ABS and datasets published by foreign statistical agencies were used since industry-specific data from foreign statistical agencies were available in a more disaggregated form than those published by the ABS. This is particularly true for details on manufacturing FDI. The US, in particular, publishes more details on FDI in Australia than any other statistical agency. Given that the US accounts for 28.1% of the FDI stock in Australia and is the largest single source of Australian inward FDI, exploring US FDI in Australia is a good starting point for the analysis of industry-specific FDI and will be used as a model for the analysis of industry-specific FDI from the UK, Japan and Germany, which combined with the US account for 61.7% of the Australian FDI stock (Table 1-4).

Table 1-4

Stock of FDI in Australia by Geographical Origin, 2001			
Rank	**Country**	**FDI Stock (in A$ billion)**	**Percentage of total FDI Stock of A$ 208.4 billion (%)**
1	**US**	58.6	28.1
2	**UK**	47.1	22.6
3	**Japan**	16.6	7.9
4	**Netherlands**	9.7	4.7

[24] Comparability due to the existence of internationally agreed guidelines for national balance-of-payments statistics. See IMF Balance of Payments Manual (IMF, 1993).

[25] The notion of a representative firm relies on the assumption that every firm follows the same rational investment decision-making process, so that one firm's decision can be derived from the decisions made by all firms combined. This is a strong assumption and disaggregation down to firm level data may prove that this may not be the case in reality. The key question is how much reality and theory differ. Using different datasets (as done in Chapters 4 to 6) may help to answer this question.

[26] Data possibilities were explored with the ABS and, to the best knowledge of the author, all FDI data series that were made available by the ABS and other statistical agencies (if available in enough detail) were used for this analysis. De Nederlandsche Bank publishes industry-specific data on FDI from the Netherlands, but Dutch FDI in Australia is only available in aggregate form.

[27] Although Australian FDI data are available for years earlier than that, the restriction to the years 1985 and after is due to changes in the ownership level.

5	**Germany**	6.4	3.1
Source: ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.17.			

This study makes a contribution to current research in various ways. It is the first comprehensive study of FDI in Australia, linking the analysis of FDI forms, determinants and consequences. It is based on a substantially longer period of aggregate quarterly FDI data than previous studies[28] and draws on data sources which have not been used previously to study country- and industry-specific FDI in Australia. It is also the only study to compare the analyses of different datasets, an approach chosen to test whether results vary across countries or industries.

1.3 PLAN OF THE THESIS

This study begins with a detailed discussion of Australia's FDI experience (Chapter 2), followed by two main parts dedicated to the analysis of the key questions: "Why do MNEs invest in Australia?" (Part I, Chapter 3 to 6) and "What are the effects of FDI in Australia?" (Part II, Chapter 7 to 9), and a final chapter (Chapter 10) with conclusions.

In Chapter 2, the trends of Australian FDI, Australia's foreign investment policy and available data are discussed and the pattern of FDI in Australia and its development over time are explored. The section covers aggregate quarterly FDI, country-specific FDI, industry-specific FDI from all countries, the US, the UK, Japan and Germany, firm-level data and survey data.

In Part I (Chapters 3 to 6), the determinants of FDI in Australia are analysed. Chapter 3 presents a review of the relevant theoretical models and econometric studies, including previous approaches used to analyse the determinants of FDI in Australia. The first part of the chapter presents a review of the different theoretical models and empirical studies. There is not one single FDI theory but a variety of theoretical models explaining FDI. A wide range of factors have been experimented with in empirical studies in order to find the determinants of FDI. Overall, nine different approaches are discussed: early studies of determinants of FDI, determinants of FDI according to the Neoclassical Trade Theory, ownership advantages as determinants of FDI, aggregate variables as determinants of FDI, determinants of FDI in the OLI framework[29], determinants of horizontal FDI according to the Proximity-Concentration Hypothesis and vertical FDI according to the Factor-Proportions Hypothesis[30], determinants of

[28] Using 71 observations compared with Yang et al.'s (2000) study (discussed in more detail in Chapter 3.2) for which 35 observations were used.
[29] OLI Framework explains the existence of MNEs by a combination of ownership advantages (i.e. foreign firms must have some unique advantage that domestic firms do not have), location advantages (locating in the foreign market must be cheaper than exporting) and internalisation advantages (investing must be preferable to alternative arrangements such as licensing or strategic alliances)
[30] Horizontal FDI represents the investment by firms that replicate the same activities in many places around the world (e.g. plants producing the same good in different countries, mainly to supply the local

FDI according to the horizontal FDI, vertical FDI and Knowledge-Capital Model, determinants of FDI according to the diversified FDI and risk diversification model and policy variables as determinants of FDI. From each theory, several potential determinants of FDI can be derived. Those include ownership advantages, market size and characteristics, factor costs, transport costs and protection, risk factors and policy variables. In the second part of the chapter, previous empirical studies of the determinants of FDI in Australia are discussed with the conclusion that empirical work so far is limited and outdated, and that the results of empirical studies on the determinants of FDI in Australia are mixed in their success to substantiate theoretically predicted effects. Hence, it is necessary to look at Australian data in more detail and for a longer time period to see whether the previous findings can be supported or whether different results emerge.

In Chapter 4, the determinants of quarterly and country-specific FDI in Australia are analysed. For the first analysis of the determinants of Australian FDI (Chapter 4.1), a model with aggregate quarterly real FDI flow data for the period Q3/1985 to Q1/2003 and a set of lagged explanatory variables including market size (measured by Australian GDP), factor costs (measured by real wages and labour supply), transport costs and protection (measured by trade or openness and customs duties), risk factors (measured by interest rate, exchange rate, inflation rate and industrial disputes), policy factors (measured by corporate tax rate) and other factors (such as OECD GDP or growth differential) is used. Although FDI is a long-term phenomenon, which is what distinguishes it from other forms of capital flows, especially portfolio investment, quarterly (rather than annual) data had to be used to boost the number of observations because the Australian definition of FDI changed in 1985, hence preventing the use of the more appropriate unit of observation. For the second analysis of the determinants of Australian FDI (Chapter 4.2), country-specific FDI is looked at. Because panel-data are used, explanatory variables now include factors that vary over time, over cross-sections or both. A model with country-specific annual real FDI flow data for the period 1992 to 2001 and a set of lagged explanatory variables including market size (measured by Australian GDP, Asia-Pacific GDP, relative GDP and combined market size), factor costs (measured by real wages, labour supply, productivity and skill endowment), transport costs and protection (measured by the trade or openness, geographical or time distance and customs duties), risk factors (measured by interest rate, exchange rate appreciation, inflation rate and industrial disputes), policy variables (measured by corporate tax rate) and other factors (such as Home's outward FDI, FDI in Asia-Pacific, OECD GDP or growth differential, English as an official language and country or region dummies) is estimated. Both models are successful in explaining FDI, though parameter variability across cross-sections in the country-specific FDI model shows that aggregation of non-homogeneous data may be an issue.

In Chapter 5, the determinants of industry-specific FDI in Australia are analysed. Five models with industry-specific annual real FDI flow data from all countries, from the US, from the

market), while vertical FDI represents an investment by firms that scatter activities around the world (e.g. headquarters services at Home, intermediate good production in one foreign country and final good production in another foreign country).

UK, from Japan and from Germany for periods varying between 1981 to 2001 and 1992 to 2001 and a set of lagged explanatory variables including market size (measured by industry size or GDP, Asia-Pacific GDP, relative GDP, combined market size and industry employment), factor costs (measured by real wages, labour supply, productivity and skill endowment), transport costs and protection (measured by the trade or openness and customs duties), risk factors (measured by interest rate, exchange rate appreciation, inflation rate and industrial disputes), policy variables (measured by corporate tax rate) and other factors (such as Home's outward FDI, FDI in Asia-Pacific, OECD GDP or growth differential and industry or sector dummies) are analysed. The models vary in their success of explaining industry-specific FDI and cast further doubt on the homogeneity of FDI data.

For the analysis of different forms of US FDI in Australia (Chapter 6), two models with industry-specific annual US MNE activity data in Australia between 1988 and 1998 and different sets of explanatory variables were estimated. For the first part of the analysis (Chapter 6.1), two different sets of explanatory variables – one including the same determinants as in the analysis of industry-specific FDI from the US in Australia (industry-specific GDP, real wages, Australian imports from the US, Australian customs duties and US total outward FDI flows) and one including a broader range of potential determinants (employment, the Australian unemployment rate, Australian openness, Australian exports to the US, the US-Australian dollar exchange rate, the interest rate difference between the US and Australia, relative inflation, the number of industrial disputes in Australia, Australia's corporate tax rate and a manufacturing sector dummy in addition to the five variables in the first model) – were used to analyse five forms of Australian FDI, i.e. total, horizontal, vertical and export platform FDI and vertical integration. For the second part of the analysis (Chapter 6.2), industry-specific employment, GDP, real wages, the number of industrial disputes, plant-level economies of scale, firm-level economies of scale and the value of sales in service industries relative to manufacturing and mining sales were used as potential determinants of the intensity (share) of vertical MNEs. The analysis in Chapter 6 is set out to be a case study and while the models are limited in their success of explaining US MNE activity in Australia, some interesting ideas for further research emerge.

In Part II (Chapters 7 to 9), the consequences of FDI in Australia are analysed. Chapter 7 presents a review of the relevant theoretical models and econometric studies, including previous studies on the effect of FDI in Australia. The first part of the chapter reviews theoretical models and empirical studies, showing that – as with FDI determinants – there is no single FDI theory but a variety of theoretical models explaining the effects of FDI. Many factors have been experimented with in empirical studies in order to find the consequences of FDI. Comparing different theories of FDI (such a neoclassical trade theory, imperfect competition models, the OLI framework, new trade theory, diversified FDI and game theoretic frameworks) gives an idea of the range of potential effects. Overall, eight different effects are discussed: effects of FDI on general welfare and tax revenue, effects of FDI on domestic investment, effects of FDI on economic growth, effects of FDI on trade, effects of FDI on employment, training and wages, effects of FDI on technology and productivity growth, effects of FDI on market structure and competition and effects of FDI on the environment. In the second part of the chapter, previous studies on the consequences of Australian FDI are discussed with the conclusion that, considering the importance of the issue and the amount of research done internationally, research on the effect of FDI on the Australian economy is limited, based on surveys or aggregate data only and outdated. Hence, further research is needed to see how FDI has contributed to the Australian economy.

Chapters 8 and 9 illustrate two different approaches to analyse the issue empirically: first, the analysis of consequences of FDI in Australia using quarterly aggregate data, and second, the analysis of consequences of industry-specific FDI. Chapter 8 first looks at a combination of ABS surveys, BEA data and Invest Australia data, suggesting that FDI should have a positive effect on economic growth and domestic investment but may have a negative effect on Australia's trade balance, increasing imports by more than exports. These findings are then tested by estimating a multivariate vector autoregression (VAR) model in order to analyse the causal links between quarterly FDI, domestic investment, economic growth and trade (imports and exports) in Australia. Given that economic theory is limited in its ability to determine the dynamic relationship of the five variables, a statistical approach was chosen to let the data speak for themselves – with some interesting results.

For the second analysis of the consequences of Australian FDI (Chapter 9), a model with industry-specific annual FDI flow data for the period between 1992 and 2001 was used to analyse the effect of FDI on industry-specific employment, wages, labour productivity and market structure. For each model, a set of variables including a combination of capital, market size and structure, labour market conditions and labour characteristics, international influences, risk factors and industry dummies was used to analyse the effect. Panel data analysis was used to estimate the models, which were successful in explaining the relevant variables and showing the consequences of FDI.

Chapter 10 summarises and concludes. The main findings and conclusions from Part I (determinants of FDI in Australia) and Part II (consequences of FDI in Australia) are discussed. Sections on policy implications and implications for further research complete the thesis.

CHAPTER 2

FORMS AND TRENDS OF FDI IN AUSTRALIA

2.1 AUSTRALIA'S FOREIGN INVESTMENT POLICY

Before exploring Australia's FDI experience in more detail, one should look at the policies in place, as they may directly affect – assist or hinder – the inflow of FDI and the establishment of private enterprises by manipulating the country's competitive structure. Australia's foreign investment policy, covering both FDI and portfolio investment, has undergone a series of changes over time, moving from 'completely unrestricted'[31] (before 1972) to 'highly restrictive' (after 1972) and to 'generally foreign investment encouraging with only a few limitations' (today).

While there were no barriers to foreign investment in Australian enterprises in the 1960s, 1972 saw a change of Australia's attitude towards foreign ownership as a response to growing foreign control, giving the government the right to block takeovers by foreigners or foreign firms if they would obtain more than 15% and 40% of voting power in the target firm respectively.[32] As a result, FDI fell from A$ 897 million in 1970/71 and A$ 870 million in 1971/72 to A$ 399 million in 1972/73.

In 1974, the Foreign Investment Advisory Committee was established and, in 1976, it was replaced by the Foreign Investment Review Board (FIRB) to screen proposed investments. The 'Foreign Acquisitions and Takeovers Act' (FATA)[33] was produced in 1975 and still provides – after having undergone a series of amendments – legislative backing for the Australian government's foreign investment policy. Hence, foreign investment is regulated principally by the FATA in combination with the Foreign Investment Policy issued by the Federal Government. Both are administered by the Federal Treasurer, who is assisted by the FIRB. The FATA provides for the notification of investment proposals and for the prohibition of certain types of proposals that are, in the judgment of the Treasurer, contrary to the national interest.

---

[31] 'Completely unrestricted' means that no official legislation was in place to block takeovers by foreigners.
[32] Dyster and Meredith (1990), p.279.
[33] Office of Legislative Drafting, Attorney-General's Department (2004)

Over time, a liberalisation of foreign investment guidelines took place. By 1987, the restrictions on foreign investments in manufacturing, services, resources processing, non-bank financial institutions, insurance, stockbroking, tourism, rural properties and primary industry (except mining) were eliminated.[34] Nowadays, Australia's Federal Government officially welcomes foreign investment into Australia and – with its network of national and state investment promotion agencies – actively promotes FDI and in some cases even offers incentives to investors. Foreign investors receive national treatment, though several industry sectors including banking, domestic and international civil aviation[35], airports, media, newspapers, broadcasting and telecommunications – although not completely closed – are still subject to limitations.[36]

Investment proposals for the acquisition of interests in Australian urban land, the acquisition of an interest of 15% in Australian businesses with assets valued at over A$ 50 million or the establishment of new business involving a total investment of A$ 10 million or more still need to be reviewed[37], though most of these proposals, if they are considered to be consistent with Australia's national interest, national security, and economic development concerns, are routinely accepted by the government. According to FIRB (2004), of the 4,747 investment proposals decided in 2002-03, 4,668 were approved and only 79 were rejected.[38] Approvals involved proposed investments (either alone or in partnership with Australians) of around A$ 85.8 billion, including A$ 30.5 billion from the US alone. Some other regulations potentially affecting foreign investment are the 'Trade Practices Act 1974' – enforced by the Australian Competition & Consumer Commission (ACCC) – which prohibits the acquisition or merger of an Australian business reducing competition in an Australian market, the 'Australian Customs Act 1901' which prohibits (usually for health and safety reasons) the import of certain products into Australia, customs duties on imports and the Australian Goods and Services Tax (GST) on imports.[39]

Currently, the FATA is undergoing review due to Australia's entry into a free trade agreement with the US. Proposed changes include the screening exemption of certain acquisitions by the US government or US investors (in particular in the financial sector) and an increase of the thresholds for notification and approval (to A$ 800 million of interest in Australian businesses in non-sensitive sectors and A$ 50 million in sensitive sectors) in relation to US investors meeting certain requirements.[40] Australia has also negotiated free trade agreements

---

[34] Dyster and Meredith (1990), p.283.
[35] In the case of Australia's national airline, Qantas, total foreign ownership is restricted to a maximum of 49% in aggregate under the 'Qantas Sale Act' (www.qantas.com.au), while foreign airlines could purchase up to 100% of the equity in an Australian domestic airline since 1999. Clayton Utz (2004).
[36] Clayton Utz (2004)
[37] Clayton Utz (2004) and Corrs Chambers Westgarth (2004)
[38] Although only a small percentage of investment proposals are rejected by the FIRB, rejection of big cases happens occasionally. One such example is Royal Dutch Shell's A$10 billion takeover bid for Woodside Petroleum in 2001.
[39] Ebsworth & Ebsworth Lawyers (2003)
[40] Corrs Chambers Westgarth (2004)

with New Zealand, Thailand and Singapore and is currently negotiating with ASEAN, the United Arab Emirates, China and Malaysia.[41]

Other bilateral treaties that Australia has negotiated over time include a set of bilateral investment treaties for the protection and promotion of investments and several treaties for the avoidance of double taxation.[42] Australia is also member of the Multilateral Investment Guarantee Agency[43], an agency whose mission it is "to promote FDI into developing countries, in order to support economic growth, reduce poverty and improve people's lives"[44]. Furthermore, Australia has signed double taxation treaties with forty countries.[45] Through bilateral treaties and double taxation treaties, governments encourage FDI, making foreign investment an easier and more profitable option for MNEs.

2.2 FDI IN AUSTRALIA BEFORE 1985

The next step in preparation for the analysis of Australian FDI is to take a closer look at the available FDI data and explore forms and trends of FDI in Australia, covering FDI before 1985 (i.e. the part of the dataset that is not included in the econometric analysis, since the FDI definition changed in that year) and FDI after 1985 with details on aggregate FDI (total and country-specific), industry-specific FDI, firm-level data and surveys. A detailed description of Australian FDI was chosen, as no such comprehensive summary has been available so far. This summary therefore contributes to the better understanding of Australian FDI.

To put Australia's more recent FDI experience into perspective, some historical evidence is presented first. Early on, the discovery of natural resources in Australia led to investment by private firms in primary production and infrastructure, guaranteeing those firms access to new international sources of supply and demand. According to Wilkins (1970), MNEs played a significant role even before the 1930s: the major wool exporters in Australia were owned by British firms, while Australia's largest enterprise in 1910, Dalgety and Co. Ltd., was headquartered in Britain. In 1930, GKN's Australian subsidiary (Lysaghts) dominated the

[41] www.dfat.gov.au

[42] Bilateral investment treaties exist between Australia and Argentina (since 1995), Chile (1996), China (1988), the Czech Republic (1993)[42], Hong Kong (1993), Hungary (1991), India (1999), Indonesia (1992), Laos (1994), Lithuania (1998), Pakistan (1998), Papua New Guinea (1990), Peru (1995), the Philippines (1995), Poland (1991), Romania (1993) and Vietnam (1991), while Australia is currently negotiating with a number of other countries including Russia and Iran. UNCTAD (2003), pp.28-29.

[43] Business Monitor International (2005), p.23.

[44] www.miga.org

[45] Argentina (1999), Austria (1986), Belgium (1977), Canada (1980), China (1988), Czech Republic (1995), Denmark (1981), Fiji (1990), Finland (1984 and 1997), France (1976), Germany (1972), Hungary (1990), India (1991), Indonesia (1989 and 1992), Ireland (1983), Italy (1982), Japan (1969), Kiribati (1991), Korea (1982), Luxembourg (1990), Malaysia (1980 and 1999), Malta (1984), Netherlands (1976), New Zealand (1972), Norway (1982), Papua New Guinea (1989), the Philippines (1979), Poland (1991), Singapore (1969), Slovakia (1999), South Africa (1999), Spain (1992), Sri Lanka (1989), Sweden (1981), Switzerland (1980), Taiwan (1996), Thailand (1989), the UK (1967), the US (1953) and Vietnam (1992). UNCTAD (2003), pp.28-29.

Australian galvanised steel production with a market share of 68%. Manufacturing followed with Ford Motor Company (established an Australian assembly plant in 1925) and General Motors (established an assembly plant in 1926) being famous examples of companies dominating the Australian market.[46]

After the upsurge of FDI in the 1920s, the depression in the 1930s restricted international private capital flows.[47] It was not until after the Second World War that FDI to Australia began to grow steadily again (Table 2-1), following the international trend of increasing corporate investment abroad. During that period, the Australian inward FDI stock increased from A$ 550 million in 1947/48 to A$ 7.3 billion in 1970/71.[48] The only set-backs were in 1952/53, in 1961/62 and in 1966/67, possibly due to recessions in the Australian economy.[49]

Table 2-1

Annual FDI Inflows into Australia, 1947/48 to 1970/71			
Year, A$ million	**Undistributed Income**	**Other Direct Investment**	**Total FDI**
1947/48	15	59	74
1948/49	12	69	81
1949/50	32	98	130
1950/51	45	89	134
1951/52	48	113	161
1952/53	36	6	42
1953/54	61	76	137
1954/55	61	137	198
1955/56	81	143	224
1956/57	95	96	191
1957/58	87	105	192
1958/59	125	83	208
1959/60	136	184	320
1960/61	113	262	375
1961/62	66	155	221
1962/63	109	275	384
1963/64	139	286	425
1964/65	124	416	540
1965/66	125	369	494
1966/67	115	219	334
1967/68	229	315	544
1968/69	280	339	619
1969/70	295	445	740
1970/71	322	655	977
Total 1947/48 to 1970/71	2,751	4,994	7,237
Aggregate totals represent the sum of recorded net inflows of capital, measured by prices current in each of the years specified. The totals accordingly should be interpreted with considerable caution.			
Source: Commonwealth Treasury (1972), p.5, Table 1.			

During that time, Australia was particularly popular with US firms, which – according to Johns (1974) – increased their FDI stock from US$ 255 million in 1951 to US$ 3.7 billion in 1971. Although the US increased in relative importance as a foreign investor in Australia, the UK remained the biggest single foreign investor in Australia (Table 2-2). Overall 44% of FDI inflows into Australia between 1947/48 and 1970/71 came from the UK, 39% from the US and Canada and only 17% from other countries.

[46] Dyster and Meredith (1990), pp.99-100.
[47] Johns (1974), pp.291.
[48] Commonwealth Treasury (1972), p.33, Table 23.
[49] Johns (1974), pp.295.

Table 2-2

FDI Inflows into Australia by Country, 1947/48 to 1970/71			
Annual average (%)	**UK**	**US and Canada**	**Others**
1947/48 – 1949/50	79	14	7
1950/51 – 1959/60	60	29	11
1960/61 – 1969/70	41	44	15
1970/71	37	36	28
1947/48 – 1970/71	44	39	17
Based on: Commonwealth Treasury (1972), p.17, Table 11.			

According to the Commonwealth Treasury (1972), overseas control accounted for 26% of the total value of production, although only 4% of Australian manufacturing firms in 1966/67 were foreign-owned. However, ownership and control levels varied significantly across industries. While foreign control was more than 70% in the automotive industry, oil and minerals and the pharmaceutical industry, it was less than 5% in energy, leather production and furniture industries. In the mining industry, 15% of all mining establishments in 1968 were in overseas control, accounting for 58% of the total value of production (compared with only 37% in 1963). In 1968, foreign-owned firms accounted for 21% of average employment in the manufacturing industry and 38% of employment in mining.

Between 1970/71 and 1984/85, the trend of increasing FDI continued, though the average growth of FDI inflows during that period was somewhat smaller. FDI inflows in Australia experienced some major downturns between 1972/73 and 1975/76 owing to Australia's stricter foreign investment policy (discussed in Chapter 2.1), which coincided with a slow-down in Australian and international economic growth (after the 1973 oil crisis), and in 1982/83, presumably due to a sharp but short domestic recession. Strong economic growth followed, which saw the quick recovery of FDI inflows (Table 2-3). For an illustration of the FDI development from 1947/48 to 1984/85 see Figure 2-1. Over time, FDI inflows increased from A$ 74 million a year in 1947/48 to A$ 977 million a year in 1970/71 and A$ 2.6 billion a year in 1984/85 in current dollars.

Table 2-3

FDI Inflows into Australia (quarterly and annual data), Q3/1959 to Q2/1985							
Financial Year (A$ million)		**March Quarter**	**June Quarter**	**Sept. Quarter**	**Dec. Quarter**	**Calendar Year (A$ million)**	
---	---	---	---	80	80	**1959**	---
1959/60	320	80	80	94	94	**1960**	348
1960/61	375	93	94	54	56	**1961**	297
1961/62	221	55	56	95	88	**1962**	294
1962/63	384	71	130	47	144	**1963**	392
1963/64	425	103	131	121	93	**1964**	448
1964/65	540	104	222	117	108	**1965**	551
1965/66	513	105	183	61	87	**1966**	436
1966/67	364	94	122	116	127	**1967**	459
1967/68	561	86	232	113	157	**1968**	588

(Table 2-3 continued)

Financial Year (A$ million)		**March Quarter**	**June Quarter**	**Sept. Quarter**	**Dec. Quarter**	**Calendar Year (A$ million)**	
1968/69	600	114	216	99	132	**1969**	561
1969/70	736	216	289	148	149	**1970**	802
1970/71	897	246	354	243	174	**1971**	1,017
1971/72	870	199	254	306	125	**1972**	884
1972/73	399	-73	41	22	105	**1973**	95

1973/74	616	166	323	198	239	**1974**	926
1974/75	657	79	141	158	-35	**1975**	343
1975/76	578	214	241	122	280	**1976**	857
1976/77	1,062	352	308	116	253	**1977**	1,029
1977/78	1,041	227	445	342	451	**1978**	1,465
1978/79	1,357	277	287	334	435	**1979**	1,333
1979/80	1,538	400	369	412	458	**1980**	1,639
1980/81	2,441	446	1,125	420	51	**1981**	2,042
1981/82	2,452	689	1,292	20	253	**1982**	2,254
1982/83	1,070	290	507	910	1,613	**1983**	3,320
1983/84	2,003	42	-562	1,183	-175	**1984**	488
1984/85	2,615	322	1,285	n/a	n/a	**1985**	3,005*

** includes Q3/1985 with A$ 490m and Q4/1985 with A$ 908m, but note that the ABS changed the ownership level from 25% to 10% on 30 June 1985.*

Source: ABS 5302.0 International Investment Position, Table 1.

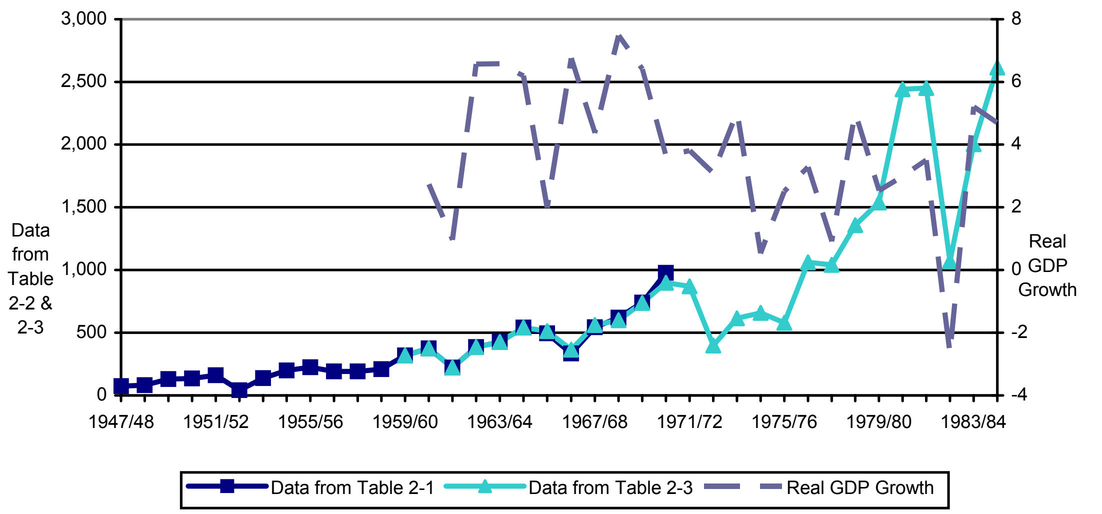


Figure 2-1: Annual FDI Inflows into Australia, 1947/48 to 1984/85[50]

2.3 Aggregate FDI

2.3.1 General Aggregate FDI – Annual and Quarterly FDI Inflows (1985 to 2003)

Having discussed the development of FDI before 1985, the focus is now on more recent FDI inflows, i.e. the time period used for the econometric analysis in this study. Overall, the pre-1985 upward trend of FDI continued until around 1990, with stronger average growth rates than between 1970/71 and 1984/85. FDI inflows increased from A$ 3.6 billion a year in 1985/86 to a high of A$ 10.8 billion in 1988/89 (Table 2-4 and Figure 2-2). The 1990s were a slower period and Australia did not experience large FDI inflows – the only exception was 1995 with A$ 16.1 billion. Increased investment in the late 1980s and early 1990s was partly due to a large number

[50] Data Source for Real GDP Growth: dxEcondata, ABS National Accounts (2002/03), Summary Tables and Productivity Estimates, Table 5204-01: Key National Accounts Aggregates, Real GDP (chain volume measure), transformed to growth rate (differenced logs), 1960/61 to 1984/85.

of privatisations conducted by both the State and Federal Governments. Major sectors included financial services, electricity and gas, transportation and communications. The Victoria and South Australian State Governments, for instance, sold electricity businesses to private foreign owners from the United States, United Kingdom and South-East Asia. In the early 2000s, FDI inflows were larger, but also more volatile. The years 2000 and 2002 were strong years for Australian inward FDI (with A$ 22.8 billion and A$ 29.0 billion a year), though the inflow in 2001 was only A$ 9.1 billion. The fluctuation was also sharp in quarterly terms, but not when the series was stated on a financial year basis.

Table 2-4

FDI Inflows into Australia (quarterly and annual data), Q3/1985 to Q2/2003							
Calendar Year (A$m)		**March Quarter**	**June Quarter**	**Sept. Quarter**	**Dec. Quarter**	**Financial Year (A$m)**	
1985	3,005*	n/a	n/a	490	908	**---**	---
1986	8,033	166	2,042	227	5,598	**1985/86**	3,606
1987	7,413	362	2,617	3,048	1,386	**1986/87**	8,804
1988	9,351	1,156	3,202	3,373	1,620	**1987/88**	8,792
1989	9,107	3,054	2,704	2,372	977	**1988/89**	10,751
1990	10,403	2,162	2,309	1,694	4,238	**1989/90**	7,820
1991	5,524	845	588	2,306	1,785	**1990/91**	7,365
1992	7,792	2,311	1,200	1,791	2,490	**1991/92**	7,602
1993	6,307	3,658	1,218	1,073	358	**1992/93**	9,157
1994	6,879	1,968	2,323	1,855	733	**1993/94**	5,722
1995	16,145	3,059	1,241	4,002	7,843	**1994/95**	6,888
1996	7,803	- 128	773	3,704	3,454	**1995/96**	12,490
1997	10,290	846	3,328	4,160	1,956	**1996/97**	11,332
1998	9,558	1,987	2,184	3,963	1,424	**1997/98**	10,287
1999	5,065	- 648	3,261	1,824	628	**1998/99**	8,000
2000	22,787	2,291	8,404	1,064	11,028	**1999/00**	13,147
2001	9,055	1,100	- 960	6,694	2,221	**2000/01**	12,232
2002	29,047	10,360	4,904	7,934	5,849	**2001/02**	24,179
2003	---	1,931	5,935	---	---	**2002/03**	21,649

** includes Q1/1985 with A$ 322m and Q2/1985 with A$ 1285m, but note that the ABS changed the ownership level from 25% to 10% on 30 June 1985.*

Source: ABS 5302.0 International Investment Position, Table 1.

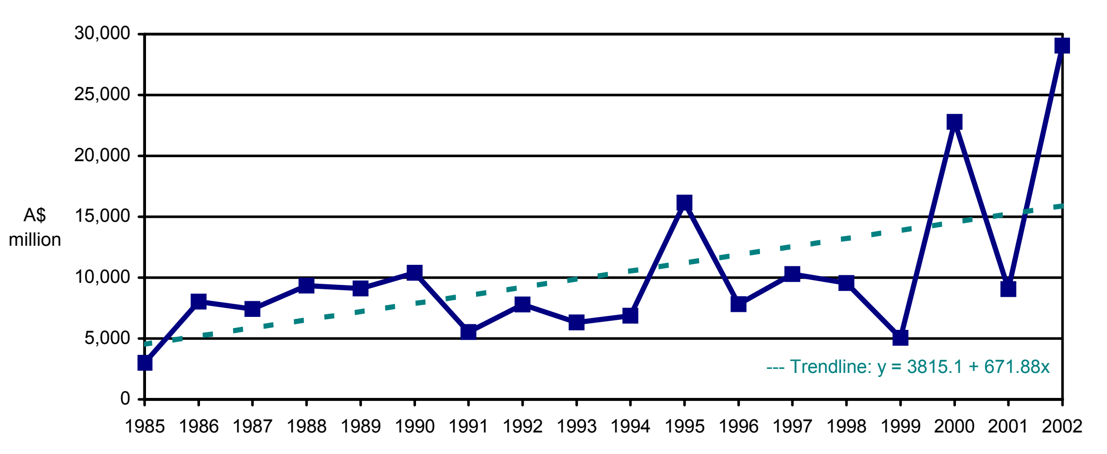


Figure 2-2: Annual FDI Inflows into Australia, 1985 to 2002

When splitting overall FDI inflows into mergers and acquisitions (M&A) inflows[51] and other FDI inflows (Table 2-5), an interesting pattern emerges (Figure 2-3).

[51] A merger is the fusion of two or more corporations by the transfer of all property to a single corporation, while an acquisition is when one company purchases a majority interest in another company (including takeovers via the Australian Stock Exchange). FDI includes those cases for foreign companies, but also

Table 2-5

Annual FDI and M&A Inflows into Australia, 1987 to 2001					
Year	FDI Inflows (US$ billion)	M&A		FDI excl. M&A	
		US$ billion	% of total FDI	US$ billion	% of total FDI
1987	5.264	1.545	29.4	3.719	70.6
1988	7.377	4.380	59.4	2.997	40.6
1989	7.259	4.704	64.8	2.555	35.2
1990	8.111	2.545	31.4	5.566	68.6
1991	4.312	2.592	60.1	1.720	39.9
1992	5.699	2.446	42.9	3.253	57.1
1993	4.318	3.191	73.9	1.127	26.1
1994	5.001	2.975	59.5	2.026	40.5
1995	12.026	17.36	144.4	-5.334	-44.4
1996	6.181	13.099	211.9	-6.918	-111.9
1997	7.631	14.795	193.9	-7.164	-93.9
1998	6.046	14.737	243.8	-8.691	-143.8
1999	5.699	11.996	210.5	-6.297	-110.5
2000	11.512	21.699	188.5	-10.190	-88.5
2001	4.067	16.879	415.0	-12.812	-315.0

Source: UNCTAD (2002), Annex Table B.7.

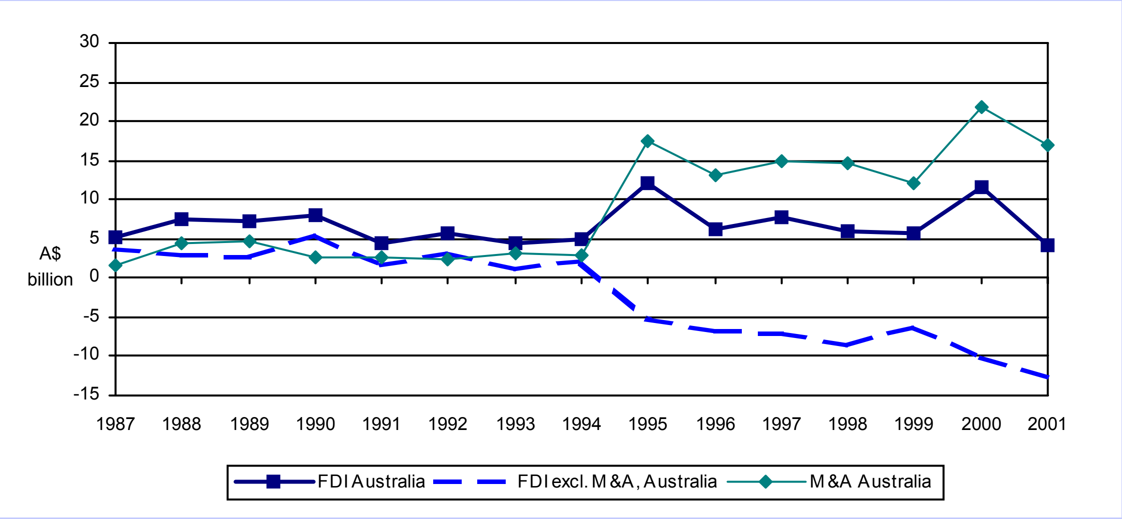


Figure 2-3: Annual FDI and M&A Inflows into Australia, 1987 to 2001

The fluctuations of the FDI series appear to be fluctuations of the M&A series. The importance of M&A inflows should not be too surprising considering that M&A deals are the most important factors behind overall FDI inflows for most OECD countries.[52] What is more surprising is that without the inclusion of M&A deals, other FDI forms (such as greenfield investment, reinvested earnings and capital transfers between related enterprises) decreased, i.e. disinvestments took place. While the share of M&A deals in total FDI inflows until 1994 varied between 29.4% in 1987 and 75.9% in 1993, M&A deals overtook and remained larger than total FDI inflows from 1995 onwards. The reduction of FDI excluding M&A deals was so large, that even taking into account the positive inflows between 1987 and 1994, cumulative inflows of FDI excluding M&A deals between 1985 and 2002 was negative US$ 34.4 billion. Hence, M&A deals have been vital in avoiding overall disinvestments.

---

includes cases where MNEs set up their own subsidiaries. For a more detailed definition and classification of M&A see UNCTAD (2000), pp.99-105.

[52] UNCTAD (2002)

According to UNCTAD (2002), the US$ 16.9 billion of FDI inflows from M&A deals in 2001 included the US$ 8.5 billion acquisition of Australian telecommunications company Cable & Wireless Optus Ltd by Singapore-based SingTel and the US$1.5 billion acquisition of Australian aluminium foundries producer Reynolds Australia Alumina by British miner Billiton PLC. Even if M&A data are not perfectly consistent with FDI data and may include transactions that are not included in FDI data, the trend seems significant enough not to be ignored. However, given that not much detail (in terms of number of observations, investment source or industry) is available on the two data series separately, the overall series was used for further analysis.

2.3.2 AGGREGATE FDI BY COUNTRY (1992 TO 2001)

Given that the motivation for investing in Australia may vary depending on the investment source, country-specific FDI is a central part of the analysis of the determinants of FDI, as will be shown in Chapter 4.2. Country-specific FDI data for Australia are available in annual form for ten years from 1992 to 2001. Firms from the US, the UK, Japan, the Netherlands and Germany are Australia's major foreign investors. Those five countries accounted for a combined total of 67% to 77% (74% on average) of Australia's inward FDI stock between 1992 and 2001 (Table 2-6). Firms from the US and the UK alone accounted for over 50% (or between A$ 59.2 billion and A$ 114.3 billion) of Australia's inward FDI stock, making Australia dependent on changes in investment motivations in those two countries (Table 2-6).

Table 2-6

FDI Stock in Australia by Geographical Origin (Top 5 Investors), 1992 to 2001

Year	US		UK		Japan		Netherlands		Germany		Others		Total
	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m
1992	32,588	*29.6*	26,647	*24.2*	14,979	*13.6*	3,940	*3.6*	2,157	*2.0*	29,735	*27.0*	110,046
1993	38,186	*31.2*	30,560	*25.0*	15,159	*12.4*	6,421	*5.2*	2,253	*1.8*	29,840	*24.4*	122,419
1994	35,684	*29.0*	29,800	*24.2*	15,137	*12.3*	7,928	*6.4*	2,481	*2.0*	31,935	*26.0*	122,965
1995	44,125	*31.6*	33,255	*23.8*	16,507	*11.8*	8,587	*6.1*	3,001	*2.1*	34,222	*24.5*	139,697
1996	44,412	*30.3*	37,326	*25.5*	15,865	*10.8*	8,093	*5.5*	4,142	*2.8*	36,708	*25.0*	146,546
1997	48,865	*31.6*	36,520	*23.6*	15,682	*10.1*	8,712	*5.6*	4,277	*2.8*	40,751	*26.3*	154,807
1998	59,592	*34.5*	42,270	*24.5*	14,619	*8.5*	7,466	*4.3*	4,463	*2.6*	44,166	*25.6*	172,576
1999	64,063	*34.8*	49,398	*26.8*	15,211	*8.3*	7,207	*3.9*	4,753	*2.6*	43,394	*23.6*	184,026
2000	55,698	*28.2*	58,560	*29.7*	15,993	*8.1*	10,065	*5.1*	5,067	*2.6*	51,842	*26.3*	197,225
2001	58,580	*28.1*	47,096	*22.6*	16,563	*7.9*	9,731	*4.7*	6,433	*3.1*	70,010	*33.6*	208,413
Average 1992-2001	**48,179**	***30.9***	**39,143**	***25.1***	**15,572**	***10.0***	**7,815**	***5.0***	**3,903**	***2.5***	**41,260**	***26.5***	**155,872**

Source: ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.17, Table 12a.

However, the share of FDI from the US, the UK, Japan, the Netherlands and Germany decreased from 73% in 1992 to 66.4% in 2001 (Figure 2-4 (a) & (b)). The US accounted for the largest share (29.6% in 1992 and 28.1% in 2001), though its share also decreased slightly. Significant investors included in the 'Others' category are France, Switzerland, New Zealand, Belgium/Luxembourg, Singapore, Canada, Malaysia, Hong Kong, South Africa, Ireland, Sweden, Korea, Italy and Taiwan. The share of investments from other investment sources has increased over time – from 27.0% in 1992 to 33.6% in 2001 (Figure 2-4 (a) & (b)). In particular investments from businesses based in Belgium/Luxembourg, France, Ireland, Asia (such as Hong Kong, Malaysia and Singapore) and Latin America have increased in both absolute and relative importance over time.[53]

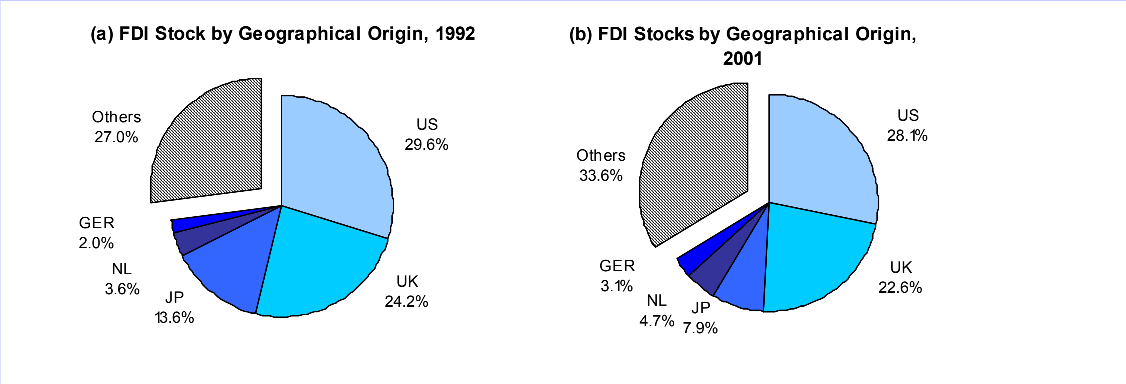


Figure 2-4 (a) & (b): FDI Stock in Australia by Geographical Origin, 1992 and 2001

Since this analysis will focus on the development of FDI in Australia over time (i.e. FDI flows), one should also explore country-specific FDI inflows. The top five investors, which accounted for about 74% of the FDI stock in Australia, accounted for an average of only 45.4% of the investment inflows between 1992 and 2001, suggesting a change and possibly diversification of investment sources (Table 2-7).

Average annual FDI inflows between 1992 and 2001 from countries in the 'Others' category accounted for 54.6% (A$ 5,480 million) of average total inflows and included significant average annual FDI inflows from Singapore (A$ 1,552 million), Switzerland (A$ 375 million), France (A$ 349 million), Belgium/Luxembourg (A$ 327 million), New Zealand (A$ 256 million), Malaysia (A$ 158 million), Hong Kong (A$ 134 million), Canada (A$ 77 million), South Africa (A$ 74 million), Ireland (A$ 69 million), Korea (A$ 55 million), Sweden (A$ 21 million) and the Philippines (A$ 6.7 million), while Indonesia (- A$ 1.4 million), Italy (- A$ 3.3 million), Taiwan (- A$ 6.8 million) and China (- A$ 10.3 million) disinvested during that period.[54]

Table 2-7

Annual FDI Inflows into Australia by Geographical Origin (Top 5 Investors), 1992 to 2001

Year	US		UK		Japan		Netherlands		Germany		Others		Total
	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m
1992	1,566	*20.1*	- 225	*-2.9*	616	*7.9*	840	*10.8*	226	*2.9*	4,769	*61.2*	7,792
1993	1,750	*27.7*	1,519	*24.1*	1,840	*29.2*	- 1,189	*-18.8*	149	*2.4*	2,239	*35.5*	6,308
1994	771	*11.2*	- 225	*-3.3*	1,065	*15.5*	318	*4.6*	237	*3.4*	4,713	*68.5*	6,879
1995	5,150	*31.9*	5,074	*31.4*	201	*1.2*	964	*6.0*	401	*2.5*	4,355	*27.0*	16,145
1996	3,831	*49.1*	1,470	*18.8*	- 542	*-6.9*	348	*4.5*	354	*4.5*	2,341	*30.0*	7,802
1997	3,028	*29.4*	31	*0.3*	472	*4.6*	-16	*-0.2*	189	*1.8*	6,586	*64.0*	10,290
1998	5,708	*59.7*	1,683	*17.6*	- 156	*-1.6*	- 574	*-6.0*	- 58	*-0.6*	2,956	*30.9*	9,559
1999	- 545	*-12.0*	1,498	*33.1*	414	*9.1*	856	*18.9*	791	*17.5*	1,517	*33.5*	4,531
2000	- 3,580	*-15.9*	13,988	*62.3*	2,013	*9.0*	938	*4.2*	138	*0.6*	8,959	*39.9*	22,456

[53] ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.17, Table 12a.

1992-2001 average	France	Switzer-land	NZ	Belgium/ LUX	Singa-pore	Ca-nada	Malay-sia	Hong Kong	South Africa	Ireland	Swe-den	Korea	Italy	Tai-wan
A$ billion	5.8	5.2	4.5	3.3	2.6	2.3	1.8	1.6	1.1	0.8	0.7	0.3	0.2	0.2
% of FDI Stock	2.8	2.5	2.2	1.6	1.3	1.1	0.9	0.8	0.5	0.4	0.4	0.1	0.1	0.1

[54] ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.9, Table 6a.

2001	2,172	*25.5*	- 12,057	*-141.5*	106	*1.2*	1 159	*13.6*	769	*9.0*	16,371	*192.1*	8,520
Average 1992-2001	**1,985**	***19.8***	**1,276**	***12.7***	**603**	***6.0***	**364**	***3.6***	**320**	***3.2***	**5,480**	***54.6***	**10,028**
Source: ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.9, Table 6a.													

Firms from the US, the UK, Japan, the Netherlands and Germany (with average annual FDI inflows ranging from A$ 340 million to A$ 1,985 million) remain Australia's major investment sources, though Singapore could be listed amongst them due to a massive A$ 13,538 million of FDI in 2001.[55] It was, however, excluded from the list of the top five investment sources since its annual average inflows between 1992 and 2000 were only A$ 220 million when excluding the outlier investment. Country-specific FDI inflows fluctuated substantially (see Figures 2-5 and 2-6 for the development of FDI inflows from Australia's top five investment sources) – as did aggregate FDI. It might therefore be possible to explain part of the variation of aggregate FDI by factors related to the investment source – as will be explored in Chapter 4-2.

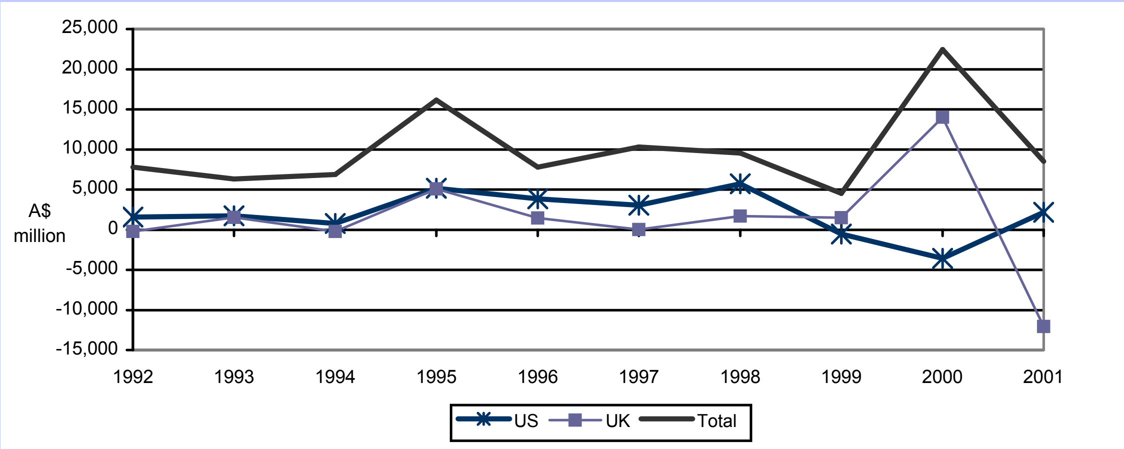


Figure 2-5: Annual FDI Inflows into Australia by Geographical Origin (US, UK and Total), 1992 to 2001

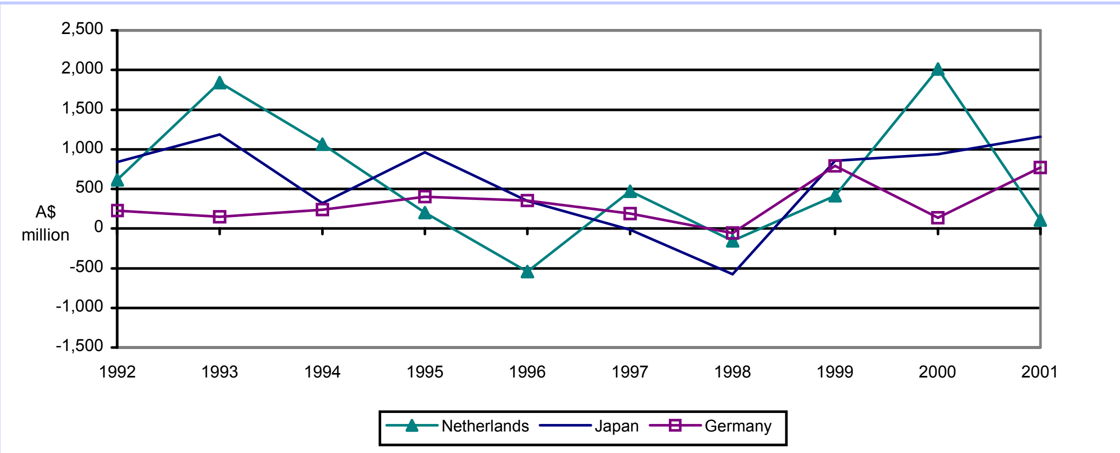


Figure 2-6: Annual FDI Inflows into Australia by Geographical Origin (Netherlands, Japan and Germany), 1992 to 2001

[55] Owing to the US$ 8.5 billion acquisition by Singtel.

2.4 INDUSTRY-SPECIFIC FDI

2.4.1 GENERAL INDUSTRY-SPECIFIC FDI (1992 TO 2001)

The motivation to invest in Australia may not only depend on the investment source, but also on the industry. Thus industry-specific FDI is another important element of the analysis of the determinants of FDI, as will be shown in Chapter 5. Industry-specific FDI data for Australia are available in annual form for the ten years between 1992 and 2001.

Compared with the composition of Australian GDP, foreign firms tend to invest proportionately more in the primary and the secondary (manufacturing) sector and proportionately less in the tertiary (service) sector.[56] Nevertheless, FDI in the tertiary sector – with an average of 47.9% of the total FDI stock between 1992 and 2001 – accounts for the largest share of FDI, followed by manufacturing (with an average of 30.8%) and primary industries (with an average of 15.7%) (Table 2-8). Looking at Figure 2-7 (a) & (b) in combination with Table 2-8, the FDI stock in Australia does not seem to have changed significantly between 1992 and 2001 – except for a larger share of unspecified FDI, which could be part of the primary, secondary or tertiary sector.

[56] Between 1992 and 2001, primary industry accounted for an average of 8.5% of GDP, manufacturing for 13.4% and services for 64.0%. Hence, the primary industry and manufacturing are overrepresented in terms of FDI, while services are underrepresented. GDP data: dxEcondata, ABS National Accounts (2003/04), Summary Tables and Productivity Estimates, Table 5204-11: Industry Gross Value Added: Current Prices (percent).

Table 2-8

FDI Stocks in Australia by Sector, 1992 to 2001									
	Primary		Secondary		Tertiary		Unspecified		Total
	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m
1992	18,998	*17.3*	33,482	*30.4*	50,365	*45.8*	7,201	*6.5*	110,046
1993	21,412	*17.5*	41,036	*33.5*	54,219	*44.3*	5,752	*4.7*	122,419
1994	20,360	*16.6*	40,962	*33.3*	57,142	*46.5*	4,501	*3.7*	122,965
1995	21,356	*15.3*	47,387	*33.9*	65,861	*47.1*	5,093	*3.6*	139,697
1996	20,998	*14.3*	45,518	*31.1*	77,320	*52.8*	2,710	*1.8*	146,546
1997	21,556	*13.9*	49,419	*31.9*	82,010	*53.0*	1,822	*1.2*	154,807
1998	23,813	*13.8*	54,889	*31.8*	83,378	*48.3*	10,496	*6.1*	172,576
1999	29,519	*16.0*	57,611	*31.3*	82,200	*44.7*	14,696	*8.0*	184,026
2000	30,769	*15.6*	53,087	*26.9*	101,050	*51.2*	12,319	*6.2*	197,225
2001	36,620	*17.6*	56,943	*27.3*	93,646	*44.9*	21,204	*10.2*	208,413
Average 1992-2001	**24,540**	***15.7***	**48,033**	***30.8***	**74,719**	***47.9***	**8,579**	***5.5***	**155,872**
Source: ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.15, Table 11a.									

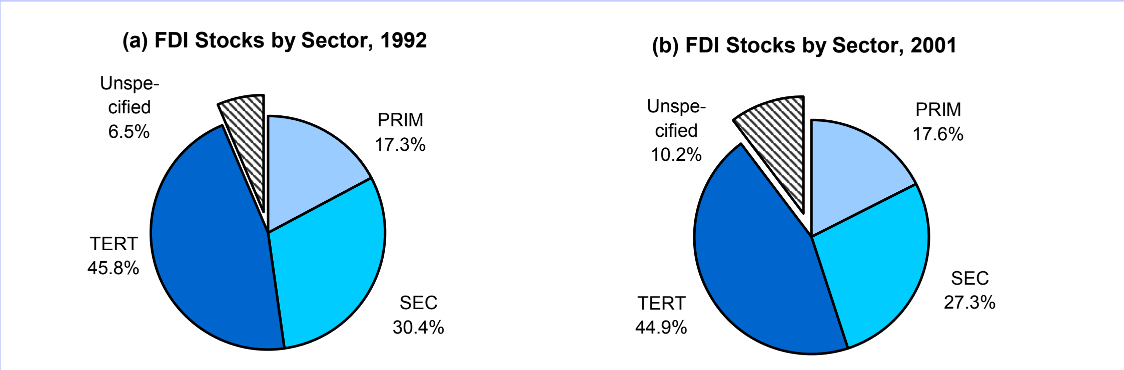


Figure 2-7 (a) & (b): FDI Stock in Australia by Sector, 1992 and 2001

Looking at some of the sectors in more detail, industries such as manufacturing (which is not available in disaggregated form), mining, business services, finance and wholesale trade dominated Australian FDI (Figure 2-8 (a) & (b)). The five industries combined accounted for 85.5% and 77.5% of the FDI stock in 1992 and 2001 respectively. Mining accounted for over 95% of the FDI stock in the primary sector, while finance, business activities and wholesale trade made up over three quarters of the FDI stock in the tertiary industry.[57]

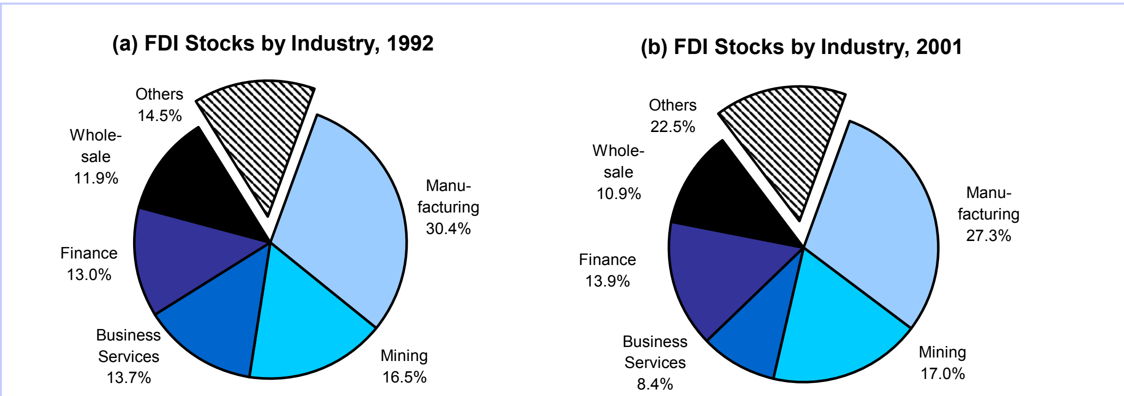


Figure 2-8 (a) & (b): FDI Stock in Australia by Industry, 1992 and 2001

[57] ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.15, Table 11a.

As discussed in the section on country-specific FDI, this analysis will focus on the development of industry-specific FDI in Australia over time, i.e. industry-specific FDI inflows (Table 2-9).

Table 2-9

Annual FDI Inflows into Australia by Sector, 1992 to 2001									
	Primary		Secondary		Tertiary		Unspecified		Total
	A$ m	%	A$ m	%	A$ m	%	A$ m	%	A$ m
1992	287	*3.7*	2,788	*35.8*	1,541	*19.8*	3,176	*40.8*	7,792
1993	-286	*-4.5*	2,184	*34.6*	3,254	*51.6*	1,156	*18.3*	6,308
1994	890	*12.9*	2,110	*30.7*	1,826	*26.5*	2,053	*29.8*	6,879
1995	1,779	*11.0*	4,738	*29.3*	6,905	*42.8*	2,723	*16.9*	16,145
1996	189	*2.4*	- 879	*-11.3*	7,370	*94.5*	1,122	*14.4*	7,802
1997	1,812	*17.6*	2,915	*28.3*	4,227	*41.1*	1,336	*13.0*	10,290
1998	2,939	*30.7*	319	*3.3*	2,571	*26.9*	3,730	*39.0*	9,559
1999	- 91	*-2.0*	2,942	*64.9*	3,867	*85.3*	-2,187	*-48.3*	4,531
2000	5,063	*22.5*	175	*0.8*	16,252	*72.4*	966	*4.3*	22,456
2001	4,045	*47.5*	1,318	*15.5*	- 6,023	*-70.7*	9,180	*107.7*	8,520
Average 1992-2001	**1,663**	***16.6***	**1,861**	***18.6***	**4,179**	***41.7***	**2,325**	***23.2***	**10,028**
Source: ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.7, Table 5a.									

With an annual average of 41.7% (A$ 4,179 million), the tertiary sector has received the largest share of FDI inflows into Australia, though it also experienced disinvestments valued at A$ 6,023 million in 2001. The share of the tertiary sector in Australia's FDI inflows is lower than its share of Australia's inward FDI stock. This is also the case for manufacturing, which received an annual average of only 18.6% (A$ 1,861 million) of FDI inflows, while the primary sector received a similar share with 16.6% (A$ 1,663 million). Unspecified investments – with an average of 23.2% (A$ 2,325 million) – were significantly higher than their share of the inward FDI stock and accounted for the second largest share of FDI inflows, making it difficult to interpret the development of FDI inflows to the individual sectors, as it is unclear which percentage of unspecified FDI belongs to which sector.

Looking at Figure 2-9, industry-specific FDI inflows have the same characteristic as aggregate and country-specific FDI inflows, i.e. a high degree of fluctuation. Since part of the variation of aggregate FDI may be explained by industry factors, industry-specific FDI inflows will be analysed in more detail in Chapter 5. Overall, there was a slight upward trend for FDI inflows in the primary and – if the A$ 6,023 million disinvestment in 2001 is excluded – in the tertiary sector, while the secondary sector experienced a downward trend. Those trends are difficult to interpret, as they do not take into account the large amount of unspecified investment.

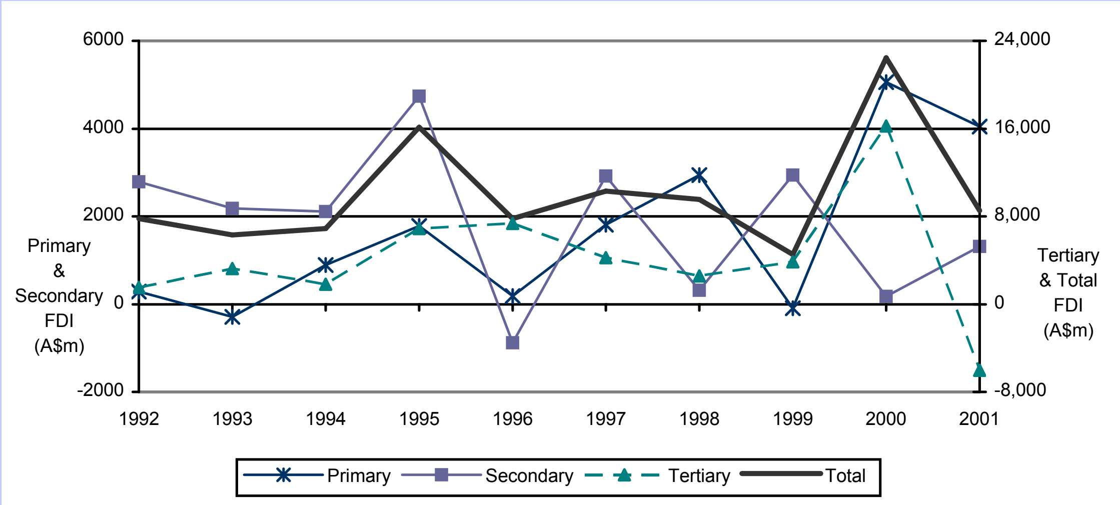


Figure 2-9: Annual FDI Inflows into Australia by Sector, 1992 to 2001

2.4.2 INDUSTRY-SPECIFIC FDI BY COUNTRY (1992 TO 2001)

Having discussed both country-specific and industry-specific FDI in Australia separately, the question arises whether FDI inflows depend on a combination of industry-specific and country-specific factors. This seems likely as countries tend to have different strengths and thus specialise in different industries. Table 2-10 supports this thought. Firms from certain countries seem to dominate certain industries. US and British firms, for instance, dominate the industrial sector, Japanese firms the tertiary sector and British firms the finance and insurance industry.

Table 2-10

Largest Affiliates of Foreign MNEs in Australia, 2000				
Company	**Home Economy**	**Industry***	**Sales**	**Employees**
Industrial* (Top 5)				
Shell Australia	Netherlands/UK	Petroleum	5,784	---
Coca-Cola Amatil	US	Beverages	4,582	---
BP Australia	UK	Petroleum	4,412	3,000
Mobil Oil Australia	US	Petroleum	3,955	2,000
IBM Australia	US	Electrical & electronic equipment	3,613	10,000
Tertiary* (Top 5)				
Mitsui & Co. (Australia)	Japan	Trade	10,706	141
Toyota Motor Corp. Aust.	Japan	Trade	5,381	4,350
Leighton Holdings	Germany	Construction	4,167	---
Marubeni Australia	Japan	Trade	2,252	100
Itochu Australia	Japan	Trade	2,173	1,008
Finance and Insurance* (Top 5)				
Royal & Sun Alliance Australia Holdings Ltd	UK	Insurance	12,461	1,400
SG Australia Ltd	France	Finance	7,404	300
HSBC Bank Australia Ltd	UK	Finance	5,921	950
Bank of Tokyo-Mitsubishi (Australia) Ltd	Japan	Finance	2,794	110
Winterthur Holdings Australia Ltd	Switzerland	Insurance	2,343	1,700

* Sector categories and industries are as stated in the UNCTAD publication. ---: not available
Source: UNCTAD (2003), p.25, Table 88.

Data on industry-specific FDI in Australia are available from the US, the UK, Germany and Japan, which together accounted for an average of 69% of the Australian inward FDI stock and 42% of the Australian FDI inflow between 1992 and 2001. Starting with the FDI stock, Table 2-11 shows that firms from different countries invest in the three sectors to a different degree. In earlier years, firms from the US and the UK had a significant share of their FDI in the primary sector (25% and 31% respectively), while only a small amount of FDI by German firms was based in that sector. Most of the German FDI stock was based in the tertiary sector (51% in 1992 and 73% in 2001). All three countries had a significant share of FDI (between 20% and 38%) in the manufacturing sector.

Table 2-11

Industry-Specific FDI Stock from the US, the UK and Germany in Australia, 1992 and 2001

%		Industry as % of Total FDI in AUS				FDI as % of AUS FDI	FDI in AUS as % of Global FDI
		Primary	Secondary	Tertiary	Unspecified		
US	**1992**	25	38	36	1	30	3
	2001	31	20	41	8	28	2
UK	**1992**	31	26	43	0	24	7
	2001	14	26	55	5	23	2
Germany	**1992**	3	36	51	10	2	1
	2001	---	21	73	6	2	1
For comparison: Total AUS	**1992**	17	30	46	7	100	n.a.
	2001	18	27	45	10	100	n.a.

Note: Japan only publishes data on FDI inflows, not FDI stocks in Australia. The Primary Sector for Germany only includes Mining, while agriculture is included in Other.

- Primary includes Agriculture, Mining, Petroleum
- Secondary includes Chemicals, Metals, Machinery, Electrical Transport, Food, Wood, Paper, etc. Manufacturing
- Tertiary includes Utilities, Construction, Retail/Wholesale Trade, Hotels, Transport/Communications, Finance/Banking, Insurance, Real Estate, Business Services, etc

n.a.: not applicable, ---: not included

Data Sources: BEA, UK National Statistics, Deutsche Bundesbank & ABS, see Appendix A.4, Table A.6.

The data also indicate that the industry-specific FDI stock in the US, the UK and Germany changed more than Australia's total industry-specific FDI stock, which remained stable (Figure 2-6 (a) & (b)). The manufacturing FDI share fell for US and Germany, while the FDI share in the primary sector fell for the UK. The US FDI share increased slightly in the primary and tertiary sector, while both the UK and the German FDI share increased in the tertiary sector. Table 2-12 supports this trend. Most average annual Australian FDI inflows from the US, Germany and Japan went into the tertiary sector. The share (ranging from 45% to 86% of average annual inflows) was higher than the Australian average of 42% of average annual inflows. UK businesses invested primarily in the manufacturing sector (36% of average annual inflows), while a significant amount of average annual FDI inflows from Japan and the UK went to the primary sector.

Table 2-12

Industry-Specific FDI Inflows from the US, the UK, Germany and Japan in Australia, 1992 and 2001

%		Sector as % of Total FDI in AUS				FDI in AUS as % of Global FDI
		Primary	Secondary	Tertiary	Unspecified	
US*	**av 1992-2000**	6	21	45	28	2
UK	**av 1992-2001**	21	36	30	13	2
Germany**	**av 1992-2001**	0	8	86	6	1
Japan	**av 1992-2001**	23	20	57	0	3
For Comparison: Total AUS	**av 1992-2001**	17	19	42	22	n.a.

Note: av = average. n.a.: not applicable. * Unspecified for US FDI includes Agriculture, Mining, Construction, Transport, Utilities and Retail Trade. ** Change in German FDI Stock in Australia is used as an approximation for German FDI Inflow since this data series is not available.

Data Sources: BEA, UK National Statistics, Deutsche Bundesbank, Japanese Ministry of Economy, Trade and Industry & ABS, see Appendix A.4, Table A.6.

Given that the ABS does not provide details on manufacturing FDI, the combination of statistics from the US, UK, Germany and Japan on detailed manufacturing FDI stocks and inflows in Australia helps to get an idea of Australia manufacturing FDI. Looking at manufacturing FDI stocks for FDI from the US, the UK and Germany, the chemical industry was the largest FDI recipient within the manufacturing sector, though its relative importance has decreased over time for FDI from all three countries (Table 2-13). Machinery (with an increasing share of the manufacturing FDI stock) and food (with decreasing relative importance) are the other major industries for FDI from the US, while FDI in transport equipment has increased in relative importance for the US and Germany.

Table 2-13

FDI Stocks in various Manufacturing Industries as a Percentage of Manufacturing FDI Stocks in Australia – FDI from the US, the UK and Germany in Comparison, 1992 and 2001

%		Chemicals	Metals	Machinery	Electrical	Transport	Other Manufacturing	Incl. Food	Incl. Textile, Paper, Wood
US	**1992**	35	3	7	4	7	44	21	9
	2001	26	10	10	1	19	34	18	7
UK	**1992**	39		20		4	37	6	13
	2001	17		20		0	63	11	9
Germany	**1992**	47	--	6	19	5	22	---	---
	2001	22	--	6	23	14	35	---	---

Note: Japan only publishes data on FDI inflows, not FDI stocks in Australia. German FDI includes FDI in Australia and New Zealand, however New Zealand only accounts for 4% of the combined FDI stock in 1992 and 5% in 2001. ---: not included.

Data Sources: BEA, UK National Statistics, Deutsche Bundesbank, see Appendix A.4, Table A.6.

In terms of manufacturing FDI inflows, FDI between 1992 and 2001 went primarily to the chemicals and transport industry for US FDI, to the chemical and food industry for UK FDI, to the transport industry for German FDI and to the machinery and food industry for Japanese FDI (Table 2-14). Disinvestments were made by US firms in the electrical industry, by UK firms in the textile, paper and wood industry and by German firms in the chemicals industry.

Table 2-14

FDI Inflows in various Manufacturing Industries as a Percentage of Manufacturing FDI Inflows in Australia– FDI from the US, the UK, Germany and Japan in Comparison, 1992 and 2001

%		Chemi-cals	Metals	Machinery	Elec-trical	Trans-port	Other manufacturing	Incl. Food	Incl. Textile, Paper, Wood
US*	**av 1992-2000**	32	2	12	-1	23	32	11	---
UK	**av 1992-2001**	32		17		1	50	57	-7
Germany	**av 1992-2001**	-71	---	2	30	49	90	---	---
Japan	**av 1992-2001**	2	27	3	4	15	49	42	5

av = average. ---: not included

Data Sources: BEA, UK National Statistics, Deutsche Bundesbank, Japanese Ministry of Economy, Trade and Industry, see Appendix A.4, Table A.6.

In contrast to manufacturing FDI, the ABS provides details on FDI stocks and inflows in various services industries. One can compare those figures with country- and industry-specific statistics from the US, the UK, Germany and Japan to see whether differences in the investment behaviour of firms from different countries exist. Finance was the largest industry for service FDI from the US (49% of the service FDI stock in 1992 and 66% in 2000), the UK in 1992 (with 29%) and Germany in 2001 (69%), while trade (including wholesale and retail trade) was the most important industry for service FDI from the UK in 2001 (with 42% of the service FDI stock) and service FDI from Germany in 1992 (55%) (Table 2-15). Other important industries include utilities for service FDI from the US in 2000 (38%) and transport and communications for service FDI from the UK (19% in 1992 and 16% in 2001). Overall, trade (in particular wholesale trade) was the largest industry for service FDI in Australia, followed by finance and – in 2001 – utilities.

Table 2-15

FDI Stocks in various Service Industries as a Percentage of Service FDI Stocks in Australia – FDI from the US, the UK, Germany and the Australian Total in Comparison, 1992 and 2001											
%		**Uti-lities**	**Construc-tion**	**Wholesale Trade**	**Retail Trade**	**Hotels**	**Transport, Communications**	**Finance**	**Incl. Insurance**	**Business activities**	**Other**
US*	**1992**	---	3	27	13	2	0	49	4	6	0
	2000	38	0	18	3	2	-39	66	8	12	0
UK	**1992**	0	2	9		14	19	29	---	---	27
	2001	---	---	42		---	16	35	---	7	0
Germany	**1992**	---	---	55		---	---	45	24	---	---
	2001	---	---	31		---	---	69	23	---	---
Total AUS	**1992**		2	26	7	4	2	29	---	30	0
	2001	10	4	24	3	3	6	31	---	19	0
---: not included.											
Data Sources: BEA, UK National Statistics, Deutsche Bundesbank, Japanese Ministry of Economy, Trade and Industry, see Appendix A.4, Table A.6.											

In terms of service FDI inflows, FDI between 1992 and 2001 went primarily into the finance industry (between 70% to 75% of average annual service FDI inflows from the US, the UK, Germany and Japan), followed by trade (between 9% to 28%) (Table 2-16). Utilities, construction, transport and communications firms from the UK made disinvestments. The US, the UK, Germany and Japan were particularly strong investors in the finance industry, as only 35% of overall service FDI inflows went into finance, i.e. other countries must have invested less in finance and more in other service industries.

Table 2-16

FDI Inflows in various Service Industries as a Percentage of Service FDI Inflows in Australia – FDI from the US, the UK, Germany, Japan and the Australian Total in Comparison, 1992 and 2001											
%		**Utilities**	**Construc-tion**	**Wholesale Trade**	**Retail Trade**	**Hotels**	**Transport, Communi-cations**	**Finance**	**Incl. Insu-rance**	**Business activities**	**Other**
US	**av 1992-2000**	---	---	9	---	---	---	73	---	---	18
UK	**av 1992-2001**	-2	-5	28		0	-26	75	---	20	10
Germany	**av 1992-2001**	---	---	25		---	---	75	23	---	---
Japan	**av 1992-2001**	---	1	15		---	1	70	---	13	---
Total AUS	**av 1992-2001**	15	4	24	3	0	15	35	---	4	0
* Change in US FDI Stock in Australia is used as an approximation for US FDI Inflow since this data series is in not enough detail available. ---: not included											
Data Sources: BEA, UK National Statistics, Deutsche Bundesbank, Japanese Ministry of Economy, Trade and Industry & ABS, see Appendix A.4, Table A.6.											

2.5 FIRM-LEVEL DATA AND SURVEYS

Having discussed the datasets that will be used for further analysis, i.e. aggregate FDI data, country-specific FDI data and industry-specific FDI data, the only missing link is firm-level data. Firm-level data link the analysis of FDI, for which aggregated datasets are used, back to the MNE theory, which is based on the decision-making of individual firms. While firm-level data are too incomplete to be used for further econometric analysis, looking at the data qualitatively is still useful.

2.5.1 ABS SURVEY (2000/01)

The ABS (2004a) has released a good survey of majority foreign-owned businesses in Australia including details on number of businesses, number of employees, industry value added, operating profits (before tax) and gross fixed capital formation.[58] The data in Table 2-17 – at least partly, as one refers to majority foreign-owned businesses, while the other refers to businesses with 10% or more foreign ownership – should link back to data on the country-specific FDI stock in Australia (discussed in Chapter 2.3.2), while Table 2-18 should link back to data on the industry-specific FDI stock in Australia (discussed in Chapter 2.4.1).

In 2000/01, there were 7,864 majority foreign-owned businesses in Australia, employing 783,300 people, accounting for only 1.2% of the number of all businesses in Australia but 12.3% of employment (Table 2-17). These foreign-owned businesses contributed A$ 78.1 billion (20.8%) to industry value added, A$ 24.1 billion (19.0%) to pre-tax operating profits and A$ 12.6 billion (25.2%) to gross fixed capital formation in Australia. The average majority foreign-owned business employs more people and contributes more to the Australian economy than the average Australian-owned business. On average, foreign majority-owned businesses employ 100 people, contribute A$ 9.9 million in industry value added, produce A$ 3.1 million in pre-tax operating profits and have a gross fixed capital formation of A$ 1.6 million (ABS, 2004a).

The US was by far the most important investment source for Australia, accounting for 44% of businesses, 42% of employment, 43% of value added, 37% of operating profits and 33% of gross fixed capital formation of majority foreign-owned businesses in Australia. Firms from the Europe (in particular the UK and Germany) and New Zealand were other important investors, accounting for 21% (10%, 5%) and 11% of majority foreign-owned businesses respectively. Majority foreign-owned firms from the EU and Switzerland combined contributed less to the Australian economy in terms of number of businesses (1,679), employment (308,700), industry value added (A$ 29.3 billion) than US-owned businesses. They are slightly bigger in terms of gross fixed capital formation (A$ 5.2 billion) and have higher operating profits (A$ 12.8 billion). Looking at the average foreign-owned businesses, Dutch and British firms contributed most to the Australian economy in terms of employment (962 and 177 people per business respectively), industry value added (A$ 26.7 million and A$ 21.6 million) and gross fixed capital formation (A$ 22.2 million and A$ 4.7 million). British firms performed best in terms of pre-tax operating profits (A$ 12.1 million per business) (ABS, 2004a).

[58] Other details available are total operating income/expenses and total assets/liabilities.

Table 2-17

Level of Majority Foreign-Owned Business Activity* in Australia by Country, 2000/01												
	Total	**US**	**UK**	**Japan**	**Germany**	**Switzerland**	**New Zealand**	**Netherlands**	**Other**	**EU**	***For Comparison: Australia Total***	***Foreign Businesses as % of Businesses in Australia***
Number of Businesses	7,864	3,439	792	347	378	167	871	45	1,825	1,512	*641,828*	1.2
Employment ('000)	783.3	331.0	140.5	41.9	28.3	40.2	39.4	43.3	118.4	268.5	*6,379.1*	12.3
Average number of employees per business	100	96	177	121	75	241	45	962	65	178	*9.9*	---
Industry Value Added (A$ b)	78.1	33.9	17.1	6.4	3.6	3.0	2.4	1.2	10.5	26.3	*375.4*	20.8
Average Industry Value Added per business (A$ m)	9.9	9.9	21.6	18.4	9.5	18.0	2.8	26.7	5.8	17.4	*0.6*	---
Operating Profits before tax (A$ b)	24.1	8.8	9.6	2.3	1.4	0.3	-0.1	-0.6	4.8	12.3	*126.8*	19.0
Average Operating Profits (before tax) per business (A$ m)	3.1	2.6	12.1	6.6	3.7	1.8	-0.1	-13.3	2.6	8.1	*0.2*	---
Gross Fixed Capital Formation (A$ b)	12.6	4.1	3.7	1.1	1.2	0.3	1.1	1.0	0.1	4.9	*50.0*	25.2
Average Gross Fixed Capital Formation per business (A$ m)	1.6	1.2	4.7	3.2	3.2	1.8	1.3	22.2	0.1	3.2	*0.1*	---

** All Industries excluding Agriculture, Forestry and Fishing*

Source: ABS (2004a)

In 2000/01, most foreign-owned businesses in Australia operated in wholesale trade, property and business services, manufacturing (in particular chemicals) and construction (Table 2-18). In relative terms, they were overrepresented (representing more than 1.2% of the number of businesses) in mining (with 11.8% of all businesses), utilities (8.2%) and chemicals manufacturing (7.5%), but also in wholesale trade, finance and insurance, food, metals and machinery manufacturing and property and business services. Most people employed by foreign-owned businesses were employed in manufacturing (in particular machinery), property and business services, wholesale and retail trade. Majority foreign-owned businesses were underrepresented (representing less than 12.3% of employment) in construction, textile, clothing and footwear manufacturing, accommodation and restaurants and retail trade, but had an employment share of 36.5% in chemicals manufacturing, 34.1% in machinery manufacturing and 28.3% in mining (ABS, 2004a).

In terms of industry value added, operating profits and gross fixed capital formation, majority-foreign owned businesses in manufacturing and mining contributed the most, while majority foreign-owned businesses in wholesale trade and property and business services were important in terms of industry value added, businesses in finance and insurance in terms of operating profits and businesses in transport, storage and communication industries in terms of gross fixed capital formation. Majority foreign-owned businesses were overrepresented in their contribution to industry value added, in terms of pre-tax operating profits and gross fixed capital formation in mining, manufacturing (in particular chemicals, metals and machinery), while businesses in wholesale trade were overrepresented both in terms of industry value added and operating profits and businesses in transport, storage and communication in terms of gross fixed capital formation.

Table 2-18

Level of Majority Foreign-Owned Business Activity in Australia by Industry, 2000/01

	Mining	Manufacturing							Utilities	Construction	Wholesale Trade	Retail Trade	Accommodation, Restaurants	Transport, Communications	Finance/Insurance	Property/ Business Services	Other Industries
		Total	Food	Textile, Clothing, Footwear	Chemicals	Metals	Machinery	Other									
Number of Businesses	169	821	84	36	233	151	160	157	23	809	1746	99	114	287	632	2600	564
Number of Businesses (% of Industry total)	*11.8*	*1.7*	*2.2*	*0.8*	*7.5*	*1.6*	*1.6*	*0.9*	*8.6*	*0.9*	*3.8*	*0.1*	*0.3*	*0.8*	*2.6*	*1.8*	*0.5*
Employment ('000)	19.6	214.4	51.1	4.4	36.3	24.4	68.8	29.4	8.2	20.0	92.7	85.3	32.2	60.6	54.0	154.8	41.2
Employment (% of Industry total)	*28.3*	*22.7*	*26.9*	*7.7*	*36.5*	*16.8*	*34.1*	*11.7*	*17.1*	*5.6*	*19.9*	*7.8*	*6.9*	*13.6*	*17.6*	*14.6*	*3.7*
Industry Value Added (A$ b)	15.3	24.8	5.1	0.3	4.9	5.1	6.1	3.3	3.1	1.6	9.5	2.6	1.1	5.4	N/a	10.8	3.9
Industry Value Added (% of Industry total)	*44.9*	*34.5*	*34.7*	*11.5*	*49.5*	*37.5*	*45.2*	*18.8*	*20.8*	*7.5*	*31.3*	*7.4*	*7.6*	*12.9*	*N/a*	*17.7*	*7.7*
Operating Profits before tax (A$ b)	7.9	6.8	1.5	0.0	1.5	2.4	0.7	0.7	0.1	0.3	2.1	0.2	0.0	-0.3	6.6	1.2	-0.8
Operating Profits before tax (% of Industry total)	*49.4*	*43.9*	*39.5*	*40.0*	*68.2*	*63.2*	*36.8*	*18.9*	*1.3*	*8.1*	*33.9*	*3.6*	*1.4*	*-3.4*	*14.9*	*9.5*	*-9.8*
Gross Fixed Capital Formation (A$b)	3.2	3.5	0.5	0.0	0.9	1.0	0.7	0.4	0.6	0.1	0.5	0.3	0.1	3.8	-0.8	0.4	1.0
Gross Fixed Capital Formation (% of Industry total)	*41.6*	*42.2*	*26.3*	*15.0*	*60.0*	*55.6*	*58.3*	*23.5*	*13.6*	*3.8*	*23.8*	*14.3*	*3.8*	*29.5*	*-100.0*	*9.8*	*21.3*

Source: ABS (2004a)

2.5.2 FIRM-LEVEL DATA (2002 TO 2004)

To complete the picture of FDI in Australia, some new investments (FDI inflows) were looked at to add to the previously discussed data of already established foreign firms (FDI stock) in Australia. This was done by looking at a list of investments undertaken during a specific time period, in this case using a database of 391 investment projects in Australia announced between January 2002 and July 2004. These 391 investments were expected to lead to US$ 62.4 billion in FDI and the creation of at least 21,547 jobs. Most announced investments were new investments (335 or 86% of all projects), but there were also some expansions (56 or 14%) (Table 2-19).

Table 2-19

FDI Projects in Australia (monthly and annual data), 2002 to 2004

		Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual Total
Projects	**2002**	8	18	29	7	11	9	7	5	13	9	6	5	127
	2003	8	16	15	11	16	16	16	30	11	16	13	7	175
	2004	10	14	15	15	11	18	6	---	---	---	---	---	89
Investment (US$m)	**2002**	92	1,284	1,368	416	5,141	107	264	815	127	423	46	525	10,608
	2003	463	1,970	1,274	4,194	1,896	1,144	209	782	959	11,060	404	1,420	25,775
	2004	237	2,408	16	3,098	0	20,201	20	---	---	---	---	---	25,980
Jobs	**2002**	365	670	2,940	1,070	460	365	530	0	210	521	362	1,085	8,578
	2003	1,325	1,700	2,135	125	410	365	1,460	643	1,590	147	625	280	10,805
	2004	0	528	490	90	156	300	600	---	---	---	---	---	2,164

Source: FDI Data Exchange Service provided to Invest Victoria by OCO Consulting (in cooperation with the World Bank), 01/2002 – 07/2004

On average, every investment project was expected to create 55 jobs and lead to US$ 159.5 million in FDI. If only the projects for which job information was available were considered (i.e. ignoring the 35 projects without employment information), the number increased to 60.5 jobs per project. Based on the total capital investment of US$ 62.4 billion, one job was created for every US $2.9 million invested. However, this number was somewhat biased, since the 35 projects without employment information accounted for US$ 53.4 billion of capital investment. Excluding those projects, one job was created for every US$ 0.4 million invested.

Given that one of the problems with data availability was that no FDI data are available on state level, this database is also useful in providing some information on state-specific FDI. Between January 2002 and July 2004, most FDI projects went into New South Wales (33% of all projects), followed by Victoria (20%) and Queensland (13%) (Table 2-20). In terms of capital invested, Western Australia received by far the largest share (41% of FDI), followed by New South Wales (8%) and Victoria (5%). However, the data on Western Australia include a massive US$ 20 billion real estate project to be built over 30 years. Most jobs were created in Victoria (27%), followed by Queensland and New South Wales (23% and 14% respectively). South Australia and Tasmania only received a small share of foreign projects, investment and employment.

Table 2-20

FDI Projects in Australia by State, 2002 to 2004

	NSW	QLD	VIC	WA	NT	TAS	SA	ACT	N/A
Projects	128	52	80	26	7	5	18	2	73
%	*32.7*	*13.3*	*20.5*	*6.6*	*1.8*	*1.3*	*4.6*	*0.5*	*18.7*
Investment (US$m)	5,042	1,413	3,155	25,842	1,542	0	979	0	24,390
%	*8.1*	*2.3*	*5.1*	*41.4*	*2.5*	*0.0*	*1.6*	*0.0*	*39.1*
Jobs	2,994	4,930	5,891	1,740	1,240	380	1,985	6	2,381
%	*13.9*	*22.9*	*27.3*	*8.1*	*5.8*	*1.8*	*9.2*	*0.0*	*11.1*

Source: FDI Data Exchange Service provided to Invest Victoria by OCO Consulting (in cooperation with the World Bank), 01/2002 – 07/2004

The investment projects were also analysed by industry (Table 2-21) to see whether the trends in FDI projects are similar to those described in Chapter 2.4. However, one has to be careful with direct comparison, as the projects are divided into different industry classifications than the ones discussed above.

Table 2-21

FDI Projects in Australia by Industry, 2002 to 2004

	BFS	CHEM	CONS	ELEC	FOOD	HEAVY	ICT	LIFE	LIGHT	LOG	PROP	TRAN

Projects	37	11	12	13	38	73	104	9	22	8	32	32
% of all Projects	*9.5*	*2.8*	*3.1*	*3.3*	*9.7*	*18.7*	*26.6*	*2.3*	*5.6*	*2.0*	*8.2*	*8.2*
Investment (US$m)	3,185	1,886	2,270	1	256	26,136	3,638	46	1,211	48	20,687	2,999
% of all FDI	*5.1*	*3.0*	*3.6*	*0.0*	*0.4*	*41.9*	*5.8*	*0.1*	*1.9*	*0.1*	*33.2*	*4.8*
Jobs	2,319	1,145	300	750	1,405	4,485	2,753	210	420	100	2,963	4,697
% of all Jobs	*10.8*	*5.3*	*1.4*	*3.5*	*6.5*	*20.8*	*12.8*	*1.0*	*1.9*	*0.5*	*13.8*	*21.8*
Main Recipient	NSW	WA	NSW, VIC	NSW	NSW	QLD, WA	NSW	NSW	VIC	NSW, NT, VIC	NSW	VIC

BFS: Business & Financial Services, CHEM: Chemicals, Plastics & Rubber, CONS: Consumer Products, ELEC: Electronics, FOOD: Food, Beverages & Tobacco, HEAVY: Heavy Industry (incl. Energy, Machinery, Metals & Mining), ICT: Information Technology, Software & Telecom, LIFE: Life Sciences, LIGHT: Light Industry (incl. Building Materials, Paper, Textiles & Wood), LOG: Logistics & Distribution, PROP: Property, Tourism & Leisure, TRAN: Transport Equipment (incl. Automotive & Aerospace).

Source: FDI Data Exchange Service provided to Invest Victoria by OCO Consulting (in cooperation with the World Bank), 01/2002 – 07/2004

Most announced projects were in the information and communications industry (ICT) industry (27% of all projects), followed by heavy industry (19%), including metals, machinery, mining and energy. In terms of capital invested, heavy industry (42% of FDI) and property, tourism and leisure (33%) were the most important industries. The transport equipment industry (22% of employment) and heavy industry (21%) dominated in terms of employment. New South Wales received most of the FDI projects in business and financial services industry, the consumer products industry, the electronics industry, the food industry, ICT, the life science industry, logistics, property, tourism and leisure, while Victoria dominated in terms of consumer goods, light industry (including textiles, paper, wood products and building materials), logistics and distribution, and transport equipment. Logistics and distribution was also the Northern Territory's most important industry for investment projects. Both Western Australia and Queensland performed well in the heavy industry, while Western Australia also received most of the projects in the chemicals industry.

Looking at the investment source, the US, the UK and Japan were the largest investors in Australia in terms of number of projects and number of jobs created, while firms from the US, the Netherlands and Japan were the leading investors in terms of capital invested (Table 2-22). New South Wales was dominated for projects from US, UK, Japanese, Canadian, Indian and other businesses[59], while Victoria was popular with Japanese, German, Dutch and Indian businesses. Queensland attracted investment from Canada and Hong Kong.

[59] The observation that NSW was popular with Japanese companies in 2002-2004 goes well with Edgington's (1990) analysis of Japanese business and FDI in Australia between 1957 and 1985 and his finding that Japanese-controlled manufacturing employment is concentrated in Sydney and Melbourne, while Japanese-controlled corporate head offices tend to be located in Sydney, while Queensland and WA have benefited from investment in resources. Looking at 2002-2004 data, Japanese businesses did indeed set up most of their manufacturing operations in Melbourne, while Japanese businesses in heavy industries invested in Queensland and WA, though NSW was also popular.

Table 2-22

FDI Projects in Australia by Geographical Origin, 2002 to 2004									
	US	**UK**	**Japan**	**Germany**	**Nether-lands**	**Canada**	**Hong Kong**	**India**	**Others**
Projects	144	58	34	23	10	12	2	11	97
%	*36.8*	*14.8*	*8.7*	*5.9*	*2.6*	*3.1*	*0.5*	*2.8*	*24.8*
Investment (US$m)	16,182	3,750	22,940	130	5,137	1,808	3,010	3,718	5,688
%	*26.0*	*6.0*	*36.8*	*0.2*	*8.2*	*2.9*	*4.8*	*6.0*	*9.1*
Jobs	11,189	2,445	3,335	725	150	1,468	0	180	2,055
%	*51.9*	*11.3*	*15.5*	*3.4*	*0.7*	*6.8*	*0.0*	*0.8*	*9.5*
Main Recipient	NSW	NSW	NSW, VIC	VIC	VIC	NSW, QLD	QLD	NSW, VIC	NSW
Source: FDI Data Exchange Service provided to Invest Victoria by OCO Consulting (in cooperation with the World Bank), 01/2002 – 07/2004									

Finally, Table 2-23 lists the biggest investment projects between January 2002 and July 2004, giving an indication of the types of investments that Australia has attracted in recent times. The list of the biggest investment projects is diverse, but supports the findings of the overall sample: most large investments went to Western Australia, were made by US firms, are new projects and were part of the mining, energy or automotive industry.

Table 2-23

Biggest Investment Projects in Australia by Capital Invested and Jobs Created, 2002 to 2004							
Date	**State**	**Investor**	**Home Country**	**Investment (US$m)**	**Number of jobs created**	**Industry**	**Company Details**
06/04	WA	Yanchep Sun city	Japan	20,000	---	Property	New: Private Urban Development named St Andrews
10/03	---	Chevron Australia	US	11,000	---	Heavy Industries (Energy)	New: Gorgon gas project – gas field and LNG facility
05/02	---	Shell	Netherlands	5,000	---	Heavy Industries (Energy)	New: Sunrise floating LNG project
04/04	NSW	State Bank of India	India	3,000	---	Financial Services	New: opening branch
04/03	---	Hutchison	Hong Kong	3,000	---	ICT	New: Broadband Wireless Project
02/04	---	Natuzzi	Italy	2,124	---	Construction	New: 17 furniture showrooms
02/03	NT	Alcan	Canada	1,500	1,200	Heavy Industries (Mining)	Expansion to boost output of bauxite mine and alumina refinery
05/03	WA	Alcoa	US	1,000	150	Heavy Industries (Mining)	Expansion of capacity at Wagerup alumina refinery
12/03	WA	Rio Tinto Group	UK	920	---	Heavy Industries (Mining)	Expansion/Upgrade of capacity of main port facilities at Dampier
03/03	---	GTL Resources	UK	510	685	Manufacturing (Chemicals)	New: Methanol production facility
12/02	---	Conoco Phillips	US	500	1,000	Heavy Industries (Energy)	New: LNG production plant in the Timor Sea
03/03	VIC	Toyota	Japan	500	1,000	Manufacturing (Auto)	New: Producer line for X-Runner
01/03	SA	General Motors	US	400	1,000	Manufacturing (Auto)	Expansion of car production facility
11/03	VIC	Holden	US	284	500	Manufacturing (Auto)	New: new-generation aluminium V6 car engine plant
04/02	WA	Mitsubishi	Japan	216	500	Heavy Industries (Metal)	New: Pig Iron production facility
09/03	VIC	GE Capital	US	98	1,500	Financial Services	New: services office
03/02	QLD	Warner Roadshow	US	---	2,500	Property	Expansion of studio
07/03	QLD	Nippon Meat Packers	Japan	---	700	Food	New: meat processing plant
Source: FDI Data Exchange Service provided to Invest Victoria by OCO Consulting (in cooperation with the World Bank), 01/2002 – 07/2004							

PART I

DETERMINANTS OF FDI

CHAPTER 3

THEORETICAL MODELS AND EMPIRICAL STUDIES OF DETERMINANTS OF FDI

3.1 GENERAL THEORETICAL MODELS AND EMPIRICAL STUDIES OF DETERMINANTS OF FDI

This chapter presents a review of the different theoretical models and econometric studies. Overall, nine theoretical models will be discussed:[60] early studies of determinants of FDI, determinants of FDI according to the Neoclassical Trade Theory, ownership advantages as determinants of FDI, aggregate variables as determinants of FDI, determinants of FDI in the OLI framework, determinants of horizontal and vertical FDI, determinants of FDI according to the Knowledge-Capital Model, determinants of FDI according to the diversified FDI and risk diversification model and policy variables as determinants of FDI. From each theory, the relevant determinants of FDI are derived.[61]

3.1.1 EARLY STUDIES OF DETERMINANTS OF FDI

In order to explain FDI and the phenomenon of MNEs, empirical studies and theoretical models started off being developed as different parts of the same story. Early empirical research was mainly undertaken in the form of field studies with only limited theoretical foundation, as a theory

[60] The number of theoretical models was chosen by the author and varies. Agarwal (1980), for instance, distinguished thirteen different models in four categories (Hypothesis of Perfect Markets, Hypothesis based on Market Imperfections, Hypothesis on the Propensity to Invest and Determinants of the Inflow of FDI).
[61] The selection of theoretical models and empirical studies is not intended to be complete because a considerably larger literature exists for most of the issues discussed. However, the models and studies referred to in this chapter are indicative of the wider range of results available.

of MNEs did not yet exist. A theory of FDI – or capital movement in general – was developed independently based on a trade theory perspective.

In terms of empirical studies, descriptive analysis dominated until the 1960s, while econometric analysis started to emerge in the 1960s and early 1970s. In studies based on secondary statistics, various combinations of research set-ups are possible and most empirical studies on determinants of FDI have previously been experimented with to find explanations for MNEs' decisions to invest overseas. FDI from a single or a group of Home countries (these can be developed countries, developing countries or both) into a single or a group of Host countries can be analysed using time-series, cross-section or panel data in an aggregated or disaggregated form, while determinants can be macroeconomic factors, microeconomic factors or a combination of both.

In early empirical studies, typically based on questionnaires, companies were asked to identify their reasons for the initial investment decision. Major contributors analysing FDI in general were Robinson (1961), Behrman (1962), Basi (1966), Kolde (1968), Wilkins (1970) and Forsyth (1972), while FDI in Australia was explored by Brash (1966), FDI in New Zealand by Deane (1970), FDI in Scotland by Forsyth (1972) and FDI in Ireland by Andrews (1972).[62] These studies looked at a variety of factors, including marketing factors, trade barriers, costs factors and investment climate. The consensus is that marketing factors, in particular market size, market growth and maintaining market share, but also dissatisfaction with existing market arrangements, were the main determinants of FDI. However, cost factors, especially the availability of labour and raw materials, lower labour or production costs and financial inducements by the government, were seen as equally important in some of the studies. Political stability was the most important determinant of FDI found by Basi, while foreign exchange stability and a positive attitude to foreign investment were other notable factors. Wilkins (1970) found local competitive threat and lower costs the predominant reasons for foreign investment when analysing foreign manufacturing plant establishments before 1900 by US companies including Colt, Singer, ITT, General Electric, Westinghouse and Eastman Kodak.

3.1.2 Determinants of FDI according to the Neoclassical Trade Theory

Turning to the early theoretical models, the first theoretical attempt to explain FDI was based on the Heckscher-Ohlin model of the Neoclassical Trade Theory where FDI was seen as part of international capital trade. The Heckscher-Ohlin model was based on a 2x2x2 general equilibrium framework with two countries (Home and Foreign), two factors of production (usually capital and labour) and two goods, assuming perfectly competitive goods and factor markets, identical constant returns to scale production functions, zero transport costs and factor endowments that are such as to exclude specialisation. The economic intuition behind the Heckscher-Ohlin model was based on the further assumption that commodities differ in relative

[62] For a detailed description of those field studies see Dunning (1973).

factor intensities and countries differ in relative factor endowments, leading to international factor price differentials. Hence, a relatively capital-abundant country, say Home, would either export the capital-intensive good to Foreign or – in the absence of commodity trade – move capital to Foreign where returns on capital (interest rates) are higher and returns on labour (wages) lower until factor price equalisation is achieved.[63] The MacDougall-Kemp Model[64] – based on theoretical models by Hobson (1914), Jasay (1960), MacDougall (1960) and Kemp (1964) – assumed full employment, perfect competition and constant returns to scale, but considered only one good and two factors of production. Again, capital was expected to move to the country with higher capital returns (i.e. the capital-scarce country). However, countries could manipulate capital returns and capital flows by imposing taxes on internationally mobile capital to enhance their welfare. Aliber (1970) expanded the view that capital moves due to a difference in capital returns, but claimed that this difference was due to a difference in capital endowments and currency risks, as interest rates include a premium that is charged according to the expected currency depreciation. Firms from countries with "harder" currencies, i.e. currencies with less fluctuation in value, could borrow money in countries with "softer" currencies at a lower interest rate than Host country firms due to their lower risk structure. Foreign firms could therefore capitalise the same stream of expected earnings at a higher rate than Host country firms, giving them a reason to invest in the Host country. Allowing for the possibility of the world being a unified currency area (without currency risk), it was argued that FDI could still take place, though it was then explained in terms of the economics of location, for instance as investment between different customs areas.

3.1.3 OWNERSHIP ADVANTAGES AS DETERMINANTS OF FDI

Hymer (1960) and Kindleberger (1969) were among the first to criticise the Neoclassical approach for its limited ability to explain FDI flows. They argued that the assumption of perfect competition in Neoclassical Theory could not explain FDI, which – in their view – needed imperfect competition, i.e. structural market imperfections, to flourish. FDI was assumed to be linked to the theory of MNEs, which are, by definition, large companies with control or market power. Both authors focused on the concept of "monopolistic advantage" to explain why firms enter foreign markets. They argued that foreign firms needed ownership advantages such as product differentiation (imperfect good markets), managerial expertise, new technology or patents (imperfect factor markets), the existence of internal or external economies of scale or government interference to balance out the disadvantages of entering a foreign market (including higher risk, less information, more uncertainty, physical distance and differences in culture, business ethics, the legal system and other regulations) in order to compete with local

[63] For a discussion of the Heckscher-Ohlin model see Markusen et al. (1995), Ch.8. A different model used to show how foreign investment was explained in terms of interest rate differentials was developed by Nurkse (1933) who based his results on the outcome of capital supply (related to increased savings) and capital demand (related to labour-saving technical discoveries).
[64] For more detail see Ruffin (1984), p.249-254.

firms. Caves (1971) focused on the importance of product differentiation as a monopolistic advantage, claiming that imperfect competition encouraged MNEs to differentiate products and engage in horizontal FDI. He further argued that FDI was preferred over exporting or licensing if knowledge was employed in product differentiation rather than in managerial skills.

Knickerbocker (1973) argued that MNEs were active in imperfectly competitive (in his case oligopolistic) markets and invested as a result of a “Follow-the-leader” strategy or in reaction to foreign firms “invading” their Home market. Hence his theory is known as the Theory of Oligopolistic Reaction. Knickerbocker analysed the behaviour of 187 US firms that had invested in 23 countries and found evidence for “Follow-the-leader” FDI, while Graham (1978) found proof for the second explanation when analysing the reaction of European MNEs to US FDI in Europe. Some other early attempts to explain FDI from different perspectives were Vernon’s Product Life Cycle Hypothesis (1966) and Aharoni’s Behavioural Theory (1966), two theories that were mainly based on historical trends and qualitative methods.[65] Vernon related investment theory with trade theory, arguing that the investment decision was a decision between exporting and investing, as products move through a life cycle divided into three stages: new, mature and standardised products, giving a cost-based rational for the switch from exporting to foreign-based production. Aharoni, who asked US MNEs about their foreign investment decisions, explained FDI as one step in an investment decision-making process, including the decision to look abroad, the investigation process, the negotiation process, the commitment to invest and the review and refinement process. Initial forces giving the impulse to invest included suggestions made by government institutions, the fear of losing competitiveness, the so-called “Follow-the-leader” effect and foreign firms starting to compete in the domestic market, though senior executives’ personal experiences and preferences could also matter.

Buckley and Casson (1976) were the first to formalise the various streams of thought into a theory of the MNE. Their theory was an extension of Coase’s (1937) internalisation concept, applying his approach to MNEs. Coase compared the efficiency of various forms of transactions between firms. Since the market approach was often inefficient owing to market failure, firms were better off internalising transactions. According to Buckley and Casson the same was true for MNEs. They claimed that markets for intermediate goods, such as production and marketing techniques, management skills, component parts or services, were imperfect and characterised by high risk and uncertainty, leading to high transaction costs such as information, enforcement and bargaining costs. The decision to internalise was assumed to depend on industry-specific factors (such as product type, market structure and economies of scale), region-specific factors (such as distance and cultural differences), nation-specific factors (such as political and financial factors) and firm-specific factors (such as management skills). Buckley and Casson showed that MNEs that were active in research and development (R&D) intensive industries had a higher

[65] Other models explaining why MNEs with headquarters in developed countries invest in other (in particular developing) countries includes Marxist theories of international capitalism and the so-called dependency theory, of which Lenin (1999) was a prominent supporter, claiming that FDI was linked to imperialism. For more details see Helleiner (1989).

degree of internalisation.[66] Magee (1977) added the appropriability problem due to the public good nature of technology as another reason to internalise transactions such as the transfer of technology or information (including information for product creation and development, for development of production functions, for market creation and for appropriability). Hennart (1982 and 1991), whose theory – according to Rugman (1986) – was largely based on McManus' (1972) theory of property rights and Williamson's (1975) "Market and Hierarchies", argued that internalisation advantages could be either due to know-how or goodwill (reputation), leading to horizontal integration, or due to lack of competence in other markets, leading to vertical integration. In both cases, replacing the price system of the market with a MNE hierarchy could eliminate transaction costs and be more efficient. Hennart saw FDI as a response to natural market imperfections (such as imperfect information), but not to structural market imperfections (such as market power). In contrast, Teece (1981 and 1985) described only vertical FDI as the response to market failure, but viewed horizontal FDI as the response to both market power and market failure. Casson (1987) argued that any market imperfection distorting market prices (including government regulations, tariffs and taxes, non-existent future markets, controls and asymmetric information between buyer and seller) provided an incentive to internalise production.

Establishing ownership advantages as determinants of FDI led to the rise of empirical studies testing those hypotheses systematically. Regression analysis became a popular approach from the 1970s onwards and was based on firm-level data or on the foreign share in the domestic industry. It was analysed whether Hymer's and Kindleberger's concept of monopolistic advantage could indeed explain why firms enter foreign markets. Horst (1972) used data on more than a thousand US manufacturing corporations – including a subset of 187 "multinationals"[67] – for twenty industries to analyse the Canadian market share of US industries. He showed that firms had a tendency to invest more in R&D-intensive industries, while FDI was more difficult in industries with scale economies. Hence, a few foreign investors controlled larger shares of foreign markets. He showed that most MNEs were of larger size than comparable domestic firms. Extending Horst's findings for a cross-section of 95 US manufacturing industries (i.e. using industry-level, not firm-level data), Wolf (1977) found that the sales of US foreign affiliates as a percentage of domestic production were increasing in average firm size and technical manpower (measured by the industry's number of scientists and engineers). Caves (1974a) explored the effect of intangible assets, firm size, trade barriers, multiplant enterprises and entrepreneurial resources on the shares of sales by foreign-owned manufacturing firms from 64 countries in Canada and the UK. Intangible assets (in particular advertising and R&D) were significant in both Canada and the UK, while multiplant enterprises and firm size only mattered in Canada. Industry concentration and entry barriers had a positive effect on MNE

[66] Casson (1979 and 1983) later continued to formalise the MNE structure, while Buckley (1985) studied contract types, including wholly-owned subsidiaries, joint ventures, foreign minority holdings, licensing, franchising, management contract and subcontracting, in more detail.

[67] This refers to multinationals according to a rather limited definition by the Harvard Business School, which classifies US firms only as multinational if they have six or more subsidiaries outside of Canada. Horst (1972), p.258.

activity, while entrepreneurial resources were not significant. Baumann (1975) found the share of US affiliate sales over total shipments in Canada to be positively affected by technological intensity and industry concentration (or firm-level scale economies), the average age of products, the share of shipments originating in multiplant firms and the size difference between US and Canadian firms. Looking at three ownership advantages, i.e. differences in research intensity (measured by R&D expenditure), skill intensity (measured by human capital input in production) and plant-level scale economies (measured by scale elasticities), as potential explanation for the composition of US relative to UK foreign affiliate production and exports for sixteen industries, Dunning and Buckley (1977) found foreign ownership advantages to be significant determinants of the ratio between US and UK foreign production. Based on the assumption that MNEs had some firm-specific knowledge advantage, Swedenborg (1979) conducted a regression analysis of Swedish outward FDI using comprehensive firm-level data. She found that the firm-specific competitive advantage of Swedish foreign investors was based on high labour skills, while the production abroad was higher when there were scale economies in production, and when industries were more capital-intensive. The length of time firms had been abroad was important for the relative and absolute volume of foreign production. Lall (1980) used data on US and foreign production and exports for 25 industries and found evidence for the monopolistic advantage hypothesis: R&D and advertising expenditure, scale economies and the average wage per employee (as a measure for the general skills level) increased foreign sales by US affiliates as a percentage of US production. Further evidence for the intangible asset hypothesis for Canada was presented by Saunders (1982) who found advertising and R&D expenditure, relative unit labour costs between Canada and the US, managerial resources, shipping costs and the extent of multiplant development in industries to be significant determinants, and Owen (1982) who showed that assets per firm, marketing (measured by the ratio of sales force expenditure to total industry shipments) and natural resource intensity had an effect on MNE activity. Blomström and Lipsey (1986) – in line with previous research by Horst (1972), Caves (1974a) and Swedenborg (1979) – examined the importance of firm size as a determinant of FDI, using cross-section data from US and Swedish manufacturing firms to show that firm size only had a threshold effect on FDI, but no effect thereafter. However, domestic sales, the capital-labour ratio, R&D and advertising expenditure had positive effects on the share of foreign sales.

In summary (Table 3-1), numerous empirical studies have substantiated the theoretical belief that ownership advantages are significant determinants of FDI, showing that factors such as R&D and advertising expenditure, managerial resources, technology, capital intensity, labour skills, firm size, scale economies and experience had an effect on FDI or MNE activity.

Table 3-1

Ownership Advantages as Determinants of FDI			
Variable	**Theoretically predicted effect**	**Effect on FDI or MNE activity found**	**Source**
Ownership Advantages			

R&D expenditure / intensity of Home industry	Positive	Positive Positive Positive Positive Positive Positive	Horst (1972) Caves (1974a) Dunning and Buckley (1977) Lall (1980) Saunders (1982) Blomström and Lipsey (1986)
Advertising expenditure of Home industry Marketing in Home	Positive	Positive Positive Positive Positive Positive	Caves (1974a) Lall (1980) Saunders (1982) Blomström and Lipsey (1986) Owen (1982)
Entrepreneurial/Managerial resources in Home	Positive	Not significant Positive	Caves (1974a) Saunders (1982)
Technology intensity of Host industry	Positive	Positive	Baumann (1975)
Technical Manpower (scientists and engineers) in Home	Positive	Positive	Wolf (1977)
Skilled labour intensity of Home production	Positive	Positive	Swedenborg (1979)
Home skill intensity	Positive	Positive	Dunning and Buckley (1977)
General skill level (average wage per employee) in Home	Positive	Positive	Lall (1980)
Capital intensity of Home production	Positive	Positive Positive	Swedenborg (1979) Blomström and Lipsey (1986)
Assets per investing firm	Positive	Positive	Owen (1982)
Natural resource intensity of Host industry	Positive	Positive	Owen (1982)
Size of investing firm	Positive	Positive Positive for Canada, but not significant for the UK Threshold effect only	Wolf (1977) Caves (1974a) Blomström and Lipsey (1986)
Size Difference (between Home and Host firms)	Positive	Positive	Baumann (1975)
Multiplant enterprises in Host industry	Positive	Positive for Canada, but not significant for the UK Positive Positive	Caves (1974a) Saunders (1982) Baumann (1975)
Plant-level scale economies (scale elasticities) in Home industry	Positive	Positive	Dunning and Buckley (1977)
Scale Economies in Home industry	Positive	Positive Positive	Swedenborg (1979) Lall (1980)
Host industry concentration	Positive	Positive Positive	Caves (1974a) Baumann (1975)
Average age of firm's products	Positive	Positive	Baumann (1975)
Length of time firm has produced abroad (experience)	Positive	Positive	Swedenborg (1979)
Other Factors			
Inverse of Unit labour cost in Host relative to Home	Positive	Positive	Saunders (1982)
Shipping costs (Home to Host)	Positive	Positive	Saunders (1982)
Host entry barriers	Positive	Positive	Caves (1974a)
Domestic sales of Home firms	Positive	Positive	Blomström and Lipsey (1986)

3.1.4 AGGREGATE VARIABLES AS DETERMINANTS OF FDI

While one approach is to view FDI as related to monopolistic advantage, another is to test the effect of aggregate variables such as market size and market growth on FDI – even without relating those variables to specific theoretical models. Scaperlanda and Mauer (1969), for instance, analysed US FDI in the European Economic Community (EEC), finding a significant relationship between EEC GNP and investment (measured by the annual change in book value of US FDI in the EEC), but no significant effects of market growth and trade barriers on FDI. However, when Goldberg (1972) repeated the analysis for US FDI in the EEC using data from 1952 to 1966, he found evidence for the growth hypothesis, i.e. the growth of EEC GNP and the ratio of EEC GNP growth relative to US GNP growth were significant determinants of FDI, but not for the market size hypothesis, i.e. the GNP level did not affect FDI. Scaperlanda and Mauer (1972) criticised Goldberg's (1972) model, claiming it was misspecified. Lunn (1980) agreed, but produced different results, claiming that both market size and market growth were important, but so were tariff barriers, supporting the tariff discrimination hypothesis when analysing data from 1957 to 1970. In another line of research, Davidson (1980) used survey data of large US MNEs to show that FDI in countries including Canada, the UK and Australia was positively affected by Host country characteristics such as market size and proximity, cultural similarity and firms' level of experience.

In summary (Table 3-2), empirical studies showed that market size, market growth and trade barriers could potentially be important determinants of FDI and should thus be incorporated into the theoretical models explaining FDI.

Table 3-2

Aggregate Variables as Determinants of FDI			
Variable	**Theoretically predicted effect**	**Effect on FDI or MNE activity found**	**Source**
Aggregate Variables			
Host market size (GNP)	Positive	Positive Not significant Positive Positive	Scaperlanda and Mauer (1969) Goldberg (1972) Lall (1980) Davidson (1980)
Host market growth (GNP growth)	Positive	Not significant Positive Positive	Scaperlanda and Mauer (1969) Goldberg (1972) Lall (1980)
Host trade Barriers	Positive	Not significant Positive	Scaperlanda and Mauer (1969) Lall (1980)
Other Factors			
Proximity	Positive	Positive	Davidson (1980)
Cultural similarity	Positive	Positive	Davidson (1980)
Investing firm's level of experience	Positive	Positive	Davidson (1980)

3.1.5 Determinants of FDI in the OLI Framework

Dunning (1977 and 1979) brought together internalisation theory and traditional trade economics to create the eclectic paradigm of FDI, synthesising the reasons for firms to operate internationally (advantages) and the mode of entry (FDI, export and licensing) (Table 3-3).

In the MNE theory, FDI was explained by identifying three types of special advantages that MNEs have: ownership, location and internalisation advantages. Ownership advantages referred to the MNE's production process, ensuring a competitive advantage over domestic firms and include patents, technical knowledge, management skills and reputation. Location advantages were motives for producing abroad including the access to protected markets, favourable tax treatments, lower production and transport costs, lower risk and favourable structure of competition. Internalisation occurred due to the public good nature of ownership advantages and – compared with licensing or exporting – had the advantage of lowering transaction costs, minimising technology imitation and maintaining the firm's reputation through effective management and quality control. Based on these assumptions, the degree of foreign ownership in an industry should be higher, the more research-, technology- or marketing-intensive products are. The OLI framework could further be related to country-, industry- and firm-specific structural variables (Table 3-4).

Table 3-3

Relationship between OLI-advantages and Mode of Entry based on Dunning's Eclectic Paradigm				
		Advantages		
		Ownership	Location	Internalisation
Mode of Entry	FDI	Yes	Yes	Yes
	Exports	Yes	Yes	No
	Licensing	Yes	No	No

Source: Perlitz (1997), p. 132, Table 35.

Table 3-4

Some Illustrations of how OLI Characteristics may vary according to Country-, Industry- and Firm-Specific Considerations			
	Country (Home – Host)	Industry	Firm
Ownership	Factor endowments (e.g. resources and skilled labour) and market size and character; government policy towards innovation, protection of proprietary rights, competition and industrial structure, government controls on inward direct investment	Degree of product or process technological intensity; nature of innovations; extent of product differentiation; production economics (e.g. if there are economies of scale); importance of favoured access to inputs and/or markets	Size, extent of production, process or market diversification; extent to which enterprise is innovative, or marketing-oriented, or values security and/or stability, e.g. in sources of inputs, markets, etc.; extent to which there are economies of joint production
Location	Physical and psychic distance between countries; government intervention (tariffs, quotas, taxes, assistance to foreign investors or to own MNEs, e.g. Japanese government's financial aid to Japanese firms investing in South East Asian labour-intensive industries)	Origin and distribution of immobile resources; transport costs of intermediate and final goods products; industry specific tariff and non-tariff barriers; nature of competition between firms in industry; can functions of activities of industry be split? Significance of 'sensitive' locational variables, e.g. tax incentives, energy and labour costs	Management strategy towards foreign involvement: age and experience of foreign involvement (position of enterprise in product cycle, etc.); psychic distance variables (culture, language, legal and commercial framework); attitudes towards centralisation of certain functions, e.g. R&D, regional office and market allocation etc.; geographical structure of asset portfolio and attitude to risk diversification
Internalisation	Government intervention and extent to which policies encourage MNEs to internalise transactions, e.g. transfer pricing; government policy towards mergers; differences in market structures between countries, e.g. with respect to transaction costs, enforcement of contracts, buyer uncertainty, etc.; adequacy of technological, educational, communications, etc. infrastructure in Host countries and ability to absorb contractual resource transfers	Extent to which vertical and horizontal integration is possible/desirable, e.g. need to control sourcing of inputs or markets; extent to which internalising advantages can be captured in contractual agreements (cf. early and later stages of product cycle); use made of ownership advantages; cf. IBM with Unilever-type operation; extent to which local firms have complementary advantage to those of foreign firms; extent to which local firms have complementary advantage to those of foreign firms; extent to which opportunities for output specialisation and internalisation division of labour exist	Organisational and control procedures of enterprise; attitudes to growth and diversification (e.g. the boundaries of a firm's activities); attitudes toward subcontracting ventures, e.g. licensing, franchising, technical assistance agreements etc.; extent to which control procedures can be built into contractual agreements

Source: Dunning (1988b), p.31, Table 1.4.

Dunning (1988b) stated that OLI advantages varied depending on whether countries were developed or developing, large or small, industrialised or not, whether industries were high or low technology, innovatory or mature, processing or assembly, competitive or monopolistic, or whether firms were large or small, old or new, leader or follower, innovator or imitator. Caves (1982) showed that the degree of multinationality was related to R&D, marketing expenditures, number of scientific and technical workers, product newness and complexity, and product differentiation. Dunning's OLI framework allowed for a variety of factors to be determinants of MNE activity, depending on whether the focus is on ownership, location or internalisation advantages, on countries, firms or industries or on different FDI forms (Table 3-5).

Table 3-5

Determinants of FDI in the OLI Framework (Theoretical Predictions)			
	Ownership Advantages	**Location Advantages**	**Internalisation Advantages**
General Model	Patents / trademarks, technology, capital, economies of joint supply, international arbitraging and market access	Transport and production costs, tariff barriers, psychic distance, investment incentives, taxes, political risks	Avoidance of property right infringement, avoidance of buyer uncertainty, price discrimination, quality control assurance, effective management control
Resource-based FDI	Capital, technology and market access	Possession of resources	To ensure stability of supply at right price, market control
Import substituting manufacturing	Capital, technology, management and organisational skills, surplus R&D and other capacity, economies of scale and trademarks	Material and labour costs, markets, government policy (with respect to barrier to imports, investment incentives, etc)	Wish to exploit technology advantages, high transaction or information costs, buyer uncertainty
Export platform manufacturing	Capital, technology, management and organisational skills, surplus R&D and other capacity, economies of scale, trademarks and market access	Low labour costs, incentives to local production by Host governments	Economies of vertical integration
Trade and distribution	Products to distribute	Local markets, need to be near customers, after-sales servicing	Need to ensure sales outlets and protect company's name
Ancillary services	Market access (in the case of other foreign investors)	Markets	Wish to exploit technology advantages, high transaction or information costs, buyer uncertainty, need to ensure sales outlets and protect company's name
Miscellaneous	Variety, including geographical diversification (airlines and hotels)	Markets	Various (see above)
Source: Dunning (1980), p.13, Table 1"			

The FDI type also determined whether sequential or only initial FDI occurs. Dunning (1980) claimed that resource-seeking (seeking natural, physical or human resources) or market-seeking (seeking domestic, adjacent or regional markets) investment was typically initial investment, while efficiency-seeking (seeking the rationalisation of production to exploit economies of specialisation and scope across or along value chains, i.e. product or process specialisation) and strategic asset-seeking investment (to advance a company's regional or global strategy or link into foreign networks of created assets, such as technology, organisational capabilities and markets) was typically sequential investment.[68] To test his OLI framework, Dunning (1980 and 1981) tested two hypotheses, an international competitiveness hypothesis, Hypothesis 1, (testing whether the competitive advantage, measured as the share of either export or local production or both in industry output, was determined by a combination of ownership and location advantages) and the location hypothesis, Hypothesis 2, (testing whether the form of involvement, measured as the ratio of exports over local production, was dependent on these ownership and location advantages). He analysed export and local production data of US manufacturing MNEs in a group of seven countries, finding relative market size (location advantage) to be significantly negative and the skilled employment ratio (ownership advantage) to be significantly positive when testing Hypothesis 1. Testing for Hypothesis 2, the export-import ratio was negatively related to the export-production ratio, but positively related to the net income to sales ratio.

Following Dunning's example, there have been numerous studies analysing factors related to ownership, location and internalisation advantages. Santiago (1987), for instance,

[68] Dunning (1996), p.84, Table 4.1 "The main types of foreign direct investment".

considered both industry- and location-specific determinants and consequences of FDI when investigating data on US firms from 64 industry groups in Puerto Rico. The industry level of foreign investment was increasing in firm size and relative profits, but decreasing in relative fuel costs. In contrast, relative productivity, relative labour costs, average profits, market concentration and capital intensity were not significant determinants of the foreign share. Schneider and Frey (1985) found that a model using economic and political determinants combined (including GNP per capita, real GNP growth, inflation, balance of payments deficit, wage costs, skilled workforce, political instability, government ideology, bilateral and multilateral aid) explained FDI better than purely economic or political models when looking at FDI in 54 less developed countries.

Most studies that analysed FDI in industrialised countries, by using a variety of variables, focused on FDI in or from the US and on MNEs in the US manufacturing sector in particular. Lall and Siddharthan (1982), for instance, found the sales share of foreign affiliates in 45 US manufacturing industries to be positively related with the industry's effective rate of protection and the share of shipments by firms with multiplant operations. Plant-level scale economies (measured by average value-added per plant in each US industry) had a negative effect. Ray (1989) investigated manufacturing FDI in the US and found the industry's R&D intensity, capital-labour ratio, market concentration, percentage of within-parent industry investment[69], industry size, industry growth, US growth trend and exchange rate to be significant explanatory variables of FDI from all countries. Moreover, the nominal tariff rate reduced FDI from Canada, while the effective tariff rate reduced EC FDI. The existence of non-tariff barriers had a negative effect on Japanese FDI. Wheeler and Mody (1992) tested US manufacturing FDI (particularly electronics FDI) in 42 countries for the existence of agglomeration economics, using variables such as labour costs, corporate taxation and market size, agglomeration benefit indices (including infrastructure quality, degree of industrialisation and level of FDI), risk and openness. The agglomeration benefit indices of current FDI, infrastructure quality and degree of industrialisation significantly increased manufacturing and electronics FDI, as did market size. Furthermore, electronics FDI was increasing in labour cost and the geopolitical risk variable 'relationship with the West'. Kogut and Chang (1991) analysed factors determining the entry of almost a thousand Japanese firms from 213 industries into the US market and their mode of entry (acquisition, joint venture or new plant). Japanese FDI was drawn to R&D-intensive industries, while voluntary export restraints in Japan encouraged Japanese FDI in the US. Joint ventures were used for sourcing and sharing US technology and hence favoured industries where the US had a greater R&D expenditure than Japan. Using a panel dataset for 102 manufacturing industries, Drake and Caves (1992) found Japanese R&D spending, US import restrictions, the real exchange rate and advertising spending in the 1980s to influence the Japanese share of foreign investment transactions in US manufacturing.

[69] Percentage of individual investment within an industry that are the same industry category as the parent firm.

Analysing US inward and outward FDI, Culem (1988) studied 30 ordered pairs of bilateral FDI flows between industrialised countries. Tariff barriers and the export-GNP share were significant explanatory variables for US FDI in the EEC and EEC FDI in the US, while market size determined US FDI in the EEC and lagged market size determined EEC FDI in the US. Focusing on US outward FDI, Barrell and Pain (1996) found the GNP level and growth, R&D expenditure, relative production costs (measured by US unit labour costs relative to unit labour costs elsewhere) and profits to positively affect outward FDI, while exchange rate appreciation led to a postponement of the investment. Biswas (2002) used a panel dataset of capital expenditures by majority-owned nonbank foreign affiliates of US firms in 44 countries to examine how traditional and non-traditional factors affect the FDI inflow. A country's regime type (democratic systems, for instance, scored better than autocratic systems), property rights index and infrastructure quality increased FDI, while a regime's duration (interpreted as a measure for flexibility and efficiency) and labour cost decreased it. Love and Lage-Hidalgo (2000) investigated US FDI in Mexico using cointegration analysis and found support for both the market size hypothesis and the factor price hypothesis. US (total, manufacturing and non-manufacturing) FDI flows were increasing in market size (measured by Mexican GDP per capita) and the difference between US and Mexican real wages, while the difference between the US and Mexican user cost of capital (including interest rates) reduced FDI.

There has also been extensive research on FDI in other industrialised countries, including the UK, Germany and Spain – to name only a few examples. To analyse UK FDI, Hughes and Oughton (1992) used data on over 400 firms of 134 manufacturing industries to explore how the foreign MNE presence in UK manufacturing was affected by a firm and industry characteristics. Factors including R&D expenditure, average wage rate and imports were analysed, but only the five-firm-concentration ratio, the minimum efficient scale, export-sales ratio and output growth were significant. Milner and Pentecost (1996) looked at the determinants of US FDI in the UK manufacturing sector in a cross-sectional regression of 48 industrial groupings. Comparative advantage (measured alternatively as export-sales ratio, as a skill-intensity proxy or as an alternative labour-intensity proxy), competitiveness (measured as sales-concentration or export-penetration ratio) and market size (measured as value of UK sales or EC production) were important factors, while the average rate of protection was not. Pain (1993) found quarterly UK FDI inflows to be increasing in the UK and European industrial production, UK labour costs relative to factor costs of FDI and the world oil price, but decreasing in the FDI stock, the world industrial production, the rest of the world industrial production, the real unit labour costs in the UK relative to overseas, the cost of capital in the UK relative to overseas and the UK-weighted effective exchange rate. Hence, market size and factor prices were again important.

Moore (1993) studied German FDI from five different manufacturing sectors in a set of foreign countries, arguing that the Host market size and Host real wage advantages explained the annual changes of the real German investment stock, though unobserved country effects also mattered. Labour market disturbances (measured as average number of workers per strike action) had an unexpected positive effect on FDI, while neither fixed exchange rate regimes nor tariff barriers mattered. Bajo-Rubio and Sosvilla-Rivero (1994) explained the determinants of Spanish FDI inflows from a macroeconomic and sectorial point of view using cointegration analysis. They found gross FDI, manufacturing FDI, non-manufacturing FDI and FDI from the European Community (EC) to be increasing in market size (measured as level of real GDP), but decreasing in inflation. Gross, manufacturing and EC FDI were decreasing in the lagged foreign capital stock, while gross FDI was increasing in trade barriers, manufacturing FDI was decreasing in the user cost of capital and non-manufacturing FDI was decreasing in unit labour costs. Furthermore, the Spanish integration into the EC positively affected EC FDI.

In summary (Table 3-6), empirical studies testing the OLI framework have found FDI to be determined by a combination of ownership advantages, market size and characteristics, factor costs, transport costs and protection and other factors including a country's regime type, infrastructure, property rights and industrial disputes.

Table 3-6

Determinants of FDI in the OLI Framework (Empirical Results) and Related Empirical Studies			
Variable	**Theoretically predicted effect**	**Effect on FDI or MNE activity found**	**Source**
Ownership Advantages			
Home R&D expenditure/intensity	Positive	Positive Positive Positive Not significant	Kogut and Chang (1991) Drake and Caves (1992) Barrel and Pain (1996) Hughes and Oughton (1992)
Home Advertising expenditure	Positive	Positive	Drake and Caves (1992)
Host skill intensity proxy	Positive	Positive	Milner and Pentecost (1996)
Skilled employment ratio (Home/Host)	Positive	Positive	Dunning (1980, 1981)
Capital intensity of Host production	Positive	Not significant	Santiago (1987)
Minimum efficient scale in production in Host industry (average plant size)	Positive	Positive	Hughes and Oughton (1992)
Average firm size in Host industry	Positive	Positive	Santiago (1987)
Host market concentration level	Positive	Not significant Positive Positive	Santiago (1987) Hughes and Oughton (1992) Milner and Pentecost (1996)
Average profits in Host industry **Average profits of investing firm**	Positive	Not significant Positive	Santiago (1987) Barrel and Pain (1996)
Relative profits (Home/Host)	Positive	Positive	Santiago (1987)
Relative productivity (Home/Host)	Positive	Not significant	Santiago (1987)

(Table 3-6 continued)

Market Size and Characteristics			
Host market size, GNP or GDP	Positive	Positive Positive Positive Positive Positive Positive Positive Positive	Wheeler and Mody (1992) Culem (1988) Barrel and Pain (1996) Love and Lage-Hidalgo (2000) Milner and Pentecost (1996) Pain (1993) Moore (1993) Bajo-Rubio and Sosvilla-Rivero (1994)
Relative market size (Home/Host)	Negative	Negative	Dunning (1980, 1981)
Host GNP per capita	Positive	Positive	Schneider and Frey (1985)
Host market/GNP growth	Positive	Positive Positive Positive	Schneider and Frey (1985) Barrel and Pain (1996) Hughes and Oughton (1992)
Net Income-Sales ratio in Host industry	Negative	Negative (increase export-production ratio)	Dunning (1980, 1981)
Export-import ratio in Host industry	Positive	Positive (decrease export-production ratio)	Dunning (1980, 1981)
Host export-GDP ratio **Export-sales ratio in Host industry**	Positive Positive	Positive Positive Positive	Culem (1988) Milner and Pentecost (1996) Hughes and Oughton (1992)
Host industry imports	Positive	Not significant	Hughes and Oughton (1992)
Factor Costs			

Relative labour costs (Home/Host)	Positive	Not significant Not significant Positive Positive Positive	Santiago (1987) Dunning (1980, 1981) Love and Lage-Hidalgo (2000) Barrel and Pain (1996) Moore (1993)
Host labour costs	Negative or Positive (if interpreted as Host skill level)	Negative Negative Positive Positive	Biswas (2002) Bajo-Rubio and Sosvilla-Rivero (1994) Wheeler and Mody (1992) Pain (1993)
Real unit labour cost in Home relative to overseas **Host labour cost relative to factor cost of FDI**	Negative Positive	Negative Positive	Pain (1993) Pain (1993)
User cost of capital differential (Home/Host) **Host user cost of capital**	Negative Negative	Negative Negative Positive	Love and Lage-Hidalgo (2000) Bajo-Rubio and Sosvilla-Rivero (1994) Pain (1993)
Cost of capital in Host relative to overseas	Negative	Negative	Pain (1993)
Fuel costs in Host	Negative	Negative	Santiago (1987)
World oil price (for high cost oil producing Home country)	Positive	Positive	Pain (1993)
Transport Costs and Protection			
Home voluntary export restraints	Positive	Positive	Kogut and Chang (1991)
Host import restrictions	Positive	Positive	Drake and Caves (1992)
Host trade barriers / tariffs	Positive	Positive Not significant Positive	Culem (1988) Moore (1993) Bajo-Rubio and Sosvilla-Rivero (1994)
Host EC membership	Positive	Positive	Bajo-Rubio and Sosvilla-Rivero (1994)
Host openness	Positive	Not significant	Wheeler and Mody (1992)
Other Factors			
Host government ideology	?	Not significant	Schneider and Frey (1985)
Host country regime type (democratic system)	?	Positive	Biswas (2002)
Host regime duration	?	Negative	Biswas (2002)
Host bilateral aid from Western countries	?	Positive	Schneider and Frey (1985)
Host bilateral aid from Communist countries	?	Negative	Schneider and Frey (1985)
Multilateral aid in Host	?	Positive	Schneider and Frey (1985)
Level of corporate taxation in Host	Negative	Not significant	Wheeler and Mody (1992)
Host infrastructure quality	Positive	Positive Positive	Wheeler and Mody (1992) Biswas (2002)
Property rights index for Host	Positive	Positive	Biswas (2002)
Industry's degree of industrialisation in Host	Positive	Positive	Wheeler and Mody (1992)
Host FDI stock	Positive	Positive Negative	Wheeler and Mody (1992) Pain (1993)
Labour market disturbances (average number of workers involved in a strike)	Negative	Positive	Moore (1993)

(Table 3-6 continued)

Other Factors (continued)			
Host country risk	Negative	Not significant	Wheeler and Mody (1992)
Exchange Rate Appreciation in Host	Negative	Negative Negative	Barrel and Pain (1996) Pain (1993)
Exchange Rate Appreciation in Home	Positive	Positive	Drake and Caves (1992)
Fixed Exchange Rate Regime in Host	?	Not significant	Moore (1993)
Host inflation	Negative	Negative Negative	Schneider and Frey (1985) Bajo-Rubio and Sosvilla-Rivero (1994)
Balance of payments deficit in Host	Negative	Negative	Schneider and Frey (1985)
Host institutional investment credit rating	Positive	Positive	Schneider and Frey (1985)

3.1.6 Determinants of Horizontal FDI according to the Proximity-Concentration Hypothesis and Vertical FDI according to the Factor-Proportions Hypothesis

Building on the Industrial Organisation models, including Internalisation and OLI theory, and following the tradition of microeconomic theoretical models of Hymer, Kindleberger and Caves, the new trade theory offered an alternative framework for analysing FDI and MNE activity, combining ownership and location advantages with technology and country characteristics. Knowledge capital was the ownership advantage, while location advantages included country size and moderate to high trade costs for horizontal firms, and low trade costs, stages of production with differing factor intensities and countries' differences in relative factor endowments for vertical firms. Internalisation advantages only arise owing to the joint-input property of knowledge capital.

Helpman (1984 and 1985)[70] used a general equilibrium model with monopolistic competition in horizontally differentiated goods to explain MNEs as an equilibrium phenomenon, arguing that firms located abroad when factor endowment differences were large and factor price differences existed. Trade costs were set to zero. MNEs were assumed to choose producing in one location due to increasing returns to scale. These MNEs produced headquarters services as firm-specific factors, taking the internalisation of their production as given. With asymmetric factor endowments, firms from human-capital-abundant countries became MNEs, generating intra-firm trade by exporting headquarters services and intermediate goods. This so-called Factor-Proportions Hypothesis explained the existence of vertically integrated firms with geographically fragmented production.[71] Excluding vertical specialisation, Markusen (1984) used a general equilibrium model to explain horizontally integrated firms with simultaneous activities in multiple similar countries. Here, knowledge capital gave rise to firm-level scale economies (or economies of multi-plant operation) due to its joint-input nature. MNEs have an advantage over domestic firms, since they increase technical efficiency by eliminating the duplication of the joint input that would occur with independent national firms.

Ethier (1986) used a general equilibrium model, linked to the OLI framework, in which the internalisation decision of the firm-specific factor was endogenised. The set-up was a two-country, two-good, two-factor (2x2x2) model with land as a specific factor and labour as a mobile factor. Manufactures were produced using labour only and their production involved three stages: research, upstream and downstream production. Research effort and product quality were the two central informational issues with public good nature. FDI was larger the more similar endowments were and the more uncertainty agents faced.

Horstmann and Markusen (1987a)[72] extended the approaches taken by Helpman and Markusen, arguing that MNE activity should be derived endogenously in a general equilibrium trade model and not be assumed as given, but focused on horizontal MNEs. Modelling MNEs as organisational mechanisms relied on the assumptions that there were firm-specific costs, tariff and transport costs that encouraged firms to have both foreign and domestic production, and that there were plant-scale economies that created an incentive to have only domestic

[70] Helpman and Krugman (1985) futher extended this model.
[71] Examples of vertically integrated MNEs are primarily case studies such as McKern (1976) who analysed FDI in natural resources in Australia, Read (1983) who explored the structure of MNEs in banana export trade and Chalmin (1986) who looked at the sugar industry and gave a case study of Tate and Lyle's diversification process between 1870 and 1980.
[72] Horstmann and Markusen's model can be linked back to Horst (1971) who analysed the investment decision in a microeconomic model where the profit-maximising MNE has the choice between FDI and export.

production and to export to the foreign market. MNEs were found in industries with large firm-specific costs and high tariff and transport costs, but relatively small plant-scale economies – a substantially different explanation of MNE activity than the one given in traditional trade theory as, for instance, described by Helpman. This Proximity-Concentration Hypothesis, based on a trade-off between maximising proximity to customers and concentrating production to achieve scale economies, was developed in a similar fashion by Krugman (1983). Firms trading due to their knowledge of how to produce different products decided whether to trade this knowledge directly or indirectly (by trading commodities), depending on the costs. When overseas production was cheaper than trade, firms preferred to invest, making FDI and exports alternatives that did not occur simultaneously. The Proximity-Concentration Hypothesis was further elaborated by Horstmann and Markusen (1992) for homogeneous goods and by Brainard (1993a) for differentiated products – with similar results: country size positively affected MNEs.

Horstmann and Markusen (1992) modelled the investment decision as a Cournot output game where firms in two countries played a two-stage game to choose how many plants to establish, which depended on firm- and plant-level scale economies and trade costs. Firm-level scale economies determined the number of firms, while plant-level scale economies and trade costs determined the number of plants. Firms were more likely to establish additional plants in Host, the larger the Host market was. Brainard (1993a) developed a two-sector, two-country model where firms in the differentiated goods sector (which was characterised by firm-level scale economies) chose between exporting and FDI. Again, the effect of plant-level scale economies and transport costs (that were rising with distance) was explored. Two-way horizontal FDI between equally endowed trading partners occurred when there were two stages of production (such as headquarters services and assembly) and when trade costs were high relative to plant-level scale economies. Two-way, intra-firm, intra-industry trade in headquarters services could replace final good trade for multiplant production when a third production stage (such as sales) was added. A mixed equilibrium (with MNEs and national firms coexisting) occured when trade costs were intermediate relative to plant-level scale economies.

Other models of horizontal firms include Markusen and Venables (1998 and 2000) who used a general-equilibrium framework – in their 1998 paper using a Cournot oligopoly model set-up and in their 2000 paper using a Dixit-Stiglitz monopolistic competition model set-up – to test how MNE activity, the trade pattern and affiliate production were related to country characteristics, such as relative factor endowments (using skilled and unskilled labour as the two factors of production), market size, asymmetries in market size, plant-level scale economies and trade costs. MNEs were more important when countries were similar in size and in relative factor endowments. MNEs had an advantage over national firms when the world market was large, when markets were of similar size with similar labour costs, when transport costs were high and when firm-level scale economies were large relative to plant-level scale economies.

Following the tradition of vertical FDI models, Zhang and Markusen (1999) used a 2x2x2 model with intermediate inputs. Firms were assumed to produce both a constant returns to scale good and a good with increasing returns to scale. The production process of the increasing returns to scale good included both a skilled-labour-intensive intermediate good (that was produced in the Home country) and unskilled-labour-intensive assembly. The existence of vertical MNEs depended on transport costs, market size and factor abundance in the Host country. Transport costs for the final good discouraged vertical MNEs more than in the usual case (i.e. the case without intermediate goods) since they needed to be paid twice – for shipping the intermediate good to the Host country and for shipping the final good back to the Home country. Overall, large markets and factor endowment differences encouraged the establishment of vertical MNEs.

The idea of simultaneous trade flows of intermediate goods and final products was further expanded as part of the theory of international fragmentation of production, focusing on vertical FDI. Literature on international fragmentation includes papers by Dixit and Grossman (1982), Sanyal and Jones (1982), Deardorff (2001), and Jones and Kierzkowski (1990, 2001, 2004). Jones and Kierzkowski (1990) showed that the production process could be split (or fragmented) into several production blocks (more than only headquarters and foreign subsidiary were possible) based in different locations and connected through service links, such that production blocks with different factor intensities could be located in countries with different technologies or factor endowments, making use of comparative advantages. Intermediate goods, services and final goods could be produced more cheaply when located in different locations, with trade occurring between the specialised production blocks.

New trade models, which combined ownership and location advantages with technology and country characteristics and explained horizontal FDI as a trade-off between maximising proximity to customers (to minimise trade costs) and concentrating production (to achieve scale economies), were tested by Brainard (1993b, 1993c and 1997), Eaton and Tamura (1994) and Ekholm (1998). All found strong support for the horizontal FDI model. Brainard (1993c) looked at a cross-section of industry-country pairs to test whether such factors as freight factors, average foreign import tariff, per capita income, exchange rate appreciation, average effective corporate income tax rate, openness to trade and FDI and plant-level scale economies were determinants of total affiliate sales between the US and other countries (used as a measure for the FDI in a country) and trade. The Proximity-Concentration Hypothesis found support as affiliate sales were increasing in trade barriers and transport costs, but decreasing in investment barriers and plant-level scale economies. Brainard (1997) extended the analysis of the proximity-concentration trade-off assessing the importance of additional factors (in addition to the ones listed above) including corporate scale economies, Host market GDP, industry R&D, occurrence of a political coup, adjacency, EC membership, same language as investing country, i.e. a dummy variable for English as the official language, and their effects on the outward and inward share of affiliates' sales over total sales and on import and export shares. Again, the Proximity-Concentration Hypothesis was robust.[73] In another study, Brainard (1993b) analysed

[73] Corporate scale economies and Host market GDP increased the inward and outward share of affiliate sales. R&D had a positive and the occurrence of a coup a negative effect on the outward share of affiliate

the Factor-Proportions Hypothesis of MNE sales and trade using the same dataset as before but looking at income share differentials, total GDP and freight factors as determinants of affiliate sales.[74] The Factor-Proportions Hypothesis as an explanation of MNE activity was rejected since foreign sales were increasing in similarities of relative income shares.

In order to look at the effect of country characteristics on FDI, Eaton and Tamura (1994) applied a gravity model using measures of factor endowments and country factors, such as population, per capita income, land-labour ratio (measuring density) and average level of eduction (measuring human capital endowment) to analyse Japanese and US bilateral trade flows, inward and outward FDI positions for a sample of a hundred countries. US outward FDI and US and Japanese inward FDI were increasing in all those factors, while Japanese outward FDI was decreasing in density, but increasing in all remaining factors. Bilateral trade increased FDI. Ekholm (1998) analysed how proximity advantages and scale economies affected the production location of Swedish and US MNEs – an approach in line with the method applied by Brainard (1997) for US MNEs. The share of affiliates' sales was higher the larger the total market was, but lower the larger the differences in GDP and human capital were. Sales of Swedish affiliates were increasing in Host market size, but decreasing in geographical distance. As in Brainard's case, these results substantiated the Proximity-Concentration Hypothesis.

In summary (Table 3-7), the Proximity-Concentration Hypothesis was robust when tested in empirical studies. Market size, transport costs and trade barriers increased FDI, while factor endowments (as predicted by the Factor-Proportions Hypothesis) were only relevant in some cases. The results substantiated the idea that MNEs were firms with ownership advantages – as previously indicated in Sections 3.1.3 and 3.1.5.

Table 3-7

Determinants of Horizontal FDI according to the Proximity-Concentration Hypothesis and Vertical FDI according to the Factor-Proportions Hypothesis			
Variable	**Theoretically predicted effect**	**Effect on FDI or MNE activity found**	**Source**
Agglomeration Economics (or Ownership Advantages)			
Corporate scale economies in investing firm	Positive	Positive	Brainard (1997)
Home R&D expenditure	Positive	Positive	Brainard (1997)
Home Advertising expenditure	Positive	Positive	Brainard (1997)
Host Advertising expenditure	Negative	Negative	Brainard (1997)
Number of production workers in median plant (scale economies at plant-level)	Negative	Negative	Brainard (1993c)
Market Size and Characteristics			
Host market size / GDP **GDP differential (Home-Host)**	Positive Negative	Positive Positive Positive Negative	Brainard (1993b) Brainard (1997) Ekholm (1998) Ekholm (1998)
Host population	Positive	Positive	Eaton and Tamura (1994)
Host density (land-labour ratio)	Positive (for Japanese Outward FDI)	Positive	Eaton and Tamura (1994)
Host income per capita	Positive	Positive Positive	Brainard (1993c) Eaton and Tamura (1994)

sales, while language had a positive and adjacency a negative effect on the inward share of affiliate sales. Other variables (such as EC membership) were not significant. Industry advertising intensity positively affected the outward FDI level but negatively affected the inward FDI level.

[74] This approach is related to studies by Kravis and Lipsey (1982) who found wages of parent firms and affiliates to be inversely correlated, which is consistent with the Factor-Proportions Hypothesis, and by Swedenborg (1979) who found affiliate sales to be increasing in wage differentials.

Income share differential (Home-Host)	Negative	Negative Negative	Brainard (1993b) Brainard (1997)
Host human capital endowment / Education	Positive	Positive	Eaton and Tamura (1994)
Human capital differential (Home-Host)	Negative	Negative	Ekholm (1998)
Differential in per capita capital endowment (Home-Host)	Negative	Not significant Not significant	Brainard (1993b) Ekholm (1998)
Transport Costs and Protection			
Transport/freight cost (for trade from Home to Host)	Positive	Positive Positive Positive	Brainard (1993b) Brainard (1993c) Brainard (1997)
Adjacency (Home to Host) **Distance (Home to Host)**	Negative	Negative Negative	Brainard (1997) Ekholm (1998)
Host trade barriers / Import tariff	Positive	Positive Positive Positive	Brainard (1993b) Brainard (1993c) Brainard (1997)
Bilateral trade (between Home and Host)	Positive	Positive	Eaton and Tamura (1994)
Host investment Barriers	Negative	Negative Negative	Brainard (1993b) Brainard (1993c)
Host EC membership	Positive	Not significant	Brainard (1997)
Other Factors			
Host exchange rate appreciation	Negative	Negative	Brainard (1993c)
Host effective corporate income tax rate	Negative	Positive	Brainard (1993c)
Occurrence of political coup in Host	Negative	Negative	Brainard (1997)
Same language in Host as in Home	Positive	Positive	Brainard (1997)

3.1.7 DETERMINANTS OF FDI ACCORDING TO THE HORIZONTAL FDI, VERTICAL FDI AND KNOWLEDGE-CAPITAL MODEL

Markusen et al. (1996) and Markusen (1997 and 2002) integrated the two streams of literature that explained vertical firms and horizontal firms independently in a so-called Knowledge-Capital Model that allowed for building multiple plants and separating headquarters services and production as special cases. They set up a 2x2x2 model with one good with constant returns to scale and a second good with plant- and firm-level scale economies, allowing for differences in relative endowments, country size, high and low transport cost and optional FDI ban. Depending on the parameter values, different types of firms could exist. Only national firms existed in both countries when trade costs were high and FDI was prohibited. Trade liberalisation (with FDI remaining prohibited) did not change outcome much, as national firms still existed over most of the parameter space. When FDI was allowed, horizontal MNEs entered over much of the parameter space, while trade and FDI liberalisation led to the existence of vertical MNEs when factor endowments were different, but to the existence of no MNEs when countries had similar factor endowments, in which case factor prices were equalised. Markusen argued that horizontal MNEs were more common than vertical MNEs, which only existed for some Host economies in some industries.

Combining those new trade theories and internalisation theory, Markusen (2002) referred to three models – Horstmann and Markusen (1987b), Ethier and Markusen (1996) and Markusen (2001) – that analysed the mode by which firms entered foreign markets, adding licensing as the third choice (in addition to exporting and FDI). However, these models had different set-ups than the models belonging to the Knowledge-Capital Model family. The models were based on game theory, information theory and the theory of contracts and included concepts such as moral hazard, asymmetric information and incomplete or unenforceable contracts.

Horstmann and Markusen (1987b) analysed a model with imperfections in the product market, dealing with moral hazard. The knowledge-based asset MNEs transferred to a licensee or a subsidiary is their reputation for product quality. Firms chose either to license their technology (though this involved sharing rents with the licensee so that he had an incentive to maintain reputation and to produce high quality goods, not cheaper low quality ones) or to internalise production and set up a subsidiary depending on the costs involved. FDI dominated in large markets (since this made exporting relatively more expensive) or when low and high quality goods were poor substitutes, while licensing was found in small and speciality markets or when low and high quality goods were close substitutes.

Ethier and Markusen (1996) and later Markusen (2001) looked at the production process instead of the product market when considering the choice between FDI and licensing and dealing with double-sided moral hazard. Markusen assumed that licensees could absorb the knowledge-based asset while producing MNE products for one time period ("learning by doing") and could defect to become local competitors in the second period of a two-period business cycle, while MNEs could dismiss the agent and hire a new one or set up a subsidiary. In order to prevent licensees from learning by doing and thus to preserve the MNE knowledge value, contracts between MNEs and licensees had to include rent sharing, so that licensees were discouraged from defecting. When the contract was too costly (e.g. when the market was large), MNEs shifted from licensing to FDI.

In his Knowledge-Capital Model, Markusen (1997) combined "horizontal" motivations for FDI (i.e. the desire to place production close to customers and thereby avoid trade costs) with "vertical" motivations (i.e. the desire to carry out unskilled-labour-intensive production activities in locations with relatively abundant unskilled labour). Similarities in market size, factor endowments and transport costs were determinants of horizontal FDI, while differences in relative factor endowments determined vertical FDI.

Carr et al. (1998) were the first authors to estimate the Knowledge-Capital Model, using a panel of inward and outward sales data of foreign affiliates for the US and 36 other countries and testing for factors including market size, factor endowments and transport costs. The estimation – yielding correct signs and strong statistical significance for most variables – supported the Knowledge-Capital Model. Blonigen et al. (2002), however, claimed that Carr et al.'s empirical framework misspecified the variables measuring differences in skilled-labour abundance. They estimated a corrected version of the model and showed that this supported the horizontal FDI model and not the Knowledge Capital Model, as MNE activity was smaller the more countries differed in their relative factor endowments.

Markusen and Maskus (2002) analysed which of the three models (the horizontal FDI model, the vertical FDI model or the Knowledge-Capital Model) was the best characterisation of the overall pattern of world FDI activity by nesting the horizontal and the vertical model as restricted versions within an unrestricted Knowledge-Capital Model (for the determinants of each model see Table 3-8). They found that the horizontal FDI model and the Knowledge-Capital Model were descriptive, but almost indistinguishable in the data, while the vertical FDI model had little explanatory power and could not explain aggregate world FDI. This result did not reject the theory that vertical models were important for some industries or in some Host countries.

In contrast, Braconier et al. (2002) analysed a pool of Swedish and US outward FDI data and showed that when vertical FDI was based on the assumption of a skilled-wage premium (i.e. skilled labour is more expensive than unskilled labour) and not based on differences in relative factor endowments, strong empirical evidence for the existence of vertical FDI was found. This was in line with Hanson et al.'s (2001) result that outsourcing to foreign affiliates[75] (measured by affiliates' imports for further processing) was higher in countries with lower average labour productivity, smaller markets and closer proximity to the US when the level of multinational sales in a country and industry was held constant.

[75] Outsourcing is defined as "the process by which firms move certain production activities geographically and/or outside the firm to an arm's-length supplier." Hanson et al. (2001), p.6.

Table 3-8

Determinants of FDI in the Horizontal, Vertical and Knowledge-Capital Model (Theoretical Predictions)			
	Horizontal FDI	**Vertical FDI**	**Knowledge-Capital Model**
GDP (Total Market size: Home + Host)	Positive	Nil	Positive
GDP Difference between Home and Host	Negative	Nil	Negative
Skill difference between Home and Host times GDP difference if Host is unskilled labour abundant	Nil	Negative	Negative
Skill difference between Home and Host times total GDP (Home + Host) if Host is unskilled labour abundant	Negative	Positive	Negative
Skill difference between Home and Host times total GDP (Home + Host) if Host is skilled labour abundant	Negative	Negative	Negative
Geographical Distance to Host	?	?	?
Investment Costs / Entry Barriers in Host	Negative	Negative	Negative
Index of Trade Costs / Trade Barriers in Host	Positive	Positive	Positive
Index of Trade Costs / Trade Barriers in Home	Negative	Negative	Negative
Source: Markusen and Maskus (2002), p. 700, Table 1.			

In summary (Table 3-9), empirical evidence has been divided into whether to support the horizontal FDI model, vertical FDI model or Knowledge-Capital Model. While there was strong support for the idea that market size and transport costs determined FDI, the idea that factor endowments were significant determinants (which would substantiate the vertical FDI model) remained disputed.

Table 3-9

Determinants of FDI according to the Horizontal FDI, Vertical FDI and Knowledge-Capital Model			
Variable	**Theoretically predicted effect***	**Effect on FDI or MNE activity found**	**Source**
Market Size and Characteristics			
Host GDP	Positive (H,), ? (V)	Positive (H, V) Positive (H, V)	Hanson et al. (2001) Braconier et al. (2002)
Home GDP	Positive (H, V)	Positive (H, V)	Braconier et al. (2002)
Host GDP per capita	Positive (H), ? (V)	Positive (H, V)	Hanson et al. (2001)
Sum of Home and Host GDP	Positive (H, KCM)	Positive (KCM) Positive (KCM) Positive (H, KCM) Positive (KCM)	Carr et al. (1998) Blonigen et al. (2002) Markusen and Maskus (2002) Braconier et al. (2002)
GDP Difference (Home-Host) Squared	Negative (H, KCM)	Negative (KCM) Negative (KCM) Negative (H, KCM) Negative (KCM)	Carr et al. (1998) Blonigen et al. (2002) Markusen and Maskus (2002) Braconier et al. (2002)
Factor Costs			
Skill Difference (Home-Host) **Positive Skill Difference (Home-Host)** **Negative Skill Difference (Home-Host)** **Absolute Skill Difference (Home-Host)**	Negative (KCM) Negative (H and KCM) or Positive (V) Positive (H, V, KCM) Negative (KCM)	Positive (KCM) Positive (KCM) Negative (KCM) Negative (H and KCM) Positive (V) Positive (KCM) Positive (H, V, KCM) Negative (KCM)	Carr et al. (1998) Blonigen et al. (2002) Blonigen et al. (2002) Markusen and Maskus (2002) Markusen and Maskus (2002) Blonigen et al. (2002) Markusen and Maskus (2002) Blonigen et al. (2002)
Wage Premium (Home skilled wage to unskilled wage over Host skilled wage relative to unskilled wage)	Positive (H, V, KCM)	Positive (H, V, KCM)	Braconier et al. (2001)
Transport Costs and Protection			
Investment Costs in Host	Negative (H, V, KCM)	Negative (KCM) Negative (KCM) Negative (H, V, KCM) Negative (H, V, KCM)	Carr et al. (1998) Blonigen et al. (2002) Markusen and Maskus (2002) Braconier et al. (2002)
Host Trade Costs	Positive (H, V, KCM)	Positive (KCM) Not significant (KCM) Positive (H, V, KCM)	Carr et al. (1998) Blonigen et al. (2002) Markusen and Maskus (2002)

(Table 3-9 continued)

Transport Costs and Protection (continued)			
Home Trade Costs	Negative (H, V, KCM)	Not significant (KCM) Not significant (KCM) Not significant (H, V, KCM)	Carr et al. (1998) Blonigen et al. (2002) Markusen and Maskus (2002)
Distance (Home to Host)	? (H, V, KCM)	Negative (KCM) Negative (KCM) Negative (H, V, KCM) Negative (H, V, KCM) Negative (H, V)	Carr et al. (1998) Blonigen et al. (2002) Markusen and Maskus (2002) Braconier et al. (2002) Hanson et al. (2001)
Home country-neighbour dummy	? (H, V, KCM)	Not significant (H, V, KCM)	Braconier et al. (2002)
Host Tariffs/Protection	Positive (H, KCM) or Negative (V)	Not significant (H, V) Not significant (H, V) Not significant (KCM)	Braconier et al. (2002) Hanson et al. (2001) Braconier et al. (2002)
Host NTBs	Positive (H) Negative (V)	Positive (H) Not significant (V)	Hanson et al. (2001) Hanson et al. (2001)
Other Factors			
Home Skill Intensity of Production	Positive (H, V)	Positive (H, V)	Hanson et al. (2001)
Average Affiliate Employment (Plant-Level Scale Economies)	Negative (H, V)	Negative (H, V)	Hanson et al. (2001)
Tax Rate	Negative (H, V)	Negative (H, V)	Hanson et al. (2001)
Same language in Host as in Home	Positive (H, V)	Positive (H, V)	Hanson et al. (2001)
**H = Horizontal FDI, V = Vertical FDI, KCM = Knowledge-Capital Model*			

3.1.8 DETERMINANTS OF FDI ACCORDING TO THE DIVERSIFIED FDI AND RISK DIVERSIFICATION MODEL

Hanson et al. (2001) argued that vertical FDI – for instance in the tradition of Markusen – was more common than theory suggested, while FDI patterns in the 1990s were richer than the research on horizontal or vertical FDI suggested. They argued that research should also focus on the choice between production- and distribution-oriented (wholesale) FDI – a choice that “does not reflect the export-versus-FDI decision common to standard models in the literature, as that decision is only about alternative production modes”[76] – and should analyse the use of foreign affiliates as export platforms and outsourcing by MNEs to their affiliates. However, the idea of different FDI types was not as original as it may seem: Dunning (1980) had already distinguished between six types of international production (resource-based, import-substituting manufacturing, export platform manufacturing, trade and distribution, ancillary services and miscellaneous) and differences in their determinants.[77]

Based on Hanson et al.’s findings, Ekholm et al. (2003) derived a theoretical model explaining export-platform FDI, while Grossman and Helpman (2002a and 2002b) modelled international outsourcing. Ekholm et al. constructed a 3x2x1 model that included three countries (two large high-cost economies (North) and a small low-cost economy (South)), two goods (one produced with constant returns to scale and one produced with increasing returns to scale using an intermediate input) and one factor of production (labour) and assumed firm- and plant-level fixed costs. The intermediate good was assumed to be produced in one of the two North countries, turning Home countries to MNEs, while assembly was undertaken in either North or South. Export-platform FDI – with North MNEs producing their goods in South and exporting

[76] Hanson et al. (2001), p.5.
[77] See Section 3.1.5, Table 3-5.

them to either the other North market or both North markets – was observed when trade costs for components and plant-level fixed costs were moderate and when South had a moderate cost advantage in assembly. The formation of a free trade area (FTA) between one North market and South resulted in the outside North MNE building a plant in South due to lower costs and to supply the joint FTA market, while the inside MNE built a single plant in South to serve the joint FTA market, exporting to the outside North market.

Grossman and Helpman (2002a and 2002b) analysed an MNE's decision between vertical integration and outsourcing (i.e. vertical specialisation, when differentiated final goods were produced using product-specific intermediate inputs). While firms wanted to internalise intermediate good production to reduce transaction costs stemming from search costs (to locate an outsourcing partner) and incomplete contracts (since firms cannot ensure product characteristics such as quality), they wanted to choose outsourcing to reduce governance costs linked to vertical integration. MNEs were more likely to choose outsourcing when specialised firms had a productivity or cost advantage, when there was an efficiency improvement of the search technology, when industry and economy were large and the number of specialised firms was high or when there was a great substitutability between the specialised goods.

While the two major types of MNEs (horizontal and vertical MNEs) were explained well by using the transaction-cost approach or the Knowledge-Capital Model, diversified MNEs, which were growing in importance, could not be explained using this approach, as it occurred owing to firms wanting to spread business risk. Firms were seen as risk-averse and assumed to locate their business activity in a number of markets that were uncorrelated in economic shocks such as recessions or macroeconomic policy changes. Changes in interest rates and exchange rates – variables already mentioned in relation to the Neoclassical model of international capital trade and Aliber's notion of currency risk – were seen as additional FDI determinants. According to Caves (1996), the establishment of diversified MNEs occurred when firms acquired horizontal or vertical MNEs or when they diversified domestically and their divisions set up horizontal or vertical subsidiaries, which are diversified to the ultimate parent firm's business. The idea of establishing MNEs to spread risk was an extension of Rugman's (1975 and 1977) "Risk Diversification Hypothesis". Rugman argued that MNEs locate overseas to enjoy product and factor market diversification and reduce variance in their profits. Producing abroad was seen as a diversification from solely producing domestically, while producing different products abroad was seen as a "double diversification" – a diversification in product and location.

In order to analyse the determinants of diversified FDI, it was tested whether FDI occurred to spread business risk and whether the FDI location was influenced by exchange rates and interest rates. Kopits (1979) measured the industrial structure of US MNEs using cross-section data on US parent companies from 15 manufacturing industries with affiliates in Canada, Europe and Latin America. He found evidence for the existence of conglomerate diversification, which accounted for around 14% of total foreign assets held by US parent companies in 1962 and 22% of US foreign assets in 1969.[78] The proportion of diversified foreign subsidiary assets over the number of industries in which the subsidiaries operated in 1968 was increasing in the ratio of R&D expenditure to total sales, the growth rate of foreign subsidiary assets and the proportion of employment in diversified domestic establishments over the number of industries in which they operate, but has not been affected by the average size of the US parent company and a concentration ratio proxy.

Evidence supporting the hypothesis that firms wanted to diversify geographically to reduce risk was presented by Hughes et al. (1975), Michel and Shaked (1993), Miller and Pras (1980) and Thompson (1985). Hughes et al. (1975) used monthly return data for 32 domestic and 50 multinational corporations in the US to analyse whether the MNEs' variability in returns was less than, equal to or greater than that of otherwise similar domestic firms (i.e. firms similar in terms of size and product diversification). While MNEs had higher average returns, they had lower systematic and unsystematic risk than domestic firms, so that MNEs could benefit by establishing affiliates overseas. Michel and Shaked (1986) compared the financial performance and characteristics of US domestic and multinational corporations and showed that MNEs had lower total and systematic risk and were more capitalised than domestic firms. However, they had an inferior risk-adjusted market-based performance. According to Miller and Pras (1980), who analysed data on 246 US corporations over a number of years, the standard deviation of net income and net operation income was negatively affected by geographic diversification and the export-sales ratio of each corporation. When export diversification was included in the regression, this variable, product and geographic diversification and export-sales ratio were significant. Geographical diversification was most important for stabilising a company's profit performance, followed by product and export performance. Thompson (1985) analysed the relationship between market-based risk measures and foreign activity for 46 large UK firms using monthly share price data. His result supported the hypothesis that international diversification reduced risk, since the firm's degree of multinationality (measured by foreign affiliate sales and exports over total sales) reduced the sensitivity of domestic security systematic risk, but increased the sensitivity of domestic security returns to movements in a world index. Terrorism is another risk factor that could affect FDI. Enders and Sandler (1996) found that terrorism in Spain and Greece led to a persistent and significant negative influence on FDI and on the stock of foreign-owned capital, therebt reducing growth. The effect of labour disputes on FDI from Korea was analysed by Tcha (1998). The variable reduced FDI to North America, but was not significant for FDI to Asia. Other determinants included exchange rate volatility, current account balance and per capita GNP.

Taking geographical and product diversification into account, Kim et al. (1993) showed that it was possible for MNEs to have high return-low risk profiles when they diversified both geographically and on a product basis. Looking at asset returns for 125 US MNEs over a five

[78] In comparison, horizontal extension accounted for 59% of total foreign assets held by US parent companies in 1962 and 49% of US foreign assets in 1968, while vertical extension accounted for 27% (16% forward and 11% backward vertical extension) of US foreign assets in 1962 and 29% (22% forward and 7% backward vertical extension) of US foreign assets in 1968. See Kopits (1979), p.101-102.

year period and comparing groups of MNEs with similar risk-return performance profiles (controlled for industry effects), they found geographically diversified MNEs to have a better risk-return performance than other MNEs. Investigating the relationship between geographical and product diversification, Pearce (1993) looked at a sample of the largest 330 US and 462 non-US companies in 20 different industries and found geographical and product diversification to be complements rather than substitutes. The complementarity was more likely to occur for foreign production than for exports. In fact, most of the product diversification occurred overseas, and foreign affiliates were more diversified than domestic affiliates.

Since FDI could also be seen as a diversification of real assets by MNEs, exchange rates (reflecting market risk for foreign affiliates) should affect FDI flows.[79] Cushman (1988) looked at US inward FDI from the UK, France, Germany, Canada and Japan to analyse the relationship between exchange rate uncertainty and FDI in a portfolio theory framework. The change of FDI stock was increasing in the standard deviation of the future change in the real price of foreign exchange, US real GNP and real US interest rates, but decreasing in the expected US dollar exchange rate appreciation, the real price of foreign exchange and real foreign interest rates. The cost of labour input for production had a negative effect on the change of the US FDI stock from France and Canada. Caves (1989) analysed the link between exchange rate movements and FDI in the US using panel data for 15 countries, and found support for the hypothesis that FDI flows take on the short-run guise of stabilising speculation. Exchange rate depreciation reduced FDI in the US. Other variables tested for included US GNP, the lagged stock of foreign-controlled capital, the profit rate, the share-price differential and the trade balance (differential). Froot and Stein (1991) showed that foreign assets and FDI were significantly affected by the mean real value of the US dollar and a time trend, and FDI was decreasing in the value of the US dollar when analysing quarterly and annual US inward FDI data. In another study of US FDI, Klein and Rosengren (1994) analysed the determinants of four measures of US inward FDI[80] from seven industrialised countries. Relative wealth[81] reduced US inward FDI and M&A flows, but not real estate purchases, real wages had no significant effect on any measure, while US dollar exchange rates had a negative effect on all measures. Dewenter (1995) explored the relationship between the value of the US dollar and FDI in the US and found that the exchange rate relationship with absolute foreign investment flows exists for exchange rate levels and changes. However, investment flows broken down by investor country did not show any significant correlations with their respective bilateral exchange rates. The US dollar depreciation was also associated with higher levels of foreign acquisitions in the US and higher foreign takeover premia for US targets.

[79] Feenstra (1998) claimed that the idea that "exchange rate changes do not affect the flow of foreign direct investment" was one of the big fallacies in relation to FDI. He used Froot and Stein's (1999) finding that MNEs have less than perfect capital markets for loans and Blonigen's (1997) argument that revenues of costs may be in different currencies to contradict this misconception.

[80] The four measures include a FDI measure by the Bureau of Economic Analysis and a FDI, M&A and a real estate purchase measure by the International Trade Administration.

[81] Defined as US stock market value relative to stock market value of each of the Home countries.

In summary (Table 3-10), empirical studies showed that risk factors including market-based risk, exchange rate and interest rate, could determine FDI and should thus be incorporated into the theoretical models explaining FDI.

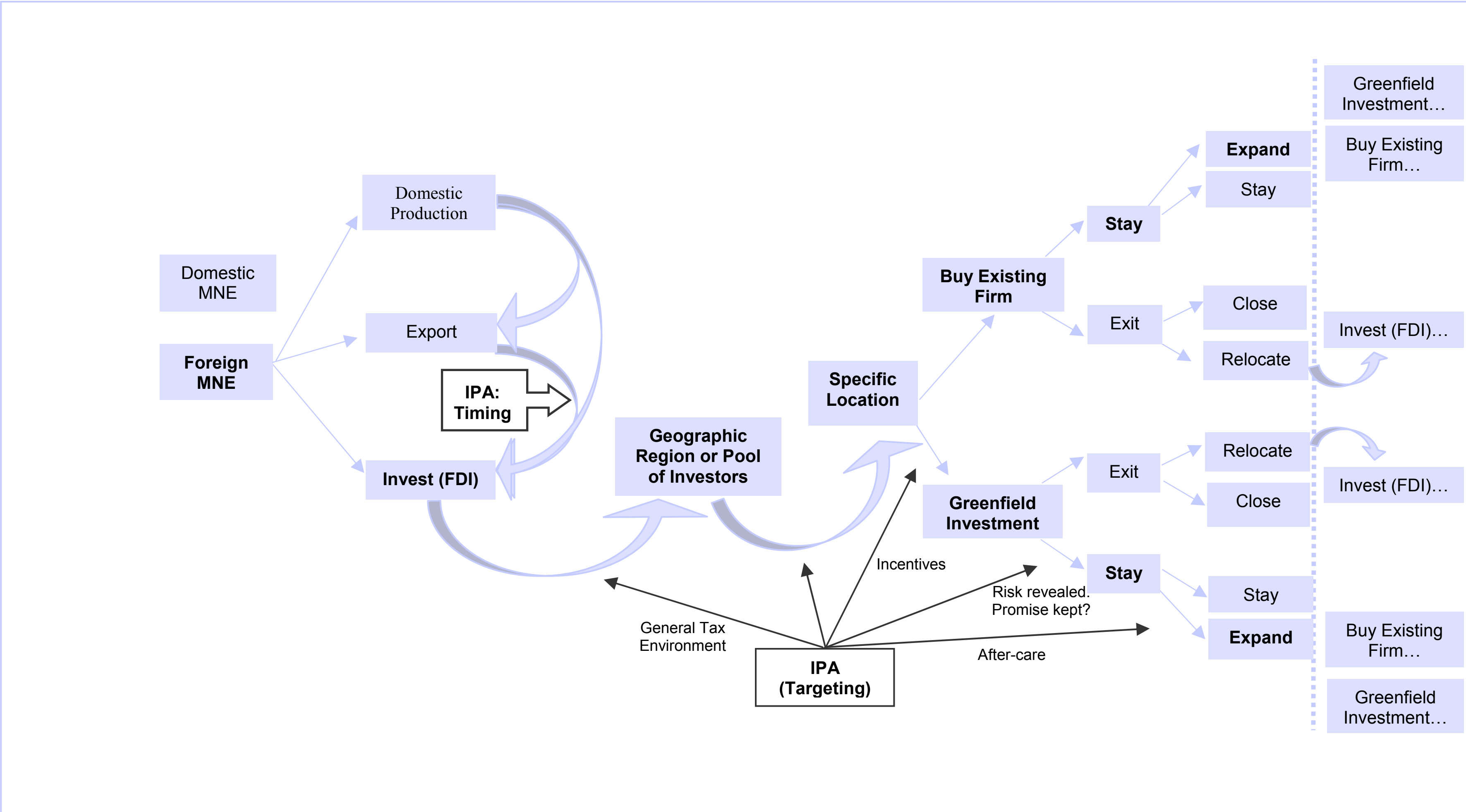
Table 3-10

Determinants of FDI according to the Diversified FDI / Risk Diversification Model			
Variable	**Theoretically predicted effect**	**Effect on FDI or MNE activity found**	**Source**
Risk Factors			
Market-based risk in Host	**Negative**	Negative	Thompson (1985)
Possibility of (systematic and unsystematic) risk reduction and lower variability in income and returns	**Positive**	Positive	Hughes et al. (1975) Michel and Shaked (1986) Miller and Pras (1980) Kim et al. (1993)
Terrorism	**Negative**	Negative	Enders and Sandler (1996)
Labour Disputes	**Negative**	Negative or Not significant	Tcha (1998)
Home exchange rate appreciation	**Positive**	Positive	Cushman (1988)
Host exchange rate appreciation	**Negative**	Negative Negative Negative Negative Negative	Cushman (1988) Caves (1989) Froot and Stein (1991) Klein and Rosengren (1994) Dewenter (1995)
Exchange rate volatility	**Negative**	Negative or Not significant	Tcha (1998)
Home real interest rate	**Negative**	Negative	Cushman (1988)
Host real interest rate	**Positive**	Positive	Cushman (1988)
Other Factors			
Host GNP	**Positive**	Positive Not significant	Cushman (1988) Caves (1989)
Host per capita GNP	**Positive**	Positive	Tcha (1998)
Relative wealth of Host firms (with currency appreciation)	**Negative**	Negative	Klein and Rosengren (1994)
Host cost of labour input **Host real wages**	**Negative**	Negative Not significant	Cushman (1988) Klein and Rosengren (1994)
Lagged Stock of Foreign Contolled Capital	**Negative**	Negative	Caves (1989)
Profit Rate	**Positive**	Positive or Not significant	Caves (1989)
Share-Price Differential	**Positive**	Positive or Not significant	Caves (1989)
Current Account Balance	**Negative**	Negative	Tcha (1998)
Trade Balance (Differential)	**Negative**	Negative	Caves (1989)

3.1.9 POLICY VARIABLES AS DETERMINANTS OF FDI

In addition to the models discussed above, FDI can be seen as a game with two players, MNE and Host government, or as a contest between two or more Host countries competing for FDI. Figure 3-1 helps to explain the investment decision process and which stages are affected by different government policies and incentives. Governments can use different strategies to influence the firm's choice between domestic production, licensing or FDI, the firm's location choice (from a region or pool of investors to a specific location), the firm's choice between greenfield investment (i.e. the construction of new factories or offices) or the acquisition of an existing firm (including joint ventures), the firm's choice to stay or to pull out after the investment is made and the firm's choice to stay or to expand. Hence, the investment decision-making process is very complex and not simply a decision between investing and not investing.

Figure 3-1: The Investment Decision-Making Process



In practice, MNEs and Host countries bargain over numerous issues, including taxes, subsidies, financing arrangements, use of expatriates, training, local employment, local input, export conditions and capital repatriation, i.e. all factors related to areas of government intervention in FDI.[82] Bargaining strength is important in the negotiating process and is influenced by information asymmetries, competitive structure of the economy, market size and projected market growth, political stability, the level of infrastructure and the endowment of natural resources, but also the competition from other Host government.

In general, one can distinguish between three main types of investment incentives: fiscal incentives (profit-based, capital investment-based, labour-based, sales-based, value-added-based, import- or export-based incentives and incentives based on particular expenses), financial incentives (government grants, government credits at subsidised rates, government equity participation and government insurance at preferential rates) and other incentives (subsidised dedicated infrastructure, subsidised services, market preferences and preferential treatment on foreign exchange). Hence, considering the many potential combinations of policy and non-policy determinants and their effects, many areas are still open for theoretical and empirical research despite the research that has been undertaken since the late 1980s. The following papers therefore offer only a glimpse into the research on policy determinants.

Early research by Bond and Samuelson (1986) showed that countries could attract FDI by offering investment incentives such as tax holidays to signal to firms that local factors were high quality when there was asymmetric information between MNEs and countries (i.e. firms did not know the quality of local inputs when choosing a location, while governments did). Barros and Cabral (2001) extended Bond and Samuelson's analysis by adding the possibility of relocation. They examined the efficiency properties of the equilibrium and proposed a contractual no-exit clause that could increase expected welfare.

Black and Hoyt (1989) analysed the competition between two cities when bidding for firms. In their model, firms located in the city with the best combination of wages, costs and tax holidays. In a related paper Haaparanta (1996) analysed the competition between multiple governments for FDI using a principal-agent model. A firm's investment was assumed to be divisible and information was assumed to be perfect. Haaparanta showed that while low-wage countries always attracted more FDI than high-wage countries when there were no subsidies, high-wage countries had the possibility to attract FDI when they offered higher subsidies than low-wage countries, though they did not necessarily do so.

Haufler and Wooton (1999) combined trade costs (used in new trade literature) with differences in country size and fiscal competition, analysing two scenarios: one where transport costs for imports were identical and exogenously given, but lump-sum profit tax or subsidy were their only policy options, the other where a tariff or consumption tax were further possible fiscal instruments. In both cases, firms located in the larger market (where they could charge a higher producer price), paying a tax that was increasing in relative market size and greater when the

[82] The idea that government policies including investment incentives influence MNE activity was also part of the OLI Framework as discussed in Dunning (1977 and 1979). Trying to incorporate this into a game-theoretic framework, however, is a new area of research.

tariff instrument was permitted, even when both countries offered subsidies. Market size often weighed so heavily that, even with lower taxes, small countries found it hard to attract FDI.

Haaland and Wooton (1999) looked at policy competition between symmetric countries and analysed the role of investment incentives offered by Host governments. FDI recipients gained from industry-level scale economies due to agglomeration effects, but needed a first investor to establish a modern sector to increase the location’s attractiveness for other investors. Countries needed investment subsidies to attract this first investor. Haaland and Wooton (2001a) subsequently studied two types of policy instruments – initial subsidies to the MNE (aimed at attracting FDI) and required redundancy payments (related to the country’s labour market flexibility) – in a dynamic setting with an industry-specific risk of failure. A trade-off between labour-market inflexibility and the need for subsidies existed when it came to the MNE’s entry decision. “Easy Come, Easy Go” Hosts were most attractive to all potential investors and found it easist to attract FDI. The model showed how various country and industry characteristics affected the firm’s entry decision, activity level and profits. Labour market flexibility was a determinant of FDI, while subsidies only had short-run effects. The higher the labour market uncertainties were, the more severe were the effects of labour market rigidities on the MNE’s decision to enter and on MNE activity, employment level and profits. Haaland and Wooton (2001b) added policy competition between countries to this model. They looked at labour-market flexibility (modelled as redundancy payments) and the employment level (modelled as the opportunity cost of employment) to determine which configurations had the most success in attracting FDI in particular industries. The country with the best incentive package and attractive local economic conditions, such as a flexible labour market (low closure costs), and high unemployment (low opportunity costs of employment) won the investment. Countries with inflexible labour markets and high unemployment attracted low-risk firms, while countries with flexible labour markets and low unemployment attracted high-risk firms.

Another interesting paper discussing risk and uncertainty for both government and MNE for different types of investment support such as grants, tax abatements and subsidized loans is by Mudambi (1999). He analysed the choice of support schemes in a strategic context, identifying advantages and disadvantages of each scheme using principal-agent theory (based on the underlying strategic risk-return considerations) and assessing whether particular types of MNEs had strong preferences for particular schemes. Strong relationships between characteristics of firms and the nature of the support package were found.

One of the first empirical studies to analyse policy variables in detail is by Root and Ahmed (1978) who tested 44 economic, social, political and policy variables for significance using data on FDI inflows of 41 developing countries. Classifying the countries in three categories (unattractive, moderately attractive and highly attractive) according to their annual per capita FDI inflow, they found that – apart from per capita GDP, export-import ratio and commerce, transport and communication ratio and extent of urbanisation – the corporate tax level discouraged and regular executive transfers encouraged FDI, while tax incentives laws and liberality were not significant. Grubert and Mutti (1991) undertook a cross-sectional study of the US FDI stock in 33 countries and found the stock of plant and equipment and the US exports to affiliates and to countries in general to be increasing in the inverse of the tax rate (i.e. reducing the Host country's tax rate had a positive effect), the tariff rate, GDP and GDP per capita. Looking at a variety of investment incentives, Rolfe et al. (1993) asked managers of almost 900 US firms with operations in the Caribbean region to assess the attractiveness of twenty Host country incentives. Overall, no restrictions on intercompany payments, no controls on dividend remittances, import duty concessions, guarantees against expropriation and tax holidays proved to be the most important incentives. Taking type of investment, market orientation and product type into account, they found that start-up companies preferred incentives that reduced their initial expenses (equipment, material exemption), while expanding firms preferred tax incentives that targeted profit. Export-oriented investors found import-duty restrictions more important than local market-oriented investors and firms in the manufacturing sector thought incentives related to depreciable assets were more desirable than firms in the service sector did due to their extensive use of fixed assets.

Loree and Guisinger (1995) examined the effects of policy and non-policy variables on the location of US FDI outflows using data on 48 countries. Investment incentives increased FDI flows, while performance requirements and Host country effective tax rates decreased FDI flows. Important non-policy variables were political stability, cultural distance, GDP per capita, telecommunications and transportation infrastructure. Analysing country-level aggregate data on US nonbank majority-owned affiliates in tax haven countries, industrialised countries and developing countries, Hines and Rice (1996) found the location of total and non-financial profits and the location of factors of production (employment and property, plant and equipment) to be decreasing in tax rates (the tax effect was strongest at low tax rates since tax^2 was significantly positive), but increasing in GDP.

Using industry- and firm-level data, instead of country data, Devereux and Griffith (1998) analysed the behaviour of US firms in the EU (particularly in the UK, France and Germany). They assumed that MNEs first decided whether to export their Home production or to produce in the target country and then, conditional on the investment decision, chose between the various possible locations. Average effective tax rates had a greater effect on FDI than marginal tax rates, while non-policy factors (such as production, demand and R&D agglomeration effects) also mattered.

Hubert and Pain (2002) found FDI to be increasing in the level of government fixed investment expenditure relative to other economies and tax competitiveness, but decreasing in structural funds from the European Regional Development Fund relative to GDP, when investigating a panel dataset on German outward FDI stocks in the European Economic Area. Furthermore, FDI was affected by the lagged FDI stock, EU GDP and industry output, the German R&D stock, relative unit labour costs, relative market size and relative number of patents. Bénassy-Quéré et al. (2001a) provided support for the hypothesis that a high rate of taxation of corporate profits reduced FDI, when using a panel data of annual inward bilateral flows from a number of European countries, Japan and the US. The effective rate of taxation, exchange rate volatility, GDP differential, distance and transport costs reduced FDI, while bilateral openness, market size and potential had a positive effect. In another study, Bénassy-Quéré et al. (2001b) analysed agglomeration and tax differential effects for a panel of eleven OECD countries using bi-directional FDI data, showing that both mattered. Tax differentials were significant (nominal tax differentials had a negative, effective tax differential a positive effect), while lagged market potential, Home market GDP, GDP differential, the distance between Home and Host and bilateral openness also mattered.

In summary (Table 3-11), policy variables such as corporate tax rates, tax concessions, tariffs and other fiscal and financial investment incentives had a significant effect on FDI in a number of studies and should thus be considered as potentially important determinants of FDI. In general, the effect that tax policy had on FDI was small compared with that of other factors (including market size and growth, basic infrastructure, political stability, cost and availability of factors of production).[83] Fiscal incentives should be seen as adding explanatory power to models that explain FDI using non-policy variables, rather than replacing them. Tax policy cannot compensate for a negative investment climate, though fiscal incentives can promote investment in a favourable investment climate.[84]

Table 3-11

Policy Variables as Determinants of FDI			
Variable	**Theoretically predicted effect**	**Effect on FDI or MNE activity found**	**Source**
Policy Variables			
Host corporate tax level	**Negative**	Negative Negative Negative	Root and Ahmed (1978) Grubert and Mutti (1991) Bénassy-Quéré et al. (2001a)
Host effective tax rate	**Negative**	Negative Negative Negative (average and marginal tax rates) Negative Negative	Loree and Guisinger (1995) Hines and Rice (1996) Devereux and Griffith (1998) Bénassy-Quéré et al. (2001a) Bénassy-Quéré et al. (2001b)
Tax[2]	**?**	Positive	Hines and Rice (1996)
Host tax competitiveness	**Positive**	Positive	Hubert and Pain (2002)
Regular executive transfers in Host	**?**	Positive	Root and Ahmed (1978)
Tax incentives laws in Host Investment incentives	**Positive**	Not significant Positive	Root and Ahmed (1978) Loree and Guisinger (1995)
Host tariff rate	**Positive (for HOR)**	Positive	Grubert and Mutti (1991)
No restrictions on intercompany payments in Host	**Positive**	Positive	Rolfe et al. (1993)
No controls on dividend remittences in Host	**Positive**	Positive	Rolfe et al. (1993)
Import duty concessions in Host	**Positive**	Positive	Rolfe et al. (1993)
Host guarantees against expropriation	**Positive**	Positive	Rolfe et al. (1993)
Host tax holidays	**Positive**	Positive	Rolfe et al. (1993)
Host performance requirements	**Negative**	Negative	Loree and Guisinger (1995)

(Table 3-11 continued)

Policy Variables (continued)			
Host level of government fixed expenditure relative to other countries	**Positive**	Positive	Hubert and Pain (2002)
Host relative structural funds from the European Regional Development Fund relative to Host GDP (signalling low infrastructure quality)	**Negative**	Negative	Hubert and Pain (2002)

[83] A possible explanation for the small effect of the tax policy may be the repatriation of profits.
[84] A comprehensive review of literature and empirical research related to policy determinants of FDI can be found in Hines (1996 and 1999), while De Mooij and Ederveen (2001) undertook a meta-regression of 25 empirical studies between 1984 and 2001, finding a number of tax rates to be important.

Overall, there is not one single theory of FDI, but a variety of theoretical models attempting to explain FDI and the location decision of MNEs. While the neoclassical model, which explained international capital trade due to differences in returns on capital, was heavily criticised because of its assumption of perfect competition, Dunning's OLI framework proved to be a better approach of explaining FDI as linked to MNEs, which were seen as firms with market power. His model combined ownership, location and internalisation advantages as determinants of FDI after they were previously discussed in separate theories. An alternative framework for analysing FDI and MNE activity, combining ownership and location advantages with technology and country characteristics and explaining both horizontal and vertical FDI, was offered by the new trade theory. Horizontal FDI, for instance, was explained using the Proximity-Concentration Hypothesis, while vertical FDI was explained using the Factor-Proportions Hypothesis. This area of research was complemented by Markusen's Knowledge-Capital Model that allowed for both FDI forms as special cases. These models could be modified to explain other FDI forms such as export-platform FDI, wholesale FDI and outsourcing. An additional type of MNEs, diversified MNEs, was explained by the Risk Diversification Hypothesis with firms seen as risk-averse and trying to spread business risk. FDI could also be viewed as a game with two players, MNE and Host government, and a contest between two or more Host countries competing for FDI with a variety of policy, fiscal, financial and other investment incentives influencing the FDI location. Hence, the different approaches do not necessarily replace each other, but explain different aspects of the same phenomenon.

Since there is a variety of theoretical models explaining FDI, there are many factors that were experimented with in empirical studies to determine which factors influence FDI. R&D and advertising expenditure, skill and technology intensity, the existence of multiplant enterprises and firm size were important ownership advantages in a number of studies while, in another area of research, aggregate variables (such as market size, growth and trade barriers) had an effect on FDI. A combination of ownership advantages, location advantages (including market size and characteristics, factor costs, transport costs and protection) and other factors (such as political regime and infrastructure quality) had explanatory power when analysed under the OLI framework. The Proximity-Concentration Hypothesis was also robust, as FDI could be explained by market size, transport costs and protection and agglomeration economics such as R&D and advertising intensity or corporate scale economies in general. Studies that looked at the horizontal FDI, vertical FDI and Knowledge-Capital Model and their determinants found market size and characteristics (in particular a country's skilled labour endowment) and transport costs and protection to be important factors explaining FDI. However, the horizontal FDI model explained overall FDI better than the vertical FDI model, while the Knowledge-Capital Model had the same explanatory power as the horizontal FDI model. Risk factors (such as market risk, the exchange rate and the interest rate) affected the location of MNEs, as did policy variables (such as corporate tax rates and tax concessions and tariffs and other fiscal and financial investment incentives). Hence the empirical evidence strengthens the idea that the different approaches do not necessarily replace each other, as every theoretical model found some support through regression analysis.

Therefore, FDI should be explained more broadly by a combination of ownership advantages or agglomeration economics, market size and characteristics, cost factors, transport costs and protection and risk factors and policy variables. This conclusion explains why many empirical studies take that approach, even when focusing on specific theories or aspects of FDI.

3.2 AUSTRALIAN EMPIRICAL STUDIES OF DETERMINANTS OF FDI

A discussion of existing Australian studies links the general research with the specific case of Australian FDI, the focus of this study. Australia, the second largest net importer of FDI in the developed world, represents a country with a substantial share of foreign ownership. It is a unique country case, as it is a small, distant and fragmented economy, which is well endowed with natural resources. Since these differences may lead to some of the econometric results differing from the results discussed in the general research chapter (the Australian market size, for instance, is unlikely to be a major determinant of FDI, while factor costs, transport costs, protection and access to the Asia-Pacific market may well matter), it is important to discuss existing Australian studies. So far, only a few field studies and empirical studies have been conducted. The first field study of Australian FDI, which is in line with the early field studies discussed in Section 3.1.1, was undertaken by Brash (1966). A hundred American manufacturing companies in Australia were asked about their motives for investing in Australia. Domestic market growth was the most important factor for FDI, followed by trade barriers (tariff barriers and import restrictions) and cost factors (financial inducements, lower production and transport costs). These factors were more important than the use of Australia as an export base (access to New Zealand, other Pacific markets and Asian markets) or the preferences of local customers for local products (Table 3-12).

Later field studies include Buckley and Mathew's (1979) study of UK first-time investors in Australia and Hutchinson and Nicholas' (1994) and Nicholas et al.'s (1996) surveys of Japanese companies in Australia. Buckley and Mathew (1979) asked 52 UK first-time investors in Australia why they chose FDI over domestic expansion or expansion in other countries. The main reason for FDI was market failure: MNEs wanted to replace their inefficient local marketing or distribution channels to help protect sales. The decision to choose FDI over domestic investment was based on the opportunity to use the company's skills in a less restrictive market, while the decision to choose Australia over other foreign locations was based on unproblematic market entering and similar market structures as in the UK. Other specific factors influencing the investment decision were related to the product range, R&D and manufacturing skills.

Table 3-12

Motives of 100 American Companies for Investing in Manufacturing Facilities in Australia					
Motives for Investment	**First**	**Second**	**Third**	**As additional factor**	**Total**
Market Growth: To take advantage of expected growth of Australian market	**54**	**19**	**13**	**3**	**89**
Barriers to trade	**24**	**31**	**19**	**6**	**78**
- To overcome tariff barriers	13	21	15	1	**50**
- To overcome import restrictions	9	10	4	5	**28**
Cost Factors	**3**	**15**	**16**	**12**	**46**
- To avoid freight charges	…	9	4	9	**22**
- To take advantage of specific encouragement by state or federal government	2	2	8	1	**13**
- To take advantage of lower Australian unit cost conditions	1	4	4	2	**11**
Export Base	**…**	**7**	**7**	**16**	**30**
- To gain access to NZ and other Pacific markets	…	6	3	10	**19**
- To gain access to Asian markets	…	1	4	6	**11**
Consumer preferences: To take advantage of consumer preference for "made in Australia" goods	**2**	**8**	**6**	**8**	**24**
Other motives	**19**	**4**	**8**	**6**	**37**
- To avoid unfavourable conditions for US expansion	…	2	1	…	**3**
- To meet need caused by the break-down of previous licensing agreement with local manufacturer	1	…	…	2	**3**
- Other	18	2	7	4	**31**
Total	**100**	**84**	**69**	**51**	**304**
Source: Adapted from Brash (1966), p. 36, Table III-1					

Nicholas and Hutchinson (1994) looked at the importance of cost factors in the investment decision of 21 Japanese manufacturing subsidiaries in Australia. Tariffs, transport costs of raw materials and government policies were the most important factors, while transport costs of products to customers, industrial relations and productivity and wage rates mattered the least. Using a survey of 69 Japanese subsidiaries in Australia, Nicholas et al. (1996) compared the motives for FDI in manufacturing, financial services and tourism. While most manufacturing firms set up subsidiaries to supply the local market and – to a lesser extent – supply other countries, financial services firms invested to complete a global network, to service Japanese costumers in Australia and to service Australian customers involved in trade with Japan. Tourist firms came to supply the Japanese tourist market and to establish a market presence. Relevant locational factors were political stability and the need to adapt to local customers' requirements in manufacturing and Australia's perception as a safe place, its warm climate, the warm relaxed people and the potential for Australian market growth in tourism. For financial services firms, locational factors were the same factors as the ones they mentioned as their motives.

There were also some econometric studies (including Parry (1978), Ratnayake (1993), Karunaratne and Tisdell (1998), Moshirian (1998), Tcha (1999) and Yang et al. (2000)) on the determinants of Australian FDI, though they were mixed in their success to substantiate theoretically predicated effects. Looking at cross-section data on 129 manufacuring industries, Parry (1978) explored the relationship between foreign ownership and structure-conduct-performance characteristics in Australia using regression analysis.[85] The degree of foreign ownership was higher, the higher an industry's fixed capital and R&D expenditure were, the higher its seller concentration was, the more capital-intensive it was, the more concentrated in

[85] Parry (1978, p.189) noted that his regression equation was *"not designed to establish the determinants of the degree of foreign ownership in Australian manufacturing industry, but is a means of establishing significant relationships between foreign ownership and various structure-conduct-performance characteristics."*

city and urban areas it was, the more important product differentiation was, the lower its use of natural resources was and the less multi-plant operations it had. However, FDI was not significantly related to the industry's profitability and diversification ratio. His results – apart from natural resource intensity and multi-plant operations – were in line with those of the empirical studies looking at ownership advantages as the determinants of FDI, yet it is unclear which factors caused Australian FDI.

Ratnayake (1993) explored the inter-industry variation of foreign ownership[86] in 132 manufacturing sectors in Australia by employing a simultaneous equation model, testing determinants including human capital intensity, R&D expenditure intensity, the presence of intangible assets (such as advertising intensity and scale economies), concentration ratio and multiplant operations, profitability, export intensity, trade barriers and transport cost. Foreign ownership was higher in human-skill- and technology-intensive industries with a high concentration and scale economies and was further induced by high protection. These results highlight the importance of ownership advantages as determinants of FDI.

Karunaratne and Tisdell (1998) found a positive causal link from US GDP to Australian FDI inflows and a bi-directional causality of a feedback relationship between Australian FDI outflows and inflows when analysing quarterly time-series data for openness (or globalisation, defined as exports plus imports over GDP), FDI inflows and FDI outflows (as ratios over GDP) and US real GDP index (as an indicator for foreign or world GDP trends) in a Vector Autoregression (VAR) model. The positive long-run relationship between globalisation and FDI flows supported the new trade theory's complementarity hypothesis (which states that trade and FDI inflows or outflows increase together) and rejected the neoclassical trade paradigm (in which trade and FDI were assumed to be substitutes). In the long-run, FDI inflows increased FDI outflows, supporting the hypothesis that MNEs use Australia as a platform to enter the Asian market. Looking at foreign investment flows in the financial services industry, Moshirian (1998) found Australia's current account balance, domestic and foreign interest rates, domestic and foreign economic activities to affect foreign investment. The foreign investment stock was determined by the bank cost of capital, the size of Australia's banking market, the real exchange rate, investment in manufacturing and banks' foreign assets.

Tcha (1999) analysed the determinants of Australian FDI using a combination of aggregate quarterly and country-specific annual pooled data (for six developed countries including the US, Japan, the UK, New Zealand, Canada and Germany). In the quarterly FDI model, real exchange rate and labour disputes (plus four time lags of each variable) were the only two explanatory variables analysed and the significance of these variables was limited. In the country-specific FDI model, exchange rate volatility, Home's current account balance and the dummy for investment from Canada were significantly negative. The dummy for Japan was significantly positive, while most variables (real exchange rate, the ratio of real GDP per capita (in the Host relative to Home), the ratio of real wages, the ratio of labour disputes, Australian real GDP and the country dummies for New Zealand, the UK and Germany) were not

[86] The foreign ownership ratio was measured as the percentage of sales by foreign-owned firms.

significant. Overall, only around 30% of the variation in FDI was explained and the robustness of the results was not discussed.

Yang et al. (2000) used quarterly aggregate FDI inflows in a purely econometric exercise to find the determinants of Australian FDI. The change of the Host interest rate, wage rate changes and industrial disputes increased FDI, while openness and lagged inflation had negative effects. Openness, industrial disputes and wage rate changes had unexpected signs, while the change in Australian GDP and exchange rate appreciation were not significant. An overview of the results of various empirical studies on Australian FDI is given in Table 3-13.

Table 3-13

Determinants of FDI in Australia Based on Econometric Studies			
Variable	**Theoretically predicted effect**	**Effect on FDI or MNE activity found**	**Source**
Ownership Advantages			
R&D intensity/expenditure in Host industry	Positive	Positive Positive	Parry (1978) Ratnayake (1993)
Advertising intensity in Host industry	Positive	Positive	Ratnayake (1993)
Fixed capital in Host industry	Positive	Positive	Parry (1978)
Capital intensity of Host industry	Positive	Positive	Parry (1978)
Human capital intensity of Host industry	Positive	Positive	Ratnayake (1993)
Natural resource intensity of Host industry	Positive	Negative	Parry (1978)
Export Intensity in Host industry	Negative	Positive	Ratnayake (1993)
Importance of product differentiation	Positive	Positive	Parry (1978)
Multiplant operations in Host industry	Positive	Negative Positive	Parry (1978) Ratnayake (1993)
Economies of scale in Host industry	Positive	Positive	Ratnayake (1993)
Seller concentration in Host industry	Positive	Positive Positive	Parry (1978) Ratnayake (1993)
Concentration in city/urban areas	Positive	Positive	Parry (1978)
Profitability of Host industry	Positive	Not significant Positive	Parry (1978) Ratnayake (1993)
Diversification ratio in Host industry	Positive	Not significant	Parry (1978)
Market Size			
Host real GDP	Positive	Not significant	Tcha (1999)
Change in Host GDP	Positive	Not significant	Yang et al. (2000)
Relative per capita income (Host/Home)	Positive	Not significant	Tcha (1999)
Factor Costs			
Relative real wages (Host/Home)	Negative	Not significant	Tcha (1999)
Change in the Host wage rate	Negative	Positive	Yang et al. (2000)
Transport Costs and Protection			
Host transport cost	Positive	Not significant	Ratnayake (1993)
Host trade barriers / rate of protection	Positive	Positive	Ratnayake (1993)
Host openness	Positive	Positive Negative	Karunaratne and Tisdell (1998) Yang et al. (2000)
Home's current account balance	?	Negative	Tcha (1999)

(Table 3-13 continued)

Risk Factors			
Exchange Rate Volatility	Negative	Negative	Tcha (1999)
Exchange Rate (Appreciation)	Negative	Not significant or Positive	Tcha (1999)
Host exchange rate appreciation	Negative	Not significant	Yang et al. (2000)
Change in Host interest rate	Positive	Positive	Yang et al. (2000)
Host inflation	Negative	Negative	Yang et al. (2000)
Host labour Disputes	Negative	Not significant	Tcha (1999)
Relative labour disputes (Host/Home)	Negative	Not significant or Negative	Tcha (1999)
Host industrial disputes	Negative	Positive	Yang et al. (2000)
Other Factors			
Host FDI outflows	?	Positive	Karunaratne and Tisdell (1998)
US GDP (indicating world GDP trends)	Positive	Positive	Karunaratne and Tisdell (1998)

The empirical studies on the determinants of Australian FDI were mixed in their success to support theoretically predicted effects. Studies focusing on ownership advantages were in line with theoretical predictions, but the testing of variables in studies focusing on location factors, such as market size, factor costs, transport costs and protection, or risk factors, did not always deliver the expected result. While some variables such as trade barriers, openness (in Karunaratne and Tisdell's study), interest rate and inflation were significant and of the predicted sign, other variables, such as Host GDP, exchange rate and transport costs, were not significant. The coefficients on wage rate changes, openness (in Yang et al.'s study) and industrial disputes had unexpected signs.

Even the most recent study, Yang et al.'s (2000) analysis of quarterly FDI data, had a number of shortcomings. The model was based on a short time period (35 observations between Q3/1985 and Q1/1994) and did not take into account the variety of theoretical models discussed above and none of the new FDI models, such as the horizontal FDI model, vertical FDI model, Knowledge-Capital Model or diversified FDI model. Nominal FDI was used as the dependent variable, and the model failed to explain large fluctuations of FDI at the end of the sample period. Given these mixed results, more evidence is needed, particularly on analysing new and more recent data.

CHAPTER 4

ANALYSIS OF DETERMINANTS OF AGGREGATE FDI IN AUSTRALIA

4.1 ANALYSIS OF DETERMINANTS OF QUARTERLY FDI INFLOWS

4.1.1 DATA

For the first econometric analysis of the determinants of Australian FDI, quarterly aggregate FDI flow data published by the ABS were used. Although FDI should be driven by long-term considerations, which is what distinguishes it from other forms of capital flows, especially portfolio investment, data prior to 1985 could not be used, since the Australian definition of FDI changed in 1985. This limits the number of observations – hence, quarterly data were used to boost the number of observations – and makes any comparisons of pre-1985 and post-1985 FDI data difficult if not impossible. Unfortunately, this data limitation led to the analysis missing a key turning point in Australia's regulatory and policy environment. Reforms in the 1980s (such as floating the exchange rate, opening the capital account, reducing protection and financial liberalisation) were significant for the commercial environment, affecting not only domestic businesses, but also foreign businesses including their FDI behaviour and motivations (e.g. changing motivations from 'rent-seeking' to 'efficiency seeking', as the old 'tariff factory' rationale began to disappear.

The dataset has not been used in its full length in any previous study and thus provides a great opportunity for new research into the determinants of Australian inward FDI. An extensive dataset with 71 observations for the period Q3/1985 to Q1/2003 was used, covering the last two decades in which increased globalisation and FDI growth has occurred.[87] The dataset includes three negative values (in Q1/1996, Q1/1999 and Q2/2001), depicting disinvestments. The series exhibits large fluctuations in the last quarter of the sample (Figure 4-1), which are aimed to be explained by this model. A price-deflated FDI series with 2000/01 prices (using the price index for private gross fixed capital expenditure (plant and equipment) as the deflator) was used, though the deflation had little effect on the series (Figure 4-1) and did not change the estimation results fundamentally.

The different factors were chosen to reflect a broad range of factors likely to affect FDI, considering the theoretical models and empirical studies previously discussed. The choice of variables was partly determined by the availability of quarterly Australian data and hence somewhat restricted. The explanatory variables included market size or growth, factor and transport costs, market risk, policy variables and OECD GDP.[88]

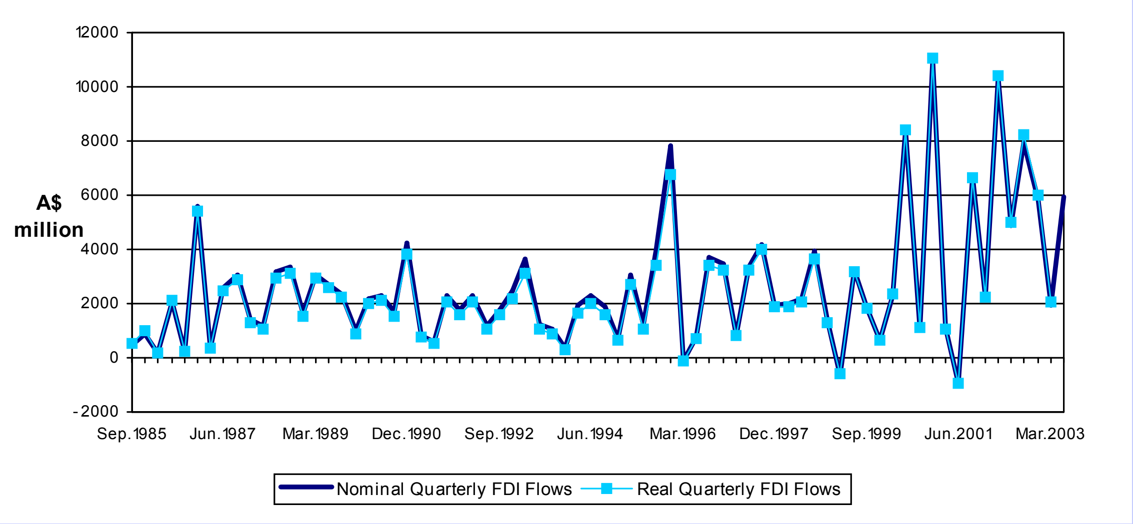


Figure 4-1: Nominal and Real Quarterly FDI Inflows, Q3/1985 to Q2/2002

Quarterly aggregate FDI was specified as a function of the following form:

fdi = f(*market, lab, rwages, trade, cdut, inr, exr, inf, indus, tax, oecdgdp*)

where the variables are as listed and defined below:[89]

fdi quarterly FDI in Australia (*ausnfdi)* or deflated by the price index for private gross fixed capital expenditure, plant and equipment (*ausinvdef*), i.e. *ausrfdi*

market Australian market size represented by real Australian GDP (*ausrgdp*),

lab labour supply in Australia, measured by the number of job vacancies (*ausjobvac*) or, alternatively, by the unemployment rate (*ausuer*)[90],

[87] The ABS changed the definition of FDI on 30 June 1985, so data from previous years could not be used owing to limited comparability. Furthermore, quarterly FDI data were only available aggregated by industry.

[88] Variables capturing commodity prices such as the export price index and the import price index (including the import price index for intermediate goods) were experimented with, but they were not found to be significant in the quarterly FDI model and were thus not included.

[89] The label *"aus"* in the variables indicates that the variables refer to the Australian market. The use of the distinction between the Home and the Host (Australian) market will become clearer in later chapters.

rwages	real wages in Australia, measured by *ausrwages1*, defined as average weekly earnings (*ausawe*) deflated by consumer price index (*auscpi*), *ausrwages2*, defined as wages, salaries and supplements (*auswss*) per employee (*ausemp*) per week deflated by the implicit price deflator for GDP (*ausipd*), or either of those variables adjusted for changes in labour productivity (*ausprod*), *ausrwages11* and *ausrwages22,*
trade	amount of trade in Australia, measured by real imports (*ausrimpo*) and real exports (*ausrexpo*) or by the openness of the economy (*ausopen*, defined as the sum of *ausrexpo* and *ausrimpo* divided by *ausrgdp*)[91],
cdut	Australian customs duties (*auscdut*)[92],
inr	Australian interest rate, measured by the nominal interest rate, i.e. the 30-day bank accepted bill rate (*ausbb30*), or by the real interest rate (*ausrir*, which is calculated as *ausbb30* minus *ausinf*),
exr	Australian exchange rate, measured using the trade-weighted index (*austwi*), or, alternatively, by the US dollar-Australian dollar exchange rate (*exrus*),
inf	Australian inflation rate (*ausinf*)
indus	number of industrial disputes in Australia (*ausindus*),
tax	Australian corporate tax rate (*austax*)[93],
oecdgdp	OECD GDP trends, measured by total real GDP of all OECD countries (*oecdrgdp*), or, alternatively, by the quarterly or annual growth difference between OECD GDP and Australian GDP (*oecdgrdifq* and *oecdgrdifa*).

In summary, market size or growth was represented by *market*, factor costs by *lab* and *rwages*, transport costs and protection by *trade* and *cdut*, risk factors by *inr*, *exr*, *inf* and *indus*, policy variables by *tax* and other factors by *oecdgdp*. For a summary see Table 4-1. Data sources, descriptive statistics and time series plots of those variables are in Appendix A.1 (Table A-1 and A-2 and Figure A-1).

[90] The Australian unemployment rate was – at least to some degree – negatively correlated with the number of job vacancies (with a correlation coefficient of –0.55).
[91] While this specification of openness is a commenly used, it has its weaknesses: it could be affected by policy changes and may not reflect actual openness of an economy.
[92] While it would have been useful to experiment with other protection variables (i.e. to measure non-tariff barriers), only customs duties were chosen as a measure for protection due to data availability constraints, in particular, the well-known problems of obtaining the tariff equivalent of non-tariff barriers.
[93] While it would have been useful to include the actual corporate tax rate (rather than the book rate) in the quarterly FDI model, this would have required comparing the Australian rate to some international benchmark and it was left to be explored in the country-specific FDI model.

Table 4-1

Determinants of FDI in Australia, Quarterly FDI Model		
	Dependent Variable	**Alternative Variable**
FDI		
Aggregate FDI (*fdi*)	*ausrfdi*	*ausnfdi*
	Explanatory Variable	**Alternative Variable**
Market Size or Growth		
Market Size (*market*)	*ausrgdp*	---
Factor Costs		
Labour Supply (*lab*)	*ausjobvac*	*usuer*
Real Wages (*rwages*)	*ausrwages1*	*ausrwages2, ausrwages11, ausrwages22*
Transport Costs and Protection		
Trade (*trade*)	*ausopen*	*ausrexpo, ausrimpo*
Customs Duty (*cdut*)	*auscdut*	---
Risk Factors		
Interest Rate (*inr*)	*ausbb30*	*ausrir*
Exchange Rate (*exr*)	*austwi*	*exrus*
Inflation Rate (*inf*)	*ausinf*	---
Industrial Disputes (*indus*)	*ausindus*	---
Policy Variables		
Corporate Tax Rate (*tax*)	*austax*	---
Other Factors		
OECD Market Size (*oecdgdp*)	*oecdrgdp*	*oecdgrdifq, oecdgrdifa*
Data Sources and Summary Statistics: See Appendix A.1, Table A-1 and A-2		

Before estimating the model, the different variables included in the quarterly FDI model and their potential substitutes are discussed and reasons for the predicted effect of each variable are given. For an overview of how the different effects that those variables have on FDI are seen in different theoretical models, see Table 4-2.

GDP is expected to increase FDI (or at least on horizontal FDI), as serving a market directly becomes more efficient relative to exporting, the larger the market is. Moreover, economic growth may encourage FDI. In contrast, if most FDI is vertical FDI, market size should not be an important determinant. Higher labour costs are expected to have a negative effect on FDI, as it makes producing in the country more expensive relative to trading. Though higher wages could also reflect a higher skill level or cause firms to substitute capital for labour in their production process, both should encourage FDI. Similarly, a higher unemployment rate (or a lower number of job vacancies) should increase FDI, since labour and the searching process for labour is cheaper for MNEs, the more people who are looking for work.

Trade and trade costs could affect FDI in various ways. MNEs often choose to invest in countries they already trade with and FDI reflects the switch from exports to local production. Therefore, Australian imports should have a positive effect on FDI, while the effect of exports is unclear. However, trade also plays a role in various stages of the production process, as firms might use intermediate inputs (vertical FDI) or set up subsidiaries to serve foreign markets (export-platform FDI), so that an economy appears more attractive for FDI, the more open it is. On the other hand, MNEs might prefer to invest and supply the foreign market directly rather than to export their goods if trade costs are higher. Hence, customs duties should encourage FDI (and particularly horizontal FDI), though higher customs duties may also discourage (vertical) FDI, as importing intermediate goods becomes more expensive.

Table 4-2

Determinants of FDI according to different Theories of FDI									
	Heckscher-Ohlin Model	**Ownership Advantages**[153]	**OLI Framework**	**Horizontal FDI (Proximity Concentration Hypothesis)**	**Vertical FDI (Factor Proportions Hypothesis)**	**Knowledge-Capital Model**	**Diversified FDI/ Risk Diversification Model**	**Policy Variables**	**Other Factors**
Market size	---	---	Positive	Positive	Nil	Positive	---	---	---
Wages	Negative	---	Negative	Positive (indicating per capita income or skilled labour)	Negative (indicating unskilled labour/factor abundance)	---	---	---	---
Labour Supply	---	---	---	Skilled labour: Positive	Unskilled labour/factor abundance: Positive	---	---	---	Negative correlation with Wages: Positive
Trade/ Openness	---	---	Positive (depends on FDI form)	---	---	---	---	---	---
Trade Barriers	---	---	Positive (depends on FDI form)	Positive	Positive	Positive	---	---	---
Interest Rate	Positive	---	Political/ Market Risk: Negative	---	---	---	Positive	---	---
Exchange Rate Appreciation	---	---		---	---	---	Negative	---	---
Inflation Rate	---	---		---	---	---	Political/ Market Risk: Negative	---	---
Industrial Disputes	---	---		---	---	---		---	---
Tax Rates	---	---	Negative	---	---	---	---	Negative	---
OECD GDP (or Growth Difference)	---	---	---	---	---	---	---	---	Positive (Negative)

153 Ownership advantages include R&D, skill and technology intensity, which could not be analysed using quarterly aggregate FDI data.

Higher market risk (represented by interest rate, exchange rate, inflation rate and industrial disputes) should discourage FDI. A higher interest rate, reflecting higher returns on capital, is expected to increase FDI if firms invest because of higher returns. However, this effect is more likely to exist for portfolio investment than for FDI, as MNEs tend to borrow money from Home and invest for other reasons than capital returns. However, a high interest rate could also reflect poor macroeconomic management and increased market risk, thus reducing the incentive to invest. The appreciation of the Australian dollar should have a negative effect on FDI, as it increases the cost of investing in Australia. The inflation rate is another means to capture market stability and is expected discourage FDI, as lower inflation is associated with a more stable macroeconomic environment. More industrial disputes might scare foreign companies off and thus discourage FDI.

A higher corporate tax rate makes investing less attractive for MNEs, while a reduction in the Host country's tax rate should have a positive effect on FDI. OECD GDP is included to represent world GDP trends[95]. MNEs may grow and increase their total FDI as the world economy grows. OECD GDP should thus have a positive effect on Australian FDI. If Australia grows by more than the OECD average, Australia should attract more FDI, while a lower growth rate than the OECD average should discourage investment.

For the estimation of the model, the time series were either used in constant price form or were deflated, so that only real data were used. Data exhibiting a seasonal pattern (*ausrgdp, ausrexpo, ausrimpo, ipd, awe, wss, emp* (used for *rwages*), *ausjobvac, ausuer, oecdrgdp, oecdgrdifq, oecdgrdifa* and *ausindus*) were used in seasonally adjusted form[96], while other time series (*ausrfdi, ausnfdi, auscdut, ausbb30, ausinf, austax*) did not exhibit any significant seasonal pattern and were thus used in unadjusted form.

If alternative variables could be used, the ones with the best fit were chosen. Current and lagged values were included when significant, while insignificant variables were not included. Lagged values were included since the investment decision is a time-consuming process, which is made a number of periods before the actual investment takes place. Hence, current values of the explanatory variables may not affect the investment decision that much. Then again, if a change in conditions suddenly makes a country appear less attractive than it was when the initial decision was made, the planned investment may not be realised. Therefore a dynamic equation as a combination of shorter and longer lag lengths, depending on each individual variable, was chosen as a model to explain FDI. The optimal number of lag lengths was chosen using the Schwarz Criterion (SC)[97], though serial correlation was also taken into account. Here, SC was minimized for the inclusion of one lag of *ausinf*, two lags of *ausrwages22*, three lags of *ausrgdp, ausopen, exrus,* four lags of *ausbb30, ausjobvac* and five lags of *austax*. The variables

[95] Because Australian GDP accounts for an average of only 1.7% of OECD GDP, it is considered as too small to affect world GDP trends and remains included in the OECD GDP series used.

[96] The variable *ausindus* was seasonally adjusted using Eviews' Census X11 (multiplicative) function. The Census X11 method is a standard method used by the US Bureau of Census to seasonally adjust publicly available data and is provided as a function in Eviews. See Eviews 4 User's Guide, p.184.

[97] The Schwarz Criterion is computed as $SC = -2(\log L/T) + k \log(T)/T$. It is preferred to other methods, such as the Akaike Information Criterion, as it imposes a larger penalty for additional coefficients.

ausindus, auscdut, oecdrgdp, *oecdgrdifq* or *oecdgrdifa* were not included, as they were not significant and their inclusion worsened the fit of the model. No lags of the dependent variable were included in the final model.[98]

4.1.2 MODEL SPECIFICATION AND ESTIMATION

Having discussed all the variables that were used in the analysis, the model can be stated as follows[99]:

$$y_t = \mu + \sum_{j=0}^{q} \beta_j x_{t-j} + \varepsilon_t$$

where x_{t-j} are the current and lagged values of the explanatory variables and ε_t is a white noise error term. Including the relevant variables for x_t, the model was estimated in the following form:

$$\begin{aligned} ausrfdi_t = \; & \alpha + \beta_{11}\, ausrgdp_t + \beta_{12}\, ausrgdp_{t-1} + \beta_{13}\, ausrgdp_{t-2} + \beta_{14}\, ausrgdp_{t-3} + \beta_{21} \\ & ausjobvac_t + \beta_{22}\, ausjobvac_{t-1} + \beta_{23}\, ausjobvac_{t-2} + \beta_{24}\, ausjobvac_{t-3} + \beta_{25} \\ & ausjobvac_{t-4} + \beta_{31}\, ausrwages22_t + \beta_{32}\, ausrwages22_{t-1} + \beta_{33}\, ausrwages22_{t-2} + \\ & \beta_{41}\, ausopen_t + \beta_{42}\, ausopen_{t-1} + \beta_{43}\, ausopen_{t-2} + \beta_{44}\, ausopen_{t-3} + \beta_{51}\, ausbb30_t \\ & + \beta_{52}\, ausbb30_{t-1} + \beta_{53}\, ausbb30_{t-2} + \beta_{54}\, ausbb30_{t-3} + \beta_{55}\, ausbb30_{t-4} + \beta_{61}\, exrus_t \\ & + \beta_{62}\, exrus_{t-1} + \beta_{63}\, exrus_{t-2} + \beta_{64}\, exrus_{t-3} + \beta_{71}\, ausinf_t + \beta_{72}\, ausinf_{t-1} + \beta_{81}\, austax_t \\ & + \beta_{82}\, austax_{t-1} + \beta_{83}\, austax_{t-2} + \beta_{84}\, austax_{t-3} + \beta_{85}\, austax_{t-4} + \beta_{86}\, austax_{t-5} + \varepsilon_t \end{aligned}$$

In order to test whether the explanatory variables should enter in differences[100], the model can be written more compactly as: $FDI_t = \mu + \sum_{i=1}^{8} \beta_i(L)x_{it} + \varepsilon_t$. The polynomial in the lag operator was defined as [101]: $\beta_i(L) = \beta_{i0} + \beta_{i1}L + \beta_{i2}L^2 + \ldots + \beta_{ir} L^{r_i}$.[102] If $\beta_{i0} + \beta_{i1} + \ldots + \beta_{ir} = 0$, x_{it} enters in differences. Hence, a Wald test[103] can be conducted for: H_0: $\beta_i(1) = 0$ and H_1: $\beta_i(1) \neq 0$. The results of the tests are presented in Table 4-3.

Table 4-3

Test for Differencing, Quarterly FDI Model					
Variable	χ^2	**Prob.**	**Variable**	χ^2	**Prob.**

[98] A model with a lagged dependent variable was experimented with, but it had little success, leading to an explosive unit root and instability.
[99] Greene (2000), p.724.
[100] For more details on the test see Davidson et al. (1978) and Charezma and Deadman (1997).
[101] See Greene (2000), p.724.
[102] Note that r is different for each i, i.e. r_i.
[103] Wald test:

$$W = \frac{\left(\sum_{i=0}^{r} \hat{\beta}_i - 0\right)^2}{\left(\hat{Var}\left[\sum_{i=0}^{r} \hat{\beta}_i - 0\right]\right)}$$

If W exceeds the 10% critical value of the χ^2_1 distribution, the hypothesis that the variable should be used in differences is rejected, if W is smaller than the 10% critical value, the variable has to be differenced at least once.

ausrgdp	0.017	0.896	***Δausrgdp***	7.784*	0.009
ausrwages22	0.014	0.905	***Δausrwages22***	16.851*	0.000
ausjobvac	7.189*	0.007	***ausjobvac***	9.712*	0.004
ausopen	4.120*	0.042	***ausopen***	12.215*	0.001
exrus	0.144	0.704	***Δexrus***	4.327*	0.045
ausbb30	3.898	0.048	***ausbb30***	8.573*	0.006
ausinf	11.486*	0.001	***ausinf***	16.888*	0.000
austax	0.788	0.375	***austax***	0.782	0.383
** significant at 10% critical value*					

The hypothesis that the variables should be used in first differences was not rejected at the 10% critical value in the cases of *ausgdp, usexr, rwages22* and *tax*. Differencing those variables – except *tax* – once and repeating estimation and test, however, shows that the hypothesis that the variables should be used in second differences was rejected at a 10% critical value for all variables. The variable *tax* has a step structure (it is constant for some periods and has some zero variances) and thus does not satisfy the usual conditions underlying tests for differencing. Since it is being used purely as in explanatory variable, it was included in the most natural form. Hence, the model including *Δausgdp*, *Δusexr*, *Δrwages22* and *tax* was used for further estimation.

The parameters in the model were estimated using ordinary least squares (OLS) and are shown in Table 4-4. The model had a good fit (R^2 of 76.1% and much a lower adjusted R^2 of 53.6% owing to the large number of regressors). Most lags for the included variables were significant at a 10% critical value and the F-statistic showed that the null hypothesis that all the slope coefficients (i.e. excluding the intercept) in a regression are zero was rejected.

These results are a major improvement to Yang et al.'s model: replicating Yang et al.'s model with data from Q3/1985 to Q1/2002 in 2000/01 prices (instead of 1989/90 prices) including current values and first lags of *ausrgdp, ausbb30, austwi, ausrwages1, ausopen, ausindus, ausindus* and one lag of *ausnfdi* as explanatory variables, led to a low R^2 and adjusted R^2 (28% and 9% respectively – in contrast to their finding of 67% and 37% for Q3/1985 to Q1/1994). This, in addition to Yang et al.'s result of a poor out-of-sample forecast, shows that their model could not explain the sharp fluctuations in the FDI series after 1994.

Table 4-4

Quarterly FDI Equation									
Dependent Variable: ***ausrfdi*** **Sample (adjusted): Q4/1986-Q2/2002. Included observations after adjusting endpoints: 63** **Least Squares**									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Variable	**Lags**	**Coeff**	**t-stat**	**Prob**		**Lags**	**Coeff**	**t-stat**	**Prob**
C	---	-53,860.030	-1.245	0.223	**C**	---	-46,506.020*	-2.922	0.006
ausrgdp	0	0.529	1.508	0.142	***Δausrgdp***	0	0.485	1.513	0.140
	1	-0.862*	-1.878	0.071		1	-0.310	-1.114	0.274
	2	1.905*	4.167	0.000		2	1.518*	4.702	0.000
	3	-1.553*	-4.329	0.000		---	---	---	---
ausrwages22	0	-69.162*	-2.482	0.019	***Δausrwages22***	0	-69.985*	-3.037	0.005
	1	-15.763	-0.521	0.606		1	-88.221*	-3.683	0.001
	2	89.631*	3.068	0.005		---	---	---	---
ausjobvac	0	2.987	0.066	0.948	***ausjobvac***	0	5.215	0.123	0.903
	1	-15.363	-0.288	0.775		1	-18.687	-0.378	0.708
	2	-124.685*	-2.396	0.023		2	-121.501*	-2.467	0.019
	3	84.265	1.651	0.110		3	81.693	1.691	0.101
	4	-104.661*	-2.042	0.050		4	-107.007*	-2.300	0.028
ausopen	0	-358.547	-0.837	0.409	***ausopen***	0	-320.591	-0.959	0.345
	1	1,337.852*	2.764	0.010		1	1,344.767*	2.923	0.006
	2	-1,613.752*	-3.335	0.002		2	-1,600.964*	-3.489	0.001
	3	1,750.865*	3.731	0.001		3	1,737.408*	4.066	0.000
ausbb30	0	-442.733	-0.738	0.467	***ausbb30***	0	-319.254	-0.686	0.498
	1	1,820.041*	2.703	0.011		1	1,809.746*	2.913	0.007
	2	-939.555	-1.587	0.123		2	-967.302*	-1.718	0.096
	3	-850.861	-1.283	0.210		3	-849.119	-1.343	0.189
	4	1,050.538*	2.458	0.020		4	1,044.182*	2.661	0.012
exrus	0	26,817.570*	1.722	0.096	***Δexrus***	0	23,088.430*	1.767	0.087
	1	-62,598.160*	-2.706	0.011		1	-36,463.220*	-2.608	0.014
	2	95,948.230*	4.437	0.000		2	58,680.810*	4.801	0.000
	3	-55,771.630*	-3.623	0.001		---	---	---	---
ausinf	0	307.680	0.657	0.517	***ausinf***	0	197.627	0.500	0.620
	1	2,350.747*	4.752	0.000		1	2,218.790*	5.579	0.000
austax	0	39.445	0.185	0.854	***austax***	0	62.962	0.320	0.751
	1	665.676*	2.486	0.019		1	657.872*	2.575	0.015
	2	-1,449.343*	-5.376	0.000		2	-1,426.736*	-5.619	0.000
	3	645.634*	3.001	0.006		3	652.092*	3.238	0.003
	4	634.412*	2.507	0.018		4	598.847*	2.591	0.014
	5	-390.064*	-2.069	0.048		5	-407.642*	-2.308	0.028
** significant at 10% critical value*									
R-squared				0.763	**R-squared**				0.761
Adjusted R-squared				0.493	**Adjusted R-squared**				0.536
S.E. of regression				1,610.258	**S.E. of regression**				1,539.541
Sum squared resid				75,194,997.000	**Sum squared resid**				75,845,993.000
Log likelihood				-530.156	**Log likelihood**				-530.427
Durbin-Watson stat				2.338	**Durbin-Watson stat**				2.308
Schwarz criterion				19.066	**Schwarz criterion**				18.878
F-statistic				2.826	**F-statistic**				3.391
Prob (F-statistic)				0.003	**Prob (F-statistic)**				0.000

4.1.3 MODEL EVALUATION

To evaluate the adequacy of the quarterly FDI model, a series of diagnostic tests was performed, including the test of hypotheses of correct specification with regard to non-autocorrelation, normal residuals (Jarque-Bera test), homoscedasticity (White-test, ARCH-test) and correct functional form (RESET-test).[104] The results are illustrated in Table 4-5.

[104] Eviews Help: "Residual Tests", "Specification and Stability Tests"; Johnston and DiNardo, 1997, Ch.4, 6.

Table 4-5

Diagnostic Tests (5% critical values), Quarterly FDI Model					
		Test	F-Statistic	5% Critical value	Probability
Heteroscedasticity	White	F(60, 3)	1.339	8.580	0.522
	ARCH (1)	F(1, 62)	0.779	4.000	0.381
	ARCH (2)	F(2, 61)	1.105	3.150	0.338
	ARCH (3)	F(3, 60)	0.698	2.760	0.557
	ARCH (4)	F(4, 59)	1.080	2.520	0.375
	ARCH (5)	F(5, 58)	0.975	2.370	0.442
Autocorrelation (Breusch-Godfrey LM Test)	Lag 1	F(1, 32)	1.376	4.150	0.250
	Lag 1-2	F(2, 31)	1.280	3.310	0.293
	Lag 1-3	F(3, 30)	1.905	2.920	0.151
	Lag 1-4	F(4, 29)	1.807	2.700	0.155
	Lag 1-5	F(5, 28)	2.474	2.560	0.057
Misspecification	Normality (Jarque-Bera)	$\chi^2(2)$	0.968	5.991	0.616
	RESET (1)	F(1, 32)	9.686*	4.150	0.004
	RESET (2)	F(2, 31)	4.687*	3.310	0.016
Parameter Stability (Chow Forecast Test)	Q3/2001 – Q2/2002	F(4, 29)	0.998	2.700	0.425
	Q3/2000 – Q2/2002	F(8, 25)	1.521	2.340	0.202
** significant at 5% critical value*					

The evaluation of the model showed that it was a satisfactory model. The hypotheses of non-autocorrelation, homoscedasticity and normality were not rejected at a 5% critical value. Hence, the parameter estimates were considered to be consistent and unbiased. Although the hypothesis of correct functional form (RESET(1)-test) was rejected at a 5% critical value, the model was the best result to be found, as no equation was found for which the RESET-test did not fail – despite experimenting with different variables and lags. Transforming the variables into log form (and experimenting with alternative variables and lags) did not solve the problem and appeared to reduce the fit. Parameter stability was tested for by applying the Chow forecast test, using the estimates for a certain time period to compute prediction errors for the remaining quarters.[105] The hypothesis of parameter stability was not rejected at 5% critical value for the quarters tested, i.e. the four quarters between Q3/2001 and Q2/2002 and the eight quarters between Q3/2000 and Q2/2002. Comparing the time series plots for the actual FDI series and the fitted series derived from the model (Figure 4-2) shows that the model performed well and managed to explain the sharp fluctuations from the mid-1990s onwards. The equation was considered to be an adequate representation of the data generating process.

The possibility of endogeneity was taken into account. It was assumed that *ausrgdp* was the only variable that *ausrfdi* could affect contemporaneously, as FDI is part of investment which in turn is part of GDP. Other variables were either exogenous by theory (such as corporate tax[106] rates or interest rates) or might only be affected by FDI over time (such as wages or exports and imports which are part of the openness variable). Using the Hausman test[107] as a test for endogeneity, one could proceed as follows: *ausrgdp* was regressed on all exogenous variables and consumption expenditure (*auscons*) as an instrument (a variable that was correlated with *ausrgdp*, but not with *ausrfdi*) and the residuals were retrieved. As a second

[105] Eviews Help: "Specification and Stability Tests, Chow's Breakpoint Test"; Johnston and DiNardo, 1997, pp.113-116.

[106] Since general corporate tax rates were used rather than taxes specific to FDI (such as tax inducements or subsidies, which are rare in the case of Australia), they were treated as exogenous.

[107] Eviews Help: "The Hausman test". No appropriate instrument was found for *Δusexr*, the other potentially endogenous variable (though the effect of FDI on exchange rate appreciation would be small at most), while the remaining variables were assumed not to be contemporaneously endogenous.

step, the quarterly FDI model was re-estimated including the residuals from the first regression as an additional regressor. Since the coefficient on the residual regressor was not significantly different from zero (t-statistic of -0.770, probability of 0.447), the OLS estimates were consistent and the hypothesis of *ausrgdp* being an endogenous variable in the FDI equation was rejected.

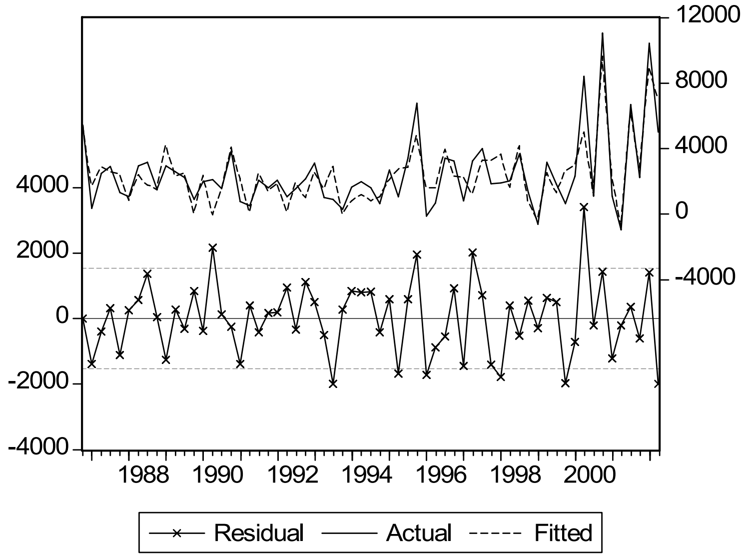


Figure 4-2: Actual and Fitted Quarterly FDI Series, Q3/1985 to Q1/2002

4.1.4 RESULTS

Having concluded that the regression equation was an adequate representation of the data generating process, the estimation results of the quarterly FDI model were analysed. In order to analyse the effect that each explanatory variable in the dynamic model had over time, the long-run effects were calculated as the sum of the coefficients for the lags of each explanatory variable and are stated in Table 4-6.[108] In Table 4-7, the signs of the current effect (taking only current values of the explanatory variables into account), the effect after one lag (in order to compare these results with Yang et al.'s results) and the long-run effect of each variable on FDI were compared with the predicted signs and Yang et al.'s results.

Table 4-6

Quarterly FDI Equation, Short-Run and Long-Run Effects							
	Current effect	Effect after 1 Lag	Effect after 2 Lags	Effect after 3 Lags	Effect after 4 lags	Effect after 5 lags	Long-run effect
Δausrgdp	0.485	0.175	1.693	---	---	---	**1.693**
Δausrwages22	-69.985	-158.205	---	---	---	---	**-158.205**

108 For example, the short-run (current) effect of *ausbb30* is the coefficient on current *ausbb30* (see Table 4-4). The effect after one lag is the sum of the coefficients on current *ausbb30* and *ausbb30(-1),* i.e. -319.254 and 1,809.746, etc. The long-run effect of *ausbb30* is equal to the sum of the coefficients on all lags of *ausbb30* in the model, in this case the sum of the coefficients on current *ausbb30* and four lags.

ausjobvac	5.215	-13.472	-134.973	-53.280	-160.287	---	**-160.287**
ausopen	-320.591	1,024.176	-576.788	1160.620	---	---	**1,160.620**
ausbb30	-319.254	1,490.492	523.190	-325.929	718.254	---	**718.254**
Δexrus	23,088.430	-13,374.790	45,306.020	---	---	---	**45,306.020**
ausinf	197.627	2,416.417	---	---	---	---	**2,416.417**
Δaustax	62.962	720.834	-705.902	-53.810	545.037	137.396	**137.396**

Table 4-7

Quarterly FDI Equation, Observed and Predicted Effects					
	Current effect	**Effect after 1 Lag**	**Long-run effect**	**Expected Sign**	**Yang et al's result (effect after 1 lag)**
GDP Change	n.s.	n.s.	+	+ or nil	n.s.
Change in wage rate	-	-	-	- or +	+
Job Vacancies	n.s.	n.s.	-	-	---
Openness	n.s.	+	+	+	-
Customs Duties	n.s.	n.s.	n.s.	+	---
Interest Rate	n.s.	+	+	+	Change: +
Host exchange rate appreciation	+	-	+	-	n.s.
Inflation	n.s.	+	+	-	-
Industrial Disputes	n.s.	n.s.	n.s.	-	+
Corporate Tax Rate Change	n.s.	+	+	-	---
OECD GDP (or Growth Difference)	n.s.	n.s.	n.s.	+ (-)	---
n.s.: not significant, ---: not included in the model					

Looking at the effects over time, the change in *ausrgdp* (*Δausrgdp*) had the expected positive effect on FDI, illustrating that economic growth makes Australia a more attractive place to invest. However, the variable was only significant in the long-run (after two lags), and not in the current time period or the short-run (current time period and one lag). Hence, Australian market growth, which indicates a sound economic environment and growth opportunities for MNEs, affected the investment decision in the time periods prior to the investment. Sudden changes in Australia's growth performance did not affect the decision to invest.

In terms of factor costs, both the number of job vacancies (*ausjobvac*) and the change in the real wage rate (*Δausrwages22*) had a negative long-run effect. FDI was decreasing in the number of job vacancies in the long-run (including up to four lags), though no significant effect was found in the current time period or after one lag. The negative sign indicates that higher labour demand makes labour and thus production more expensive, making Australia a less attractive place to invest and affecting the investment decision a number of time periods before the actual investment is made.

This theory is supported when looking at the change in the real wage rate. Wage growth reduced FDI (in the current time period and after one lag). This seems a reasonable result, as higher wages make local production more expensive, discouraging FDI. In contrast, Yang et al.'s result of a positive effect of wage rate changes and the assumption made in the Proximity-Concentration Hypothesis or the horizontal FDI model that FDI is attracted by a higher real wage rate were not supported. One interesting outcome is that contemporaneous wage rate changes affected FDI. In fact, the wage rate is one of the only variables to have an effect in the current time period.

Transport costs and protection were measured by openness (*ausopen*) and customs duties (*auscdut*). Customs duties, against theoretical prediction, were insignificant and therefore not included. The insignificance of customs duties may be explained by the fact that customs duties matter only in a small number of specific industries (such as automotive and TCF). Openness had the expected positive effect on FDI inflows – in the long-run (despite a significantly negative second lag) and after one lag, though no significant contemporaneous effect was observed. Hence, openness affected the investment decision in the time periods prior to the investment, encouraging FDI. The positive effect on openness is in contrast to Yang et al's negative sign for the openness variable and their argument that FDI inflows are a substitute for trade.

The estimation results for the four risk factors, interest rate (*ausbb30*), exchange rate appreciation (*Δexrus*), inflation rate (*ausinf*) and the number of working days lost due to industrial disputes (*ausindus*), were mixed. While industrial disputes were not significant – in contrast to Yang et al.'s unexpected finding of a positive effect, the Australian exchange rate appreciation and inflation rate had signs contrary to the predictions.

The Australian interest rate had the expected positive effect in the long-run (including up to four lags) and after one lag, illustrating that higher Australian capital returns encourage FDI, but had no significant contemporaneous effect. The positive sign is consistent with the Heckscher-Ohlin model and the risk diversification hypothesis and supports Yang et al.'s result. Furthermore, interest rates positively affected the investment decision one or more lags before the investment occurred, while contemporaneous changes did not affect FDI.

The unexpected positive signs for exchange rate appreciation and inflation rate are more difficult to explain. If a higher inflation rate signals market instability, it should have a negative effect on FDI. The unpredicted positive sign is in contrast to theoretical predictions and Yang et al.'s findings. As the effect of inflation on FDI was limited to the current time period and one lag, it only affected the actual investment, but not the decision-making process in the long run.

An appreciation of the Host exchange rate relative to the US dollar makes it more expensive for MNEs to invest in Australia and should therefore discourage FDI. However, the results are more complex than the prediction, as the analysis of the exchange rate revealed some interesting dynamics. A strong Australian dollar had a positive contemporaneous effect, but a negative effect after one lag. A strong Australian dollar makes investing more expensive and thus discourages FDI. A positive sign was also found after two lags, indicating that a strong Australian dollar encourages FDI and affects the investment decisions in the time periods prior to the investment.[109] A strong Australian dollar may reflect Australia's sound economic environment, making it a good place to invest. Movements in the Australian dollar may also be linked to terms of trade, so that an appreciating exchange rate would not necessarily discourage FDI. There may also be prospects of growth and higher net returns, as intermediate goods can be bought more cheaply in the international market place. The dynamics of the exchange rate are in contrast to the result in Yang et al., where no significant effect was found, and results by Cushman (1988) or Klein and Rosengren (1994) who found host exchange rate appreciation to discourage FDI.

[109] This significantly positive effect is only found for *exrus.* The variable *austwi,* which has a strong positive correlation (0.75) with *exrus*, was insignificant.

Another interesting result is the effect of corporate tax rates on FDI. While there is much discussion that lower corporate tax rates encourage FDI flows, this theory was not supported by the results here (Table 4-4). The corporate tax rate (*austax*), the policy variable included, did not have the predicted negative sign, but was positive overall. The positive effect in some of the *austax* lags dominated the overall effect on FDI, though other *austax* lags and the overall effect up to the third lag had negative signs. Finally, OECD GDP (*oecdgdp),* which was used as an indicator of world GDP and growth trends, was insignificant and was therefore not included in the final model.

Overall, the model proved to be an adequate representation of the data generating process and had higher explanatory power than that of previous models, such as Yang et al.'s model. The model explained the sharp fluctuations in the FDI series from the mid-1990s onwards. Australian FDI appeared to be driven by long-term considerations and its determinants could not be fully explained by any single theoretical model.

Of eleven potential determinants, five (*Δausgdp, ausjobvac, Δausrwages22, ausopen, ausbb30*) were significant and of the predicted signs, three (*Δusexr, ausinf, austax*) had significant effects of unexpected signs, while the remaining three (*indus, cdut, oecdgdp*) were not significant and were therefore not included in the final model. Factors that had a strong influence on the investment decision in the time periods prior to the investment were economic growth, openness, interest rates and job vacancies, while contemporaneous wage rate changes and variations in the inflation rate had a short-term effect. Exchange rate appreciation encouraged FDI in the long-run, but discouraged it in the short-run, while the corporate tax rate had an unexpected positive effect in the long-run.

4.1.5 CONCLUSIONS

In the study, for which the most recent dataset was used, some of the limitations of previous studies were overcome and the variation of FDI over time was explained more successfully. Most explanatory variables (GDP growth, wage rate growth, job vacancies, openness, interest rate) had the expected signs, while the signs of the remaining variables (exchange rate appreciation and inflation rate) were plausible – the only exception being the corporate tax rate.

Two points of interest emerged from this estimation. Firstly, the model shows that decisions about FDI – unlike portfolio investment decisions – are predominantly driven by longer term considerations. The explanatory variables were not significant in the time period when the investment was made, but were significant for up to five lags, indicating that the year before FDI occurs is crucial for the investment decision. The current economic environment does not have much of an effect. The growth in real wages and exchange rate appreciation were the only factors that had an immediate effect on FDI: contemporaneous wage growth discouraged FDI, while exchange rate appreciation encouraged FDI.

Secondly, the estimation results do not show clear support for any of the eight theoretical models discussed in Chapter 3. The estimation results were consistent with the Heckscher-Ohlin model, though the fact that wages and capital returns were not the only significant variables indicates that the Heckscher-Ohlin model is not complete. Other models were only partly supported. Market growth is consistent with the OLI framework, the horizontal FDI model and the Knowledge-Capital Model. A negative sign on wage growth is consistent with the OLI framework and the vertical FDI model, but not with the horizontal FDI model. The positive sign on openness is consistent with the OLI framework and interest rate with the risk diversification model. Insignificant trade barriers do not fit into any of the models discussed. The mixed results in terms of risk factors only give limited support to the OLI framework and the risk diversification model, while the positive sign on tax rates does not support the OLI framework or a model using policy variables.

It is unclear, which model works best in explaining Australian FDI. Comparing these empirical results with the theoretical predictions (Table 4-2), a combination of the OLI framework and the Heckscher-Ohlin or risk diversification model works best as a theoretical basis, but still remains incomplete. Despite the lack of support for one individual model, the results are consistent with the assumption made previously that there is not one single theory explaining FDI but a combination of theories.

Obviously many research issues are open for further analysis[110] and results are limited by data limitations. Nevertheless the estimated quarterly FDI model overcame the limitations of Yang et al.'s study and could explain the large fluctuations of FDI by using variables based on a combination of different theoretical models.

[110] An example is the analysis of the determinants of country-specific FDI, industry-specific FDI and different forms of FDI in Australia and the analysis of consequences of quarterly and industry-specific FDI. Those issues have been analysed in related research by the author.

4.2 ANALYSIS OF DETERMINANTS OF ANNUAL COUNTRY-SPECIFIC FDI INFLOWS

4.2.1 DATA

For the second econometric analysis of the determinants of Australian FDI, country-specific annual FDI flow data published by the ABS were used. This panel dataset (i.e. a dataset with repeated observations on the same set of cross-section units)[111] has not been used in any previous study and provides a great opportunity for new research. The dataset is available for the period 1992 to 2001, covering ten years of Australian FDI. Data on FDI inflows from 22 countries (the US, Singapore, the UK, the Netherlands, Switzerland, Japan, France, Belgium/Luxembourg, Germany, New Zealand, Malaysia, Hong Kong, Ireland, Canada, South Africa, Korea, Sweden, Philippines, Thailand, Indonesia, Italy and China) were used, giving 216 observations (due to four missing values). The data series included 72 negative values (at least one per time period and at least one per country), depicting disinvestments. The 216 observations and overall annual FDI inflows in Australia are shown in Figure 4-3. Looking at the graph, there is a larger variation in the size of investment flows from different countries in later years than in earlier years, which this model aims to explain. While using annual data reduced the variation of FDI over time, using country-specific FDI increased the variation over the different countries, which made the analysis of country-specific effects possible.

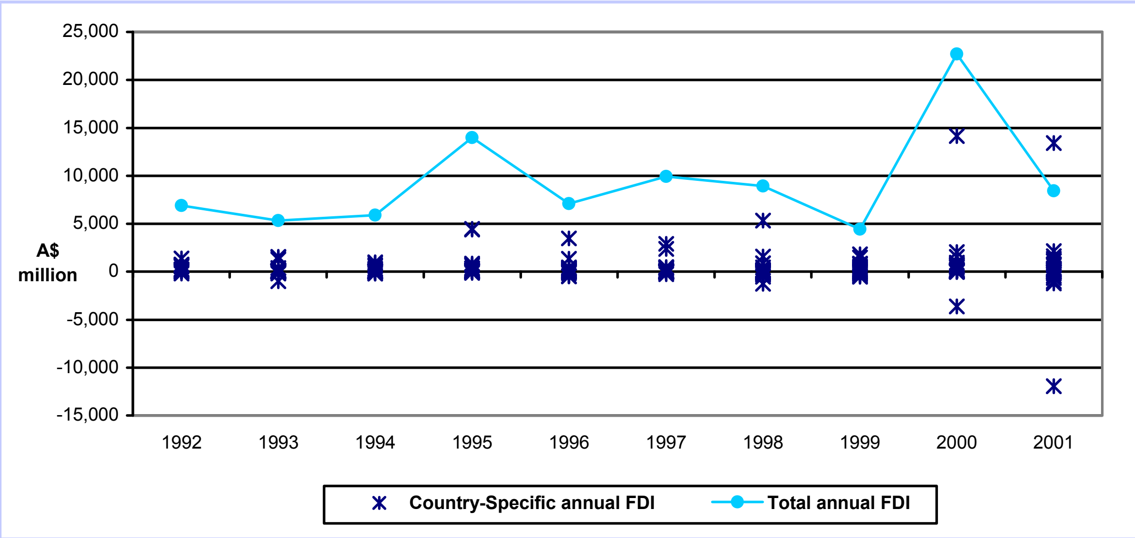


Figure 4-3: Real annual Australian FDI Inflows (by Country and Total), 1991 to 2002

As in the quarterly FDI model, the explanatory variables included market size or growth, factor and transport costs, market risk, policy variables and other factors such as outward FDI,

[111] Johnston and DiNardo (1997), p.388.

regional FDI, OECD GDP and language and regional dummies.[112] Country-specific annual FDI was specified as a function of the following form:

fdic = f(*market, apmarket, marketdif, marketsum, lab, rwages, prod, skill, trade, dist, cdut, trdbar, inr, exr, inf, indus, tax, outfdi, apfdi, oecdgdp, language, region*)

where the variables are as listed and defined below:[113]

fdic	annual country-specific FDI in Australia (*ausnfdic*) or deflated by the price index for private gross fixed capital expenditure, plant and equipment (*invdef*), i.e. *ausrfdic,*
market	defined as in Section 4.1 (but in annual terms), i.e. *ausrgdp,*
apmarket	regional (Asia-Pacific) market size, measured by real GDP of all countries in the Asia-Pacific region (*aprgdp*),
marketdif	market size differential between each investing country (Home) and Australia (*rgdpdifc*) or, alternatively, relative market size, defined as Home real GDP divided by Australian real GDP per country (*relgdpc*),
marketsum	combined market size, defined as the sum of Home and Australian GDP per country (*gdpsumc*),
lab	defined as in Section 4.1 (but in annual terms), i.e. *ausjobvac* or *ausuer*
rwages	defined as in Section 4.1 (but in annual terms), i.e. *ausrwages1, ausrwages2, ausrwages11, ausrwages22,*
prod	Australian labour productivity (*ausprod*),
skill	Australian skill endowment, measured by the percentage of people with tertiary education (*austert*) or, alternatively, relative skill endowment, defined by the skill endowment in Home divided by the Australian skill endowment per country (*reltertc*),
trade	amount of trade between Home and Australia, measured by real imports per country (*rimpoc*) or real exports per country (*rexpoc*) or, alternatively, by the openness of the Australian economy in general, defined as in Section 4.1 (but in annual terms), *i.e. ausopen,*
dist	distance between Home and Australia, measured by geographical distance per country (*geodistc*) or time zone per country (*timedistc*)*,*
cdut	defined as in Section 4.1 (but in annual terms), i.e. *auscdut,*
trdbar	other trade barriers either measured by Home customs duties (*cdutc)* or combined Home and Host customs duties *(sumcdutc),*

[112] As with the quarterly FDI model, variables capturing commodity prices such as the export price index and import price index (including import price index for intermediate goods) were experimented with, but they were not found to be significant in the country-specific FDI model and were thus not included. Although the resource-seeking motive may be important for FDI from some countries such as Japan, commodity prices were not found to be a significant determinant in the overall sample or in regional subsamples.

[113] As mentioned in Section 4.1, the label *"aus"* in the variables indicates that the variables refer to the Australian market. If a variable has the ending *"c",* the variable is country-specific.

inr	defined as in Section 4.1 (but in annual terms), i.e. *ausbb30*, or measured by relative interest rate (interest rate in Home divided by Australian interest rate) per country (*relinrc*) or interest rate differential between Home and Australia per country (*inrdifc*),
exr	defined as in Section 4.1 (but in annual terms), i.e. *austwi*, or measured by exchange rate between the Home's currency and the Australian dollar per country (*exrc*) or the volatility of those exchange rates (*exrvolc*),
inf	defined as in Section 4.1 (but in annual terms), i.e. *ausinf*, or measured by relative inflation rate (inflation rate in Home divided by Australian inflation rate) per country (*relinfc*) or inflation rate differential between Home and Australia per country (*infdifc*),
indus	defined as in Section 4.1 (but in annual terms), i.e. *ausindus,*
tax	defined as in Section 4.1 (but in annual terms), i.e. *austax*, or measured by corporate tax rate differential between Home and Australia (*taxdifc*),
outfdi	real outward FDI flows for each Home country (*outrfdic*),
apfdi	real inward FDI flows into the Asia-Pacific region (*aprfdi),*
oecdgdp	defined as in Section 4.1 (but in annual terms), i.e. *oecdrgdp* or *oecdgrdifa,*
language	dummy for Home countries with English as an official language (*eng*),
region	dummy for Home region, i.e. Europe (*eu*), Asia-Pacific (*ap*) and North America (*na*).

In summary, market size or growth was represented by *market, apmarket* and *marketdif, marketsum,* factor costs by *lab, rwages, prod* and *skill*, transport costs and protection by *trade, dist, cdut* and *trdbar,* risk factors by *inr, exr, inf* and *indus*, policy variables by *tax* and other factors by *outfdi, apfdi, oecdgdp, language* and *region*. For a summary see Table 4-8. Data sources and descriptive statistics of those variables are in Appendix A.2 (Table A-3 and A-4).

Table 4-8

Determinants of FDI in Australia, Country-Specific FDI Model		
	Dependent Variable	**Alternative Variable(s)**
FDI		
Country-Specific FDI (*fdic*)	*ausrfdic*	*ausnfdic*
	Explanatory Variable	**Alternative Variable(s)**
Market Size or Growth		
Host Market Size (*market*)	*ausrgdp*	---
Asia-Pacific Market Size (*apmarket*)	*aprgdp*	---
Market size differential (relative market size) (Home/Host) (*marketdif*)	*rgdpdifc*	*relgdpc*
Combined market size (Home and Host) (*marketsum*)	*rgdpsumc*	---

(Table 4-8 continued)

Factor Costs		
Host Labour Supply (*lab*)	*ausjobvac*	*ausuer*
Host Wage Rate (*rwages*)	*ausrwages1*	*ausrwages2, ausrwages11, ausrwages22*
Host Labour Productivity (*prod*)	*ausprod*	---
Skill Endowment (Tertiary Education), Host or Relative (*skill*)	*austert*	*reltertc*
Transport Costs and Protection		
Trade between Home and Host/Host Openness (*trade*)	*rimpoc, rexpoc*	*rtradec, ausopen*
Distance (geographical/time) between Home and Host (*dist*)	*geodistc*	*timedistc*

Host Customs Duties (*cdut*)	*auscdut*	---
Other trade barriers (Home or combined Customs Duties) (trdbar)	*cdutc*	*cdutsumc*
Risk Factors		
Interest Rate, Host or Relative (*inr*)	*ausbb30*	*relinrc, inrdifc*
Exchange Rate Appreciation, LCU/A$ (*exr*)	*austwi*	*exrc, exrvolc*
Inflation, Host or Relative (*inf*)	*ausinf*	*relinfc, infdifc*
Industrial Disputes (Total or No. of Working Days Lost), Host or Relative (*indus*)	*ausindus*	---
Policy Variables		
Host Corporate Tax Rate (*tax*)	*austax*	*taxdifc*
Other Factors		
Home Outward FDI (*outfdi*)	*outrfdic*	---
Asia-Pacific Inward FDI (*apfdi*)	*aprfdi*	---
OECD GDP (*oecdgdp*)	*oecdrgdp*	*oecdgrdifa*
Dummy for Home countries with English as an official language (*language*)	*eng*	---
Dummy for Home region (*region*)	*eu, ap, na*	---
Data Sources and Summary Statistics: See Appendix A.2, Table A-3 and A-4		

The panel model – in contrast to the previously discussed time-series model – makes it possible to use three types of variables: variables that vary over cross-sections and time, variables that only vary over time (i.e. all factors describing Home market conditions) and variables that only vary over cross-sections (i.e. all factors describing constant conditions, such as language, geographical distance, time zone, regional dummies).

Variables that are the same as in the quarterly FDI model have expected signs as discussed in Section 4.1 (for an overview of how the different theoretical models see the effect that those variables have on FDI, refer back to Table 4-2). In addition, Asia-Pacific GDP should encourage horizontal or export-platform FDI. The combined market size should encourage horizontal FDI, while the GDP difference should discourage (horizontal) FDI. In contrast, market size should not have an effect on vertical FDI. If FDI is intended to be used to set up subsidiaries serving the local market, growth in the rest of the Asia-Pacific region is expected to have a negative effect on the inflow of FDI into Australia, as firms may choose alternative locations in the region.

The Australian skill endowment and the relative skill endowment are both expected to have a positive effect on FDI, since higher labour quality should encourage FDI. The theoretical predictions for the effect of geographical and time distance on FDI are unclear. As geographical distance increases trade costs, this should encourage horizontal FDI, but discourage vertical FDI or FDI in general, making it harder for MNEs to control and communicate with their subsidiaries. Time difference could have a positive or negative effect on FDI. A bigger time difference makes communication more difficult, but could be of advantage if firms operate for twenty-four hours a day in a 'Follow-the-Sun Principle". Home customs duties could discourage vertical FDI, but should have no effect on horizontal FDI. The effect of combined customs duties from Home and Host is unclear, as horizontal FDI should be encouraged by Host customs duties, but not by Home customs duties, while vertical FDI should be discouraged by both Home and Host customs duties.

The interest rate difference should have a negative effect on FDI, since a higher interest rate in Australia than in the investing country (i.e. a negative difference) should encourage FDI.

In contrast, a higher inflation rate in Australia than in the investing country (i.e. a negative difference) should discourage FDI and a positive sign should be observed.

Outward FDI from the investing country could be an indicator for the world investment climate and should thus encourage FDI. The same is true for FDI in the Asia-Pacific region, though other countries in the region may act as competitors, so that increased investment in that region reduces investment in Australia. English as an official language could explain why certain countries invest more in Australia than others, while the regional dummies could show whether and how the Home region affects the FDI.

As in the quarterly FDI model, data were either used in constant price form or were deflated, so that only real data were used. Since data are in annual form, seasonality is not an issue. If alternative variables could be used, the ones with the best fit were chosen. Current and lagged values were included when significant, while insignificant variables were not included. As in the quarterly FDI model, the lag specification seemed reasonable since the investment decision can be a time-consuming process. The number of lags included was restricted to a maximum of three, since there are only ten time periods and every lag reduced the number of observations by 22 (i.e. the number of cross-sections in each time period).[114] If a lag of a variable was insignificant, it was not included – except if its inclusion increased the adjusted R^2.

4.2.2 MODEL SPECIFICATION AND ESTIMATION

4.2.2.1 THEORETICAL BACKGROUND

There are several ways to estimate a panel model: by applying a simple OLS regression (with no effects), by using a regression with variable intercepts (fixed or random effects) or by using a regression with variable coefficients. To get a better understanding of the methods, some theoretical background is given before the country-specific FDI model is discussed.

The simplest way to estimate a panel is to use data in stacked form (i.e. time series data on any given variable for a number of cross-sections are stacked to form a row vector for this variable), expressing the standard linear model as follows[115]:

$y_{it} = \mu + X_{it}\beta + \varepsilon_{it}$ where $\varepsilon_{it} \sim iid(0, \sigma^2)$[116], i = 1, 2, …n and t = 1, 2, …T

y_{it} is the stacked dependent variable

X_{it} is the set of the stacked explanatory variables

or

[114] Due to this restriction it was not necessary to search for the appropriate lag lengths using the Schwarz Criterion as done in the Quarterly FDI model.

[115] Greene (2000), p.560 and Johnston and DiNardo (1997), p.389 – with slightly different labelling.

[116] This reads “the ε_{it} are independently and identically distributed with zero mean and variance σ^2.”

$$\begin{bmatrix} y_{11} \\ y_{12} \\ \vdots \\ y_{nT} \end{bmatrix} = \mu \begin{bmatrix} 1 \\ 1 \\ \vdots \\ 1 \end{bmatrix} + \begin{bmatrix} X_{11}^{1} & X_{11}^{2} & \cdots & X_{11}^{k} \\ X_{12}^{1} & X_{12}^{2} & \cdots & X_{12}^{k} \\ \vdots & \vdots & \ddots & \vdots \\ X_{nT}^{1} & X_{nT}^{2} & \cdots & X_{nT}^{k} \end{bmatrix} \beta + \begin{bmatrix} \varepsilon_{11} \\ \varepsilon_{12} \\ \vdots \\ \varepsilon_{nT} \end{bmatrix} .$$ [117]

The model can then be estimated using OLS, assuming that $\varepsilon_{it} \sim iid(0, \sigma^2)$, for all i (number of cross-sections) and t (number of time periods). However, by assuming that each observation is iid, the panel structure of the data is ignored, which may not be appropriate for all panel models. In some cases, an extension to this simple model is more appropriate. While the first case describes a model with the restriction that slope and intercept coefficients are the same across cross-sections and time, these assumptions can be relaxed and three other cases can be analysed:[118]

1. Regression slope coefficients are the same, intercepts are not.
2. Regression intercepts are the same, slope coefficients are not.
3. Slope and intercept coefficients vary across cross-sections.

The second case is mostly ignored, as it does not make much theoretical sense to analyse the case where intercepts are equal when slope coefficients vary, since there is no plausible reason to assume that intercepts are the same when slope coefficients vary – apart from coincidence perhaps. It is unlikely that the intercept of country-specific FDI is identical if the coefficients on all the variables affecting country-specific FDI differ. Hence, this leaves the possibilities of models where intercepts vary (which can be solved by using either fixed effects or random effects estimation) and models where slope coefficients vary.

In the first case, i.e. if intercepts are variable, the model should be written as:[119]

$$y_{it} = \mu + X_{it}\beta + \varepsilon_{it} \qquad \text{with} \quad \varepsilon_{it} = \alpha C_i + \lambda T_t + u_{it} \qquad \text{where } u_{it} \sim iid(0, \sigma^2).$$

C is a matrix of dummy variables for each country (though the last country (n) is dropped and only n-1 dummies included to avoid perfect collinearity), while T are dummy variables for each relevant year (though the last period (t) is dropped and only t-1 dummies included to avoid perfect collinearity). For a fixed-effect model, a country-effect, a time-effect or a combination of both effects should be included using the so-called Least-Squares Dummy-Variable approach depending on the structure of the model.

A fixed effects model (using only the country-effect for simplification) may then be estimated as:[120]

$$\left(y_{it} - \bar{y}_i + \bar{\bar{y}}\right) = \mu + (X_{it} - \bar{X}_i + \bar{\bar{X}})\beta + \left(\varepsilon_{it} - \bar{\varepsilon}_i + \bar{\alpha}\right) + \bar{\bar{\varepsilon}} ,$$

where

[117] In this model: y_{11} is the dependent variable *fdic* for i=1 (Belgium/Luxembourg) in t=1 (1992), y_{1T} is *fdic* for i=1 (Belgium/Luxembourg) in t=T (here: T=10, hence T= 2001), while y_{nT} is *fdic* for i=n (here: n=22, which is the US) in t=T (2001). Similarly, X^1_{11} is the first explanatory variable (k=1, here *market*) for i=1 (Belgium/Luxembourg) in t=1 (1992). Hence, variables are first stacked by time, then by cross section.

[118] Johnston and DiNardo (1997), p.390-397 and Hsiao (2003), pp.15-16.

[119] Greene (2000), p.560, 564 and Johnston and DiNardo (1997), p.390.

[120] Greene (2000), p.562-567.

$$\bar{y}_i = \sum_{t=1}^{T_i} y_{it} / T_i \qquad \bar{\bar{y}} = \sum_i \sum_t y_{it} / (nT_i).$$

In the case that the country-specific variables are not fixed constants over time, but random variables, the model can be expressed as a random effects model, known as error components model, since the error term consists of various components. This can be written as:[121]

$$y_{it} = \mu + X_{it}\beta + \varepsilon_{it} \qquad \text{where} \quad \varepsilon_{it} = \alpha_i + \lambda_t + u_{it}$$

$$\text{and} \qquad \alpha_i \sim iid(0, \sigma_\alpha^2),\ \lambda_t \sim iid(0, \sigma_\lambda^2),\ u_{it} \sim iid(0, \sigma_u^2)$$

α_i are country-specific effects assumed to be uncorrelated with X_{it} which vary across cross-section units, but are constant over time. λ_t are time-specific effects, also uncorrelated with X_{it} which are constant over cross-sections, but vary over time. The residual, u_{it}, varies unsystematically across cross-sections and time. The variance of y_{it} conditional on x_{it} is:

$$\sigma_y^2 = \sigma_\alpha^2 + \sigma_\lambda^2 + \sigma_u^2.$$

The error covariance of the disturbance term of each individual cross-section unit is:[122]

$$\Omega = \begin{bmatrix} \sigma_\alpha^2 + \sigma_\lambda^2 + \sigma_u^2 & \sigma_u^2 & \text{K} & \sigma_u^2 \\ \sigma_u^2 & \sigma_\alpha^2 + \sigma_\lambda^2 + \sigma_u^2 & \text{K} & \sigma_u^2 \\ \text{M} & \text{M} & \text{O} & \text{M} \\ \sigma_u^2 & \sigma_u^2 & \text{K} & \sigma_\alpha^2 + \sigma_\lambda^2 + \sigma_u^2 \end{bmatrix}.$$

The covariance of the error term for all the observations in the stacked model is:[123]

$$V = \begin{bmatrix} \Omega & 0 & \text{K} & 0 \\ 0 & \Omega & \text{K} & 0 \\ \text{M} & \text{M} & \text{O} & \text{M} \\ 0 & 0 & \text{K} & \Omega \end{bmatrix} \quad \text{where } \Omega \text{ is the TxT matrix from above.}$$

For ease of exposition it is assumed that $\lambda_t = 0$ for all t, so that $\sigma^2_\lambda = 0$, too. The inverse of the variance-covariance matrix can be written as:[124]

$$V^{-1} = \frac{1}{\sigma_u^2}\left[I_T - \frac{\sigma_\alpha^2}{\sigma_u^2 + T\sigma_\alpha^2} ee' \right], \qquad \text{where} \quad \frac{\sigma_u^2}{\sigma_u^2 + T\sigma_\alpha^2} = \theta.$$

The random-effects model can then be estimated as:[125]

$$(y_{it} - \theta\bar{y}_i) = (1-\theta)\mu + (X_{it} - \theta\bar{X}_i)\beta + \{(1-\theta)\alpha_i + (u_{it} - \theta\bar{u}_i)\}.$$

It can be shown that $\theta = 1$ if σ_α^2 is equal to zero. The only effect would then be u_i and the random effects model would be equal to the fixed effects model discussed above.

---

[121] Greene (2000), p.567-568, Johnston and DiNardo (1997), p.391-392 and StataCorp (2003), p.192-193.
[122] Greene (2002), p.568 and Johnston and DiNardo (1997), p.392 – with σ_u^2 added.
[123] Greene (2002), p.568.
[124] Greene (2000), p.569 and Johnston and DiNardo (1997), p.392.
[125] StataCorp (2003), p.193.

Finally, parameters can vary across cross-sections and/or over time, so that the model should be written as a Variable-Coefficient model:

$$y_{it} = \sum_{k=1}^{K} X_{kit}\beta_{kit} + \varepsilon_{it} \qquad \text{where } X_{1it} = 1 \text{ is the first intercept.}$$

For coefficients varying over time and cross-sections, this model can be written as:[126]

$$y_{it} = \sum_{k=1}^{K} X_{kit}\beta_{kit} + u_{it} = \sum_{k=1}^{K} \left(\overline{\beta}_k + \alpha_{ki} + \lambda_{kt}\right)X_{kit} + u_{it} \, .$$

Other specifications are possible, but since this theoretical overview is limited, the three model specifications described should suffice for this analysis.

4.2.2.2 EMPIRICAL MODEL

Estimating the annual country-specific FDI model using the same variables as in the quarterly FDI model (but in annual form) was not successful. When the model was estimated with OLS (including no effects), none of the parameters of *ausrgdp, ausopen, exrus, ausbb30, ausinf, ausrwages22, ausjobvac* and *austax* were significant. Adding *oecdrgdp, ausindus*, or *auscdut* worsened the fit. The F-statistic showed that the null hypothesis that all the slope coefficients in a regression are zero was not rejected, and looking at the R^2, the model did not fit.

ausrfdic = 28,830.460 + 0.010**ausrgdp* + 105.231**ausopen* + 1,190.830**exrus* + 479.518**ausbb30*
(0.169) (0.319) (0.530) (0.128) (0.397)
\+ 159.648**ausinf* - 57.226**ausrwages22* – 34.132**ausjobvac* – 24.132**austax*
(1.037) (-0.228) (-0.167) (-0.079)

R^2 = 0.014 *F-statistic: 0.355 (P=0.943)*
R^2 adjusted = -0.025 *DW = 2.025*

The model exhibited heteroscedasticity and there was parameter variability, hence the model was not regarded as an appropriate representation of the data generating process. Since experimenting with variable intercepts and/or variable coefficients was equally unsuccessful, it was assumed that the variation of annual FDI over cross-sections was influenced by other factors than those explaining quarterly FDI.

After experimenting with a variety of variables describing market size and growth, factor costs, transport costs and protection, market risk, policy factors and other factors, a combination of *ausrgdp, ausrwages11, rimpoc, rexpoc, inrdifc, austwi, ausinf* and *outrfdic* worked best in explaining *ausrfdic*. The inclusion of lags of the explanatory variables was experimented with by comparing the adjusted R^2 and the Durbin-Watson statistics as an indicator for autocorrelation.

[126] StataCorp (2003), p.187-188.

Two lags for *rimpoc, ausrwages11* and *inrdifc* and one lag for *ausrgdp, rexpoc, outrfdic* were included.[127]

The model was estimated in the following form:

$$ausrfdic_{it} = \alpha + \beta_{11}\, ausrgdp_t + \beta_{12}\, ausrgdp_{t-1} + \beta_{21}\, ausrwages11_t + \beta_{22}\, ausrwages11_{t-1} + \beta_{31}\, rimpoc_{it} + \beta_{32}\, rimpoc_{it-1} + \beta_{33}\, rimpoc_{it-2} + \beta_{41}\, rexpoc_{it} + \beta_{42}\, rexpoc_{it-1} + \beta_{51}\, inrdifc_{it} + \beta_{52}\, inrdifc_{it-1} + \beta_{53}\, inrdifc_{i-2t} + \beta_{61}\, austwi_t + \beta_{71}\, ausindus_t + \beta_{81}\, outrfdic_{it} + \beta_{82}\, outrfdic_{it-1} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

Before proceeding with further improvements to the fit of the model, the possibility that there are variable intercepts and that the model should more appropriately be estimated as a fixed or random effects model was explored. Specifications as a fixed or random effects model were not found to be appropriate (Table 4-9), since both the hypothesis that $u_i = 0$ (fixed effects model) and the hypothesis that Var(u) = 0 (random effects model) were not rejected at a 5% critical level.[128] Hence the model was estimated using least squares.

Table 4-9

Testing of Fixed and Random Effects Model, Country-Specific FDI Model		
Fixed Effects Model		
F test that all $u_i = 0$	$F(21, 136) = 0.540$	Prob > F = 0.950
Random Effects Model		
Breusch and Pagan LM test for random effects (test that Var(u) = 0)	$\chi^2(1) = 1.970$	Prob > χ^2 = 0.160
* significant at 5% critical value		

In order to further improve the fit of the model that was estimated using least squares, it needed to be tested whether the variables should enter in differences. For that purpose, the model was written as: $FDI_t = \mu + \sum_{i=1}^{8} \beta_i(L)x_{it} + \varepsilon_t$ where $\beta_i(L) = \beta_{i0} + \beta_{i1}L + \beta_{i2}L^2 + \ldots + \beta_{ir}L^{r_i}$. As seen in the quarterly model, x_{it} enters in differences if $\beta_{i0} + \beta_{i1} + \ldots + \beta_{ir} = 0$. A Wald test was carried out for: H_0: $\beta_{i0} + \beta_{i1} = 0$ and H_1: $\beta_{i0} + \beta_{i1} \neq 0$. The results of the tests are presented in Table 4-10.

All variables included with lags were used in first differences, as the hypothesis that the variables should be used in first differences was not rejected at a 10% critical value. But since differencing all appropriate variables simultaneously reduced the fit of the model, differencing was completed step-by-step, i.e. only one variable is differenced at a time (choosing the variable that had the highest probability of differencing): *outrfdi*, followed by *rexpoc* and *inrdifc*, which had to be differenced twice. The model including Δ*rexpoc,* $\Delta\Delta$*inrdifc* and Δ*outrfdic* was used for further estimation.

[127] As with the quarterly model, a lag of the dependent variable was not included – to simplify the model.
[128] u_i is the fixed or random error component, which is part of the overall error component e_{it} (see Section 4.2.2.1 for more details). Since neither of the two models fitted well, there was no need to analyse which one has the better fit by using the Hausman test (see Chapter 5 for more details on the test).

Table 4-10

Test for Differencing, Country-Specific FDI Model					
Variable	χ^2 (Prob)	χ^2 (Prob)	χ^2 (Prob)	χ^2 (Prob)	χ^2 (Prob)
ausrgdp	3.696* (0.055)	4.575* (0.033)	5.041* (0.025)	5.033* (0.025)	5.335* (0.021)
ausrwages11	3.773* (0.052)	4.582* (0.032)	5.050* (0.025)	5.029* (0.025)	5.303* (0.021)
rimpoc	0.576 (0.448)	2.936* (0.087)	3.591* (0.058)	3.873* (0.049)	3.908* (0.048)
rexpoc	0.013 (0.909)	0.134 (0.715)	---	---	---
inrdifc	0.259 (0.611)	0.544 (0.461)	0.422 (0.516)	0.031 (0.861)	---
austwi	---	---	---	---	---
ausinf	---	---	---	---	---
outrfdic	0.007 (0.934)	---	---	---	---
Result	*outrfdi* → *Δoutrfdi*	*rexpoc* → *Δrexpoc*	*inrdifc* → *Δinrdifc*	*Δinrdifc* → *ΔΔinrdifc*	---
* significant at 10% critical value					

The country-specific FDI model was then estimated as a combination of two variables in levels form without lags (*austwi* and *ausinf*), one variable in levels form with first lag (*ausrgdp*), two variables in levels form with two lags (*rimpoc* and *ausrwages11*), two variables in first differences without lags (Δ*outrfdi* and Δ*rexpoc*) and one variable in second difference without lags (ΔΔ*inrdifc*), i.e. twelve variables in total. The parameters in the model were estimated using least squares (with White heteroscedasticity-consistent standard errors for reasons to be outlined in Section 4.2.3) and are shown in Table 4-11 Model B.

In contrast to the quarterly FDI model, the country-specific FDI model only explained one third of the variation of FDI (R^2 of 30.8% and an adjusted R^2 of 25.5%), although nine out of twelve explanatory variables were significant at a 10% critical value (except for *ausrgdp* and *rimpoc(-2)*, which were only significant at a 15% critical value[129], and *austwi*, which was not significant at a 15% critical value). The F-statistic showed that the null hypothesis that all the slope coefficients in a regression are zero was rejected. Although *eng*, the dummy variable for English as an official language in Home, was not significant when included in Model A, its inclusion in Model B raised the R^2 to 31.8% and the adjusted R^2 to 26.1%. All variables would at least be significant at a 15% critical value, including *eng*, which had a coefficient of 406.701 (t-stat: 1.497, Prob: 0.136). However, since the variable was not chosen for the first equation and was at no stage significant at a 10% critical value, it was also excluded from the second equation.

Table 4-11

Country-Specific FDI Equation										
Dependent Variable: *ausrfdic* Sample: Time: 1992 – 2001, t = 10 (9 after adjusting endpoints), N = 22. Missing values = 8. Included observations: 170 Least Squares, White Heteroscedasticity-Consistent Standard Errors and Covariance										
Model A: Model with variables in levels form					**Model B: Model after differencing**					
Variable	Lags	Coefficients	t-stat	Prob.		Lags	Coefficients	t-stat	Prob.	
C	---	130,135.900**	1.883	0.062	**C**	---	131,048.400**	2.268	0.025	
ausrgdp	**0**	0.108*	1.499	0.136	***ausrgdp***	**0**	0.109*	1.475	0.142	
	1	-0.202**	-1.804	0.073		**1**	-0.203**	-1.898	0.060	
ausrwages11	**0**	42.396*	1.626	0.106	***ausrwages11***	**0**	42.596**	1.696	0.092	
	1	-167.882**	-1.940	0.054		**1**	-169.063**	-2.190	0.030	

[129] The 15% critical value was added, as it helped in determining the appropriate combination of variables and lag lengths. In terms of significance, the variables that are only significant at a 15% critical value should be treated cautiously.

rimpoc	**0**	0.657*	1.484	0.140	***rimpoc***	**0**	0.654**	1.910	0.058
	1	-1.325**	-1.835	0.069		**1**	-1.329**	-1.919	0.057
	2	0.768	1.399	0.164		**2**	0.779*	1.519	0.131
rexpoc	**0**	-0.647**	-1.724	0.087	***Δrexpoc***	**0**	-0.655**	-1.762	0.080
	1	0.636*	1.538	0.126		---	---	---	---
inrdifc	**0**	-96.422	-1.324	0.188	***ΔΔinrdifc***	**0**	-93.039**	-2.034	0.044
	1	184.703**	1.870	0.063		---	---	---	---
	2	-102.133*	-1.611	0.109		---	---	---	---
austwi	**0**	69.057*	1.514	0.132	***austwi***	**0**	70.058	1.435	0.153
ausinf	**0**	1,055.144**	2.199	0.029	***ausinf***	**0**	1,061.427**	2.344	0.020
outrfdic	**0**	0.024**	2.327	0.021	***Δoutrfdic***	**0**	0.024**	2.737	0.007
	1	-0.023**	-2.000	0.047		---	---	---	---
** significant at 10% critical value, * significant at 15% critical value									
R-squared				0.310	**R-squared**				0.308
Adjusted R-squared				0.238	**Adjusted R-squared**				0.255
S.E. of regression				1,711.979	**S.E. of regression**				1,692.615
Sum squared resid				448,000,000	**Sum squared resid**				450,000,000
Durbin-Watson stat				2.123	**Durbin-Watson stat**				2.124
F-statistic				4.295	**F-statistic**				5.819
Prob (F-statistic)				0.000	**Prob (F-statistic)**				0.000

4.2.3 MODEL EVALUATION

The choice of the appropriate model depends on whether non-specific disturbances are spherical (whether disturbances do not exhibit heteroscedasticity or autocorrelation) and whether exogenous variables are strictly exogenous.[130]

As the first step in a series of diagnostic tests, it was analysed whether the model exhibited heteroscedasticity. If the model exhibits heteroscedasticity, OLS produces maximum likelihood parameter estimates, so that the log-likelihood of the model estimated with panel-level heteroscedasticity and the log-likelihood of the model without heteroscedasticity can be compared by performing a likelihood-ratio (LR) test. The number of constraints is equal to the number of panels over groups minus one.[131] The hypothesis of homoscedasticity was rejected at a 5% critical value (Table 4-12). Experimenting with alternative specifications of the model (with alternative variables listed in Table 4-8) did not change the result. Heteroscedasticity was therefore accepted as a property of the model, and it was assumed that the error covariance matrix could be written as:

$$\Omega = \begin{bmatrix} \sigma_1^2 I & 0 & \cdots & 0 \\ 0 & \sigma_2^2 I & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & \sigma_m^2 I \end{bmatrix}$$

The model was estimated using White heteroscedasticity-consistent standard errors and covariances, which are robust to general heteroscedasticity (variances within a cross-section are allowed to differ across time).[132]

---

[130] Mátyás and Sevestre (1996), p.141.
[131] STATA, Frequent Asked Questions. Testing for panel-level heteroskedasticity and autocorrelation. www.stata.com/support/faqs/stat/panel.html
[132] Eviews Help Topics "Pooled Estimation, White Heteroscedasticity covariance"

The second step (after estimating the model using White heteroscedasticity-consistent standard errors and covariances) was to test for autocorrelation. When disturbances are autocorrelated, a first-order autoregressive process has to be included that is written as:

$$u_{it} = \rho_1 u_{it-1} + e_{it} \qquad \text{where } E(e_{it}|x_{it}, u_{it-1}, x_{it-1}, x_{it-2}, \ldots) = 0 \,.$$

Under the Null hypothesis of no autocorrelation (i.e. $\rho_1 = 0$), an F-test on the estimate of ρ_1 can be performed.[133] The hypothesis of no autocorrelation was not rejected at a 5% critical value, i.e. the model did not exhibit autocorrelation (Table 4-12).

Table 4-12

Diagnostic Tests (5% critical values), Country-Specific FDI Model					
		Test	**F-Statistic**	**5% Critical value**	**Probability**
Heteroscedasticity	**White LR-test**	$\chi^2(21)$	280.190*	32.671	0.000
Autocorrelation	**F-test**	F(1,147)	1.645	3.910	0.202
Misspecification	**RESET(1)**	F(1,156)	1.058	3.910	0.305
	RESET(2)	F(2,155)	44.722*	3.060	0.000
Parameter Stability	Cannot be estimated for two different time periods: near singular matrix.				
Test of parameter constancy (Random Coefficients Model)	Cannot be estimated for all cross-sections since the number of explanatory variables exceeds the number of time periods per cross-section, but the model for three regional groups (North America, Europe and Asia-Pacific) can be compared as shown below.				
* significant at 5% critical value					

In addition, misspecification related to the functional form of the model should be tested for. This was done by applying the Ramsey RESET-test, which makes use of the fitted values and thus avoids having to add squares and cross products of all exogenous variables to test for neglected nonlinearities. If the model is written as $y = x\beta + u$ where $E(u|x) = 0$, the OLS estimator $\hat{\beta}$ can be used to get $\hat{y} = X\hat{\beta}$ as the OLS fitted values and $\hat{u}$ as the OLS residuals. Ramsey suggests adding the low-order polynomials in $\hat{y}$, say $\hat{y}^2$ and $\hat{y}^3$, to the model and performing a standard F-test. While the RESET(1)-test of correct functional form was not rejected, the RESET(2)-test was rejected, indicating misspecification. The form of misspecification was unclear and experimenting with log transformation worsened the fit of the model. Since a superior specification was not found, the model was regarded as an appropriate representation of the data generating process.

Finally, the issue of whether all exogenous variables are strictly exogenous was addressed. While most variables, such as *ausrwages11, inrdifc, austwi, ausinf* and *outrfdic* were (at least contemporaneously) exogenous by theoretical assumption, this statement was not as clear for others, such as GDP, imports and exports, but testing proved difficult.[134]

Finally, parameter stability – over time and across countries – was tested for by splitting the sample into time- or country-specific subsamples and comparing the parameter estimates. However, in this case the time-specific subsamples could not be compared (as there were too many variables and too few time periods) and the random coefficient model could not be

[133] Wooldridge, 2002, pp.176-177 and 282-283.
[134] It was difficult to find appropriate instrumental variables. Since *rexpoc* was used in first differences, it was assumed to be exogenous. Looking at the correlation between *ausrfdic* and *Δrexpoc* shows that there is little correlation between the two variables (-0.072). There is also little evidence of a correlation between *ausrfdic* and *ausrgdp* (0.053) or *ausrfdic* and *rimpoc* (0.173).

estimated since the number of explanatory variables exceeded the number of time periods per cross-section. Instead, the possibility that coefficients vary depending on which regional group Home belongs to (North America, Europe or Asia-Pacific) was explored. Since the country-specific FDI model did not fit too well (with an R^2 of 30.8%), the possible instability across cross-sections was analysed. The three regions analysed were North America, Europe, Asia-Pacific and a combination of the UK and the US (the two main investors in Australia, accounting for almost a third of FDI inflows)[135]. While the region (measured by including regional dummy variables) did not affect FDI inflows, re-estimating the country-specific FDI model for three regional groups (North America, Europe, Asia-Pacific) did make a difference (Table 4-13).

The model fitted well for the European and the North American sample, but did not fit for the Asia-Pacific sample. The model seemed to primarily explain Australian FDI from Europe and North America, as estimating the model for the combined UK and US sample showed that the model did well in explaining FDI from those two investors.

[135] The US accounted for 19.8%, the UK for 12.7% of FDI inflows between 1992 and 2001. See Section 2.3.2, Table 2-6 for more details.

Table 4-13

Regional Effects: Change in Intercept and Slope Coefficients, Country-Specific FDI Model											
Dependent Variable: *ausrfdic* Sample: Time: 1992 – 2001, t = 10 Least Squares, White Heteroscedasticity-Consistent Standard Errors and Covariance											
		Model A: Total Sample (N=22)		Model B: North America Sample (N=2)		Model C: Europe Sample (N=9)		Model D: Asia-Pacific Sample (N=10)		Model E: UK, US Sample (N = 2)	
Variable	**Lags**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**
C	---	131,697.400	2.253	526,529.300	5.468	4,565.962	0.050	11,706.810	0.184	2,097,072.000	2.789
ausrgdp	0	0.109*	1.466	0.987**	7.458	-0.198*	-1.525	0.065	0.544	1.584**	2.650
	1	-0.204**	-1.891	-1.415**	-7.779	0.202	1.110	-0.075	-0.470	-3.110**	-2.801
aus-rwages11	0	42.844**	1.675	452.249**	4.444	-56.637*	-1.498	36.679	0.812	1,227.139**	2.769
	1	-169.804**	-2.173	-958.342**	-6.637	51.102	0.449	-52.411	-0.507	-3,241.494**	-3.080
rimpoc	0	0.653**	1.822	0.271	0.694	2.947**	1.905	-0.062	-0.285	0.993	1.233
	1	-1.332**	-1.899	2.160	1.699	-4.922**	-2.424	-0.397	-0.577	0.531	0.402
	2	0.786*	1.474	-2.575*	-2.203	2.091**	2.081	0.512	0.895	-1.761	-0.986
Δrexpoc	0	-0.662**	-1.711	2.225	1.521	-0.373	-1.140	-0.369	-0.757	0.906	0.820
ΔΔinrdifc	0	-93.390**	-2.005	-1,158.863**	-5.628	-12.877	-0.126	-18.519	-0.326	-3,745.639*	-2.035
austwi	0	71.127*	1.465	562.267**	4.668	18.620	0.318	58.583	0.907	1,420.474*	1.929
ausinf	0	1,065.790**	2.321	4,526.821**	8.138	-236.646	-0.377	410.034	0.593	15,278.340**	3.410
Δoutrfdic	0	0.024**	2.705	-0.001	-0.094	0.016**	2.729	0.013	1.225	0.082**	8.576
na	0	-229.888	-0.501	---	---	---	---	---	---	---	---
eu	0	-195.917	-0.731	---	---	---	---	---	---	---	---
ap	0	-132.063	-0.533	---	---	---	---	---	---	---	---
** significant at 10% critical value, * significant at 15% critical value											
R-squared		0.308		0.966		0.610		0.128		0.960	
Adjusted R-squ.		0.241		0.831		0.525		-0.033		0.798	
SE of regression		1708.260		915.370		1,625.903		1,620.190		2,364.646	
Sum squared res		449,000,000.000		2,513,708.000		145,000,000.000		171,000,000.000		16,774,658.000	
DW stat		2.126		2.745		2.653		1.130		2.351	
F-statistic		4.579		7.141		7.179		0.796		5.934	
Prob (F-statistic)		0.000		0.066		0.000		0.653		0.084	

Since the regression coefficients from the three regional equations appeared to differ when comparing the estimation results, it was tested whether the difference was significant. For this purpose, each regional sub-sample was compared with the remaining observations. The data and regression model were set up in such a way that the regional sub-model (eg. the NA model) could be nested in a more general model (i.e. the general country-specific FDI model).[136]

The regression models for the two subsamples, for instance one for the non-NA sub-sample (1) and one for the NA-sub-sample (2), were stated in the following form:

(1) $FDI_{1it} = \mu_1 + \beta_1 X_{it} + \varepsilon_{1it}$ and (2) $FDI_{2it} = \mu_2 + \beta_2 X_{it} + \varepsilon_{2it}$

The regression models for two subsamples were then combined (which added up to the general country-specific FDI model), so that the following regression was run:

$FDI_{it} = \mu_1 + \mu_2 {*} d + \beta_1 X_{it} + \beta_2 w_{it} + \varepsilon_{it}$ where d is a dummy variable equal to 1 when the data came from the second dataset and 0 when the data came from the first dataset, while w_{it} is an interaction variable between d and X_{it} (i.e. $w_{it} = d{*} X_{it}$).

In order to test whether the estimated parameters from the regression using the first subsample differ significantly from the estimated parameter from the regression using the second subsample, an F-test was conducted to see whether μ_2 and β_2 were jointly zero. Neither

[136] STATA, Frequent Asked Questions. Testing the equality of coefficients across independent regressions. www.stata.com/support/faqs/stat/testing.html

the European nor the Asia-Pacific subsample differed significantly from the other regions used in the model (see Table 4-14).

The North American subsample and the subsample using only data from the UK and the US differed significantly (at a 5% critical level) and should thus not be combined with the remaining twenty countries. Since the variables chosen for the general country-specific FDI model explained Australian FDI from North America or the UK and the US well, it seemed as though these were indeed the determinants of FDI in those countries, while the determinants of FDI from other countries differed from the variables chosen, explaining the relatively low fit of the overall model. The model, which explains around one third of the variation of country-specific FDI, does well in explaining FDI from the two countries that accounted for almost one third of FDI inflows, while FDI from other countries was possibly determined by other factors. However, the determinants may not be the same for each of the remaining twenty countries, but differ from country to country, so that the determinants of FDI for those countries should best be modelled individually. Given the small sample size for individual country samples, individual estimation was not possible and was left for future research.

Table 4-14

Test of equality of regression coefficients generated from regional sub-samples, Country-Specific FDI Model

	Test	F-Statistic	5% Critical value	Probability
NA Sample	**F(13, 144)**	18.558*	1.820	0.000
EU Sample	**F(13, 144)**	1.010	1.820	0.445
AP Sample	**F(13, 144)**	1.356	1.820	0.188
UK, US Sample	**F(13, 144)**	34.318*	1.820	0.000

* significant at 5% critical value

4.2.4 RESULTS

Despite the limited adequacy of this model, the estimation results from the country-specific FDI model are discussed in more detail and compared with the results from the quarterly FDI model. However, the results should be interpreted with great caution owing to the short time period of only ten years. 4-15 shows the current and long-run (after one lag) effects as predicted by the model, and compares them to the expected effects.

The size of the Australian market (*ausrgdp*) had the expected positive effect on FDI in the short-run, but a negative effect after one lag and in the long-run. Market size was important, though the negative sign was contrary to the predicted outcome. Neither the size of the Asian-Pacific market (*apmarket*, measured by *aprgdp*), the differences in market size between Home, i.e. the source of FDI, and Australia (*marketdif*, measured by *rgdpdifc* or *relgdpc*) nor the combined market size of Home and Australia (*marketsum*, measured by *rgdpsumc*) – indicators for horizontal FDI – had any significant effect in the model. Hence, despite experimenting with different market size variables, no indication to the type of Australian FDI was found.

Table 4-15

Country-Specific FDI Equation, Observed and Predicted Effects (Total Sample)					
	Short-run effect (current value)		Long-run effect (after 1 lag)		Expected Sign
ausrgdp	0.109	+	-0.094	-	+
apmarket	---	n.s.	---	n.s.	?
marketdif	---	n.s.	---	n.s.	?
marketsum	---	n.s.	---	n.s.	?
lab	---	n.s.	---	n.s.	-
ausrwages11	42.596	+	-126.467	-	-
prod	---	n.s.	---	n.s.	+
skill	---	n.s.	---	n.s.	+
rimpoc	0.654	+	0.104	+	+
Δrexpoc	-0.655	-	-0.655	-	?
dist	---	n.s.	---	n.s.	-
cdut	---	n.s.	---	n.s.	+
trdbar	---	n.s.	---	n.s.	?
ΔΔinrdifc	-93.039	-	-93.039	-	-
austwi	70.058	n.s. (+)	70.058	n.s. (+)	-
ausinf	1,061.427	+	1,061.427	+	-
indus	---	n.s.	---	n.s.	-
tax	---	n.s.	---	n.s.	-
Δoutrfdic	0.024	+	0.024	+	+
eng	---	n.s. (+)	---	n.s. (+)	+
apfdi	---	n.s.	---	n.s.	-
oecdgdp	---	n.s.	----	n.s.	+ (-)
region	---	n.s.	---	n.s.	?

The real wage rate (*ausrwages11*) had the expected negative sign after one lag, i.e. higher wages reduced the attractiveness of Australia as a FDI destination, while none of the other variables related to factor costs – labour supply (*lab*, measured by *ausjobvac* or *ausuer*), labour productivity (*prod*, measured by *ausprod*) and any variable measuring skill endowment in an economy (*skill*, measured by *austert* and *reltertc*) – were significant.

Surprisingly, trade costs did not have any effect on Australian FDI – neither when measured by customs duties (*cdut*, measured by *auscdut, or trdbar, measured by cdutc or cdutsums*) nor when measured by geographical or time distance (*dist*, measured by *geodistc or timedistc*). Trade measured by the amount of real imports (*rimpoc*) and the change in real exports (Δ*rexpoc*) was a significant determinant. Australian imports from Home positively affected FDI, while the reverse was true for the change of exports from Australia to Home. Firms may switch from exporting (i.e. importing to Australia) to producing locally (thus the positive sign of *rimpoc*, as more imports may lead to more FDI). An increase in Australian exports to Home (*rexpoc*) reduced the attractiveness of Australia as an investment location possibly because it causes Home MNEs to focus more on their domestic markets to compete with these (Home) imports, thereby reducing their overseas investments.

Political and market risk was measured by interest rate differences between Home and Australia (*inrdifc*), Australia's exchange rate (*austwi*) and Australia's inflation rate (*ausinf*). The number of industrial disputes in Australia (*ausindus*) was experimented with, but it was not significant. The negative sign on the rate at which the growth rate of changes in *inrdifc* (ΔΔ*inrdifc*) did not directly substantiate the prediction that higher interest rates in Home than in Host (i.e. a positive *inrdifc*) have a negative effect on FDI (i.e. a negative interest rate difference encourages FDI), though the result was substantiated when looking at the equation before differencing, as it was negative overall. The larger the change of *inrdifc* (i.e. the more the interest rate difference between Home and Host increases), the lower is FDI. A higher interest rate in Home relative to Host did indeed discourage FDI. Australia's exchange rate had an unpredicted positive (though not significant) sign, indicating that an appreciating Australian dollar promotes FDI. This result was not so surprising, as a stronger Australian currency (relative to the US Dollar) was found to increase quarterly FDI. So the positive sign on *austwi* (despite not being significant) could support this result. A positive sign on the inflation rate (*ausinf*) was contrary to prediction, but supported the result from the quarterly FDI model.

Neither the corporate tax rate in Australia nor the difference in corporate tax rates between Home and Australia (*tax*, measured by *austax* or *taxdifc*) were significant and were therefore not included. Of the remaining variables, only the change in Home's outward FDI (∆*outrfdic*) had the predicted positive sign, i.e. the world investment climate increased Australian FDI. FDI in the Asia-Pacific region (*apfdi*, measured by *aprfdi*) did not affect Australian FDI. A dummy variable for English as an official language in the Home economy (*language*, measured by *eng*) was not included in Model A, as it was not significant. When including it in Model B, it was significant and of the expected positive sign, showing that Australian FDI from countries with English as an official language was overall higher than that from other countries. The variable *oecdgdp* (measured by *oecdrgdp* or *oecdgrdifa*) as an indicator of world GDP or growth trends was not significant, substantiating the result from the quarterly FDI model. Finally, the three regional dummies (*region*, measured by *na, eu* and *ap*) did not affect FDI significantly when included in the country-specific FDI model, showing that there was no significant difference in the overall size of FDI flows from the different regions.

Comparing the results for the regression model using the regional samples (Table 4-16), Australian GDP was found to have the expected positive sign only for the European sample (i.e. for Australian FDI from Europe), while real wages had the expected positive sign for all but the Asia-Pacific sample. Real imports had the expected positive sign for the European and the total sample, while real exports were only significant (and negative) for the overall sample. The interest rate difference between Home and Host had the expected negative sign for the North American, US and UK and total sample, while the unexpected positive sign for exchange rate and inflation rate that was found for the total sample was supported by the results from the North American and US and UK model. Outward FDI had the predicted positive effect on country-specific FDI in the European, US and UK and the total sample.

Table 4-16

Country-Specific FDI Equation, Observed and Predicted Effects (Regional Samples)						
	North America Sample (N=2), 16 observations	Europe Sample (N=9), 68 observations	Asia-Pacific Sample (N=10), 78 observations	US, UK Sample (N=2), 16 observations	Total Sample (N=22), 170 observations	Expected Sign
ausrgdp	-	+	n.s.	-	-	+
ausrwages11	-	-	n.s.	-	-	-
rimpoc	-	+	n.s.	n.s.	+	+
Δrexpoc	n.s.	n.s.	n.s.	n.s.	-	?
ΔΔinrdifc	-	n.s.	n.s.	-	-	-
austwi	+	n.s.	n.s.	+	+	-
ausinf	+	n.s.	n.s.	+	+	-
Δoutrfdic	n.s.	+	n.s.	+	+	+

4.2.5 ALTERNATIVE APPROACH: TESTING THE EXPLANATORY POWER OF DIFFERENT THEORETICAL MODELS

While the previous model explained country-specific FDI with a combination of explanatory variables based on a number of different theories, the next step is to explore how well the theories worked individually in explaining FDI. The question is whether some of the models were more appropriate representations of the data generating process than others, or whether FDI should be explained using a combination of various models. For this purpose, six different models were estimated: a model using aggregate variables only, a model using risk variables only and a model using policy variables only (Table 4-17) as well as the horizontal FDI model, vertical FDI model and the Knowledge-Capital Model (Table 4-18).

The aggregate model combined Australian GDP (*ausrgdp*), Australian and Home customs duties (*auscdut*, *cdutc*), while the policy model included both customs duties variables (*auscdut* and *cdutc*), the Australian corporate tax rate (*austax*) and the corporate tax rate differential between Home and Australia (*taxdifc*). The risk model used four risk factors: interest rate difference between Home and Host (*inrdifc*), the Australian exchange rate (*austwi*), the Australian inflation rate (*ausinf*) and the number of industrial disputes in Australia (*ausindus*).

Two lags for each variable were included to allow for some time lag in the effects. Before estimating the six models, it should be noted that knowing that country-specific FDI was best explained using a variety of different variables means that estimating models without some of the variables that were significant in the previous model (Table 4-12) should result in some specification error, as the new model was deliberately estimated with missing explanatory variables. Nevertheless, the estimation of the six individual models could give some valuable results and might support the choice of using a combination of variables.

None of the first three models individually could explain country-specific FDI in Australia. The three R^2 were extremely low (1.9%, 3.2% and 3.9%), the adjusted R^2 were negative. None of the explanatory variables was significant and the F-statistic showed that the null hypothesis of all slope coefficients being zero was not rejected in any of the three cases. Hence, the three models were misspecifications of the data generating process.

Table 4-17

Comparison of Alternative Theories I: Aggregate Variables, Risk Variables and Policy Variables as Determinants of FDI							
Dependent Variable: ***ausrfdic*** **Least Squares**							
		Aggregate Variables		**Risk Variables**		**Policy Variables**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	**---**	6,557.185	0.433	-3,817.076	-0.762	52,851.760	0.995
ausrgdp	**0**	-0.026	-0.688	---	---	---	---
	1	-0.004	-0.031	---	---	---	---
	2	0.028	0.299	---	---	---	---
auscdut	**0**	-1,556.545	-0.353	---	---	-6,169.793	-1.000
	1	-504.128	-0.468	---	---	862.331	0.369
	2	692.273	0.408	---	---	-105.396	-0.070
cdutc	**0**	-32.861	-0.337	---	---	63.194	0.221
	1	16.312	0.158	---	---	89.584	0.241
	2	-15.703	-0.200	---	---	-211.591	-0.835
inrdifc	**0**	---	---	40.384	0.426	---	---
	1	---	---	-45.490	-0.330	---	---
	2	---	---	-29.904	-0.326	---	---
austwi	**0**	---	---	76.499	1.252	---	---
	1	---	---	-19.340	-0.292	---	---
	2	---	---	4.456	0.073	---	---
ausinf	**0**	---	---	188.568	1.027	---	---
	1	---	---	-112.421	-0.779	---	---
	2	---	---	-26.726	-0.132	---	---
ausindus	**0**	---	---	0.391	0.259	---	---
	1	---	---	1.094	0.529	---	---
	2	---	---	-0.304	-0.228	---	---
austax	**0**	---	---	---	---	-687.149	-0.968
	1	---	---	---	---	303.140	0.558
	2	---	---	---	---	-625.555	-0.851
taxdifc	**0**	---	---	---	---	-40.492	-0.347
	1	---	---	---	---	68.895	0.506
	2	---	---	---	---	-36.669	-0.507
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.019		0.032		0.039	
Adjusted R-squared		-0.035		-0.041		-0.067	
S.E. of regression		1,968.869		1,995.036		2,375.935	
Sum squared resid		640,000,000.000		629,000,000.000		615,000,000.000	
Durbin-Watson stat		2.111		2.120		2.185	
F-statistic		0.350		0.442		0.367	
Prob (F-statistic)		0.957		0.944		0.972	

For the estimation of the final three models, the horizontal FDI model, the vertical FDI model and the Knowledge-Capital Model, a combination of the combined market size of Home and Host, measured by GDP (*rgdpsumc*), the market size difference between Home and Host (*rgdpdifc*), the skill difference between Home and Host (*skilldif1* and *skilldif2*)[137], geographical distance (*geodist*), Australian or Host customs duties (*auscdut*) and Home customs duties (*cdutc*) was used.[138] *Skilldif1*rgdpdifc* was expected to have no effect on horizontal FDI and was therefore not included in the horizontal FDI model, while *rgdpsumc* and *rgdpdifc* were left out of the vertical FDI model.[139]

---

[137] *skilldif1* = skill difference if Home is relatively more skilled labour abundant than Host, *skilldif2* = skill difference if Host is relatively more skilled labour abundant than Home. Skill was measured by net tertiary school enrolments (as a share of total).

[138] This model is based on Markusen and Maskus (2002), as described in Section 3.1.7, Table 3-8. Investment Cost/Entry Barrier (*invcost*) to Host as a determinant of FDI were left out of the estimation, since no appropriate variable could be found for Australia.

[139] These restrictions were made by Markusen and Maskus (2002). One can test whether the restrictions are valid by applying a Wald test to the Knowledge-Capital Model, which includes all variables. The restriction on the coefficient of *skilldif1*rgdpdifc* in the Horizontal FDI Model seems valid (χ^2 = 1.276, Prob = 0.256), while the restriction on the coefficients of *rgdpsumc* and *rgdpdifc* in the Vertical FDI Model do not appear to be valid (χ^2 = 8.924, Prob = 0.012 for joint Wald test), though the tests were of limited relevance, as the model was misspecified.

The three R^2s were extremely low (4.6%, 2.0% and 5.1%). Most of the explanatory variables in the three models were not significant (except for *skilldif2*rgdpsumc* in the horizontal FDI model and in the Knowledge-Capital Model). The F-statistic showed that the null hypothesis that all slope coefficients are zero was not rejected in any of the three cases. Although the fit of those three models was a slight improvement to the first three models, the final three models were clear misspecifications of the data generating process. Thus the country-specific FDI model explained FDI best by using a combination of factors based on a number of different theories. None of the individual models came close in explaining as much of the variation in country-specific FDI as was explained by the country-specific FDI model.

Table 4-18

Comparison of Alternative Theories II: Horizontal FDI, Vertical FDI and the Knowledge-Capital Model							
Dependent Variable: ***ausrfdic*** **Least Squares**							
		Horizontal FDI		**Vertical FDI**		**Knowledge-Capital Model**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	2628.420**	1.878	1102.614	1.421	2332.566*	1.531
rgdpsumc	0	-0.001	-0.838	---	---	-0.000	-0.559
rdgdpdifc	0	0.001	1.089	---	---	-0.001	0.795
skilldif1*rgdpdifc	0	---	---	0.003*	1.462	0.003	1.130
skilldif1*rgdpsumc	0	-0.001	-1.040	-0.002	-1.103	-0.004	-1.200
skilldif2*rgdpsumc	0	0.001**	1.938	0.000	1.071	0.001**	1.985
geodist	0	-0.007	-0.268	0.006	0.212	-0.008	-0.289
invcost	---	---	---	---	---	---	---
auscdut	0	-400.094**	-1.839	-178.834	-0.963	-344.608*	-1.453
cdutc	0	-8.384	-0.513	-17.588	-1.246	-8.007	-0.496
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.046		0.020		0.052	
Adjusted R-squared		0.014		-0.008		0.015	
S.E. of regression		1742.702		1761.997		1742.035	
Sum squared resid		632,000,000.000		649,000,000.000		628,000,000.000	
Durbin-Watson stat		2.120		2.077		2.132	
F-statistic		1.430		0.725		1.391	
Prob (F-statistic)		0.195		0.630		0.202	

4.2.6 CONCLUSIONS

For the second analysis of the determinants of Australian FDI, a model with country-specific annual real FDI flow data for the period 1992 to 2001 and a set of lagged explanatory variables including Australian GDP, real wage costs, the level of imports and the change in exports between the individual Home countries and Australia, the size of the change of the difference between the Home and Australian interest rates, the Australian exchange rate, the Australian inflation rate and Home's outward FDI was used. English as an official language in the Home country could also be included. Other potential determinants such as Asia-Pacific GDP, relative GDP, the sum of Home and Australian GDP, labour supply, productivity, skill endowment, geographical (or time) distance, customs duties, industrial disputes, FDI in Asia-Pacific and OECD GDP were not significant in this model and were thus not included. Of the eight explanatory variables (or nine if *eng* was counted), most variables had the expected sign (Australian GDP, real wages, imports and exports, the interest rate difference, Home outward

FDI – and the English dummy if included). The Australian exchange rate and inflation rate were the only two variables that had significant effects, but were of unexpected signs.

While a combination of variables worked reasonably well in explaining country-specific FDI in Australia, separate models with FDI determinants from alternative theories were not sufficient in explaining country-specific FDI and led to misspecification owing to missing variables. Neither aggregate variables, risk variables, policy variables, determinants of horizontal FDI, determinants of vertical FDI nor determinants in the Knowledge-Capital Model by themselves explained the variation in country-specific FDI. A combination of variables from different theories was the better choice when looking for a model explaining country-specific FDI in Australia.

CHAPTER 5

ANALYSIS OF DETERMINANTS OF INDUSTRY-SPECIFIC FDI FROM THE US, THE UK, JAPAN, GERMANY AND ALL COUNTRIES IN AUSTRALIA

5.1 DATA

For the econometric analysis of the determinants of disaggregated FDI in Australia, data on industry-specific FDI inflows into Australia published by the ABS, the US Department of Commerce – Bureau of Economic Analysis, UK National Statistics, the Japanese Ministry of Economy, Trade and Industry and the Deutsche Bundesbank were used. Hence, five different datasets were available: industry-specific FDI in Australia from all countries and industry-specific FDI in Australia from each of the US, the UK, Japan and Germany individually. None of the five panel datasets has been used in any previous study on Australian FDI, so they provide an exciting new data source to be explored. The selection, representing investors from North America, Europe and the Asia-Pacific region, goes well with the fact that those four countries (the US, the UK, Japan and Germany) combined accounted for an average of 69% of the Australian inward FDI stock and 42% of the Australian FDI inflows between 1992 and 2001.[140]

Before analysing the determinants of country- and industry-specific FDI in Australia empirically, it may be useful to look at the individual country cases, to discuss in which industries US, UK, Japanese and German firms are active and to highlight differences in their industry structures. US companies dominate Australian FDI in most industries. Business and financial services (e.g. Citibank, Merrill Lynch), wholesale trade and manufacturing are the largest industries overall. Pharmaceuticals/chemicals (e.g. Eli Lily, Merck, Pfizer, Dow Chemicals, Monsanto), food (e.g. Coca-Cola, Kraft, Mars, Heinz, Simplot), automotive (e.g.

[140] See Table 2.2 and Table 2.3 in Chapter 2 for data references.

Holden/General Motors, Ford), metals (e.g. Alcoa), electronics (e.g. General Electric, IBM, Intel, Oracle) and consumer goods (e.g. Johnson & Johnson, Procter & Gamble, Mattel, Nike, Kodak) dominate the manufacturing sector. US investors also account for the largest share of foreign ownership in the Australian mining/petroleum (e.g. ESSO, Exxon, Mobil Oil) and utilities industries.

Business and financial services (e.g. Royal & Sun Alliance, HSBC Bank), manufacturing – such as pharmaceuticals/chemicals (e.g. GlaxoSmithKline), food (e.g. Cadbury-Schweppes) and electronics (e.g. Invensys) – and mining/petroleum (e.g. BP, Shell) were also the key sectors for UK investments, though transport/communications (e.g. Vodaphone) and wholesale trade were important industries, too. Japanese companies have invested strongly in mining, manufacturing – particularly automotive (e.g. Toyota and Mitsubishi), electronics (e.g. Fujitsu, NEC, Toshiba), food (e.g. Snowbrand, Yakult) and metals – and wholesale trade (e.g. Mitsui, Marubeni, Itochu), but they also have some significant foreign ownership in the financial services (e.g. Bank of Tokyo) and tourism sectors. Finally, wholesale trade and manufacturing are the key sectors for German companies. Chemicals (e.g. BASF, Bayer, Hoechst), electronics (e.g. Siemens) and automotive (e.g. Robert Bosch, Siemens VDO, EDAG, Mahle) are the most important industries in the manufacturing sector. Some major players in the Australian construction (e.g. Leighton Holdings, Walter Construction Group) and insurance industries (e.g. Allianz) are also German-owned.

The time periods covered were dependent on data availability and varied between ten years for total Australian FDI (1992 to 2001), thirteen years for Japanese and German FDI[141] (1989 to 2001), twenty years for US FDI (1982 to 2001) and 30 years for UK FDI (1972 to 2001). Most data series included a number of negative values, depicting disinvestments (26 for FDI from all countries, 27 for FDI from the US, 41 for FDI from the UK, but zero for both FDI from Japan and FDI from Germany). The number of cross-sections varied depending on their availability, but generally included a number of industries from the primary, secondary and tertiary sectors (except for total Australian FDI for which only an aggregate for manufacturing FDI was available). Overall, the datasets included between 83 and 219 observations. See Table 5-1 for an overview of the available FDI data.[142] FDI inflow data were used in real form, i.e. the nominal FDI series was deflated using the price index for private gross fixed capital expenditure. Graphical representations of the FDI series are presented in the subchapters (Sections 5.2.1 to 5.2.5).

Table 5-1

FDI Data Availability, Industry-Specific FDI Model					
	Years (No)	No of Cross-Sections	Missing Values	Observations	Negative Values
Australian FDI	1992 – 2001 (10)	10	4	96	26

[141] The German FDI series included data for Australia and New Zealand combined, which were not available separately. However, since FDI in New Zealand accounted for an average of only 5.3% of the combined series, the combined series was used to derive the results for German industry-specific FDI in Australia. However, the series is only an approximation of the actual amount of German FDI in Australia.
[142] For more detail on which industries are included for which country, see the Appendix A.3, Table A-5.

US FDI in Australia	1982 – 2001 (14)	9	11	115	27
UK FDI in Australia	1972 – 2001 (21)	13	54	219	41
Japanese FDI in Australia	1989 – 2001 (13)	13	14	155	0
German FDI in Australia	1989 – 2001 (13)	7	8	83	0

As in the quarterly and the country-specific FDI models, the explanatory variables included market size or growth, factor and transport costs, market risk, policy variables and other factors such as outward FDI, regional FDI, OECD GDP and language and regional dummies. Industry-specific annual FDI was specified as a function of the following form:

fdii = f(*market, apmarket, marketdif, marketsum, emp, lab, rwages, prod, skill, trade, cdut, inr, exr, inf, indus, tax, outfdi, apfdi, oecdgdp, sector*)

where the variables are as listed and defined below:[143]

fdii annual industry-specific FDI in Australia (*ausnfdii*) or deflated by the price index for private gross fixed capital expenditure, plant and equipment (*ausinvdef*), i.e. *ausrfdii*, or, alternatively, real industry- and country-specific FDI in Australia (*rfdiic*), i.e. real annual industry-specific FDI from the US in Australia (*rfdiius*), real annual industry-specific FDI from the UK in Australia (*rfdiiuk*), real annual industry-specific FDI from Japan in Australia (*rfdiijp*) and real annual industry-specific FDI from Germany in Australia (*rfdiide*), deflated using *ausinvdef,*

market defined as in Chapter 4.2, i.e. *ausrgdp,* or measured by industry-specific real GDP in Australia (*ausrgdpi*)

apmarket defined as in Chapter 4.2, i.e. *aprgdp,*

marketdif defined as in Chapter 4.2, i.e. *rgdpdifc* or *relgdpc*,

marketsum defined as in Chapter 4.2, i.e. *rgdpsumc,*

emp total employment in Australia (*ausemp*) or, alternatively, industry-specific employment in Australia (*ausempi*),

lab defined as in Chapter 4.2, i.e. *ausjobvac* or *ausuer*, or measured by the industry-specific number of job vacancies (*ausjobvaci*),

rwages defined as in Chapter 4.2, i.e. *ausrwages1, ausrwages2, ausrwages11, ausrwages22* or measured by industry-specific real wages in Australia (*ausrwages1i, ausrwages11i, ausrwages2i, ausrwages22i*, defined in the same way as *ausrwages1*, *ausrwages11, ausrwages2 and ausrwages22,* but in industry-specific form),

prod defined as in Chapter 4.2, i.e. *ausprod*, or measured by output per worker (*auslp1i*), defined as industry-specific GDP divided by industry-specific

[143] As mentioned in Section 4.1, the label *"aus"* in the variables indicates that the variables refer to the Australian market. If a variable has the ending *"i"*, the variable is industry-specific. The ending *"c"* (country) can be replaced by the endings *"us", "uk", "jp"* or *"de"* (i.e. the only four countries in this analysis), which indicate that variables refer to the US, UK, Japanese or German market.

	employment, or output per hour worked (*auslp2i*), defined as industry-specific GDP divided by total number of hours worked in an industry[144],
skill	defined as in Chapter 4.2, i.e. *austert* or *reltertc,*
trade	defined as in Chapter 4.1 (but in annual terms), i.e. *ausrimpo, ausrexpo* or *ausopen*, defined as in Chapter 4.2, i.e. *rexpoc* or *rimpoc*, or measured as industry-specific import or export intensity (imports or exports relative to GDP in a certain industry, i.e. *ausimpinti, ausexpinti*) or industry-specific openness (the sum of imports and exports over GDP in a certain industry, i.e. *ausopeni*)
cdut	defined as in Chapter 4.2, i.e. *auscdut,*
inr	defined as in Chapter 4.2, i.e. *ausbb30, relinrc* or *inrdifc,*
exr	defined as in Chapter 4.2, i.e. *austwi*, *exrc* or *exrvolc*,
inf	defined as in Chapter 4.2, i.e. *ausinf, relinfc* or *infdifc,*
indus	defined as in Chapter 4.2, i.e. *ausindus,* or measured by industry-specific number of industrial disputes in Australia (*ausindusi*),
tax	defined as in Chapter 4.2, i.e. *austax or taxdifc*,
outfdi	defined as in Chapter 4.2, i.e. *outrfdic*,
apfdi	defined as in Chapter 4.2, i.e. *aprfdi,*
oecdgdp	defined as in Chapter 4.2, i.e. *oecdrgdp* or *oecdgrdifa,*
sector	sector dummy for the primary (*prim*), manufacturing (*man*) or tertiary (*tert*) sector.

In summary, market size or growth is represented by *market, apmarket, marketdif, marketsum* and *emp,* factor costs by *lab, rwages, prod* and *skill*, transport costs and protection by *trade* and *cdut,* risk factors by *inr, exr, inf* and *indus*, policy variables by *tax* and other factors by *outfdi, apfdi, oecdgdp* and *sector*. For a summary see Table 5-2. Data sources and descriptive statistics of those variables are in Appendix A.3 (Table A-6 and A-7). As in the country-specific FDI model, three kinds of variables were used: variables that vary over cross-sections and time, variables that vary over time (i.e. factors that are independent of the industry, eg. Australian market size, total labour supply or openness of the Australian economy) and variables that vary over cross-sections (i.e. constant conditions such as sector dummies).

Table 5-2

Determinants of FDI in Australia, Industry-Specific FDI Model		
	Dependent Variable	**Alternative Variable(s)**
FDI		
Industry-Specific FDI (*fdii*)	*ausrfdii, rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide)*	*ausnfdii, nfdiic (nfdiius, nfdiiuk, nfdiijp, nfdiide)*
	Explanatory Variable	**Alternative Variable(s)**
Market Size or Growth		
Host Market Size (*market*)	*ausrgdp*	*ausrgdpi*

[144] If labour productivity (*auslp1i*, defined as *ausempi/ausgdpi*) was used in a model including both *ausempi* and *ausgdpi* in levels form, there would be a problem of collinearity and a different combination of variables should be chosen. However, this problem did not occur in any of the industry-specific FDI models analysed.

Asia-Pacific Market Size (*apmarket*)	*aprgdp*	---
Market size differential (relative market size) (Home/Host) (*marketdif*)	*rgdpdifc (rdgpdifus, rgdpdifuk, rgdpdifjp, rgdpdifde)*	*relgdpc (relgdpus, relgdpuk, relgdpjp, relgdpde)*
Combined market size (Home and Host) (*marketsum*)	*rgdpsumc (rgdpsumus, rgdpsumuk, rgdpsumjp, rgdpsumde)*	---
Number of employed persons (*emp*)	*ausemp*	*ausempi*
Factor Costs		
Host Labour Supply (*lab*)	*ausjobvac*	*ausuer, ausjobvaci*
Host Wage Rate (*rwages*)	*ausrwages1*	*ausrwages11, ausrages2, ausrwages22, ausrwages1i, ausrwages11i, ausrwages2i, ausrwages22i*
Host Labour Productivity (*prod*)	*ausprod*	*auslp1i, auslp2i*
Skill Endowment (Tertiary Education), Host or Relative (*skill*)	*austert*	*reltertc (reltertus, reltertuk, reltertjp, reltertde)*
Transport Costs and Protection		
Trade between Home and Host/Host Openness (*trade*)	*ausrimpo, ausrexpo*	*ausopen, rimpoc (rimpous, rimpouk, rimpojp, rimpode), rexpoc (rexpous, rexpouk, rexpojp, rexpode), ausimpointi, ausexpinti, ausopeni*
Host (Host and Home) Customs Duties (*cdut*)	*auscdut*	*cdutc (cdutus, cdutuk, cdutjp, cdutde)*
Risk Factors		
Interest Rate, Host or Relative (*inr*)	*ausbb30*	*relinrc (relinrus, relinruk, relinrjp, relinrde), inrdifc (inrdifus, inrdifuk, inrdifjp, inrdifde)*
Exchange Rate Appreciation, LCU/A$ (*exr*)	*austwi*	*exrc (exrus, exruk, exrjp, exrde), exrvolc (exrvolus, exrvoluk, exrvoljp, exrvolde)*
Inflation, Host or Relative (*inf*)	*ausinf*	*relinfc (relinfus, relinfuk, relinfjp, relinfde), infdifc (infdifus, infdifuk, infdifjp, infdifde)*
Industrial Disputes (Total or No. of Working Days Lost), Host or Relative (*indus*)	*ausindus*	*ausindusi*
Policy Variables		
Host Corporate Tax Rate (*tax*)	*austax*	*taxdifc (taxdifus, taxdifuk, taxdifjp, taxdifde)*
Other Factors		
Home Outward FDI (*outfdi*)	*outrfdic (outrfdius, outrfdiuk, outrfdijp, outrfdide)*	---
Asia-Pacific Inward FDI (*apfdi*)	*aprfdi*	---
OECD GDP (*oecdgdp*)	*oecdrgdp*	*oecdgrdifa*
Dummy for Sector (*sector*)	*prim, man, tert*	---
Data Sources and Summary Statistics: See Appendix A.3, Table A-6 and A-7		

Variables that were the same as in the quarterly FDI model or the country-specific FDI model had the same expected signs, as discussed in Chapters 4.1 and 4.2. In addition, industry-specific real GDP in Australia was expected to have the same effect as real GDP, i.e. to increase FDI in a particular sector. Total and industry-specific employment were used as alternative variables to measure market size and should have the same positive effect as total or industry-specific GDP. Since industry-specific real wages reflect labour costs in particular industries, they were expected to have a negative effect on FDI. An industry's import intensity, export intensity or openness should have a positive effect on FDI, though this may depend on the FDI form. Industry-specific industrial disputes reflect higher industry-specific risk and should thus discourage FDI. Sector dummies could show whether and how industries affect FDI.

If alternative variables could be used, the ones with the best fit were chosen. Current and lagged values were included when significant, while insignificant variables were not included. As in the country-specific FDI model, lags for each explanatory variable were included when this increased the fit of the model. Again, the number of lags included was restricted to a maximum of three owing to the limited number of time periods included.

5.2 MODEL SPECIFICATION, ESTIMATION AND EVALUATION

The five models used to explore industry-specific FDI and its determinants in Australia (using industry-specific FDI flows from all countries to Australia, industry-specific FDI from the US to Australia, industry-specific FDI from the UK to Australia, industry-specific FDI from Japan to Australia and industry-specific FDI from Germany to Australia) will now be discussed. Sections 5.2.1 to 5.2.5 will include model specification, estimation and evaluation.

5.2.1 INDUSTRY-SPECIFIC FDI FROM ALL COUNTRIES IN AUSTRALIA[145]

Industry-specific FDI from all countries in Australia (*ausrfdii*) between 1992 and 2001 was modelled first (Figure 5-1). A combination of market size (*ausempi*), factor costs (*ausrwagesi*), trade (*ausopen*) and risk factors (*exrus* and *ausinf*) performed best in explaining industry-specific FDI in Australia. Three lags were included for *ausempi*, and one lag was included for *ausinf*, while only current values were included for *ausrwages1i*, *ausopen*, *exrus* and *ausinf*. The model was stated as:

$$ausrfdii_{it} = \alpha + \beta_{11}\, ausempi_{it} + \beta_{12}\, ausempi_{it-1} + \beta_{13}\, ausempi_{it-2} + \beta_{14}\, ausempi_{it-3} + \beta_{21}\, ausrwages1i_{it} + \beta_{31}\, ausopen_{t} + \beta_{41}\, exrus_{t} + \beta_{51}\, ausinf_{t} + \beta_{52}\, ausinf_{t-1} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

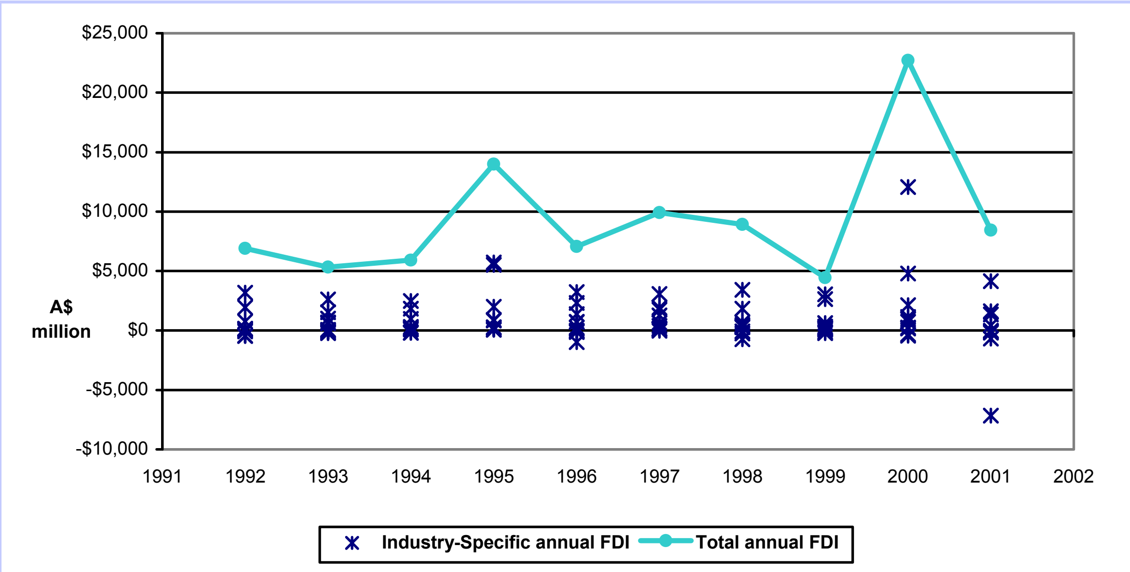


Figure 5-1: Real annual FDI Flows from All Countries into Australia (by Industry and Total), 1991 to 2002

Before discussing the model further, it should be ensured that it is correctly estimated using least squares, and that it should not be estimated as a fixed or random effects model.

[145] Industry-specific FDI from all countries refers to total industry-specific FDI, i.e. all foreign investors combined.

However, neither of these these specifications was found to be appropriate (Table 5-3), so that the model was estimated using least squares (Table 5-6, Model A).

Table 5-3

Testing of Fixed and Random Effects Model, Industry-Specific FDI Model (FDI from All Countries)		
Fixed Effects Model		
F test that all $u_i = 0$	F(8, 67) = 0.430	Prob > F = 0.899
Random Effects Model		
Breusch and Pagan LM test for random effects (test that Var(u) = 0)	$\chi^2(1) = 1.640$	Prob > $\chi^2 = 0.201$
* significant at 5% critical value		

The next step was to analyse whether any of the variables (*ausempi* and/or *ausinf*, as those were the only variables included with lags) should be used in first differences. For this purpose, a test for differencing based on the methodology applied to the country-specific FDI model was carried out. It was found that *ausempi* should be used in levels form, while *ausinf* was differenced once, since the hypothesis that the variable should be used in first differences was not rejected at a 10% critical value (Table 5-4). The model including *Δausinf* was used for further estimation.

The industry-specific FDI model for FDI from all countries was then estimated as a combination of three variables in levels form without lags (*ausrwages1i, ausopen* and *exrus*), one variable in first differences without lags (*Δausinf*) and one variable in levels form with three lags (*ausempi*), i.e. eight variables in total. The parameters in the model – estimated using least squares – are shown in Table 5-5, Model B. Similar to the country-specific FDI model, the first industry-specific FDI model only explained one third of the variation of FDI (R^2 of 37.3% and an adjusted R^2 of 30.7%), although all included variables were significant at a 10% critical value. The F-test showed that all variables in the regression combined were not equal to zero.

Table 5-4

Test for Differencing, Industry-Specific FDI Model (FDI from All Countries)		
Variable	**χ^2 (Prob)**	**χ^2 (Prob)**
ausempi	6.121* (0.016)	6.062* (0.016)
ausrwages1i	---	---
ausopen	---	---
exrus	---	---
ausinf	0.433 (0.513)	---
Result	*ausinf* → *Δausinf*	---
* significant at 10% critical value		

Table 5-5

Industry-Specific FDI Equation (FDI from All Countries)									
Dependent Variable: ***ausrfdii*** **Sample: Time: 1992 – 2001, t = 10 (10 after adjusting endpoints), N = 10. Missing values = 15. Included observations: 85** **Least Squares**									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**		**Lags**	**Coefficients**	**t-stat**	**Prob**
C	---	-11,718.040**	-2.820	0.006	**C**	---	-11,422.740**	-2.776	0.007
ausempi	**0**	-33.194**	-4.749	0.000	***ausempi***	**0**	-32.873**	-4.732	0.000
	1	50.427**	4.794	0.000		**1**	51.419**	4.957	0.000
	2	-29.159*	-2.643	0.010		**2**	-30.605**	2.841	0.006
	3	12.918**	1.735	0.087		**3**	13.041**	1.759	0.083

ausrwages1i	**0**	1.539**	1.995	0.050	***ausrwages1i***	**0**	1.553**	2.022	0.047
ausopen	**0**	139.532**	2.094	0.040	***ausopen***	**0**	143.997**	2.180	0.032
exrus	**0**	7,759.926**	2.653	0.010	***exrus***	**0**	7,354.869**	2.582	0.012
ausinf	**0**	372.440**	3.184	0.002	***Δausinf***	**0**	319.841**	3.760	0.000
	1	-276.333**	-2.558	0.013		**---**	---	---	---
** significant at 10% critical value, * significant at 15% critical value									
R-squared			0.377		**R-squared**			0.373	
Adjusted R-squared			0.302		**Adjusted R-squared**			0.307	
S.E. of regression			1,572.233		**S.E. of regression**			1,566.354	
Sum squared resid			185,000,000.000		**Sum squared resid**			186,000,000.000	
Durbin-Watson stat			2.229		**Durbin-Watson stat**			2.232	
F-statistic			5.040		**F-statistic**			5.658	
Prob (F-statistic)			0.000		**Prob (F-statistic)**			0.000	

Having estimated the model, a series of diagnostic tests – as outlined in Chapter 4.2 – were applied to assess whether the model was correctly specified. Neither the hypothesis of non-autocorrelation nor the hypothesis of homoscedasticity was rejected. Ramsey's RESET(1)-test of correct functional form was not rejected, though the RESET(2)-test was (Table 5-6). While misspecification was an issue, the form of it was unclear and experimenting with log transformation only worsened the fit of the model. Since no superior specification was found, the model was regarded as an appropriate representation of the data generating process. Most explanatory variables (*ausopen, exrus* and *Δausinf*) were assumed to be (at least contemporaneously) exogenous, while this statement was not as clear for other (*ausempi* and *ausrwages1i*), but testing proved difficult.[146]

Table 5-6

Diagnostic Tests (5% critical values), Industry-Specific FDI Model (FDI from All Countries)					
		Test	**Test-Statistic**	**5% Critical value**	**Probability**
Heteroscedasticity	**White LR-test**	$\chi^2(8)$	14.328	15.507	0.074
Autocorrelation	**F-test**	F(1,57)	1.571	4.010	0.215
Misspecification	**RESET(1)**	F(1,64)	0.168	3.990	0.683
	RESET(2)	F(2,63)	3.505*	3.140	0.036
* significant at 5% critical value					

Parameter stability over time was tested by splitting the total sample into two subsamples. A split into pre-1995 and 1995 and later seemed most appropriate as the series was more volatile after 1995 compared with before it (Figure 5-1). Trying to compare those two time periods, the earlier subsample was found to be too small and could not be estimated. Hence, the series was split into half so that the two subsamples were for 1992 to 1996 and 1997 to 2001. The model was then estimated for those two subsamples individually and the parameters were compared with test whether the difference was significant. The results for the two different subsamples are stated in Table 5-7, Model A and B.

Table 5-7

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from All Countries)
Dependent Variable: ***ausrfdii*** **Sample: Cross-Sections: N = 9** **Least Squares**

[146] It would have been preferable to test for endogeneity, but since no appropriate instrumental variables were found to test this, one has to make the assumption that the variables are not contemporaneously endogenous, in particular since little evidence of a correlation between *ausrfdii* and *ausempi* (0.066) or *ausrfdii* and *ausrwages1i* (0.191) existed.

		Model A: 1992 – 1996 Sample (t = 5)		Model B: 1997 – 2001 Sample (t = 5)		Model C: Total Sample, 1992 – 2001 (t = 10)	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-16,395.560**	-2.748	-24,363.150*	-1.671	-12,690.630**	-2.735
ausempi	0	-18.311**	-2.191	-34.385**	-3.269	-33.163**	-4.742
	1	18.199	1.373	64.283**	4.225	50.612**	4.819
	2	-13.743	-1.012	-42.110**	-2.445	-29.316**	-2.658
	3	14.219**	1.758	13.379	1.059	12.859**	1.726
ausrwages1i	0	0.102	0.129	2.417**	1.999	1.544**	2.001
ausopen	0	56.028	0.400	401.184	1.324	196.326**	1.794
exrus	0	20,427.030**	1.796	8,909.521**	1.923	6,551.476*	2.075
Δausinf	0	298.189**	2.365	345.829**	2.394	319.119**	3.735
T(1997-2001)	---	---	---	---	---	-495.934	-0.601
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.322		0.480		0.376	
Adjusted R-squared		0.153		0.362		0.301	
S.E. of regression		1,003.288		1,923.351		1,572.974	
Sum squared resid		32,210,752.000		129,000,000.000		186,000,000.000	
Durbin-Watson stat		1.699		2.448		2.229	
F-statistic		1.903		4.044		5.027	
Prob (F-statistic)		0.094		0.002		0.000	

Although the estimation results differed slightly (the fit and significance of variables was better for the 1997 to 2001 time period, but the signs of the variables were the same), the parameters were not significantly different from each other (Table 5-8). This result was also true for the intercept: a dummy for the time period 1997 to 2001 was not significant (Table 5-7, Model C). The model was correctly specified in terms of parameter stability over time.

Table 5-8

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific FDI Model (FDI from All Countries)				
	Test	**F-Statistic**	**Critical value**	**Probability**
Parameter Stability (1995 – 2001)	Cannot be estimated: near singular matrix			
Parameter Stability (1997 – 2001)	F(9,67)	1.141	2.020	0.347
* significant at 5% critical value				

Parameter stability over cross-sections was tested by splitting the sample into two subsamples, one for primary industries and manufacturing combined (since it was not possible to estimate the subsamples for primary industries or manufacturing individually) and one for tertiary industries. The parameter values derived from those two subsamples differed in terms of signs and significance of the explanatory variables. The F-test of joint significance of all explanatory variables was not rejected for the better fitting tertiary industry subsample (R^2 of 46.1%), but it was rejected for the primary and manufacturing industry subsample, which had the poorer fit (R^2 of 27.4% and negative adjusted R^2) (Table 5-9, Model A and B). However, the two subsamples did not differ significantly from each other (Table 5-10). Manufacturing and tertiary industry dummies were not significant either (Table 5-9, Model C). So far, the model was considered as correctly specified in terms of parameter stability.

Table 5-9

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from All Countries)							
Dependent Variable: ***ausrfdii*** **Sample: Time: 1992 – 2001, t = 10** **Least Squares**							
		Model A: PRIM, MAN Sample (N = 2)		**Model B: TERT Sample (N=7)**		**Model C: Total Sample (N =9)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	**---**	-19,701.250	-1.070	-11,526.690**	-2.518	-10,935.910**	-2.445
ausempi	**0**	0.738	0.031	-39.297**	-5.243	-32.791**	-4.556
	1	6.015	0.236	65.929**	5.702	51.364**	4.874
	2	-1.131	-0.036	-39.247**	-3.284	-30.828**	-2.750
	3	5.313	0.210	13.542*	1.586	13.229**	1.601
ausrwages1i	**0**	19.672	1.353	0.838	0.689	1.169	0.921
ausopen	**0**	-162.187	-0.616	137.677**	1.877	147.105**	2.134
exrus	**0**	1,252.972	0.148	8,588.568**	2.753	7,354.455**	2.522
Δausinf	**0**	94.665	0.473	365.227**	3.907	319.972**	3.714
man	**---**	---	---	---	---	-319.870	-0.304
tert	**---**	---	---	---	---	-365.913	-0.386
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.274		0.461		0.375	
Adjusted R-squared		-0.254		0.384		0.290	
S.E. of regression		1,767.622		1,498.863		1,585.783	
Sum squared resid		34,369,355.000		126,000,000.000		186,000,000.000	
Durbin-Watson stat		2.988		2.251		2.237	
F-statistic		0.519		5.992		4.431	
Prob (F-statistic)		0.819		0.000		0.000	

When estimating the model as a random coefficients model, the hypothesis of parameter constancy was rejected at a 5% critical value, i.e. parameter estimates differed depending on the industry analysed (Table 5-11). This indicates that there is parameter variability within the primary/manufacturing and tertiary industry subsamples, so industries should not necessarily be grouped according to the sector they belong to, since determinant vary within one sector. Given the small sample size for individual industry samples, individual estimation was not possible and was left for future research.

Table 5-10

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific FDI Model (FDI from All Countries)				
	Test	F-Statistic	5% Critical value	Probability
TERT Sample	F(9, 67)	1.222	2.020	0.297
Random Coefficients Model	$\chi^2(54)$	321.32*	72.136	0.000
* significant at 5% critical value				

Returning to the original industry-specific FDI equation for Australian FDI from all countries (Table 5-5, Model B), the estimation results can be summarised as follows: Australian market size measured by the employment in a certain industry (*ausempi*) had the expected positive effect on industry-specific FDI from all countries in the long-run, though it also reduced current FDI. The industry-specific real wage rate (*ausrwages1i*) had an unexpected positive sign, indicating that not cheaper labour, but industries with higher wages attracted more FDI. This could be explained with the theory that higher wages reflect higher skills, making investing in those industries more attractive. Openness (*ausopen*) had the expected positive sign, i.e. greater openness of the Australian economy (more trade relative to GDP) encouraged FDI. The Australian exchange rate (US dollar relative to the Australian dollar) had a positive sign – in contrast to the hypothesis that an appreciating Australian dollar discourages FDI (or an appreciating US dollar encourages FDI), but consistent with the results from the quarterly and country-specific FDI model. The change in the Australian inflation rate (*Δausinf*) had an unexpected positive sign. Since the Australian inflation rate also increased FDI in the quarterly and country-specific FDI model, the result that a rising inflation rate had a positive effect did was not that surprising. The explanation, however, remained unclear. A comparison of the observed and predicted effects of the variables that were used to explain industry-specific FDI from all countries in Australia can be found in Table 5-11.

Table 5-11

Industry-Specific FDI Equation, Observed and Predicted Effects (Total Sample, FDI from All Countries)					
	Short-run effect (current value)		Long-run effect (after 3 lags)		Expected Sign
ausempi	-32.873	-	0.982	+	+
ausrwages1i	1.553	+	1.553	+	-
ausopen	143.997	+	143.997	+	+
exrus	7,354.869	+	7,354.869	+	-
Δausinf	319.841	+	319.841	+	-

5.2.2 INDUSTRY-SPECIFIC FDI FROM THE US IN AUSTRALIA

Industry-specific FDI from the US in Australia (*rfdiius*) between 1982 and 2001 was modelled second (Figure 5-2), though only the time period between 1988 and 2001 was used for the econometric analysis due to limitations in the availability of some explanatory variables.

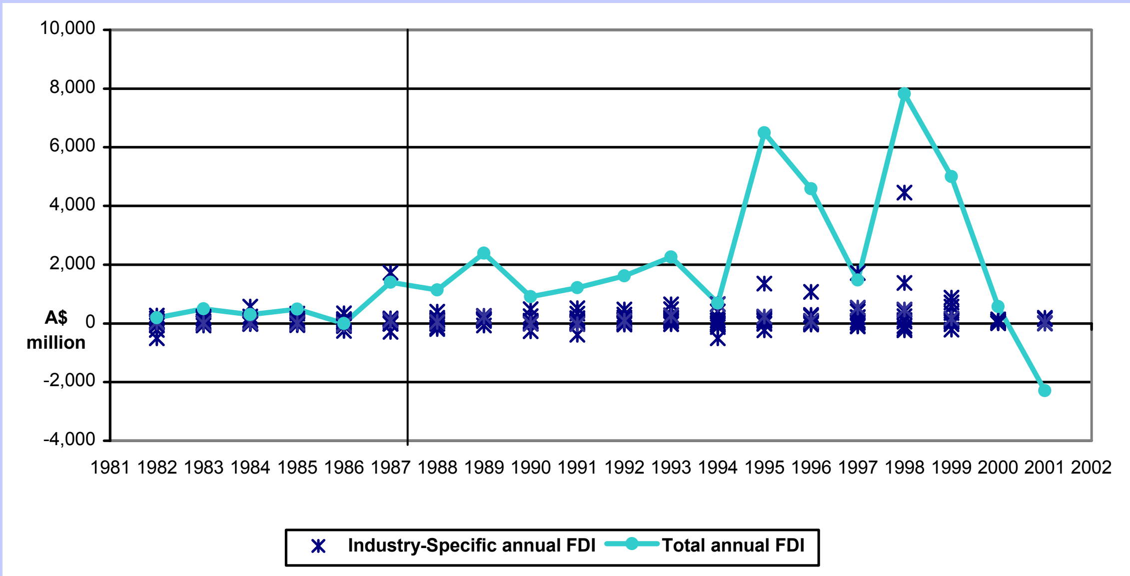


Figure 5-2: Real annual FDI Flows from the US into Australia (by Industry and Total), 1981 to 2002

A combination of market size (*ausrgdpi*, included with two lags), factor costs (*ausrwages1i*), trade (*rimpous* and *auscdut*) and other factors (*outrfdius*, included with one lag) performed best in explaining industry-specific FDI from the US in Australia. No policy or risk factors were included, since they were not significant determinants of industry-specific FDI from the US. The model was stated as:

$$rfdiius_{it} = \alpha + \beta_{11}\, ausrgdpi_{it} + \beta_{12}\, ausrgdpi_{it-1} + \beta_{13}\, ausrgdpi_{it-2} + \beta_{21}\, ausrwages1i_{it} + \beta_{31}\, rimpous_t + \beta_{41}\, auscdut_t + \beta_{51}\, outrfdius_t + \beta_{52}\, outrfdius_{t-1} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

While the model was originally estimated using least squares and no effects (Table 5-12), a specification of the model as a fixed effects model proved to be more suitable since the F-test that all $u_i = 0$ was rejected. In contrast, estimating the model as a random effects model was not appropriate (Table 5-13). Hence, the estimation was continued using the fixed effects model (Table 5-15, Model A).

Table 5-12

Industry-Specific FDI Equation (FDI from the US)				
Dependent Variable: ***rfdiius*** **Sample: Time: 1988 – 2001, t = 14. Cross-Sections: N = 9. Missing values = 11. Included observations: 115** **Least Squares**				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**
C	**---**	-2,641.070*	-1.555	0.123
ausrgdpi	**0**	0.098	1.131	0.261
	1	-0.233	-1.392	0.167
	2	0.146*	1.627	0.107
ausrwages1i	**0**	0.459**	1.861	0.066
rimpous	**0**	0.124*	1.518	0.132
auscdut	**0**	125.378	1.214	0.228
outrfdius	**0**	-0.001	-0.413	0.680
	1	-0.006**	-2.081	0.040
** significant at 10% critical value, * significant at 15% critical value				
R-squared				0.220
Adjusted R-squared				0.161
S.E. of regression				467.694
Sum squared resid				23,186,228.000
Durbin-Watson stat				1.390
F-statistic				3.729
Prob (F-statistic)				0.001

Table 5-13

Testing of Fixed and Random Effects Model, Industry-Specific FDI Model (FDI from the US)		
Fixed Effects Model		
F test that all $u_i = 0$	F(8,60) = 2.310*	Prob = 0.032
Random Effects Model		
Breusch and Pagan LM test for random effects (test that Var(u) = 0)	$\chi^2(1) = 0.020$	Prob > χ^2 = 0.875
* significant at 5% critical value		

A test for differencing was carried out to analyse whether any of the variables that were included with lags (i.e. *ausrgdpi* and *outrfdius*) should be used in first differences. It was found that *outrfdius* should be used in levels form, while *ausrgdpi* should be differenced twice, as the hypothesis that the variables should be used in first differences was not rejected at a 10% critical value for *ausrgdpi* and *Δausrgdpi* (Table 5-14). The fixed effects model including *ΔΔausrgdpi* was used for further analysis.

Table 5-14

Test for Differencing, Industry-Specific FDI Model (FDI from the US)			
Variable	**χ^2 (Prob)**	**χ^2 (Prob)**	**χ^2 (Prob)**
ausrgdpi	0.889 (0.346)	0.213 (0.644)	---
ausrwages1i	---	---	---
rimpous	---	---	---
auscdut	---	---	---
outrfdius	4.167* (0.041)	3.771* (0.052)	3.729* (0.056)
Result	*ausrgdpi* → *Δausrgdpi*	*ausrgdpi* → *ΔΔausrgdpi*	
* significant at 10% critical value			

The industry-specific FDI model for FDI from the US was then estimated as a fixed effects model (with White heteroscedasticity-consistent standard errors for reasons stated in Table 5-16) including three variables in levels form without lags (*ausrwages1i, rimpous* and *auscdut*), one variable in second differences without lags (*ΔΔausrgdpi*), one variable in levels form with one lag (*outrfdius*) and eight industry dummies (for food, chemicals, machinery, metals, electronics, transport equipment, trade and financial services – excluding the ninth industry, mining) reflecting the fixed effects. The parameters for fourteen explanatory variables are shown in Table 5-15, Model B. The second industry-specific FDI model explained almost half the variation of industry-specific FDI from the US (R^2 of 44.1% and an adjusted R^2 of 36.3%). Eleven of the fourteen variables (including the industry dummies) were significant at a 10% critical value. Moreover, *rimpous* was significant at a 15% critical value, while *auscdut* (which was nevertheless included, as it was significant at a 15% critical level in the model before differencing and improved the fit of the model) and the current value of *outrfdius* were not significant at a 15% critical level. The result from the F-test showed that the hypothesis that all variables in the regression combined are equal to zero was rejected.

Table 5-15

Industry-Specific FDI Equation (FDI from the US)									
Dependent Variable: *rfdiius* Sample: Time: 1988 – 2001, t = 14, N = 9. Missing values = 11. Included observations: 115 Least Squares (Fixed Effects Estimation), White Heteroskedasticity-Consistent Standard Errors and Covariance									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**	**Variable**	**Lags**	**Coefficients**	**t-stat**	**Prob**
C	---	-6,167.870**	-.1967	0.052	**C**	---	-6,168.034**	- 2.021	0.046
ausrgdpi	0	0.114	1.449	0.151	***ΔΔausrgdpi***	0	0.117**	1.687	0.095
	1	-0.245**	-1.740	0.085		---	---	---	---
	2	0.150**	2.001	0.048		---	---	---	---
ausrwages1i	0	3.263**	1.839	0.069	***ausrwages1i***	0	3.721**	2.112	0.037
rimpous	0	0.103**	1.671	0.098	***rimpous***	0	0.097*	1.526	0.130
auscdut	0	141.072*	1.499	0.137	***auscdut***	0	120.848	1.247	0.215
outrfdius	0	-0.001	-0.749	0.456	***outrfdius***	0	-0.001	-0.804	0.423
	1	-0.007**	-2.494	0.014		1	-0.006**	-2.268	0.026
min	---	---	---	---	***min***	---	---	---	---
food	---	1,782.960**	1.762	0.081	***food***	---	1,809.974**	1.963	0.053
chem	---	1,970.689**	1.911	0.059	***chem***	---	1,968.490**	2.132	0.036
mach	---	1,762.026**	1.756	0.082	***mach***	---	1,807.136**	1.970	0.052
met	---	1,754.388**	1.707	0.091	***met***	---	1,751.058**	1.906	0.060
elec	---	1,695.143**	1.687	0.095	***elec***	---	1,738.151**	1.891	0.062
tran	---	1,831.317**	1.825	0.071	***tran***	---	1,876.608**	2.045	0.043
trd	---	1,886.032	1.408	0.162	***trd***	---	2,718.340**	2.034	0.045
fins	---	1,946.502**	1.966	0.052	***fins***	---	2,349.751**	2.341	0.021
** significant at 10% critical value, * significant at 15% critical value									
R-squared		0.449			**R-squared**		0.441		
Adjusted R-squared		0.359			**Adjusted R-squared**		0.363		
S.E. of regression		408.870			**S.E. of regression**		407.521		
Sum squared resid		16,383,120.000			**Sum squared resid**		16,607,335.000		
Durbin-Watson stat		1.939			**Durbin-Watson stat**		1.892		
F-statistic		4.983			**F-statistic**		5.636		
Prob (F-statistic)		0.000			**Prob (F-statistic)**		0.000		

The results from the diagnostic tests of the model showed that only the hypothesis of non-autocorrelation was not rejected, while the hypotheses of homoscedasticity and correct functional form were rejected at a 5% critical value (Table 5-16). The problem of heteroscedasticity was solved by accepting heteroscedasticity as a property of the model and estimating it using White heteroscedasticity-consistent standard errors and covariances. The possible misspecification of the model could not be solved, as experimenting with alternative variables and log transformation only worsened the fit of the model. The explanatory variables (*ΔΔausrgdpi, rimpous, auscdut* and *outrfdius*) were assumed to be (at least contemporaneously) exogenous, though this statement was not as clear for *ausrwages1i,* but testing proved difficult.[147]

Table 5-16

Diagnostic Tests (5% critical values), Industry-Specific FDI Model (FDI from the US)					
		Test	Test-Statistic	5% Critical value	Probability
Heteroscedasticity	**White LR-test**	$\chi^2(8)$	82.690*	15.507	0.000
Autocorrelation	**F-test**	F(1,88)	0.317	3.950	0.575
Misspecification	**RESET(1)**	F(1,99)	35.631*	3.940	0.000
	RESET(2)	F(2,98)	163.074*	3.090	0.000
* significant at 5% critical value					

In order to test for parameter stability, the sample was split into two subsamples, one for 1988 to 1994 and one for 1995 to 2001, and the estimation results were compared. As for industry-specific FDI from all countries, this split seemed most appropriate, since the series was more volatile from 1995 onwards compared with before (Figure 5-2). The estimation results for the two different subsamples are stated in Table 5-17, Model A and B.

Table 5-17

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from the US)							
Dependent Variable: *rfdiius* Sample: Cross-Sections: N = 9 Least Squares (Fixed Effects Estimation), White Heteroscedasticity-Consistent Standard Errors and Covariance							
		Model A: 1988 – 1994 Sample (t = 7)		Model B: 1995 – 2001 Sample (t = 7)		Model C: Total Sample, 1988 – 2001 (t = 14)	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	1,515.217	0.498	-11,286.500	-1.463	-6,357.458**	-1.796
ΔΔausrgdpi	0	0.024	0.675	0.222**	1.811	0.128**	1.811
ausrwages1i	0	-1.080	-0.402	5.129	1.262	3.899**	1.881
rimpous	0	-0.010	-0.201	0.145	1.177	0.089	1.028
auscdut	0	-21.905	-0.441	810.818	1.078	134.289	1.231
outrfdius	0	0.004	0.906	-0.001	-0.413	-0.001	-0.626
	1	-0.003	-1.140	-0.007**	-2.136	-0.006**	-1.974
min	---	---	---	---	---	---	---
food	---	-389.765	-0.324	2,574.692	1.087	1,919.889**	1.727
chem	---	-247.993	-0.206	2,777.065	1.171	2,053.586**	1.852
mach	---	-458.373	-0.380	2,693.908	1.135	1,910.203**	1.726
met	---	-484.365	-0.402	2,544.672	1.076	1,841.186**	1.664
elec	---	-536.454	-0.445	2,641.128	1.116	1,845.550**	1.664
tran	---	-434.610	-0.361	2,816.317	1.186	1,979.744**	1.788
trd	---	-667.783	-0.380	4,201.986	1.196	2,905.142**	1.796
fins	---	-272.538	-0.235	3,521.944*	1.514	2,498.518**	2.125
T(1995-2001)	---	---	---	---	---	42.862	0.180
** significant at 10% critical value, * significant at 15% critical value							
R-squared			0.242		0.620		0.461
Adjusted R-squared			0.011		0.484		0.371
S.E. of regression			213.093		502.150		418.982
Sum squared resid			2,088,794.000		9,834,043.000		15,799,112.000
Durbin-Watson stat			2.310		2.616		1.972
F-statistic			1.048		4.552		5.122
Prob (F-statistic)			0.426		0.000		0.000

The results of the two subsamples seemed to differ: while the first subsample (1988 to 1994) had a lower fit (R^2 of 24.2%), only included insignificant variables and did not reject the F-test, the second subsample (1995 to 2001) had a good fit (R^2 of 62.0%), although only three of

[147] It would have been preferable to test for endogeneity, but since it was not possible to find appropriate instrumental variables to test this, one has to make the assumption that the variables are not contemporaneously endogenous, particularly since little evidence of a correlation between *rfdiius* and *ausrwages1i* (0.153) existed.

the fourteen explanatory variables were significant. Hence, the lower overall fit (R^2 of 44.1%) could be due combining the two different subsamples and some additional variables that were insignificant in the overall sample, but could be significant in the individual subsamples. Despite the apparent difference between the models for the two subsamples, they were not significantly different from each other (Table 5-18). A dummy for the time period 1995 to 2001 was not significant either (Table 5-17, Model C).

Table 5-18

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific FDI Model (FDI from the US)				
	Test	**F-Statistic**	**Critical value**	**Probability**
Parameter Stability (1995 – 2001)	F(15,76)	0.858	2.150	0.612
* significant at 5% critical value				

A second method to test for parameter stability was to split the sample into three industry-specific subsamples (for primary industries, manufacturing and tertiary industries) and to compare the estimation results. Since mining was the only industry included in the primary sector, primary and secondary industries were combined to be compared with tertiary industries, but the results for manufacturing by itself are also shown. A test of equality of regression coefficients generated from industry-specific subsamples could not be performed, since the subsamples included different industry dummies, so the results could be compared. The subsamples differed from each other when comparing the fit of the model, the signs and significance of the explanatory variables (Table 5-19, Model A, B and C).

Table 5-19

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from the US)							
Dependent Variable: *rfdiius* Sample: Time: 1988 – 2001, t = 14 Least Squares, White Heteroscedasticity-Consistent Standard Errors and Covariance							
		Model A: PRIM and MAN (N=7)		**Model B: MAN Sample (N=6)**		**Model C: TERT Sample (N = 2)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-3,593.429**	-1.797	-2,260.734	-1.159	-8,662.043**	-2.024
ΔΔausrgdpi	0	0.049	1.048	-0.015	-0.523	0.137*	1.712
ausrwages1i	0	2.641**	1.772	3.832	1.201	6.231**	1.777
rimpous	0	0.015	0.550	-0.023	-0.987	0.375**	2.048
auscdut	0	82.476*	1.649	14.621	0.539	187.066	0.769
outrfdius	0	0.001	0.613	-0.001	-0.434	-0.010*	-1.722
	1	-0.002**	-2.025	0.000	-0.487	-0.016**	-2.136
min	---	---	---	---	---	---	---
food	---	1,267.650**	1.703	---	---	---	---
chem	---	1,410.339**	1.892	141.542*	1.645	---	---
mach	---	1,254.211**	1.691	-9.824	-0.151	---	---
met	---	1,201.091*	1.621	-61.636	-0.967	---	---
elec	---	1,181.053*	1.592	-91.071	-1.482	---	---
tran	---	1,323.503**	1.783	59.468	0.835	---	---
trd	---	---	---	---	---	---	---
fins	---	---	---	---	---	-1,118.543	-1.212
** significant at 10% critical value, * significant at 15% critical value							

(Table 5-19 continued)

	Model A: PRIM and MAN (N=7)	**Model B: MAN Sample (N=6)**	**Model C: TERT Sample (N = 2)**
R-squared	0.297	0.301	0.689
Adjusted R-squared	0.185	0.179	0.574
S.E. of regression	213.398	138.718	604.597
Sum squared resid	3,415,394.000	1,212,291.000	6,945,202.000
Durbin-Watson stat	2.253	2.211	1.920

F-statistic	2.644	2.470	6.006
Prob (F-statistic)	0.005	0.012	0.001

When excluding the industry dummies and comparing the coefficients generated from industry-specific subsamples, both secondary and tertiary industries were found to significantly differ from the remainder of the sample. Estimating the model as a random coefficients model (excluding the industry dummies) and testing for parameter constancy shows that parameters were heterogeneous and differed depending on the industry analysed (Table 5-20). Hence, combining all industries might have blurred the different effects and there could be explanatory variables that are important in some industries, but not in the overall model.

Table 5-20

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific FDI Model (FDI from the US)				
	Test	**F-Statistic**	**Critical value**	**Probability**
MAN	F(7,101)	6.137*	3.290	0.000
TERT	F(7,101)	15.860*	3.290	0.000
Random Coefficients Model	$\chi^2(35)$	120.390*	49.766	0.000
* significant at 5% critical value				

Returning to the original industry-specific FDI equation for US FDI in Australia (Table 5-15, Model B), the estimation results can be summarised as follows: In terms of market size, the change in the change of industry-specific GDP in Australia, i.e. the change in the growth rate, increased industry-specific FDI from the US in Australia. The higher the growth of the GDP growth rate in a certain industry was, the more FDI this industry attracted. As in the industry-specific FDI model for FDI from all countries, the positive sign for industry-specific real wages (*ausrwages1i*) in the industry-specific FDI model for US FDI was contradictory to the theory that cheaper labour attracts more investment, but supported the theory that higher wages reflected higher skills, which attracted more investment. Australian imports from the US (*rimpous*) – though only significant at a 15% critical level – had the predicted positive sign, supporting the theory that countries start off trading and switch to FDI at a later time, so that higher imports lead to higher FDI. Australian customs duties (*auscdut*) had the expected positive sign, but were not significant when included in the model after differencing. In the model with variables in levels form (Table 5-15, Model A), they had a significantly positive effect. US total outward FDI (*outrfdius*) had an unexpected negative effect on FDI, indicating that FDI to Australia was lower the higher US total FDI outflows were, indicating that industry-specific FDI by US firms in Australia was less in times when they invested mores in other countries and vice versa. A comparison of the observed and predicted effects of the variables that were used to explain industry-specific FDI from the US in Australia can be found in Table 5-21.

Table 5-21

Industry-Specific FDI Equation, Observed and Predicted Effects (Total Sample, FDI from the US)					
	Short-run effect (current value)		**Long-run effect (after 2 lags)**		**Expected Sign**
ΔΔausrgdpi	0.117	+	0.117	+	+
rwages1i	3.721	+	3.721	+	-
rimpous	0.097	+	0.097	+	+

auscdut	120.848	n.s.	120.848	n.s.	+
outrfdius	-0.001	-	-0.007	-	+

5.2.3 INDUSTRY-SPECIFIC FDI FROM THE UK IN AUSTRALIA

Industry-specific FDI from the UK in Australia (*rfdiiuk*) between 1972 and 2001 (Figure 5-3) was modelled third, though only the time period between 1981 and 2001 was used for the econometric analysis due to limitations in the availability of some of the explanatory variables. Determinants of FDI from the UK were a combination of factor costs (*ausuer*), risk factors (*inrdifuk, relinfuk, ausindusi*) and other factors (*outrfdiuk*), while neither any of the market size variables, trade variables or policy factors were significant (Table 5-24). The model was stated as:

$$rfdiiuk_{it} = \alpha + \beta_{11}\, ausuer_t + \beta_{21}\, inrdifuk_t + \beta_{22}\, inrdifuk_{t-1} + \beta_{31}\, relinfuk_t + \beta_{32}\, relinfuk_{t-1} + \beta_{41}\, ausindusi_{it} + \beta_{51}\, outrfdiuk_t + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

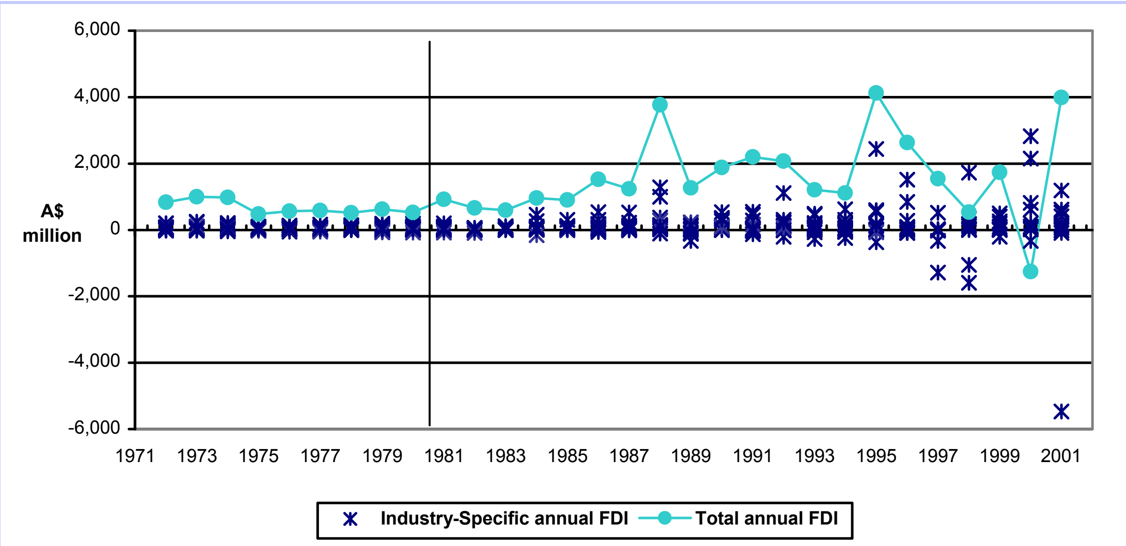


Figure 5-3: Real annual FDI Flows from the UK into Australia (by Industry and Total), 1971 to 2002[148]

Before discussing the model further, it was explored whether it was correctly estimated using least squares or whether it should be specified as a fixed or random effects model. Testing for these possibilities, neither the fixed nor the random effects model specification was appropriate (Table 5-22), so that the model was estimated using least squares (Table 5-24).

Table 5-22

Testing of Fixed and Random Effects Model, Industry-Specific FDI Model (FDI from the UK)		
Fixed Effects Model		
F test that all $u_i = 0$	F(11, 178) = 0.850	Prob > F = 0.603

[148] The outlier disinvestment was an A$ 5,470.679 million disinvestment in the hospitaly (restaurants, hotels) industry.

Random Effects Model
The number of cross-sections is smaller than the number of coefficients, so the Random Effects Model cannot be estimated.
* significant at 5% critical value

The two variables included with a lag (*inrdifuk* and *relinfuk*) were used in levels form, since the hypothesis that the variables should be differenced once was rejected (Table 5-23).

Table 5-23

Test for Differencing, Industry-Specific FDI Model (FDI from the UK)		
Variable	χ^2	**Prob**
ausuer	---	---
Inrdifuk	3.585*	0.058
relinfuk	5.706*	0.017
ausindusi	---	---
outrfdiuk	---	---
Result	---	
* significant at 10% critical value		

The industry-specific FDI model for UK FDI was then estimated as a model without effects including three variables in levels form without lags (*ausuer, ausindusi* and *outrfdiuk*), one variable in levels form with one lag (*inrdifuk*) and one variable in levels form with two lags (*relinfuk*). The parameters estimates for the eight explanatory variables are stated in Table 5-24.

Table 5-24

Industry-Specific FDI Equation (FDI from the UK)				
Dependent Variable: ***rfdiiuk*** **Sample: Time: 1981 – 2001, t =21, N = 13. Missing values = 54. Included observations: 219** **Least Squares**				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**
C	---	-302.561	-1.193	0.234
ausuer	0	38.940	1.250	0.213
inrdifuk	0	14.922	0.720	0.472
	1	-41.823**	-1.805	0.073
relinfuk	0	-42.387**	-2.250	0.026
	1	-27.729**	-1.716	0.088
	2	-37.843**	-1.668	0.097
ausindusi	0	0.055**	2.641	0.009
outrfdiuk	0	0.004**	3.484	0.001
** significant at 10% critical value, * significant at 15% critical value				
R-squared				0.107
Adjusted R-squared				0.073
S.E. of regression				542.596
Sum squared resid				61,826,078.000
Durbin-Watson stat				1.602
F-statistic				3.160
Prob (F-statistic)				0.002

The third industry-specific FDI model performed badly when it came to explaining FDI. The model only explained a tenth of the variation of FDI from the UK (R^2 of 10.7% and adjusted R^2 of 7.3%), although most variables were significant at a 10% critical value and the F-test of joint insignificance of the variables was rejected.[149] Since experimenting with other variables did not increase the explanatory power of the model, the original model was used for further analysis.

[149] The variable *ausuer* improved the overall fit of the model and was included although it was not significant at a 10% or 15% critical level.

Despite the poor fit of the model, standard diagnostic tests showed that the model was not misspecified, as neither the hypothesis of homoscedasticity, non-autocorrelation or correct functional form (RESET(1) and RESET(2)) were rejected at a 5% critical value (Table 5-25). Furthermore, the explanatory variables (*ausuer, inrdifuk, relinfuk, ausindusi* and *outrfdiuk*) were assumed to be (at least contemporaneously) exogenous.

Table 5-25

Diagnostic Tests (5% critical values), Industry-Specific FDI Model (FDI from the UK)					
		Test	**Test-Statistic**	**5% Critical value**	**Probability**
Heteroscedasticity	**White LR-test**	$\chi^2(8)$	4.087	15.507	0.849
Autocorrelation	**F-test**	F(1,179)	0.096	3.900	0.756
Misspecification	**RESET(1)**	F(1,209)	0.665	3.890	0.416
	RESET(2)	F(2,208)	0.456	3.040	0.635
* significant at 5% critical value					

Parameter instability or variability (over time or across industries) was another possibility to explain the poor fit of the model. Starting with the test of parameter stability over time, it seemed most appropriate to split the series into pre-1988 and 1988 and later or pre-1995 and 1995 and later since the series is more volatile after both 1988 and 1995 (Figure 5-3). However, due to the number of observations included, it was not possible to do so. Hence, the series was split into half so that the two subsamples were for 1981 to 1991 and 1992 to 2001. While the model performed better for the first subsample (1981 to 1991) with an R^2 of 40.2% compared with an R^2 of 12.4% for the second subsample, the significance of the variables in both subsamples was limited. The hypothesis of joint insignificance was not rejected for the second subsample, but it was rejected for the first subsample (Table 5-26, Model A and B). Although the subsamples seemed different, the hypothesis of parameter stability was not rejected (Table 5-27).

A dummy variable for the period 1992 to 2001 could be included or not, since it was significant at a 15% critical value, but not at a 10% critical value. Its inclusion slightly increased the R^2, but decreased the adjusted R^2. If the dummy variable was included, it meant that annual industry-specific FDI flows after 1992 were overall (ignoring the effects of the other explanatory variables in the model) A$ 23.171 million lower than those before 1992 (Table 5-26, Model C).

Table 5-26

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from the UK)							
Dependent Variable: *rfdiiuk* Sample: Cross-Sections: N = 13 Least Squares							
		Model A: 1981 – 1991 Sample (t = 11)		**Model B: 1992 – 2001 Sample (t = 10)**		**Model C: Total Sample, 1981 – 2001 (t = 21)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	**---**	224.280	0.949	-675.523	-0.581	-328.414	-0.959
ausuer	**0**	-7.595	-0.450	19.050	0.247	42.090	1.199
inrdifuk	**0**	-2.845	-0.395	-27.543	-0.382	14.107	0.975
	1	-19.963**	-1.932	-110.028	-0.959	-41.975	-1.412
relinfuk	**0**	-62.301	-1.250	-60.364**	-1.885	-41.545**	-2.319
	1	-62.562	-1.372	-33.672	-1.209	-27.302	-1.084
	2	-26.997	-0.831	-59.057**	-1.915	-37.681*	-1.563
ausindusi	**0**	0.041**	3.867	0.122**	3.341	0.055**	3.839
outrfdiuk	**0**	-0.002	-0.761	0.006*	1.507	0.004**	2.153
T(1992-2001)	**---**	---	---	---	---	-23.171*	-0.131

** significant at 10% critical value, * significant at 15% critical value			
R-squared	0.402	0.124	0.108
Adjusted R-squared	0.359	0.046	0.069
S.E. of regression	128.416	801.654	543.831
Sum squared resid	1,830,457.000	57,838,386.000	61,812,218.000
Durbin-Watson stat	1.534	1.703	1.601
F-statistic	9.336	1.586	2.801
Prob (F-statistic)	0.000	0.140	0.004

Table 5-27

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific FDI Model (FDI from the UK)				
	Test	**F-Statistic**	**Critical value**	**Probability**
Parameter Stability (1995 – 2001)	Cannot be estimated: near singular matrix			
Parameter Stability (1992 – 2001)	**F(9,201)**	1.152	1.920	0.328
* significant at 5% critical value				

Testing for parameter variability across industries, the sample was split into three industry-specific subsamples (primary industries, manufacturing and tertiary industries). The estimation results differed depending on the industry analysed. While the model explained 59.0% of the variation of industry-specific FDI from the UK for primary industries, it explained 22.5% of the variation for manufacturing and only 10.5% of the variation for tertiary industries. The significance of the variables was limited. The F-test of joint significance was rejected at a 5% critical level for both primary and secondary industries, but it was not rejected for tertiary industries (Table 5-28, Model A, B and C). However, the difference between the industry groups was not significant (Table 5-29). Dummies for manufacturing and tertiary industries were not found to be significant (Table 5-28, Model D).

Finally, one could consider the case that parameter variability existed within industry groups. If this hypothesis were true, these industry groups would be heterogeneous groups and industries should not be grouped together. Parameter stability was tested by estimating the model as a random coefficients model and comparing the estimation results for FDI from each industry individually (and not only for industry groups). The hypothesis of parameter stability was rejected and there was evidence that parameters were heterogeneous and dependent on the industry analysed (Table 5-29). Hence, if determinants differ from industry to industry, a mistake is made by grouping them together. The model's poor fit could thus be explained by the fact that variables that were significant for only one or a few industries were not significant in the overall model, since their effect was blurred.

Table 5-28

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from the UK)									
Dependent Variable: ***rfdiiuk*** **Sample: Time: 1981 – 2001, t = 21** **Least Squares**									
		Model A: PRIM Sample (N=2)		**Model B: MAN Sample (N=5)**		**Model C: TERT Sample (N = 6)**		**Model D: Total Sample (N=13)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	**---**	-464.841	-0.930	-197.759	-0.849	-373.423	-0.923	-294.868**	-1.871
ausuer	**0**	27.102	0.480	28.513	0.966	49.503*	1.576	38.603**	2.252
inrdifuk	**0**	-56.135	-1.170	6.875	0.390	37.974	1.258	14.842	0.790
	1	23.704	0.585	-13.924	-0.863	-78.095	-1.347	-42.042	-1.442
relinfuk	**0**	-27.498	-1.336	-47.901**	-1.667	-36.332*	-1.545	-42.704**	-2.343
	1	-41.260	-1.201	11.972	0.377	-79.150**	-2.353	-27.885	-1.156
	2	58.232	0.930	-49.984	-1.349	-22.296	-0.672	-37.848*	-1.588

ausindusi	**0**	0.061**	3.836	0.096*	1.554	0.020	0.123	0.054**	4.180
outrfdiuk	**0**	0.008*	1.665	0.004	1.318	0.003*	1.523	0.004**	2.126
man	**---**	---	---	---	---	---	---	13.814	0.276
tert	**---**	---	---	---	---	---	---	-22.898	-0.314
** significant at 10% critical value, * significant at 15% critical value									
R-squared			0.590		0.225		0.105		0.108
Adjusted R-squared			0.396		0.153		0.025		0.066
S.E. of regression			298.155		359.911		710.491		544.912
Sum squared resid			1,511,235.000		11,010,543.000		45,431,706.000		61,761,305.000
Durbin-Watson stat			1.414		2.456		1.274		1.604
F-statistic			3.052		3.093		1.314		2.528
Prob (F-statistic)			0.025		0.004		0.247		0.007

Table 5-29

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific FDI Model (FDI from the UK)				
	Test	**F-Statistic**	**Critical value**	**Probability**
PRIM	F(9,201)	1.159	1.920	0.324
MAN	F(9,201)	0.994	1.920	0.447
TERT	F(9,201)	1.442	1.920	0.172
Random Coefficients Model	$\chi^2(99)$	514.120*	123.222	0.000
* significant at 5% critical value				

Returning to the original industry-specific FDI equation for UK FDI in Australia (Table 5-24), the estimation results can be summarised as follows: The Australian unemployment rate (*ausuer*) had the expected positive effect on industry-specific real FDI from the UK in Australia: a higher unemployment rate could be an indication of a larger labour supply, making labour relatively abundant and possibly cheaper, thus attracting FDI – similar to the results from the quarterly and country-specific FDI model, but in contrast to the resuls from the industry-specific FDI models for FDI from all countries and the US. The sign of the difference between the Australian and the UK interest rate (*inrdifuk*) was negative, supporting the theoretical idea that investment was higher when the Australian interest rate was higher than the UK one. The inflation rate in the UK relative to Australia (*relinfuk*) reduced industry-specific FDI from the UK, so the higher inflation in the UK relative to Australia, the less attractive is investing in Australia (or the lower inflation in Australia relative to the UK, the more attractive is investing in Australia). While this effect could not be explained theoretically, it substantiated the findings from the quarterly and the country-specific FDI model. The number of industry-specific industrial disputes in Australia (*ausindusi*) had an unexpected positive effect on industry-specific FDI from the UK, so that FDI was higher the more working days were lost due to industrial disputes, which did not seem to make much theoretical sense. UK outward FDI (*outrfdiuk*) had the predicted positive effect on FDI, i.e. FDI in all industries was higher when all UK firms invest more and total FDI was higher. A comparison of the observed and predicted effects of the explanatory variables for industry-specific FDI from the UK in Australia can be found in Table 5-30.

Table 5-30

Industry-Specific FDI Equation, Observed and Predicted Effects (Total Sample, FDI from the UK)					
	Short-run effect (current value)		**Long-run effect (after 2 lags)**		**Expected Sign**
ausuer	38.940	+	44.981	+	+
inrdifuk	14.922	n.s.	-26.901	-	-
relinfuk	-42.387	-	-70.116	-	+
ausindusi	0.055	+	0.055	+	-

outrfdiuk	0.004	+	0.004	+	+

5.2.4 INDUSTRY-SPECIFIC FDI FROM JAPAN IN AUSTRALIA

Industry-specific FDI from Japan in Australia (*rfdiijp*) between 1989 and 2001 (Figure 5-4) was modelled fourth.

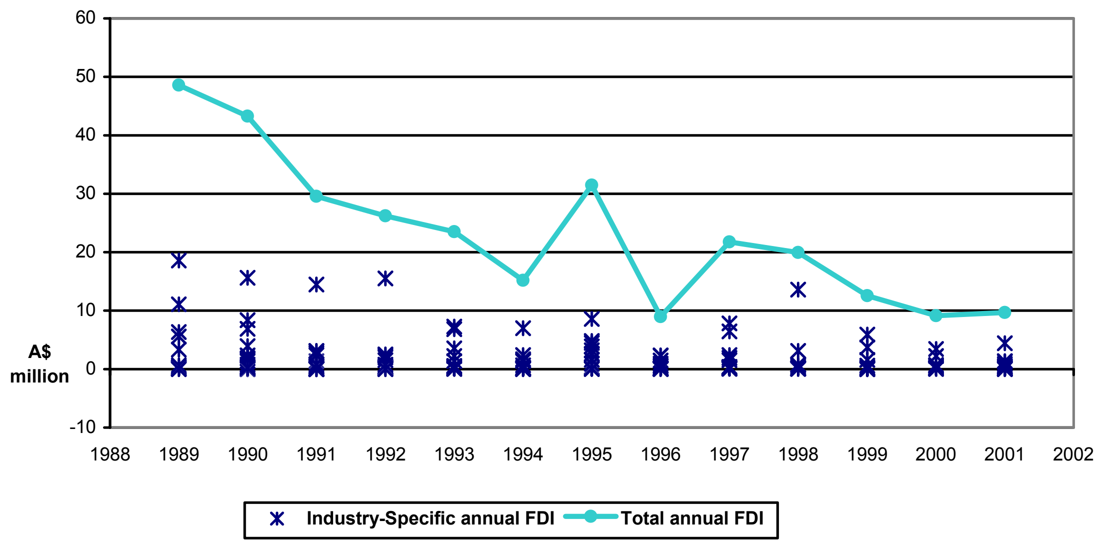


Figure 5-4: Real annual FDI Flows from Japan into Australia (by Industry and Total), 1988 to 2002

A combination of market size (*ausempi*), factor costs (*ausrwages1i, ausjobvac*), trade factors (*auscdut*) and risk factors (*exrvoljp*, included with one lag), performed best in explaining Japanese industry-specific FDI in Australia, while policy or other factors did not have any effect. The model was stated as:

$$rfdiijp_{it} = \alpha + \beta_{11}\, ausempi_{it} + \beta_{21}\, ausrwages1i_{it} + \beta_{31}\, ausjobvac_t + \beta_{41}\, auscdut_t + \beta_{51}\, exrvoljp_t + \beta_{52}\, exrvoljp_{t-1} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

The model was first estimated using least squares and no effects (Table 5-31), but a specification as a fixed or random effects model was later found to be more appropriate, as both the hypothesis that $u_i = 0$ and the hypothesis that $Var(u) = 0$ were rejected at a 5% critical level (Table 5-32).

Table 5-31

Industry-Specific FDI Equation (FDI from Japan)				
Dependent Variable: *rfdiijp* Sample: Time: 1989 – 2001, t = 13, N = 13. Missing values = 27. Included observations: 142 Least Squares				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**

C	**---**	3.470	1.028	0.306
ausempi	**0**	-0.002	-2.358	0.020
ausrwages1i	**0**	-0.003	-1.149	0.253
ausjobvac	**0**	0.010	0.670	0.504
auscdut	**0**	0.482	1.382	0.169
exrvoljp	**0**	-0.020	-0.736	0.463
	1	0.029	1.053	0.294
** significant at 10% critical value, * significant at 15% critical value				
R-squared				0.081
Adjusted R-squared				0.040
S.E. of regression				3.220
Sum squared resid				1,399.746
Durbin-Watson stat				0.502
F-statistic				1.980
Prob (F-statistic)				0.073

Table 5-32

Fixed and Random Effects Estimation, Industry-Specific FDI Model (FDI from Japan)		
Fixed Effects Model		
F test that all $u_i = 0$	F(11, 112) = 27.370*	Prob > F = 0.000
Random Effects Model		
Breusch and Pagan LM test for random effects (test that Var(u) = 0)	$\chi^2(1) = 281.710$*	Prob > χ^2 = 0.000
* significant at 5% critical value		

Since both the fixed and the random effects model could be applied to estimate the model, a test was needed to determine which is more appropriate. This was done by performing the Hausman test, which was set up as:

$$H = (\hat{\beta}_{RE} - \hat{\beta}_{FE})'(\Sigma_{FE} - \Sigma_{RE})^{-1}(\hat{\beta}_{RE} - \hat{\beta}_{FE}),$$

comparing the parameter estimates from the fixed effects model with the ones from the random effects model.[150] If (as assumed in the Null hypothesis) the random effects estimator was correct, it would be consistent and efficient, though the fixed effects estimator would still produce consistent (but not efficient) estimates. If the Null was rejected, the effects could be viewed as uncorrelated with the explanatory variables and the fixed effects estimator would be consistent and efficient, while the random effects estimator would now be inconsistent. In the model for industry-specific FDI from Japan, the Null hypothesis was rejected at a 5% critical value (Table 5-33) and the fixed effects model was used for further estimation (Table 5-35, Model A).

Table 5-33

Hausman Test (FDI from Japan)					
Variable	**Lags**	**Coefficients Fixed Effects (b)**	**Coefficients Random Effects (B)**	**(b-B) Difference**	**sqrt(diag(V_b-V_B)) S.E.**
ausempi	**0**	-0.020	-0.011	-0.009	0.002
ausrwages1i	**0**	-0.011	-0.012	0.001	0.002
ausjobvac	**0**	0.040	0.028	0.012	---
auscdut	**0**	0.626	0.521	0.105	---
exrvoljp	**0**	-0.033	-0.033	-0.000	---
Test: Ho: The random effects estimator is consistent and efficient but the fixed effects estimator will still produce consistent (but not efficient) estimates. H1: The effects are uncorrelated with the explanatory variables, the fixed effects estimator is consistent and efficient but the random effects estimator is now inconsistent . $\chi^2(6)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = 29.800, Prob> χ^2 = 0.000 → H_0 is rejected.					

[150] Johnston and DiNardo (1997), p.404.

The next step was to test for differencing to see whether the explanatory variables with lags (in this case only *exrvoljp*) should be used in first differences. Since the hypothesis that the variable should be used in first differences was not rejected at a 10% critical value, *exrvoljp* was used in first differences, i.e. as *Δexrvoljp* (Table 5-34).

Table 5-34

Test for Differencing, Industry-Specific FDI Model (FDI from Japan)		
Variable	χ^2	**Prob**
ausempi	---	---
ausrwages1i	---	---
ausjobvac	---	---
auscdut	---	---
exrvoljp	2.335	0.127
Result	***exrvoljp → Δexrvoljp***	
* significant at 10% critical value		

The industry-specific FDI model for FDI from Japan in Australia was then estimated as a fixed effects model (using White heteroscedasticity-consistent standard errors for reasons outlined in Table 5-36) including four variables in levels form without lags (*ausempi, ausrwages1i, ausjobvac* and *auscdut*), one variable in first differences without lags (*Δexrvoljp*) and twelve industry dummies (for food, textiles, chemicals, machinery, metals, electronics, transport equipment, construction, trade, financial services, real estate and business services and transport services – excluding the thirteenth industry, mining) reflecting the fixed effects. The parameter estimates are shown in Table 5-35, Model B. The model had a good fit, explaining 71.1% of the variation of industry-specific FDI from Japan (adjusted R^2 is 67.1%). Most of the seventeen explanatory variables (except for the dummies for construction, financial services and transport services) were significant at a 10% critical value and the hypothesis of joint insignificance of all explanatory variables was rejected.

Table 5-35

Industry-Specific FDI Equation (FDI from Japan)									
Dependent Variable: *rfdiijp* **Sample: Time: 1989 – 2001, t = 13, N = 13. Missing values = 27. Included observations: 142** **Least Squares (Fixed Effects Estimation), White Heteroskedasticity-Consistent Standard Errors and Covariance**									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**	**Variable**	**Lags**	**Coefficients**	**t-stat**	**Prob.**
C	---	14.263**	2.180	0.031	**C**	---	14.492**	2.201	0.030
ausempi	**0**	-0.020**	-4.450	0.000	***ausempi***	**0**	-0.020**	-4.270	0.000
ausrwages1i	**0**	-0.010**	-1.994	0.048	***ausrwages1i***	**0**	-0.011**	-2.111	0.037
ausjobvac	**0**	0.032**	3.066	0.003	***ausjobvac***	**0**	0.035**	3.298	0.001
auscdut	**0**	0.519**	2.220	0.028	***auscdut***	**0**	0.586**	2.528	0.013
exrvoljp	**0**	-0.012	-0.751	0.454	***Δexrvoljp***	**0**	-0.025**	-1.818	0.072
	1	0.039**	2.303	0.023		**---**	---	---	---
min	---	---	---	---	***min***	---	---	---	---
food	---	12.916**	2.498	0.014	***food***	---	12.321**	2.344	0.021
texw	---	11.741**	2.273	0.025	***texw***	---	11.226**	2.146	0.034
chem	---	11.455**	2.229	0.028	***chem***	---	10.932**	2.099	0.038
mach	---	11.668**	2.274	0.025	***mach***	---	11.108**	2.137	0.035
met	---	12.389**	2.418	0.017	***met***	---	11.795**	2.273	0.025
elec	---	11.783**	2.308	0.023	***elec***	---	11.134**	2.153	0.033
tran	---	12.542**	2.426	0.017	***tran***	---	11.938**	2.281	0.024
con	---	0.946	0.299	0.765	***con***	---	0.534	0.168	0.867
trd	---	22.509**	2.873	0.005	***trd***	---	21.615**	2.719	0.008
fins	---	-2.745	-1.055	0.294	***fins***	---	-3.112	-1.199	0.233
rebs	---	12.780**	2.968	0.004	***rebs***	---	12.240**	2.811	0.006

tras	---	-2.473	-0.954	0.342	***tras***	---	-2.822	-1.085	0.280
** significant at 10% critical value, * significant at 15* critical value									
R-squared				0.715	**R-squared**				0.711
Adjusted R-squared				0.673	**Adjusted R-squared**				0.671
S.E. of regression				1.878	**S.E. of regression**				1.884
Sum squared resid				433.781	**Sum squared resid**				440.024
Durbin-Watson stat				1.686	**Durbin-Watson stat**				1.683
F-statistic				17.158	**F-statistic**				17.951
Prob (F-statistic)				0.000	**Prob (F-statistic)**				0.000

Turning to the diagnostic tests, the hypothesis of homoscedasticity was rejected at a 5% critical value, which is why standard errors were made heteroscedasticity-consistent. The hypotheses of non-autocorrelation and correct functional form were not rejected (Table 5-36). While most variables (*ausempi, ausrwages1i, ausjobvac, auscdut* and *Δexrvoljp*) were assumed to be (at least contemporaneously) exogenous, this statement was not as clear for others (*ausempi* and *ausrwages1i*), but testing proved difficult.[151]

Table 5-36

Diagnostic Tests (5% critical values), Industry-Specific FDI Model (FDI from Japan)					
		Test	**Test-Statistic**	**5% Critical value**	**Probability**
Heteroscedasticity	**White LR-test**	$\chi^2(11)$	152.410*	19.675	0.000
Autocorrelation	**F-test**	F(1,97)	1.560	3.940	0.122
Misspecification	**RESET(1)**	F(1,123)	17.533*	3.920	0.000
	RESET(2)	F(2,122)	8.722*	3.070	0.000
* significant at 5% critical value					

In order to test for parameter stability, the sample was split into two subsamples, one for 1989 to 1994 and one for 1995 to 2001, comparing the parameter estimates. Those two subsamples were chosen, since the series was more volatile after 1995 than before (Figure 5-4). The first sample had a better fit (R^2 of 80.7%) and included more significant variables and parameters of different signs than the second model (with an R^2 of 67.6%), while the F-test showed that the hypothesis of joint insignificance was rejected in both cases (Table 5-37, Model A and B). The difference between the two subsamples was significant, since the hypothesis of parameter stability over time was rejected at a 5% critical value (Table 5-38). Hence, the two subsamples should best be analysed individually, as different sets of determinants matter in the two different time periods. While *ausempi* was significantly negative for both subsamples, *aurwages1i* only had a significant effect on the first subsamples, and *ausjobvac* and *auscdut* only had a significant effect on the second subsample. A dummy for the second time period (1995 to 2001) was not significant (Table 5-37, Model C).

Table 5-37

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from Japan)							
Dependent Variable: *rfdiijp* Sample: Cross-sections: N = 13 Least Squares (Fixed Effects Estimation), White Heteroskedasticity-Consistent Standard Errors and Covariance							
		Model A: 1989 – 1994 Sample (t = 6)		**Model B: 1995 – 2001 Sample (t = 7)**		**Model C: Total Sample, 1989 – 2001 (t = 13)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-2.768	-0.129	17.200	0.700	13.039**	1.918

[151] It was difficult to find appropriate instrumental variables to test this, but there was little evidence of a correlation between *rfdiijp* and *ausempi* (-0.146) or *rfdiijp* and *ausrwages1i* (0.064).

ausempi	**0**	-0.041**	-3.127	-0.013*	-1.547	-0.021**	-4.625
ausrwages1i	**0**	0.000	0.030	-0.013**	-1.780	-0.011**	-2.163
ausjobvac	**0**	0.066*	1.641	0.015	0.313	0.024**	1.871
auscdut	**0**	1.381**	1.727	1.359	0.316	1.000**	2.282
Δexrvoljp	**0**	-0.065	-0.954	-0.027	-1.151	-0.021*	-1.559
min	**---**	---	---	---	---	---	---
food	**---**	41.632**	2.322	1.922	0.192	12.949**	2.510
texw	**---**	39.071**	2.193	2.009	0.198	11.845**	2.295
chem	**---**	38.671**	2.186	1.640	0.163	11.446**	2.232
mach	**---**	38.936**	2.196	1.678	0.167	11.707**	2.284
met	**---**	39.358**	2.220	2.894	0.288	12.423**	2.426
elec	**---**	38.924**	2.195	2.329	0.235	11.820**	2.315
tran	**---**	39.677**	2.237	2.928	0.286	12.629**	2.444
con	**---**	15.412	1.417	-4.362	-0.701	0.724	0.228
trd	**---**	61.109**	2.358	8.018	0.501	22.592**	2.884
fins	**---**	8.156	0.889	-7.055*	-1.561	-2.974	-1.145
rebs	**---**	30.068**	2.512	3.945	0.462	12.660**	2.965
tras	**---**	7.431	0.857	-6.345	-1.296	-2.708	-1.041
T(1995-2001)	**---**	---	---	---	---	1.378	1.324
** significant at 10% critical value, * significant at 15% critical value							
R-squared			0.807		0.676		0.720
Adjusted R-squared			0.745		0.573		0.679
S.E. of regression			2.003		1.572		1.863
Sum squared resid			212.608		131.028		427.117
Durbin-Watson stat			1.484		2.127		1.676
F-statistic			13.009		6.516		17.532
Prob (F-statistic)			0.000		0.000		0.000

Table 5-38

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific FDI Model (FDI from Japan)				
	Test	**F-Statistic**	**Critical value**	**Probability**
Parameter Stability (1995 – 2001)	F(18,106)	1.880*	2.000	0.025
* significant at 5% critical value				

Knowing that parameters were variable over time, parameter stability across industries was tested for. This was done by splitting the sample into three subsamples (for primary, secondary and tertiary industries). Mining was the only industry included in the primary sector, so primary and secondary industries were combined to be compared with tertiary industries, though the results for manufacturing by itself are also shown. Since the industry-specific subsamples included different industry dummies, the results from the two regressions could be compared, but it could not be tested whether differences were statistically significant. The parameter estimates produced using the different subsamples differed in terms of sign and significance of variables and in relation to the explanatory power (the R^2 ranged between 22.1% for the manufacturing sample, 51.5% for the mining and manufacturing sample and 75.8% for the tertiary industry sample). The F-test showed that all variables combined were not insignificant for two of the three subsamples (mining and manufacturing combined and tertiary industries), while the hypothesis of joint insignificance was not rejected for manufacturing (Table 5-39, Model A, B and C). As shown for industry-specific FDI from the US, the parameter estimates generated from industry-specific subsamples using fixed-effects estimation could only be compared when excluding the industry dummies. In this case, secondary and tertiary industries were significantly different from the rest of the sample, showing that parameters should not be regarded as constant. Estimating the model as a random coefficients model (excluding the industry dummies) showed that parameters were inconsistent within industry groups. FDI from each industry may have different determinants (Table 5-40). The instability over time and across industries meant that the industry-specific FDI model – despite its good fit – may not be the best representation of the data generating process of Japanese FDI. However, the estimation of FDI for each industry individually for six or seven time periods was not possible and was left for further research.

Table 5-39

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from Japan)							
Dependent Variable: ***rfdiijp*** **Sample: Time: 1989 – 2001, t = 13** **Least Squares (Fixed Effects Estimation), White Heteroskedasticity-Consistent Standard Errors and Covariance**							
		Model A: PRIM and MAN Sample (N=8)		**Model B: MAN Sample (N=7)**		**Model C: TERT Sample (N=5)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	14.267**	1.726	67.037	1.232	14.545*	1.662
ausempi	**0**	-0.009	-1.378	-0.022	-0.953	-0.020**	-3.404
ausrwages1i	**0**	-0.009	-1.344	-0.059	-1.311	-0.012	-1.352
ausjobvac	**0**	0.014	1.202	0.059	1.017	0.047**	2.656
auscdut	**0**	0.108	0.384	-0.059**	-1.769	0.790*	1.634
Δexrvoljp	**0**	-0.007	-0.607	-0.016	-0.752	-0.054**	-1.840
min	---	---	---	---	---	---	---
food	---	2.495	0.337	---	---	---	---
texw	---	1.331	0.185	-1.276**	-1.798	---	---
chem	---	1.110	0.156	-1.443**	-1.959	---	---
mach	---	1.172	0.165	-1.437**	-1.928	---	---
met	---	1.969	0.278	-0.526	-0.714	---	---
elec	---	1.267	0.179	-1.208*	-1.603	---	---
tran	---	2.154	0.304	-0.397	-0.472	---	---
con	---	---	---	---	---	---	---
trd	---	---	---	---	---	21.120**	3.175
fins	---	---	---	---	---	-3.750**	-2.244
rebs	---	---	---	---	---	11.620**	5.813
tras	---	---	---	---	---	-3.495**	-2.564
** significant at 10% critical value, * significant at 15* critical value							

(Table 5-39 continued)

	Model A: PRIM and MAN Sample (N=8)	**Model B: MAN Sample (N=7)**	**Model C: TERT Sample (N=5)**
R-squared	0.515	0.221	0.758
Adjusted R-squared	0.434	0.078	0.712
S.E. of regression	1.412	1.304	2.429
Sum squared resid	143.493	102.054	277.336
Durbin-Watson stat	1.924	1.847	1.599
F-statistic	6.372	1.545	16.375
Prob (F-statistic)	0.000	0.139	0.000

Table 5-40

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific FDI Model (FDI from Japan)				
	Test	**F-Statistic**	**Critical value**	**Probability**
MAN	F(6,130)	6.750*	3.710	0.000
TERT	F(6,130)	8.121*	3.710	0.000
Random Coefficients Model	$\chi^2(18)$	95.720*	28.869	0.000
* significant at 5% critical value				

Returning to the original industry-specific FDI equation for Japanese FDI in Australia (Table 5-35), the estimation results can be summarised as follows: Industry-specific FDI from Japan in Australia was affected by the size of the Australian market measured by the industry-specific employment (*ausempi*), as was the case of industry-specific FDI from all countries in Australia. While this variable increased FDI from all countries, it had an unexpected negative effect for FDI from Japan, indicating Japanese companies invest in smaller industries (i.e. industries with a lower number of employees). The industry-specific real wage rate (*ausrwages1i*), which had an unexpected positive sign for FDI from all countries, had the expected negative sign, indicating FDI was attracted by cheaper labour. While FDI should have been positively affected by a lower number of job vacancies (or a higher unemployment rate), Australian job vacancies (*ausjobvac*) affected industry-specific FDI from Japan positively. Australian customs duties (*auscdut*) had the expected positive effect on FDI. FDI was higher the higher customs duties were, as this encouraged firms to invest and produce directly rather than to export to Australia. The change in the exchange rate volatility (or appreciation) of the Japanese Yen relative to the Australian dollar (*Δexrvoljp*) had a negative sign, indicating that an increasing Japanese Yen relative to the Australian dollar encouraged FDI, as investing in Australia became relatively cheaper. A comparison of the observed and predicted effects of the explanatory variables of industry-specific FDI from Japan can be found in Table 5-41.

Table 5-41

Industry-Specific FDI Equation, Observed and Predicted Effects (Total Sample, FDI from Japan)					
	Short-run effect (current value)		**Long-run effect (after 2 lags)**		**Expected Sign**
ausempi	-0.020	-	-0.020	-	+
ausrwages1i	-0.011	-	-0.011	-	-
ausjobvac	0.035	+	0.035	+	-
auscdut	0.586	+	0.586	+	+
Δexrvoljp	-0.025	-	-0.025	-	?

5.2.5 INDUSTRY-SPECIFIC FDI FROM GERMANY IN AUSTRALIA

Industry-specific FDI from Germany in Australia (*rfdiide*) between 1989 and 2001 (Figure 5-5) was modelled last. A combination of market size (*ausrgdpi* and *ausempi*), factor costs (*ausrwages11*), trade factors (*ausrimpo*) and risk factors (*exrde* and *relinfde*) performed best in explaining German industry-specific FDI in Australia, while policy and other factors were not significant. The model was stated as:

$$rfdiide_{it} = \alpha + \beta_{11}\, ausrgdpi_{it} + \beta_{21}\, ausempi_{it} + \beta_{31}\, ausrwages11_{t} + \beta_{41}\, ausrimpo_{t} + \beta_{51}\, exrde_{t} + \beta_{52}\, exrde_{t-1} + \beta_{53}\, exrde_{t-2} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

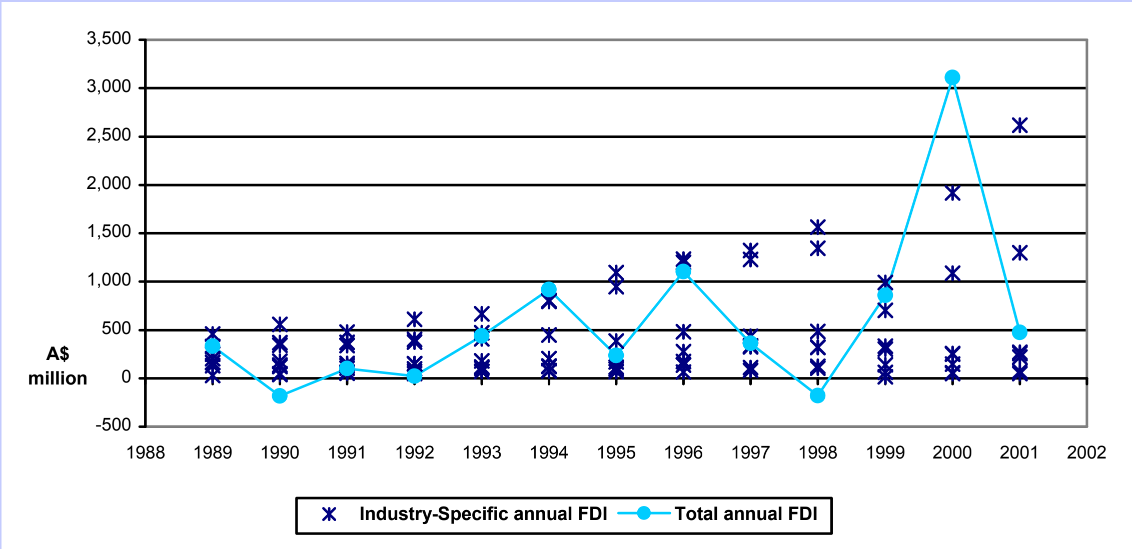


Figure 5-5: Real annual FDI Flows from Germany into Australia (by Industry and Total), 1988 to 2002[152]

The model was first estimated using least squares and no effects (Table 5-42), but the fixed effects model specification was later found to be more suitable, since the F-test that all u_i = 0 was rejected. Estimating the model as a random effects model was not appropriate (Table 5-43). Hence, the estimation was continued using the fixed effects model (Table 5-45, Model A).

[152] While all industry-specific FDI inflows are positive, the overall series is negative in 1995 and 1997. Adding up industry-specific annual FDI presented here does not add up to total annual FDI since not all industries were included in the dataset used for the estimation of the German industry-specific FDI model (given that industry specifications had to match the industry specifications of other data).

Table 5-42

Industry-Specific FDI Equation (FDI from Germany)				
Dependent Variable: ***rfdiide*** **Sample: Time: 1989 – 2001, t = 13, N = 7. Missing values = 8 Included observations: 83 Least Squares**				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**
C	**---**	8294.600	2.0889	0.040
ausrgdpi	**0**	0.021	11.571	0.000
ausempi	**0**	-0.229	-3.028	0.003
ausrwages11	**0**	-8.927	-1.984	0.051
ausrimpo	**0**	-0.014	-1.690	0.095
exrde	**0**	652.226	1.197	0.235
	1	619.249	1.552	0.125
	2	-949.750	-2.102	0.039
relinfde	**0**	-21.097	-1.088	0.280
** significant at 10% critical value, * significant at 15% critical value				
R-squared				0.691
Adjusted R-squared				0.658
S.E. of regression				281.432
Sum squared resid				5861105.000
Durbin-Watson stat				0.483
F-statistic				20.7122
Prob (F-statistic)				0.000

Table 5-43

Fixed and Random Effects Estimation, Industry-Specific FDI Model (FDI from Germany)		
Fixed Effects Model		
F test that all $u_i = 0$	F(6, 60) = 9.430*	Prob > F = 0.000
Random Effects Model		
The number of cross-sections is smaller than the number of coefficients, so the Random Effects Model cannot be estimated.		
* significant at 5% critical value		

Testing for differencing showed that the only variable with lags included in the model (*exrde*) should be differenced once, since the hypothesis that the variable should be used in first differences was not rejected at a 10% critical value (Table 5-44). So *Δexrde* was included in the model used for further estimation.

Table 5-44

Test for Differencing, Industry-Specific FDI Model (FDI from Germany)		
Variable	**χ^2 (Prob)**	**χ^2 (Prob)**
ausrgdpi	---	---
ausempi	---	---
ausrwages11	---	---
ausrimpo	---	---
exrde	0.686 (0.408)	5.788* (0.016)
relinfde	---	---
Result	*exrde*→ *Δexrde*	---
* significant at 10% critical value		

The industry-specific FDI model for FDI from Germany could then be estimated as a fixed effects model (with White heteroscedasticity-consistent standard errors for reasons stated in Table 5-46) including five variables in levels form without lags (*ausrgdpi, ausempi, ausrwages11, ausrimpo* and *relinfde*), one variable in first differences with one lag (*Δexrde*) and six industry dummies (for chemicals, machinery, electronics, transport equipment, trade and financial services – excluding the seventh industry, agriculture) reflecting the fixed effects. The parameters of the thirteen variables in the model are shown in Table 5-45, Model B. The model performed well in explaining industry-specific FDI from Germany, as it explained 84.7% of its variation (adjusted R^2 is 81.8%). All explanatory variables (even the industry dummies) were significant at a 10% critical value and the F-test of joint insignificance was rejected.

Table 5-45

Industry-Specific FDI Equation (FDI from Germany)									
Dependent Variable: *rfdiide* Sample: Time: 1989 – 2001, t = 13, N = 7. Missing values = 8. Included observations: 83 Least Squares (Fixed Effects Estimation), White Heteroskedasticity-Consistent Standard Errors and Covariance									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Variable	**Lags**	**Coefficients**	**t-stat**	**Prob.**	**Variable**	**Lags**	**Coefficients**	**t-stat**	**Prob.**
C	---	6,700.723**	2.137	0.036	**C**	---	5,563.172**	2.066	0.043
ausrgdpi	**0**	0.085**	3.417	0.001	***ausrgdpi***	**0**	0.084**	3.467	0.001
ausempi	**0**	-2.809**	-1.910	0.060	***ausempi***	**0**	-2.653**	-1.975	0.052
ausrwages11	**0**	-7.169**	-2.077	0.042	***ausrwages11***	**0**	-5.572**	-1.991	0.051
ausrimpo	**0**	-0.018**	-2.695	0.009	***ausrimpo***	**0**	-0.016**	-2.955	0.004
	0	821.616**	1.937	0.057		**0**	588.714**	2.378	0.020
exrde	**1**	697.660**	1.978	0.052	***Δexrde***	**1**	1,151.050**	3.114	0.003
	2	-1,155.310**	-3.087	0.003		---	---	---	---
relinfde	**0**	-22.852**	-1.717	0.091	***relinfde***	**0**	-20.725**	-1.758	0.083
agr	---	---	---	---	***agr***	---	---	---	---
chem	---	3,081.193**	2.441	0.017	***chem***	---	2,966.028**	2.535	0.014
mach	---	2,536.127**	2.117	0.038	***mach***	---	2,423.838**	2.187	0.032
elec	---	2,697.031**	2.251	0.028	***elec***	---	2,584.742**	2.332	0.023
tran	---	2,579.137**	2.153	0.035	***tran***	---	2,466.848**	2.226	0.029
trd	---	1,318.529	1.152	0.254	***trd***	---	1,161.379**	1.145	0.256
fins	---	-962.409**	-1.903	0.061	***fins***	---	-924.271**	-1.925	0.058
** significant at 10% critical value, * significant at 15* critical value									
R-squared			0.848		**R-squared**			0.847	
Adjusted R-squared			0.817		**Adjusted R-squared**			0.818	
S.E. of regression			205.948		**S.E. of regression**			205.2629	
Sum squared resid			2,884,204.000		**Sum squared resid**			2,907,166.000	
Durbin-Watson stat			1.175		**Durbin-Watson stat**			1.164	
F-statistic			27.115		**F-statistic**			29.354	
Prob (F-statistic)			0.000		**Prob (F-statistic)**			0.000	

Despite the good fit of the model, the hypothesis of homoscedasticity was rejected at a 5% critical value, which is why heteroscedasticity-robust standard errors were used in the estimation. The hypothesis of non-autocorrelation was not rejected, but the hypothesis of correct functional form was rejected when applying the RESET(1)- and RESET(2)-test, which casted some doubt on whether the model was correctly specified (Table 5-46).

Table 5-46

Diagnostic Tests (5% critical values), Industry-Specific FDI Model (FDI from Germany)					
		Test	**Test-Statistic**	**5% Critical value**	**Probability**
Heteroscedasticity	**White LR-test**	$\chi^2(4)$	31.000*	9.488	0.000
Autocorrelation	**F-test**	F(1,61)	2.313	4.000	0.134
Misspecification	**RESET(1)**	F(1,68)	6.893*	3.980	0.011
	RESET(2)	F(2,67)	17.330*	3.140	0.000
* significant at 5% critical value					

The possible misspecification of the model could not be solved, as experimenting with alternative variables and log transformation only worsened the fit of the model. While most explanatory variables (ausrgdpi, ausrimpo, ∆exrde and relinfde) were assumed to be (at least contemporaneously) exogenous, this statement was not as clear for others (ausempi and ausrgdpi), but testing proved difficult. The variable ausempi was expected to only adjust over time if affected by industry-specific FDI, while ausrgdpi seemed unlikely to be affected by FDI from Germany owing to its relatively small proportion.

In order to test for parameter stability, the sample should be split into two subsamples, one from 1989 to 1994 and one from 1995 to 2001 (Figure 5-5). Since it was not possible to estimate the model for the second subsample (or for a shorter first subsample), the 1989 to 1994 subsample could only be compared with the longer 1994 to 2001 subsample, but it could not be tested whether differences were statistically significant. The model fitted well in both cases, explaining 93.4% of the variation in industry-specific FDI from Germany for the first subsample and 87.9% for the second subsample. The parameter values and signs were different for the two subsamples, while parameter significance was better for the second than for the first subsample. The hypothesis of joint insignificance of all variables was rejected in both cases (Table 5-47, Model A and B). Since the two subsamples overlap, it could not be tested whether the differences were statistically significant (Table 5-48). A dummy for the time period between 1995 and 2001 was not significant (Table 5-47, Model C).

Table 5-47

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from Germany)

Dependent Variable: *rfdiide*
Sample: Cross-Sections: N = 7
Least Squares (Fixed Effects Estimation), White Heteroskedasticity-Consistent Standard Errors and Covariance

		Model A: 1989 – 1994 Sample (t = 6)		Model B: 1994 – 2001 Sample (t = 8)		Model C: Total Sample, 1989 – 2001 (t = 13)	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-25,423.900	-0.572	8,284.931**	2.204	7,346.590*	1.477
ausrgdpi	0	0.039**	2.609	0.067**	2.139	0.082**	3.449
ausempi	0	0.753*	1.567	-2.845**	-1.777	-2.523**	-1.855
ausrwages11	0	23.183	0.539	-8.214**	-2.123	-7.512	-1.413
ausrimpo	0	0.059	0.590	-0.018**	-2.427	-0.018**	-2.186
Δexrde	0	-1,677.831	-0.607	1,111.782*	1.609	692.868**	2.255
	1	-2,971.337	-0.607	1,764.079**	1.892	1,319.392**	2.342
relinfde	0	95.775	0.652	-37.570	-1.351	-25.889*	-1.539
agr	---	---	---	---	---	---	---
chem	---	166.928	0.381	2,851.353**	2.030	2,868.295**	2.443
mach	---	-249.130	-0.606	2,339.569**	1.775	2,329.695**	2.092
elec	---	-123.996	-0.303	2,522.508**	1.910	2,490.598**	2.234
tran	---	-166.899	-0.406	2,353.611**	1.787	2,372.705**	2.131
trd	---	-1,493.194**	-3.169	2,008.426**	1.739	1,048.394	0.994
fins	---	-121.807	-0.540	-513.448	-0.765	-881.859**	-1.843
T(1995-2001)	---	---	---	---	---	-96.841	-0.577
** significant at 10% critical value, * significant at 15% critical value							
R-squared			0.934		0.879		0.848
Adjusted R-squared			0.902		0.834		0.817
S.E. of regression			66.505		236.671		206.118
Sum squared resid			119,417.400		1960458.000		2,888,949.000
Durbin-Watson stat			1.171		1.547		1.132
F-statistic			29.397		19.496		27.062
Prob (F-statistic)			0.000		0.000		0.000

Table 5-48

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific FDI Model (FDI from Germany)

	Test	F-Statistic	Critical value	Probability
Parameter Stability (1995 – 2001)	Cannot be estimated: near singular matrix			
* significant at 5% critical value				

Since the first test for parameter stability did not give any results, the second method of testing for it was applied, for which the sample was split into three industry-specific subsamples (for primary, secondary and tertiary industries). Since agriculture was the only industry included in the primary sector, primary and secondary industries were combined, so they could be compared with tertiary industries (though the results for manufacturing by itself are also shown). The regression results from the two industry-specific subsamples could be compared, but it could not be tested whether differences were statistically significant. The parameter coefficients estimated using the different subsamples were similar in sign, but different in significance, while the explanatory power was good for all three subsamples (R^2 of 86.8%, 85.9% and 79.1%). The F-test showed that all variables combined were not insignificant for any of the three subsamples (Table 5-49, Model A, B and C).

Table 5-49

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific FDI Model (FDI from Germany)							
Dependent Variable: *rfdiide* Sample: Time: 1989 – 2001, t = 13 Least Squares (Fixed Effects Estimation), White Heteroskedasticity-Consistent Standard Errors and Covariance							
		Model A: MAN and PRIM (N = 5)		**Model B: MAN Sample (N = 4)**		**Model C: TERT Sample (N = 2)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	**---**	299.330	0.263	1,140.605	1.048	22,699.080**	3.006
ausrgdpi	**0**	0.032**	1.906	0.041**	1.864	0.044	0.557
ausempi	**0**	-0.693*	-1.662	-0.731*	-1.568	-3.322	-1.001
ausrwages11	**0**	-0.402	-0.367	-0.153	-0.133	-19.518**	-2.915
ausrimpo	**0**	-0.003	-1.220	-0.002	-1.161	-0.031	-1.316
Δexrde	**0**	153.926**	1.733	127.406	1.244	900.712**	2.126
	1	212.706*	1.496	183.365	1.029	2,341.462**	2.429
relinfde	**0**	0.925	0.191	2.187	0.379	-60.965**	-2.529
agr	**---**	---	---	---	---	---	---
chem	**---**	1,104.786	2.797	---	---	---	---
mach	**---**	707.445	1.932	-423.597**	-7.298	---	---
elec	**---**	868.349	2.358	-262.693**	-4.238	---	---
tran	**---**	750.455	2.057	-380.586**	-6.426	---	---
trd	**---**	---	---	---	---	---	---
fins	**---**	---	---	---	---	-3,701.111	-1.169
** significant at 10% critical value, * significant at 15% critical value							
R-squared			0.868		0.859		0.791
Adjusted R-squared			0.835		0.825		0.693
S.E. of regression			53.546		55.618		300.938
Sum squared resid			129024.500		126,828.900		1539579.000
Durbin-Watson stat			0.901		0.874		1.244
F-statistic			26.829		25.065		8.046
Prob (F-statistic)			0.000		0.000		0.000

As shown for FDI from the US and Japan, the industry dummies were excluded to compare the coefficients generated from industry-specific subsamples using least squares with no effect. The subsamples for secondary and tertiary industries were significantly different from the rest of the sample, so there was evidence for parameter variability (Table 5-50). Estimating the model as a random coefficients model (excluding industry dummies) was not possible since the number of explanatory variables exceeded the number of time periods per cross-section.

Table 5-50

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific FDI Model (FDI from Germany)				
	Test	F-Statistic	Critical value	Probability
MAN	F(8,67)	12.750*	3.020	0.000
TERT	F(8,67)	13.961*	3.020	0.000
Random Coefficients Model	Cannot be estimated for all cross-sections since the number of explanatory variables exceeds the number of time periods per cross-section but the model can be compared for three industry groups (Primary, Secondary and Tertiary Industry) as shown above.			
* significant at 5% critical value				

Returning to the original industry-specific FDI equation for German FDI in Australia (Table 5-45), the estimation results can be summarised as follows: Market or industry size measured by industry-specific GDP in Australia (*ausrgdpi*) had an expected positive effect on industry-specific FDI from Germany in Australia, i.e. FDI was higher the larger the industry. The same could not be said when industry size was measured by the number of employees (*ausempi*), as the variable had an unexpected negative effect on industry-specific FDI. Real wages in Australia (*ausrwages11*) had the expected negative sign on German FDI, the same result as previously found in the country-specific FDI model, indicating that higher wages are equivalent to higher production costs, thus discouraging FDI. In contrast to the country-specific FDI model, Australian imports (*ausrimpo*) had an unexpected negative effect on FDI, i.e. FDI was higher the lower imports were in the same period. The change in the exchange rate of the German mark relative to the Australian dollar (*Δexrde*) had a positive sign, i.e. when the Australian dollar appreciated relative to the German mark, FDI was higher although investing became relatively more expensive. Inflation in Germany relative to Australia (*relinfde*) had an unexpected negative sign, indicating that FDI was higher the lower the inflation in Germany relative to the inflation in Australia, i.e. the higher the inflation in Australia relative to the one in Germany, the higher was industry-specific FDI from Germany – a result that is contrary to the prediction, but not surprising, as the result was similar to the quarterly, country-specific and industry-specific FDI model for FDI from the UK. A comparison of the observed and predicted effects of the explanatory variables of industry-specific FDI from Germany in Australia can be found in Table 5-51.

Table 5-51

Industry-Specific FDI Equation, Observed and Predicted effects (Total Sample, FDI from Germany)					
	Short-run effect (current value)		Long-run effect (after 2 lags)		Expected Sign
ausrgdpi	0.084	+	0.084	+	+
ausempi	-2.653	-	-2.653	-	+
ausrwages11	-5.572	-	-5.572	-	-
ausrimpo	-0.016	-	-0.016	-	+
Δexrde	588.714	+	1,739.764	+	-
relinfde	-20.725	-	-20.725	-	+

5.3 RESULTS

Overall, variables including industry-specific GDP, GDP growth, industry-specific employment, industry-specific and total real wages, unemployment rate, the number of job vacancies, openness of the economy, country-specific and total imports, customs duties, exchange rate and exchange rate volatility, interest rate differences, inflation, industry-specific industrial disputes and outward FDI were used to explain industry-specific FDI in Australia from all or individual countries (Table 5-52).

Table 5-52

Summary of Factors used as Determinants, Industry-Specific FDI Model						
	Market Size	**Factor Costs**	**Trade**	**Risk**	**Policy Factors**	**Other Factors**
FDI from All Countries in Australia (*ausrfdii*)	*ausempi*	*ausrwages1i*	*ausopen*	*exrus, ausinf*	---	---
US FDI in Australia (*rfdiusi*)	*ausrgdpi*	*ausrwages1i*	*rimpous, (auscdut)*	---	---	*outrfdius*
UK FDI in Australia (*rfdiuki*)	---	*ausuer*	---	*inrdifuk, relinfuk, ausindusi*	---	*outrfdiuk*
Japanese FDI in Australia (*rfdijpi*)	*ausempi*	*ausrwages1i, ausjobvac*	*auscdut*	*exrvoljp*	---	---
German FDI in Australia (*rfdidei*)	*ausrgdpi, ausempi*	*ausrwages11*	*ausrimpo*	*exrde, relinfde*	---	---

One important result is that determinants of industry-specific FDI vary depending on the country analysed: industry-specific GDP, for instance, affected FDI from the US and Germany, but not FDI from the UK and Japan, while real wages affected FDI from the US, Japan and Germany (though with varying signs), but not FDI from the UK. Hence, aggregating may make it difficult to find the determinants of FDI.

Australian industry size (*ausrgdpi*) had the expected positive effect on FDI from Germany, showing that German firms invest in larger industries or at least in industries with more value added. Industry-specific GDP mattered in only one other model: in the case of industry-specific FDI from the US, though it was the rate at which the growth rate of industry-specific GDP changed (*ΔΔausrgdpi*) that affected FDI in that case, i.e. FDI increased when industry-specific FDI grew at a faster rate. Before differencing, *ausrgdpi* had no significant current effect on industry-specific FDI from the US, but a negative effect after one lag and a positive effect after two lags. Industry-specific employment (*ausempi*), another indicator of industry size, was significant for Australian industry-specific FDI from all countries collectively, Japan and Germany. While this variable had the expected positive effect for FDI from all countries, it was negative for Japanese and German FDI, i.e. indicating that Japanese and German firms preferred to invest in industries with fewer employees.

In terms of factor costs, industry-specific real wages (*ausrwages1i*) were a significant for industry-specific FDI from all countries collectively, the US and Japan. FDI from all countries and the US was larger, the higher industry-specific wages (and potentially labour quality) were. In contrast, Japanese FDI was attracted by lower industry-specific wages (as predicted by theory). Similar to the case of industry-specific FDI from Japan, industry-specific FDI from Germany was higher the lower real wages in Australia (*ausrwages11*) were, though it was total (not industry-specific) real wages that were significant. The Australian unemployment rate (*ausuer*) increased industry-specific FDI from the UK, further strengthening the hypothesis that firms invest more, the lower wages are. In this case, a higher unemployment rate appeared to indicate an excess supply of labour, putting downward pressure on wages and thus reducing wages. Although industry-specific FDI from Japan appeared to be attracted by lower industry-specific wages, the number of Australian job vacancies (*ausjobvac*) had an unexpected positive effect on Japanese FDI (i.e. Japanese firms invested more, the more jobs were vacant), although a high number of job vacancies should push wages up. Yet a high number of job vacancies could also indicate an optimistic business environment, attracting Japanese FDI.

Openness of the Australian economy (*ausopen*) had the expected positive sign on industry-specific FDI from all countries, but no effect on FDI from individual countries. As in the models discussed in Chapter 4, openness and trade were important in determining Australian FDI. Imports to Australia (*ausrimpo*) had an unexpected negative effect on industry-specific FDI from Germany, indicating that an increase in imports substituted for FDI in the case of Germany. In contrast, Australian imports from the US (*rimpous*) increased industry-specific FDI from the US, indicating that US firms switched from exporting (i.e. importing to Australia) to producing locally. Australian customs duties (*auscdut*), an indicator of trade costs to Australia, had the expected positive effect on Japanese and US FDI, showing that some MNEs prefer to invest and supply the foreign market directly rather than export when trade costs are high. However, the variable was only significant for Japanese FDI, but became insignificant for industry-specific FDI from the US after differencing other variables.

Political and market risk in the industry-specific FDI models were measured by a combination of interest rate, exchange rate and inflation rate fluctuations and industrial disputes. The interest rate was only significant for industry-specific FDI from the UK. Interest rate differences between the UK and Australia had the expected negative effect on FDI, i.e. a higher interest rate in the UK (relative to Australia) reduced FDI in Australia, while a higher interest rate in Australia (relative to the UK) – indicating higher capital returns – promoted FDI inflows.

The Australian-US dollar exchange rate (*exrus*) increased industry-specific FDI from all countries collectively – in contrast to theoretical predictions, but consistent with the findings in Chapter 4. A stronger Australian dollar (relative to the US dollar) increased FDI. Similarly, the German Mark-Australian Dollar exchange rate appreciation ($\Delta exrde$) increased German industry-specific FDI in Australia. Exchange rate volatility was a significant determinant of Japanese FDI, though the rate at which the growth rate (volatility) of the Japanese Yen-Australian dollar exchange rate ($\Delta exrvoljp$) changed had a significantly negative effect on FDI, indicating that the more the Japanese Yen appreciated (relative to the Australian dollar), the more Japanese firms invested. This result was substantiated when looking at the equation before differencing: exchange rate volatility had a negative effect overall.

A positive sign on the change of the inflation rate ($\Delta ausinf$) in the industry-specific FDI model for all countries was against theoretical predictions, but substantiated the results of positive signs on the Australian inflation rate in the models in Chapter 4. While previous results indicated that foreign firms invest more when Australia experiences inflation, this result showed that FDI increased the more inflation increased. Relative inflation rates (*relinfuk* and *relinfde*) were of significance for industry-specific FDI from the UK and Germany. Again, inflation had an unexpected positive effect on FDI (i.e. a negative sign on *relinfc*). Industry-specific FDI was higher, the higher the Australian inflation rate was in comparison to the UK or German inflation rate (or the lower *relinfc*, i.e. Home relative to Australian inflation). Industry-specific industrial disputes in Australia (*ausindusi*) had an unexpected positive sign on industry-specific FDI from the UK, which was somewhat surprising since industrial disputes should not encourage FDI.

Finally, Home's outward FDI was included as an indicator of overall investment trends for firms in those countries. It was a significant variable for industry-specific FDI from the US and the UK (*outrfdius* and *outrfdiuk*), though it affected FDI in different ways. While UK outward FDI increased UK FDI in Australia, indicating that UK firms invested more in Australian the more they invested globally, US outward FDI reduced US FDI in Australia, showing that US firms invested less in Australia the more they invested overall. For a summary of the variables and their estimated and predicted signs see Table 5-53.

Table 5-53

Industry-Specific FDI Equation, Observed and Predicted effects (Total Sample, Comparison)

	Long-run effect					**Expected Sign**
	All Countries ***(ausrfdii)***	**US** ***(rfdiius)***	**UK** ***(rfdiiuk)***	**Japan** ***(rfdiijp)***	**Germany** ***(rfdiide)***	
ausrgpdi					+	+
ΔΔausrgdpi		+				+
ausempi	+			-	-	+
ausrwages1i	+	+		-		-
ausrwages11					-	-
ausuer			+			+
ausjobvac				+		-
ausopen	+					+
ausrimpo					-	+
rimpous		+				+
auscdut		n.s. (+)		+		+
inrdifuk			-			-
exrus	+					+
Δexrde					+	+
Δexrvoljp				-		?
Δausinf	+					-
relinfuk, relinfde			-		-	+
ausindusi			+			-
outrfdius, outrfdiuk		-	+			+

5.4 ALTERNATIVE APPROACH: TESTING THE EXPLANATORY POWER OF DIFFERENT THEORETICAL MODELS

While the previous model (as described in Section 5.2) explained industry-specific FDI using a combination of explanatory variables based on a number of different theories – as was the case for the models in Chapter 4 – the next step was to explore how well individual theories worked in explaining FDI and whether some of the models were more appropriate representations of the data generating process than others – following the same procedure as in Chapter 4.2.5. As mentioned in Chapter 4.2.5, knowing that some variables were significant in the combined model and were left out of the individual models means that the models were estimated knowing that there must be some specification error. Nevertheless, six individual models (using only aggregate variables, only risk variables, only policy variables or only variables from the horizontal FDI model, the vertical FDI model or the Knowledge-Capital Model) were estimated in the hope that they would give some valuable results or support the hypothesis that a combination of variables works best in explaining industry-specific FDI in Australia.

Estimating the models using only aggregate variables, risk variables or policy variables (Tables 5-54, 5-55 and 5-56), the three models did not explain industry-specific FDI in Australia well. The R^2 was no higher than 13.3% for any of the countries analysed, while the R^2s in the combined model (with the exception of FDI from the UK) ranged from 37.3% to 84.7%. For industry-specific FDI from the UK, the model including aggregate variables (with an R^2 of 10.7%) did almost as well in explaining the variation of FDI as did the combined model (with an R^2 of 10.8%), though only Australian GDP was significant in the first case, while *inrdifuk, relinfuk, ausindusi* and *outrfdiuk* were significant in the second case.

Table 5-54

Industry-Specific FDI Equation: Aggregate Variables											
Dependent Variable*: ausrfdii and rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide)* Least Square											
		All Countries *(ausrfdii)*		US *(rfdiius)*		UK *(rfdiiuk)*		Japan *(rfdiijp)*		Germany *(rfdiide)*	
Variable	Lags	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
C	---	-18,147.540*	-1.629	-451.892	-0.025	-860.359	-0.029	5.234	0.064	22,271.670	0.930
aus-rgdp	0	0.007**	2.334	0.000	-0.080	0.005*	1.584	0.000	0.048	0.001	0.492
	1	-0.011	-1.236	0.004	0.867	-0.006*	-1.466	0.000	1.082	0.000	-0.093
	2	0.006	0.696	-0.004	-0.761	0.001	0.200	0.000	-1.171	-0.003	-0.548
auscdut	0	-535.924*	-1.640	39.678	0.282	-191.288	-0.972	0.154	0.190	36.459	0.211
	1	711.380**	1.721	-156.311	-0.685	374.364	1.362	-0.634	-0.541	34.159	0.149
	2	218.368	0.652	42.434	0.244	288.200	1.420	0.055	0.092	45.547	0.274
cdutc	0	---	---	32.223	0.084	-404.412	-0.350	3.501	0.467	-628.126	-0.686
	1	---	---	305.736	0.720	-532.758	-0.378	-1.853	-0.336	-829.781	-0.717
	2	---	---	---	---	---	---	---	---	---	---
** significant at 10% critical value, * significant at 15% critical value											
R-squared		0.090		0.109		0.106		0.063		0.071	
Adjusted R-sq		0.021		-0.004		0.016		-0.026		-0.088	
SE of regr.		1848.154		625.132		851.596		2.421		577.931	
Sum squ resid		270,000,000.000		24,619,751.000		58,017,209.000		492.487		15,698,186.000	
DW stat		2.205		1.212		1.671		0.957		0.168	
F-statistic		1.302		0.962		1.180		0.703		0.447	
Prob (F-stat)		0.266		0.473		0.321		0.688		0.886	

Table 5-55

Industry-Specific FDI Equation: Risk Variables											
Dependent Variable: *ausrfdii and rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide)* Least Squares											
		All Countries *(ausrfdii)*		US *(rfdiius)*		UK *(rfdiiuk)*		Japan *(rfdiijp)*		Germany *(rfdiide)*	
Variable	Lags	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
C	---	5,720.099	0.305	24.102	0.041	304.279	0.606	3.352	0.146	18.398	0.007
inrdifc	0	-233.035	-0.323	0.581	0.026	52.674**	1.845	-0.571	-0.713	49.540	0.500
	1	839.570	0.571	-6.938	-0.209	-49.985	-1.381	-0.150	-0.260	101.823	0.571
	2	-751.473	-0.900	15.265	0.612	-5.744	-0.163	0.264	0.271	-27.558	-0.249
austwi	0	-45.552	-0.168	482.130	0.512	529.251	0.451	-0.143	-0.339	-721.969	-0.423
	1	-53.017	-0.286	-133.388	-0.098	117.009	0.076	0.084	0.542	1,293.638	0.549
	2	---	---	-247.175	-0.265	-664.727	-0.541	0.022	0.091	-938.718	-0.310
ausinf	0	333.258	0.606	11.749	0.370	-40.569**	-1.722	-0.070	-0.073	95.606	0.585

Variable	Lags	All Countries Coeff.	t-stat	US Coeff.	t-stat	UK Coeff.	t-stat	Japan Coeff.	t-stat	Germany Coeff.	t-stat
	1	-630.410	-0.793	85.636**	3.271	-7.784	-0.372	0.087	0.100	25.005	0.419
	2	---	---	2.156	0.081	-0.145	-0.007	-0.027	-0.062	23.452	0.205
ausindus	0	0.941	0.292	0.010	0.051	0.034	0.139	-0.001	-0.082	1.446	0.477
	1	2.537	0.868	0.087	0.352	-0.067	-0.465	0.002	0.264	-0.640	-0.476
	2	---	---	-0.126	-0.568	-0.029	-0.322	-0.002	-0.406	0.092	0.113
** significant at 10% critical value, * significant at 15% critical value											
R-squared		0.102		0.113		0.047		0.046		0.133	
Adjusted R-squared		0.007		0.036		-0.012		-0.043		-0.015	
S.E. of regression		1,793.047		464.216		582.730		3.356		484.882	
Sum squared resid		273,000,000.000		29,738,462.000		65,877,497.000		1,452.793		16,457,711.000	
Durbin-Watson stat		2.122		1.319		1.660		0.468		0.158	
F-statistic		1.077		1.470		0.803		0.519		0.896	
Prob (F-statistic)		0.388		0.142		0.647		0.899		0.555	

Table 5-56

Industry-Specific FDI Equation: Policy Variables											
Dependent Variable: ***ausrfdii and rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide)*** **Least Squares**											
		All Countries ***(ausrfdii)***		**US** ***(rfdiius)***		**UK** ***(rfdiiuk)***		**Japan** ***(rfdiijp)***		**Germany** ***(rfdiide)***	
Variable	**Lags**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
C	**---**	-4,951.128	-0.619	-3,642.656	-1.255	-6,114.157	-0.772	-18.175	-0.800	2,236.839	0.349
auscdut	0	-1,512.588	-0.941	607.521	0.859	-1,783.113**	-1.912	1.290	0.545	457.049	0.630
	1	-1,082.018	-0.754	-329.235	-0.625	898.517	0.745	-1.133	-0.441	488.475	0.510
	2	1,301.660	0.820	-413.469	-0.666	352.168	0.340	-0.832	-0.354	-833.669	-1.027
cdutc	0	---	---	-108.920	-0.710	-1,109.647**	-1.935	2.484	0.915	-151.194	-0.337
	1	---	---	442.227**	2.446	709.679	1.049	-1.628	-0.431	240.456	0.451
	2	---	---	56.584	0.215	379.633	0.503	0.559	0.172	-11.868	-0.020
austax	0	146.065	0.754	32.281	0.467	158.475**	1.711	0.293	0.819	-6.521	-0.088
	1	37.010	0.114	-8.301	-0.131	0.064	0.001	-0.179	-0.516	-64.607	-0.909
	2	86.599	0.338	39.116	0.642	44.766	0.324	0.289	0.962	3.451	0.030
** significant at 10% critical value, * significant at 15% critical value											
R-squared		0.036		0.119		0.073		0.036		0.123	
Adjusted R-squared		-0.030		0.029		-0.004		-0.036		0.005	
S.E. of regression		1826.578		540.268		753.014		3.082		494.146	
Sum squared resid		294,000,000.000		25,686,254.000		61,806,260.000		1,140.103		16,360,067.000	
Durbin-Watson stat		2.203		1.192		1.679		0.591		0.160	
F-statistic		0.541		1.320		0.952		0.497		1.046	
Prob (F-statistic)		0.775		0.238		0.484		0.874		0.414	

The estimation of the horizontal FDI model, the vertical FDI model and the Knowledge-Capital Model (Tables 5-57, 5-58 and 5-59), for which a combination of market size, skill endowment, geographical distance and transport costs were used, showed that those three models were poor representations of the data generating process with insignificant explanatory variables and R^2s not higher than 11.6%. While the horizontal FDI model could not be estimated for industry-specific FDI from all countries, the UK, Japan and Germany, estimation was difficult for other models as not all variables could be included due to limited variation in the explanatory variables. Hence, the horizontal and vertical FDI model and the Knowledge-Capital Model should best be tested using another set of dependent variables – for instance country-specific FDI or, if available, FDI from several countries in a number of different countries – and not for industry-specific FDI.

Table 5-57

Industry-Specific FDI Equation: Horizontal FDI Model											
Dependent Variable: ***ausrfdii and rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide)*** **Least Squares**											
		All Countries ***(ausrfdii)***		**US** ***(rfdiius)***		**UK** ***(rfdiiuk)***		**Japan** ***(rfdiijp)***		**Germany** ***(rfdiide)***	
Variable	**Lags**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
C	**---**	---	---	-111.494	-0.039	---	---	---	---	---	---

Variable	Lags	All Countries Coeff.	All Countries t-stat	US Coeff.	US t-stat	UK Coeff.	UK t-stat	Japan Coeff.	Japan t-stat	Germany Coeff.	Germany t-stat
rgdpsumc	**0**	---	---	0.000	0.251	---	---	---	---	---	---
rgdpdifc	**0**	---	---	-0.001	-0.122	---	---	---	---	---	---
skilldif1*rgdpdifc	**0**	---	---	---	---	---	---	---	---	---	---
skilldif1*rgdpsumc	**0**	---	---	0.000	-0.630	---	---	---	---	---	---
skilldif2*rgdpsumc	**0**	---	---	---	---	---	---	---	---	---	---
geodistc	**0**	---	---	---	---	---	---	---	---	---	---
invcost	**0**	---	---	---	---	---	---	---	---	---	---
auscdut	**0**	---	---	13.464	0.112	---	---	---	---	---	---
cdutc	**0**	---	---	17.792	0.103	---	---	---	---	---	---
** significant at 10% critical value, * significant at 15% critical value											
R-squared		---		0.036		---		---		---	
Adjusted R-squared		---		-0.008		---		---		---	
S.E. of regression		---		512.592		---		---		---	
Sum squared resid		---		28639787.000		---		---		---	
Durbin-Watson stat		---		1.276		---		---		---	
F-statistic		---		0.815		---		---		---	
Prob (F-statistic)		---		0.541		---		---		---	

Table 5-58

Industry-Specific FDI Equation: Vertical FDI Model

Dependent Variable: ***ausrfdii and rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide)***
Least Squares

		All Countries *(ausrfdii)*		US *(rfdiius)*		UK *(rfdiiuk)*		Japan *(rfdiijp)*		Germany *(rfdiide)*	
Variable	**Lags**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
C	**---**	---	---	781.923	1.196	186.094	0.577	-1.856	-0.433	948.407	2.081
rgdpsumc	**0**	---	---	---	---	---	---	---	---	---	---
rgdpdifc	**0**	---	---	---	---	---	---	---	---	---	---
skilldif1*rgdpdifc	**0**	---	---	0.010	0.625	---	---	---	---	---	---
skilldif1*rgdpsumc	**0**	---	---	-0.001	-0.675	---	---	---	---	---	---
skilldif2*rgdpsumc	**0**	---	---	---	---	0.001	0.971	0.000	-0.010	0.000	-0.610
geodistc	**0**	---	---	---	---	---	---	---	---	---	---
invcost	**0**	---	---	---	---	---	---	---	---	---	---
auscdut	**0**	---	---	-82.727	-0.547	-123.819	-1.046	0.344	0.309	38.224	0.262
cdutc	**0**	---	---	-32.421	-0.342	79.581	0.911	0.385	0.270	-109.819	-1.569
** significant at 10% critical value, * significant at 15% critical value											
R-squared		---		0.039		0.009		0.027		0.115	
Adjusted R-squared		---		0.004		-0.013		0.006		0.082	
S.E. of regression		---		509.595		700.941		3.277		461.146	
Sum squared resid		---		28,565,527.000		67,310,588.000		1,481.966		16,799,772.000	
Durbin-Watson stat		---		1.265		1.726		0.510		0.208	
F-statistic		---		1.103		0.410		1.272		3.425	
Prob (F-statistic)		---		0.359		0.746		0.286		0.021	

Table 5-59

Industry-Specific FDI Equation: Knowledge-Capital Model											
Dependent Variable: *ausrfdii and rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide)* Least Squares											
		All Countries *(ausrfdii)*		US *(rfdiius)*		UK *(rfdiiuk)*		Japan *(rfdiijp)*		Germany *(rfdiide)*	
Variable	Lags	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat	Coeff.	t-stat
C	---	---	---	5,729.820	1.236	7847.690	0.462	-8.044	-0.126	4188.733	0.236
rgdpsumc	0	---	---	0.001	1.504	-0.001	-0.359	0.000	-0.034	-0.001	-0.227
rgdpdifc	0	---	---	-0.018	-1.477	-0.002	-0.457	0.000	0.490	0.000	0.209
*skilldif1*rgdpdifc*	0	---	---	0.055	1.599	---	---	---	---	---	---
*skilldif1*rgdpsumc*	0	---	---	-0.006	-1.618	---	---	---	---	---	---
*skilldif2*rgdpsumc*	0	---	---	---	---	0.001	0.841	0.000	-0.021	0.000	-0.047
geodistc	0	---	---	---	---	---	---	---	---	---	---
invcost	0	---	---	---	---	---	---	---	---	---	---
auscdut	0	---	---	-197.212	-1.108	-320.936	-0.720	0.410	0.326	-40.685	-0.084
cdutc	0	---	---	-40.139	-0.230	-57.777	-0.160	0.997	0.264	-202.170	-0.463
** significant at 10% critical value, * significant at 15% critical value											
R-squared			---		0.058		0.010		0.029		0.116
Adjusted R-squared			---		0.006		-0.026		-0.007		0.059
S.E. of regression			---		508.972		705.564		3.298		466.883
Sum squared resid			---		27,977,712.000		67,205,681.000		1,479.290		16,784,449.000
Durbin-Watson stat			---		1.303		1.745		0.505		0.211
F-statistic			---		1.115		0.285		0.803		2.019
Prob (F-statistic)			---		0.358		0.921		0.550		0.085

Variables based on the horizontal and vertical FDI model and the Knowledge-Capital Model could not explain much of the variation of industry-specific FDI – in contrast to the models based on a broader range of factors (as shown in Section 5.2). Since none of the models performed well, it was not possible to identify which of the three model performed best in explaining industry-specific FDI. The vertical FDI model and the Knowledge-Capital Model appeared to explain a similar (low) share of the variation of the industry-specific FDI from the US, the UK, Japan and Germany, while the horizontal FDI model could only be estimated in the case of the US where its explanatory power was as low as in the other two cases.

5.5 CONCLUSIONS

For the third analysis of the determinants of Australian FDI, a model with industry-specific annual real FDI flow data from all countries, the US, the UK, Japan and Germany for periods varying between 1981 to 2001 and 1992 to 2001 and a set of lagged explanatory variables including market size, factor costs, trade, risk, policy factors and other factors, was used. For industry-specific FDI from all countries, the set of (five) significant explanatory variables included industry size measured by employment, industry-specific real wages, openness of the Australian economy, exchange rate between US and Australian dollar and Australian inflation rate. For industry-specific FDI from the US the (five) explanatory variables were industry size measured by GDP, industry-specific real wages, Australian imports from the US, Australian customs duties and US real outward FDI flow, while for industry-specific FDI from the UK, Australian unemployment rate, interest rate difference between the UK and Australia, relative inflation in the UK compared with Australia, the number of industrial disputes by industry and the UK real outward FDI flow were the (five) explanatory variables. The (five) significant explanatory variables for industry-specific FDI from Japan were industry size measured by employment, industry-specific real wages, the number of job vacancies in Australia, Australian customs duties and exchange rate volatility of the Yen compared with the Australian dollar. Finally, the model explaining industry-specific FDI from Germany included industry size measured by both GDP and employment, Australian real wages, Australian imports, the exchange rate between German Mark and Australian dollar and the relative inflation in Germany compared with Australia as the (six) significant explanatory variables.

Overall, of the 26 explanatory variables in the five models estimated, half had the expected sign (industry-specific GDP for German and US FDI, industry-specific employment for FDI from all countries, industry-specific real wages for Japanese FDI, real wages for German FDI, the Australian unemployment rate for UK FDI, openness of the Australian economy for FDI from all countries, imports from the US for US FDI, Australian customs duties for Japanese and US FDI, exchange rate volatility for Japanese FDI, interest rate difference between the UK and Australia and UK outward FDI for UK FDI), while the remaining variables indicated significant effects, but of unexpected signs (such as industry-specific employment for Japanese and German FDI, industry-specific real wages for FDI from all countries and the US, Australian job vacancies for Japanese FDI, imports for German FDI, the US-Australian dollar exchange rate for FDI from all countries, the German Mark-Australian dollar exchange rate for German FDI, the Australian inflation rate for FDI from all countries, relative inflation for UK and German FDI, the number of Australian industrial disputes for UK FDI and US outward FDI for US FDI). Most of the unexpected signs could be explained, though explanations for some (such the positive sign on industrial disputes for UK FDI) remained unclear. Comparing the results from Chapter 5 with the ones from Chapter 4, it becomes clear that some variables significantly contribute to the variation of all FDI forms (for an overview see Table 5-60), while others are only significant in some of the models discussed.

The variables that were significant in more than one model include total or industry-specific market size (which increased quarterly and industry-specific FDI from Germany and the US, but reduced country-specific FDI), total or industry-specific real wages (which reduced quarterly, country-specific and industry-specific FDI from Japan and Germany), Australian number of job vacancies (which had a negative effect on quarterly FDI, but a positive effect on industry-specific FDI from Japan, while the Australian unemployment rate had a positive effect on industry-specific FDI from the UK, but a positive effect on industry-specific FDI from all countries and the US), openness of the Australian economy (which had a positive effect on quarterly and industry-specific FDI from all countries, but no significant effect on country-specific FDI), Australian imports (which had a positive effect on country-specific and industry-specific FDI from the US, but a negative effect on industry-specific FDI from Germany), the Australian interest rate (which had a positive effect on quarterly, country-specific and industry-specific FDI from the UK), the appreciation of the Australian exchange rate (which increased quarterly, country-specific and industry-specific FDI from all countries and Germany, but a negative effect on industry-specific FDI from Japan), the Australian inflation rate (which was positive for quarterly, country-specific and industry-specific FDI from all countries, the UK and Germany) and Home's outward FDI (which increased country-specific and industry-specific FDI from the UK, but a negative effect on industry-specific FDI from the US). Variables that were specific to individual models include corporate tax rate (in the quarterly FDI model), Australian exports and English language (in the country-specific FDI model) and industry-specific employment, Australian customs duties and the number of industrial disputes (in the industry-specific model).

Table 5-60

Observed and Predicted Long-Run Effects from the Quarterly FDI Equation, the Country-Specific FDI Equation and the Industry-Specific FDI Equation

	Quarterly FDI *(ausrfdi)*	Country-Specific FDI *(ausrfdic)*	Industry-Specific FDI					Expected Sign
			From All Countries *(ausrfdii)*	From the US *(rfdiius)*	From the UK *(rfdiiuk)*	From Japan *(rfdiijp)*	From Germany *(rfdiide)*	
Market Size	*Δausrgdp:* +	*ausrgdp:* -	*n.s.*	*$\Delta\Delta$ausrgdpi:* +	n.s.	n.s.	*ausrgdpi:* +	+
Employment	---	---	*ausempi:* +	n.s.	n.s.	*ausempi:* -	*ausempi:* +	+
Real Wages	*Δausrwages22:* -	*ausrwages11:* -	*ausrwages1i:* +	*ausrwages1i:* +	n.s.	*ausrwages1i:* -	*ausrwages11* -	-
Job Vacancies/ Unemployment Rate	*ausjobvac:* -	n.s.	n.s.	n.s.	*ausuer:* +	*ausjobvac:* +	n.s.	- (+ for *ausuer)*
Openness	*ausopen:* +	n.s.	*ausopen:* +	n.s.	n.s.	n.s.	n.s	+
Imports	n.s.	*rimpoc:* +	n.s.	*rimpous:* +	*n.s.*	*n.s.*	*ausrimpo:* -	+
Exports	n.s.	*Δrexpoc:* -	n.s.	n.s.	n.s.	n.s.	n.s.	?
Customs duties	n.s.	n.s.	n.s.	n.s.	n.s.	*auscdut:* +	n.s.	+
Interest Rate	*ausbb30:* +	*$\Delta\Delta$inrdifc:* -	n.s.	n.s.	*inrdifuk:* -	n.s.	n.s.	+ (- for *inrdifc)*
Exchange Rate	*Δexrus:* +	*austwi:* +	*exrus:* +	n.s.	n.s.	*Δexrvoljp:* -	*Δexrde:* +	-
Inflation	*ausinf:* +	*ausinf:* +	*Δausinf:* +	n.s.	*relinfuk:* -	n.s.	*relinfde:* -	- (+ for *relinfc)*
Industrial Disputes	n.s.	n.s.	n.s.	n.s.	*ausindusi:* +	n.s.	n.s.	-
Corporate Tax	*austax:* +	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	-
Outward FDI	---	*Δoutrfdi:* +	n.s.	*outrfdius:* -	*outrfdiuk:* +	n.s.	n.s.	+
English Language	---	*eng:* +	---	---	---	---	---	+

n.s.: not significant and therefore not included in the model --- not included in the model

While a combination of variables works well in explaining industry-specific FDI in Australia, separate models with FDI determinants derived from alternative theories were not sufficient in explaining industry-specific FDI and led to misspecification owing to missing variables. Neither aggregate variables nor risk variables or policy variables by themselves could explain the variation in industry-specific FDI. The estimation of the horizontal FDI model vertical FDI model or Knowledge-Capital Model appeared to be better as a representation of country-specific FDI than of industry-specific FDI, since the explanatory variables did not have enough variation to explain the variation of industry-specific FDI. Overall, a combination of variables from different theories – as done for quarterly and country-specific FDI – worked better in explaining industry-specific FDI in Australia.

Comparing these results with previous studies analysing the determinants of Australian FDI shows that FDI should be explained with a wider set of determinants than previously assumed. The study shows that a combination of market size, factor costs, transport costs and protection, risk factors, policy variables and other factors performs well in explaining Australian FDI inflows. None of the previous studies has analysed the full set of determinants that was used for this study, so this study makes a contribution by providing a more complete picture of Australian FDI. The study has overcome some of the limitations of previous studies and is based on more recent and previously unexplored datasets. In terms of the signs and significance of the determinants analysed, many results from previous studies are supported by this study, but this study also gives significance to determinants that were previously not significant or of an unexpected sign.

Market size and policy variables were only significant in this study. Market size, for instance, was an important determinant, as it was significant in the quarterly and country-specific FDI model and most of the industry-specific FDI models, though with varying signs. Tcha (1999) and Yang et al. (2000) found market size not to be significant, while Ratnayake (1993) and Karunaratne and Tisdell (2000) did not test for market size. Factor costs, another important determinant of FDI in this study, were only significant in Yang et al.'s (2000) study where wage growth had an unexpected positive effect on quarterly FDI. In this study, factor costs were significant in all the models analysed, but varied in signs. While wages positively affected industry-specific FDI from all countries and the US in Australia, most models (i.e. the ones analysing quarterly, country-specific and industry-specific FDI from Japan and Germany) found wages or wage growth to have a significantly negative effect.

The positive effect of openness on FDI supports the findings by Yang et al. (2000), but is in contrast to Karunaratne and Tisdell (2000)'s findings of a negative effect, while the positive sign on customs duties supports the findings by Ratnayake (1993). In terms of risk factors, the positive effect of interest rates on FDI was in line with Yang et al.'s (2000) result of a positive effect of interest rate growth, while the positive sign on inflation was in contrast to Yang et al.'s (2000) findings of a negative sign. Exchange rate appreciation was not significant in studies by Tcha (1999) and Yang et al. (2000), though Tcha (1999) found evidence of a positive effect of exchange rate appreciation and a negative effect of exchange rate volatility in his study. The results in this study support those results, although exchange rate appreciation was expected to have a negative sign based on theoretical predictions: exchange rate and exchange rate appreciation were significantly positive, while exchange rate volatility had a negative effect. The unexpected positive sign on industrial disputes in this study supported Yang et al.'s (2000) findings of a positive effect, but was in contrast to Tcha's (1999) findings of a negative or no significant effect. Policy variables were not tested for in any other study of Australian FDI, so that the unexpected positive sign on corporate tax rates cannot be further contested.

When comparing the results from this study with previous econometric studies analysing the determinants of FDI internationally, one should focus on the variables with unexpected signs or no significant effects, since variables with expected signs are generally in line with previous research results (see Chapter 3 for more details on those results). In terms of the effects of economic growth, market size, wages, labour supply, openness, customs duties and interest rates, Australia reflects the international experience.

Of the unexpected results, the positive effect of the corporate tax rate on FDI was supported by results from Brainard (1993c), while Wheeler and Mody (1992) did not find a significant link between corporate tax rate and FDI. The result was in contrast with findings by Hanson et al. (2001), Root and Ahmed (1978), Grubert and Mutti (1991) and Bénassy-Quéré et al. (2001a). The negative effect of wages on FDI was in line with results from Wheeler and Mody (1992) and Pain (1993) – who interpreted higher labour costs as a higher skill level – and Yang et al. (2000), while most other studies found support for a negative link between wages and FDI (including Saunders (1982), Biswas (2002), Bajo-Rubio and Sosvilla-Riverso (1994), Love and Lage-Hidalgo (2000), Barrel and Pain (1996), Moore (1993), Cushman (1988) and Klein and Rosengren (1994)). The positive effect of exchange rate (appreciation) on FDI only found support through Tcha's (1999) analysis of country-specific FDI in Australia, but was in contrast to results by Barrel and Pain (1996), Pain (1993), Brainard (1993c), Cushman (1988), Caves (1989), Froot and Stein (1991), Klein and Rosengren (1994) and Dewenter (1995). The positive effect of industrial disputes on FDI was supported by Moore (1993) and Yang et al. (2000), while Tcha (1998 and 1999) found the variable to be insignificant or negative. The signs on inflation rate and outward FDI could neither be supported by Australian nor by international studies. Schneider and Frey (1985), Bajo-Rubio and Sosvilla-Rivero (1994) and Yang et al. (2000) found the effect the effect of inflation to be negative, while no results for the effect of Home's outward FDI on FDI was found. Overall, the unexpected results were more in line with other Australian studies than with international results, though most results fitted into the international experience as well.

CHAPTER 6

ANALYSIS OF DETERMINANTS OF THE FDI PATTERN IN AUSTRALIA USING US FDI IN AUSTRALIA AS AN EXAMPLE

The analysis in Chapters 4 and 5 helped to clarify what determines aggregate, country-specific and industry-specific FDI in Australia, but it did not indicate which form Australian FDI takes, i.e. whether it is horizontal, vertical or export-platform FDI. While no detailed information is available for total MNE activity in Australia, data from the US as a source of FDI – due to the detail they are available with – can be used as a case study. Looking at US MNE activity in Australia may give an idea of what form Australian FDI is – keeping in mind that the US is Australia's largest investor accounting for 28% of the FDI stock.[153] The distinction between different FDI forms is important since different forms can have different effects on the Host economy. It is not only important to find out which proportion of FDI falls into which FDI category, but also – since some FDI forms are preferable to others – which factors are favourable for and/or determine which from FDI takes.

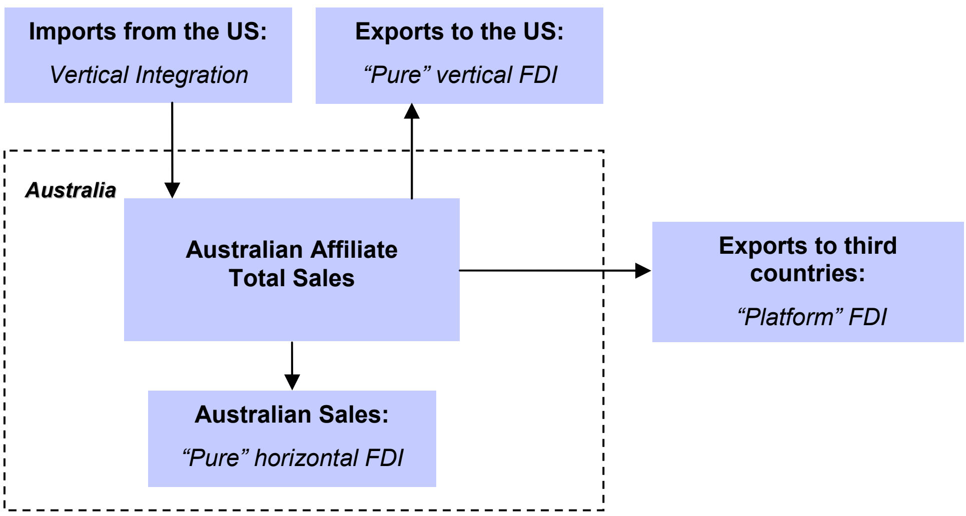
The data used are on majority-owned, non-bank affiliates of US-headquartered corporations collected by the US Bureau of Economic Analysis (BEA) and include total sales of Australian affiliates (of US parents), local (Australian) sales, exports to the US, exports to third countries and imports by affiliates from US parents. According to Hansen et al. (2001) and Braconier et al. (2002) those sales data can be seen as approximations of horizontal FDI, vertical FDI, platform FDI and vertical integration and can be further analysed as such.

The first part of this chapter (Section 6.1) will use those sales data to look at horizontal, vertical and platform FDI by US MNEs in Australia, while the second part (Section 6.2) will analyse the issue of vertical integration for US MNEs in Australia, measuring the intensity of vertical integration and analysing its determinants The second part of the analysis is also based on BEA data, though data are not on sales alone, but on sales, employment and assets of Australian affiliates of US parents by both industry of affiliate and industry of parent.

[153] ABS, International Investment Section, unpublished data, cited in UNCTAD (2003), p.17, Table 12a.

6.1 HORIZONTAL, VERTICAL AND EXPORT-PLATFORM FDI IN AUSTRALIA

The analysis of the different FDI forms in Australia is an attempt to measure which proportion of Australian FDI is horizontal or vertical and whether there are other FDI forms such as export-platform FDI (i.e. affiliates export goods prouced in Australia to third markets locally – instead of selling it locally or exporting it to the parent company). The link between horizontal, vertical and export-platform FDI is illustrated in Figure 6-1.



Source: based on Braconier et al, 2002, p.11, Figure 4 "Different FDI measures and their relationships"

Figure 6-1: Different FDI Measures and their Relationships

Different forms of FDI will be analysed in order to investigate whether they are determined by different factors. It will be tested whether aggregating FDI over different FDI forms – as was done in Chapters 4 and 5 when aggregate quarterly, country-specific or industry-specific FDI datasets were used – is appropriate. If aggregation is not appropriate, determinants of different FDI forms should be analysed individually (data availability permitting), as aggregating may blur determinants of firm-specific FDI.

Other FDI forms such as production-oriented and distribution-oriented FDI (describing whether foreign affiliates produce goods in Australia, or whether they only distribute goods produced elsewhere) and the phenomenon of outsourcing (a term that is used to distinguish between whether affiliates are vertically integrated or vertically specialised) will also be discussed. Section 6.1.1 will take a closer look at the data available (i.e. data on US MNEs in

Australia), while the analysis of the determinants of FDI is covered in Section 6.1.2. This analysis will be evaluated in Section 6.1.3. Results are stated in Section 6.1.4.

6.1.1 DATA DESCRIPTION

Tables 6-1 and 6-2 show the distribution of FDI flows, FDI stocks, affiliates, assets, sales (including total, local, to the US and to other countries), affiliates' imports, net property, plant and equipment, net income, gross product, capital expenditure and R&D expenditure for majority-owned affiliates of US parent companies across countries (Australia, Asia-Pacific, developed countries and the world) and industries, respectively, for five years (1983, 1986, 1991, 1996 and 2001) to better understand the US MNE data used to analyse the forms of US FDI in Australia.

Table 6-1 shows the location of US-owned foreign affiliates in the cross-section, comparing Australia with the Asia-Pacific region, developed countries and the world, over a nineteen year period.

Table 6-1

US FDI and Level of US Majority-Owned Foreign-Affiliate Activity in Australia, Asia-Pacific, Developed Countries and the World

		Australia		Asia-Pacific		Developed Countries		World
		Level	World Share (%)	Level	World Share (%)	Level	World Share (%)	Level
FDI Inflow from the US (US$m)	**1983**	405	4.3	2,857	30.0	9,367	98.3	9,525
	1986	-4	-0.0	1,687	8.6	11,480	58.4	19,641
	1991	1,061	3.2	3,854	11.8	21,018	64.3	32,696
	1996	3,787	4.5	15,363	18.2	50,453	59.8	84,426
	2001	-396	-0.4	14,680	14.1	62,726	60.4	103,767
	2002	3,726	3.1	28,779	24.0	85,520	71.4	119,742
Inward FDI Stock from the US (US$m)	**1983**	9,151	4.3	30,916	14.6	156,665	73.8	212,150
	1986	9,670	3.6	38,472	14.2	199,653	73.8	270,472
	1991	16,072	3.4	72,219	15.4	349,299	74.7	467,844
	1996	30,006	3.8	139,548	17.5	542,332	68.2	795,195
	2001	32,574	2.4	216,445	15.6	940,968	68.0	1,383,225
	2002	36,337	2.4	269,947	17.7	1,051,496	69.1	1,520,965
Number of Affiliates	**1983**	707*	4.2*	2,731*	16.1*	10,647*	62.8*	16,965*
	1986	697*	4.2*	2,746*	16.4*	10,665*	63.7*	16,753*
	1991	642	4.1	2,706	17.2	10,639	67.7	15,710
	1996	793	4.0	3,949	20.0	13,215	67.0	19,713
	2001	797	3.6	4,519	20.5	14,124	64.1	22,023
Number of Employees (in Affiliates)	**1983**	184,000	3.8	695,000	14.3	3,253,000	67.0	4,854,000
	1986	100,000	3.2	438,000	14.2	2,065,000	66.8	3,092,000
	1991	191,000	3.6	832,000	15.4	3,723,000	69.1	5,387,000
	1996	222,000	3.7	1,150,000	18.9	3,936,000	64.8	6,077,000
	2001	265,000	3.2	1,615,000	19.7	5,074,000	61.9	8,193,000
Total Assets of Affiliates (US$m)	**1983**	20,776	3.6	65,684	11.2	379,537	64.9	585,196
	1986	26,386	3.6	84,005	11.5	516,879	71.0	728,128
	1991	41,672	3.0	197,702	14.4	1,098,161	79.8	1,375,789
	1996	75,917	2.9	440,626	16.6	2,098,262	78.9	2,657,831
	2001	101,371	1.9	768,522	14.7	3,972,161	76.0	5,225,797

(Table 6-1 continued)

		Australia		Asia-Pacific		Developed Countries		World
		Level	World Share (%)	Level	World Share (%)	Level	World Share (%)	Level
Total Sales of	**1983**	25,607	3.6	99,737	14.1	527,117	74.7	705,811
	1986	23,000	3.2	96,561	13.4	580,565	80.6	720,069

Affiliates (US$m)	1991	38,226	3.1	200,678	16.1	1,000,778	80.5	1,242,635
	1996	54,214	2.9	371,988	19.9	1,436,600	76.9	1,868,588
	2001	58,563	2.3	515,743	20.5	1,835,609	72.8	2,520,556
Local Affiliate Sales (US$m)	1983	22,776	5.0	66,728	14.6	360,160	78.8	457,048
	1986	20,375	4.3	67,184	14.2	391,605	83.0	471,775
	1991	31,984	3.9	144,576	17.5	680,493	82.5	824,471
	1996	45,173	3.7	265,524	21.7	956,907	78.1	1,225,652
	2001	48,825	3.0	365,865	22.3	1,224,443	74.5	1,643,857
Local Aff. Sales as Share of Total Sales	1983	88.9	---	66.9	---	68.3	---	64.8
	1986	88.6	---	69.6	---	67.5	---	65.5
	1991	83.7	---	72.0	---	68.0	---	66.3
	1996	83.3	---	71.4	---	66.6	---	65.6
	2001	83.4	---	70.9	---	66.7	---	65.2
Aff. Sales to the US (Exports) (US$m)	1983	674	0.9	14,027	18.3	40,063	52.2	76,814
	1986	617	0.8	12,936	16.2	50,351	63.0	79,979
	1991	1,443	1.1	22,744	18.1	77,416	61.7	125,526
	1996	1,752	0.9	37,762	19.9	110,110	58.1	189,392
	2001	1,712	0.6	46,980	17.3	154,712	56.8	272,141
Affiliate Exports to the US as Share of Total Sales	1983	2.6	---	14.1	---	7.6	---	10.9
	1986	2.7	---	13.4	---	8.7	---	11.1
	1991	3.8	---	11.3	---	7.7	---	10.1
	1996	3.2	---	10.2	---	7.7	---	10.1
	2001	2.9	---	9.1	---	8.4	---	10.8
Aff. Sales to third countries (Exports) (US$m)	1983	2,157	1.3	18,982	11.0	126,894	73.8	171,949
	1986	2,008	1.2	16,441	9.8	138,609	82.4	168,315
	1991	4,799	1.6	33,358	11.4	246,208	84.1	292,638
	1996	7,288	1.6	70,702	15.6	358,812	79.1	453,544
	2001	8,026	1.3	102,898	17.0	443,012	73.3	604,559
Affiliate Exports to third countries as Share of Total Sales	1983	8.4	---	19.0	---	24.1	---	24.4
	1986	8.7	---	17.0	---	23.9	---	23.4
	1991	12.6	---	16.6	---	24.6	---	23.5
	1996	13.4	---	19.0	---	25.0	---	24.3
	2001	13.7		20.0	---	24.1	---	24.0
Aff. Sales to US and third countries (Exports) (US$m)	1983	2,831	1.1	33,009	13.3	166,957	67.1	248,763
	1986	2,625	1.1	29,377	11.8	188,960	76.1	248,294
	1991	6,242	1.5	56,102	13.4	319,675	76.4	418,164
	1996	9,040	1.4	106,464	16.6	466,725	72.6	642,936
	2001	9,738	1.1	149,878	17.1	593,705	67.7	876,700
Aff Exports to US and third countries as Share of Total Sales	1983	11.1	---	33.1	---	31.7	---	35.2
	1986	11.4	---	30.4	---	32.5	---	34.5
	1991	16.3	---	28.0	---	31.9	---	33.7
	1996	16.7	---	28.6	---	32.5	---	34.4
	2001	16.6	---	29.1	---	32.3	---	34.8
Affiliate Imports of Goods for Further Processing	1983	1,414	2.6	7,841	14.4	43,013	79.0	54,468
	1986	1,952	2.9	9,325	13.8	59,700	88.1	67,749
	1991	3,072	2.8	19,733	18.1	84,255	77.4	108,839
	1996	4,789	2.5	47,781	25.4	131,894	70.2	187,960
	2001	4,662	2.3	42,216	21.3	129,151	65.0	198,547
Aff. Imports of Goods as Share of Total Sales	1983	5.5	---	7.9	---	8.2	---	7.7
	1986	8.5	---	9.7	---	10.3	---	9.4
	1991	8.0	---	9.8	---	8.4	---	8.8
	1996	8.8	---	12.8	---	9.2	---	10.1
	2001	8.0	---	8.2	---	7.0	---	7.9
Net Property, Plant and Equipment (US$m)	1983	6,698	4.2	21,447	13.5	110,182	69.2	159,137
	1986	8,086	4.4	25,746	14.1	135,994	74.2	183,183
	1991	13,445	4.4	46,583	15.2	242,992	79.5	305,598
	1996	25,183	5.9	87,816	20.7	301,834	71.0	424,929
	2001	23,827	3.7	119,463	18.7	412,725	64.6	638,407
Net Income (US$m)	1983	597	2.0	5,366	17.5	19,502	63.7	30,600
	1986	886	2.2	5,650	13.9	29,964	73.5	40,779
	1991	1,144	1.7	11,110	16.8	46,179	70.0	65,990
	1996	2,935	2.5	23,109	19.4	81,962	68.9	118,918
	2001	2,407	1.4	28,879	16.4	121,775	69.0	176,380

(Table 6-1 continued)

		Australia		Asia-Pacific		Developed Countries		World
		Level	World Share (%)	Level	World Share (%)	Level	World Share (%)	Level
Gross Product (US$m)	**1983**	---	---	---	---	---	---	---
	1986	---	---	---	---	---	---	---
	1991	---	---	---	---	---	---	---
	1996	17,335	3.5	86,168	17.3	387,082	77.7	498,310
	2001	18,427	3.2	109,995	18.9	439,192	75.3	583,444
Capital Expendi-ture	**1983**	---	---	---	---	---	---	---
	1986	---	---	---	---	---	---	---
	1991	---	---	---	---	---	---	---
	1996	4,261	5.3	16,417	20.4	55,176	68.6	80,462
	2001	3,088	2.8	18,689	16.8	73,202	65.7	111,442
R&D Expendi-ture	**1983**	---	---	---	---	---	---	---
	1986	---	---	---	---	---	---	---
	1991	144	1.5	916	9.7	8,842	94.1	9,396
	1996	409	2.9	2,076	14.8	13,084	93.2	14,039
	2001	285	1.5	4,303	22.2	16,308	84.1	19,402

Table partly based on Hanson et al. (2001), Table 1, 3, 6 and 7
Data Source: US Department of Commerce, Bureau of Economic Analysis (BEA), Surveys of US Direct Investment Abroad
Developed Countries include: EU (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden and the UK), Australia, Canada, Israel, Japan, New Zealand, Norway and Switzerland
** Number is for all affiliates, not only majority-owned affiliates.*

A number of patterns emerged. Overall, all variables grew over time, but at different growth rates – depending on the variable and the region analysed. US FDI flows into Australia varied significantly over time (ranging from – US$ 396 million to US$ 3,787 million and a share of –0.4% to 4.5% of total US FDI outflows in the five years analysed), while FDI flows into the Asia-Pacific region and developed countries grew continuously over time, as did their shares of total FDI flows. The US FDI stock in Australia increased over time, though its share of the total US outward FDI stock fell – similar to the case of the US FDI stock in developed countries, but in contrast to the US FDI stock in the Asia-Pacific region, which increased over time. Generally, US MNEs concentrated their operations in developed countries, though Asia-Pacific received an ever-growing share of US MNE activity. Australia, in contrast, decreased in importance as a location of US MNE operations, as competition from other locations (including other countries in the Asia-Pacific region) increased.

The number of affiliates, the number of employees and total assets in Australia as a share of total US's affiliates, number of employees and assets, decreased despite an overall increase in Asia-Pacific and developed countries. Hence the increase in both factors in Australia was smaller than in the rest of the world. The shares of total and local sales for Australia and developed countries decreased, while the Asia-Pacific share rose.

The shares of affiliates' exports and net property, plant and equipment for Australia and developed countries remained constant, while the Asia-Pacific share increased. The share of affiliates' imports and R&D expenditure for Australia remained relatively constant, but increased for Asia-Pacific and decreased for developed countries. The respective shares of net income and gross product remained constant for Australia, Asia-Pacific and developed countries, while the shares of capital expenditure decreased for Australia, Asia-Pacific and developed countries. In Australia, US affiliates sold most of their goods locally: over 80% of total sales were local sales (Figure 6-2) compared with only 65% to 70% in Asia-Pacific, developed countries and the world. Australia's use of imports by US affiliates was approximately 8% from 1986 onwards – similar to that in the other regions (where it varied between 7% and 13%).

Table 6.2 shows the share of activities by the US affiliates in Australia by major industry (including petroleum, various manufacturing industries, wholesale trade, finance and insurance, services and other industries), comparing the share over a period of nineteen years.

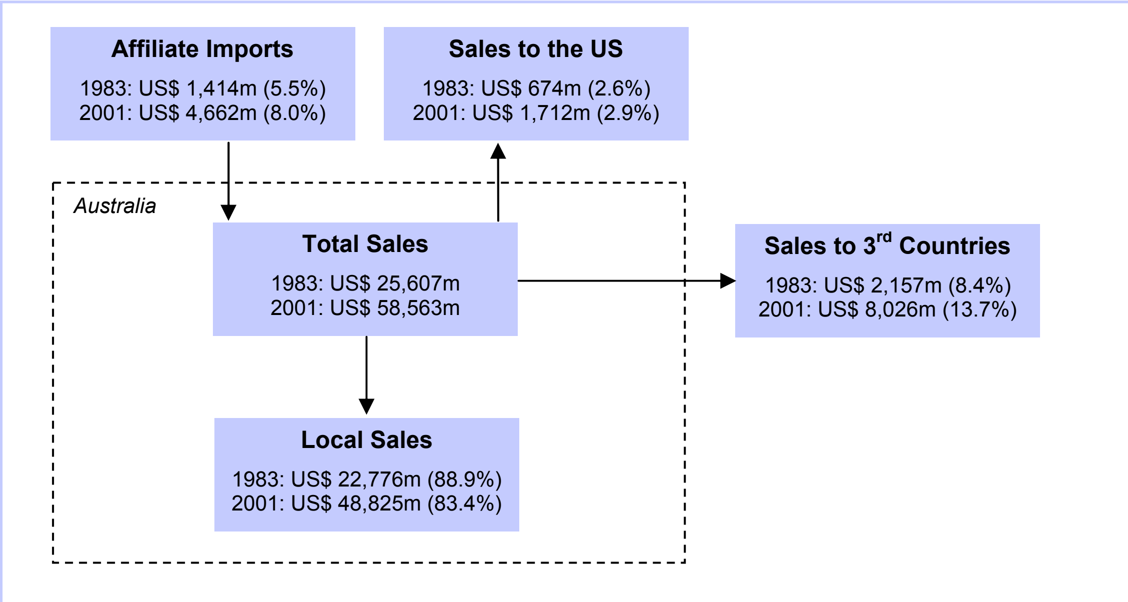


Figure 6-2: Different FDI Measures and their Relationships in Australia (All Industries)

Table 6-2

Level of US Majority-Owned Foreign-Affiliate Activity in Australia by Industry														
% of Australian Total (E.g. FDI Flow into the Australian Petroleum Industry/Total FDI Flow into Australia. Note: Percentages add up to 100 %.)		**Petroleum**	**Manufacturing**								**Wholesale Trade**	**Finance and Insurance**	**Services**	**Other Industries**
			Total	**Food**	**Chemicals**	**Metals**	**Industrial Machinery**	**Electronic Equipment**	**Transport Equipment**	**Other Manufacturing**				
FDI Flow (Petroleum = Mining in 01, 02)	**1983**	13.1	9.9	-1.5	36.0	2.0	-12.8	2.7	---	---	27.7	42.5	1.5	5.2
	1986	-950.0	50.0	-250.0	-1075.0	-5775.0	1100.0	1450.0	4250.0	350.0	1875.0	2425.0	675.0	4625.0
	1991	-31.4	63.1	27.5	14.8	1.1	0.8	-1.3	7.4	12.6	2.9	42.3	-1.8	24.8
	1996	5.7	9.1	-0.8	1.7	0.4	0.7	-0.2	6.6	0.6	0.9	24.6	2.1	57.5
	2001	-242.4	151.0	20.5	-26.0	348.0	-0.8	-3.5	-52.3	-134.8	55.6	-60.1	-9.1	205.1
	2002	66.0	28.8	-0.7	1.0	30.5	-2.5	0.2	-2.0	2.4	5.6	10.6	6.2	17.3
FDI Stock	**1983**	16.0	35.0	3.3	14.0	1.2	4.1	2.1	2.7	7.7	12.4	15.3	1.8	19.5
	1986	18.2	35.5	4.3	15.8	1.1	3.7	0.6	3.2	6.8	10.8	18.8	1.7	15.0
	1991	15.3	38.4	7.7	12.5	1.6	3.5	2.3	2.3	8.4	9.5	16.7	3.6	16.5
	1996	11.0	25.7	3.2	9.6	0.9	2.4	0.8	3.1	5.7	6.6	24.9	6.2	25.6
	2001	21.0	28.4	3.9	4.5	4.1	1.3	0.3	3.5	10.8	7.9	18.3	2.5	22.0
	2002	22.6	29.7	3.6	4.2	7.0	0.9	0.3	3.1	10.6	7.9	15.5	3.0	21.3
Number of Employees (in Affiliates)	**1983**	---	59.0	7.0	11.9	1.9	5.2	3.8	---	---	9.8	3.0	6.1	---
	1986	5.0	59.4	7.4	12.1	2.6	5.9	2.7	---	---	15.6	3.3	6.4	10.3
	1991	4.8	48.9	9.5	9.0	2.4	5.9	3.0	9.1	9.9	13.7	2.7	10.4	19.6
	1996	2.1	45.1	8.8	7.3	3.2	5.1	1.3	9.4	10.2	7.7	2.9	16.2	26.0
	2001	0.9	38.4	8.8	5.5	3.8	2.8	0.5	7.4	9.6	9.7	4.2	10.7	36.1
Total Assets of Affiliates	**1983**	19.6	40.6	4.1	16.4	---	3.6	1.5	---	6.0	9.0	19.2	3.4	8.1
	1986	16.1	39.6	4.0	15.2	2.6	4.0	1.5	---	---	13.2	20.8	3.8	6.6
	1991	19.4	33.3	6.5	10.6	1.5	2.7	1.7	4.5	5.8	12.6	20.8	5.4	8.5
	1996	17.4	25.9	5.0	8.7	0.6	2.2	0.6	4.5	4.3	6.3	26.7	6.3	17.4
	2001	11.0	18.5	3.1	3.7	2.7	0.8	0.6	2.9	4.7	7.9	25.5	2.9	34.2

(Table 6-2 continued)

% of Australian Total		Petroleum	Manufacturing: Total	Food	Chemicals	Metals	Industrial Machinery	Electronic Equipment	Transport Equipment	Other Manufacturing	Wholesale Trade	Finance and Insurance	Services	Other Industries
Total Sales of Affiliates	1983	---	42.2	5.5	12.0	---	---	1.9	---	6.8	12.3	3.3	4.4	---
	1986	24.0	43.3	---	12.2	2.3	---	1.9	---	---	20.2	3.9	3.8	4.8
	1991	21.7	45.0	8.3	11.8	1.9	4.8	2.3	8.9	7.0	16.8	3.6	5.8	7.0
	1996	14.9	43.5	9.0	10.2	1.2	3.8	1.3	10.7	7.3	16.5	4.4	9.8	10.9
	2001	4.8	40.9	8.0	8.4	4.4	1.8	1.2	9.6	7.5	24.8	5.9	6.7	16.9
Local Affiliate Sales	1983	---	---	6.0	---	---	3.7	1.9	---	7.0	11.8	---	4.9	7.2
	1986	25.6	42.2	---	---	1.8	---	2.1	---	---	18.9	---	4.3	---
	1991	23.9	41.8	8.1	8.3	1.5	4.6	2.5	9.4	7.4	16.8	4.3	6.4	6.8
	1996	15.5	39.9	7.1	7.2	1.3	3.4	1.4	12.2	7.3	17.4	5.1	11.0	11.2
	2001	3.7	36.9	6.9	7.8	1.5	1.8	1.2	9.9	7.8	25.9	6.5	7.3	19.7
Local Aff. Sales as Share of Total Sales (% by Industry)	1983	---	---	96.2	---	---	---	93.5	---	92.1	85.2	---	98.9	---
	1986	94.8	86.5	---	---	68.3	---	95.7	---	---	83.0	---	98.8	---
	1991	92.3	77.7	81.6	58.6	64.6	80.3	93.6	88.3	88.4	83.3	97.6	92.2	81.5
	1996	86.4	76.4	65.4	59.0	90.1	75.1	89.0	94.7	83.5	87.8	96.5	93.5	85.5
	2001	63.7	75.3	72.3	77.1	28.2	82.3	84.6	85.9	86.4	87.1	91.8	90.3	97.5
Aff. Sales to the US (Exports)	1983	---	---	1.0	---	0.3	---	1.3	1.0	0.1	28.3	---	0.6	---
	1986	---	37.4	0.3	---	0.6	---	0.2	1.1	---	44.9	---	0.8	---
	1991	17.0	53.4	0.1	---	1.0	1.1	0.1	---	5.2	24.4	2.2	---	---
	1996	---	60.8	---	---	0.4	1.7	0.1	8.3	7.6	4.6	2.3	6.7	---
	2001	---	52.0	16.6	3.7	---	1.2	9.0	1.7	---	20.8	8.6	9.6	---
Affiliate Exports to the US as Share of Total Sales (% by Industry)	1983	---	---	0.5	---	---	---	1.9	---	0.1	6.1	---	0.4	---
	1986	---	2.3	---	---	0.8	---	0.2	---	---	6.0	---	0.6	---
	1991	3.0	4.5	0.1	---	1.9	0.9	0.2	---	2.8	5.5	2.3	---	---
	1996	---	4.5	---	---	1.1	1.5	0.1	2.5	3.4	0.9	1.7	2.2	---
	2001	---	3.7	6.1	1.3	---	2.0	9.8	0.5	---	2.5	4.3	4.2	---
Aff. Sales to third countries (Exports)	1983	22.7	52.7	2.1	29.1	1.4	3.1	1.0	9.7	6.3	12.7	0.8	0.3	10.7
	1986	---	55.6	6.3	25.0	8.3	---	0.9	---	7.1	25.5	---	0.3	---
	1991	1.6	12.4	2.4	---	1.0	1.4	0.2	---	1.0	2.9	0.0	---	---
	1996	---	61.7	---	---	0.8	6.7	1.0	2.3	7.1	13.9	0.6	3.1	---
	2001	---	55.8	11.2	11.8	---	1.8	2.2	8.4	---	16.9	1.5	2.4	---
Affiliate Exports to third countries as Share of Total Sales (% by Industry)	1983	---	10.5	3.2	20.4	---	---	4.6	---	7.8	8.7	2.0	0.6	---
	1986	---	11.2	---	17.8	31.2	---	4.1	---	---	11.0	---	0.7	---
	1991	4.7	17.8	18.3	---	33.5	18.9	6.3	---	8.8	11.2	0.1	---	---
	1996	---	19.1	---	---	8.9	23.5	10.8	2.8	13.1	11.3	1.8	4.3	---
	2001	---	21.0	21.6	21.6	---	15.7	12.7	13.5	---	10.5	3.9	5.6	---
Aff. Sales to other countries (Exports)	1983	---	---	1.9	---	---	---	1.1	---	4.9	16.5	---	0.4	---
	1986	11.0	51.4	---	---	6.5	---	0.7	---	---	30.1	---	0.4	---
	1991	10.2	61.5	9.4	30.0	4.1	5.8	0.9	6.4	5.0	17.2	0.5	2.8	7.9
	1996	12.2	61.5	18.6	25.0	0.7	5.7	0.8	3.4	7.2	12.1	0.9	3.8	9.5
	2001	10.5	60.8	13.3	11.6	18.9	1.9	1.1	8.1	5.9	19.3	2.9	3.9	2.6
Aff. Exports as Share of Total Sales (% by Industry)	1983	---	---	3.8	---	---	---	6.5	---	7.9	14.8	---	1.1	---
	1986	5.2	13.5	---	---	31.7	---	4.3	---	---	17.0	---	1.3	---
	1991	7.7	22.3	18.4	41.4	35.4	19.7	6.4	11.7	11.6	16.7	2.4	7.8	18.5
	1996	13.6	23.6	34.6	41.0	9.9	24.9	11.0	5.3	16.5	12.2	3.5	6.5	14.5
	2001	36.3	24.7	27.7	22.9	71.8	17.7	15.4	14.1	13.6	12.9	8.2	9.7	2.5
Aff. Imports of Goods for Distribution or Further Processing	1983	---	58.4	---	18.5	1.2	---	2.0	8.8	14.0	37.4	0.0	1.0	---
	1986	0.7	50.6	1.4	14.0	1.3	---	1.7	2.7	---	47.5	0.0	---	---
	1991	---	43.1	10.1	12.6	0.8	3.7	3.0	3.2	9.7	---	0.0	2.8	---
	1996	0.6	46.1	0.5	13.2	1.4	7.5	2.3	9.7	11.5	44.0	---	7.6	1.7
	2001	0.3	47.8	1.1	10.7	3.0	1.9	1.0	21.9	8.2	47.7	0.0	1.5	2.7
Aff. Imports as Share of Total Sales (% by Industry)	1983	---	7.6	---	8.5	---	---	5.9	---	11.4	16.8	0.0	1.2	---
	1986	0.3	9.9	---	9.7	4.9	---	7.7	---	---	20.0	0.0	---	---
	1991	---	7.6	9.9	8.6	2.9	6.2	9.6	2.8	11.2	19.5	0.0	3.9	---
	1996	0.4	9.4	0.5	11.5	10.2	17.3	15.7	8.0	14.0	23.5	---	6.9	1.4
	2001	0.4	9.3	1.0	10.1	5.5	8.3	6.4	18.2	14.1	15.3	0.0	1.7	1.3
Net Property, Plant and Equipment	1983	30.4	49.3	4.0	27.4	---	2.0	1.2	---	2.1	4.5	0.9	2.7	12.3
	1986	28.7	51.9	4.5	27.6	4.3	1.7	0.8	---	---	6.1	1.1	2.2	10.0
	1991	29.7	41.0	11.2	15.1	2.3	1.6	1.3	6.2	5.4	5.4	1.1	6.0	14.7
	1996	25.6	31.6	6.5	14.9	0.5	1.6	0.3	4.1	3.6	2.3	3.0	6.2	31.3
	2001	19.4	26.1	4.6	4.0	5.9	0.6	0.6	4.3	6.1	3.4	2.1	1.8	39.0

(Table 6-2 continued)

% of Australian Total		Manufacturing			

			Total	Food	Chemicals	Metals	Industrial Machinery	Electronic Equipment	Transport Equipment	Other Manufacturing				
Net Income	**1983**	---	46.1	9.2	24.6	---	---	4.0	---	12.7	15.7	11.1	3.5	---
	1986	27.9	42.2	---	14.1	1.9	---	4.2	---	---	10.5	24.6	-2.8	-2.4
	1991	57.3	61.1	12.3	30.8	2.2	6.6	0.7	-7.8	16.3	-25.8	8.5	-4.4	3.3
	1996	27.7	41.6	1.0	15.9	1.6	1.7	1.2	13.1	7.1	8.2	13.7	7.4	1.5
	2001	27.1	57.8	6.5	9.7	26.7	3.0	1.2	6.2	4.5	8.2	11.8	1.2	-6.1
Gross Product	**1983**	---	---	---	---	---	---	---	---	---	---	---	---	---
	1986	---	---	---	---	---	---	---	---	---	---	---	---	---
	1991	---	---	---	---	---	---	---	---	---	---	---	---	---
	1996	27.6	39.3	5.4	10.5	1.3	3.0	1.0	8.1	10.0	8.3	3.8	11.2	9.8
	2001	11.2	42.0	6.4	6.3	7.5	2.1	0.7	6.8	12.2	16.3	3.9	9.1	17.5
Capital Expenditure	**1983**	---	---	---	---	---	---	---	---	---	---	---	---	---
	1986	---	---	---	---	---	---	---	---	---	---	---	---	---
	1991	---	---	---	---	---	---	---	---	---	---	---	---	---
	1996	21.9	35.1	10.3	7.3	0.4	3.4	0.2	7.5	5.9	2.5	3.1	12.3	25.1
	2001	23.6	28.5	4.0	4.3	2.6	0.8	7.9	7.7	1.2	4.9	7.9	6.8	28.3
R&D Expenditure	**1983**	---	---	---	---	---	---	---	---	---	---	---	---	---
	1986	---	---	---	---	---	---	---	---	---	---	---	---	---
	1991	0.7	84.7	---	27.1	1.4	4.2	4.2	---	---	---	0.0	4.9	---
	1996	---	77.8	4.2	20.5	0.5	---	0.2	---	---	7.3	0.0	14.7	0.2
	2001	---	90.9	9.5	22.1	3.2	1.8	---	---	---	5.6	0.0	3.2	---

Table partly based on Hanson et al. (2001), Table 2, 4, 6 and 7
** The Petroleum category was changed to Mining in 2001 and may therefore include a different industry mix.*
Data Source: US Department of Commerce, Bureau of Economic Analysis (BEA), Surveys of US Direct Investment Abroad

Industry-specific US FDI flows into Australia were volatile with shares of total ranging between 4,250% for transport equipment in 1986 and –5,775% for metals in 1986. The US FDI stock in Australia was mainly in the manufacturing sector (in particular chemicals and metals), but its share decreased slightly (35% in 1983 and 29.7% in 2002). Petroleum (between 16% and 22.6%) and finance and insurance (between 15.3% and 24.9%) were the other important sectors. In terms of sales, employment and assets, manufacturing was Australia's largest single industry in all years, accounting for 38.4% of employment and 40.9% of total sales in 2001. However, in terms of total assets, finance and insurance (25.5%) and other industries (34.2%) were larger than manufacturing (18.5%). Within manufacturing, food, chemicals and transport equipment were the three most important industries in terms of employment, assets and sales of US affiliates in Australia.

Manufacturing was also the most dominant industry in terms of net property, plant and equipment (26.1%), net income (57.8%), gross product (42.0%) and capital expenditure (28.5%) in 2001, though its importance varied. Mining (listed under petroleum) was important in terms of net property, plant and equipment, net income and capital expenditure (19.4%, 27.1% and 23.6% respectively), while wholesale trade was important in terms of gross product (16.3%). Moreover, most of the R&D expenditure was invested in the manufacturing sector (including 22.1% for chemicals). Depending on which indicator is analysed, wholesale trade (with 24.8% of sales, but only 9.7% of employment and 7.9% of assets), finance and insurance (with 25.5% of assets, but only 4.2% of employment and 5.9% of sales) or services (with 10.7% of employment, but only 6.7% of sales and 2.9% of assets) were the other most important sectors of US affiliate activity in Australia.

The large share of sales in the wholesale sector indicates that distribution-oriented FDI was an important part of Australian FDI. The percentage of total sales that was sold locally varied by industry. In 2001, it was larger than the average of 83.4% in the wholesale, finance and insurance and service sector, but less than average in mining and manufacturing, i.e. sectors for which the use of Australia as an export platform is more important (for a comparison of the sales structure of wholesale trade and manufacturing see Figure 6-3).

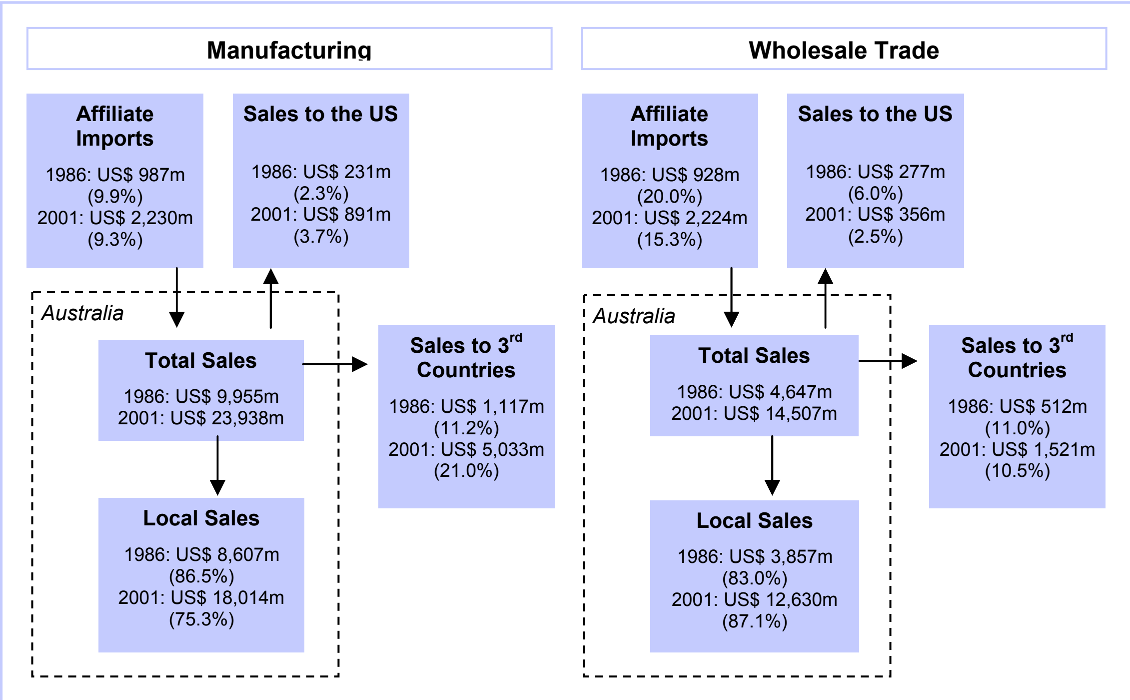


Figure 6-3: Different FDI Measures and their Relationships in Australia (Manufacturing and Wholesale Trade)

In 2001, the percentage of sales to third countries was larger than the average of 13.7% in mining and most of the manufacturing industries (in particular metals, food and chemicals), but less than the average in finance and services. The percentage of sales to the US was larger than the average of 2.9% in manufacturing (in particular electronics and food), finance and services, but less than the average in wholesale trade. Imports by affiliates were mainly used in wholesale trade (for further distribution), manufacturing (in particular transport equipment and chemicals), while their importance in mining, food manufacturing, finance and insurance and services was limited. Comparing the structure of manufacturing and wholesale trade sales in 2001, both imports by affiliates and local sales were relatively more important for wholesale trade, while exports to third countries and sales to the US were relatively more important for manufacturing than for wholesale trade.

6.1.2 Model Specification, Estimation and Evaluation

Having analysed industry-specific US FDI in Australia (Chapter 5.2.2) and discussed US FDI and US MNE activity in Australia in detail (Section 6.1.1), the next part of the analysis of Australian FDI will focus on five kinds of industry-specific "FDI flows' (*fdiformsi*): US affiliate exports from Australia to the US (*ussalesi*, indicating vertical FDI), local sales by US affiliates in Australia (*localsalesi*, indicating horizontal FDI), US affiliate exports from Australia to third countries (*thirdsalesi*, indicating export-platform FDI), total sales by US affiliates based in Australia (*totalsalesi*, indicating total FDI) and imports by US affiliates in Australia from US parents (*affimportsi*, indicating vertical integration).

The data series were used in Australian dollar and real form, i.e. the nominal series were deflated using the Australian GDP Implicit Deflator, so that *rfdiformsi* (or more specifically, *russalesi, rlocalsalesi, rthirdsalesi, rtotalsalesi* and *raffimportsi*) was used for further analysis. For each series, ten industries were included for a total of eleven years between 1988 and 1998, giving a maximum of 110 observations.[154] However, most series included a number of missing data points. None of the series included negative values. Figure 6-4 illustrates the five series and US FDI inflows in Australia for all industries combined to give an idea of the series – although industry-specific data were used for the analysis.

The analysis was conceptually based on Hansen et al. (2001) and Braconier et al. (2002) – as those two papers analysed the determinants of US exports, local sales, third country sales, total sales and affiliate imports, but it differed in terms of the determinants[155] and data that were analysed (in this study only Australian data were used).

As in the industry-specific FDI models, a combination of market size, factor costs, trade, risk factors and policy variables were used as the determinants of the different FDI forms. For the first part of the analysis the same combination of factors that were significant in the analysis of industry-specific US FDI in Australia (discussed in Chapter 5.2.2) were tested as determinants of the different FDI forms, i.e. industry-specific GDP (*ausgdpi*), industry-specific real wages (*ausrwages1i*), real imports from the US (*rimpous*), Australian customs duties (*auscdut*), real US outward FDI (*outrfdius*) and a set of industry dummies (*min, food, chem, mach, met, elec, tran, trd and fins*). For a summary of the factors see Table 6-3. For a definition of the variables and predicted signs, refer to Chapter 5.1.

It was tested how different FDI forms (vertical FDI, horizontal FDI, export-platform FDI, total FDI and vertical integration) were affected by those factors, and whether determinants differed depending on the FDI forms analysed. This model was stated as follows:[156]

---

[154] Eleven years between 1988 and 1998 is the maximum number of years available, as the series only started in 1988 and definitions changed after 1998. The nature of the changes in the definitions prevented any splicing of the series pre- and post-1988. The nine industries (Mining, Food, Chemicals, Machinery, Metals, Electronic Equipment, Transport Equipment, Trade and Finance/Insurance) were the same as for industry-specific US FDI in Australia analysed in Section 5.2.2. The sample ended in 1998 since the industry classification for the dependent variables changed in 1999. However, this was not the case for the FDI series, which is why a longer time period was used for the analysis in Chapter 5.2.2.

[155] This is partly because some of the determinants used in Hanson et al.'s and Braconier et al.'s analyses could only be analysed for a pool of countries and not a single country. Hansen et al. (2001) used GDP, GDP per capita, (1- tax rate), distance from the US, a dummy for English speaking countries, US skill intensity, average affiliate employment, transport costs, tariffs and non-tariff barriers, while Braconier et al. (2002) analysed Home GDP, Host GDP, distance, wage premium, investment costs, protection, time dummies, Home country dummies and a Home-country neighbour dummy as potential determinants.

[156] The original variables *ausrgdpi, ausrgdpi(-1)* and *ausrgdpi(-2)*, i.e. the variables before differencing (which was tested within the model) were included instead of *ΔΔausrgdpi.*

$$rfdiformsi_{it} = \alpha + \beta_{11}\, ausrgdpi_{it} + \beta_{12}\, ausrgdpi_{it-1} + \beta_{13}\, ausrgdpi_{it-2} + \beta_{21}\, ausrwages1i_{it} + \beta_{31}\, rimpous_t + \beta_{41}\, auscdut_t + \beta_{51}\, outrfdius_t + \beta_{52}\, outrfdius_{t-1} + \beta_{61}\, min_i + \beta_{62}\, food_i + \beta_{63}\, chem_i + \beta_{64}\, mach_i + \beta_{65}\, met_i + \beta_{66}\, elec_i + \beta_{67}\, tran_i + \beta_{68}\, trd_i + \beta_{69}\, fins_i + \varepsilon_{it}$$

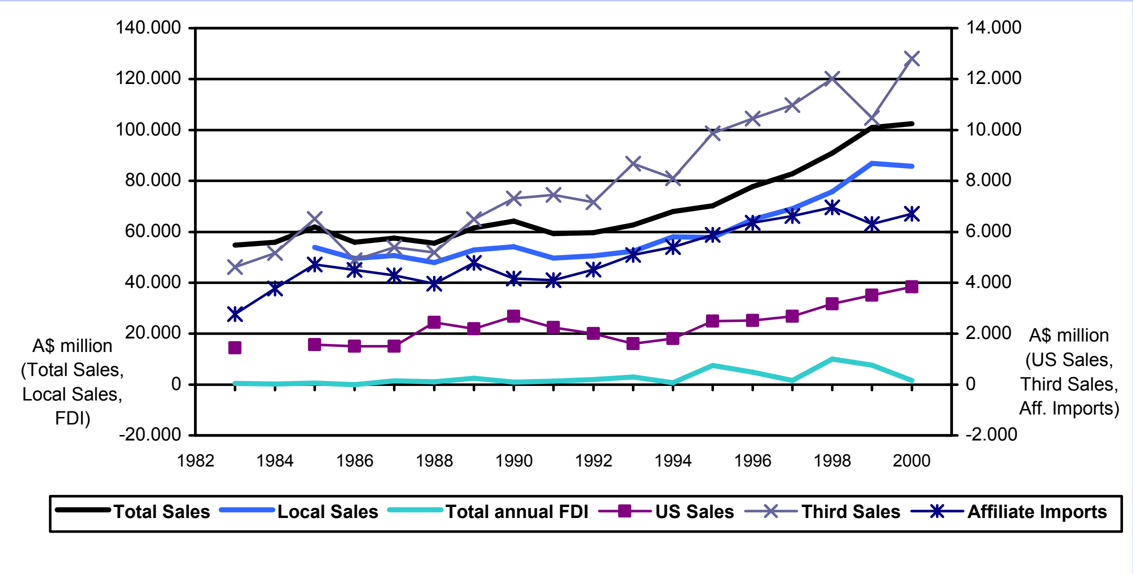


Figure 6-4: Total Sales, Local Sales, US Sales, Third-Country Sales, Affiliate Imports and Total Annual FDI by US firms in Australia, 1982 to 2001

For the second part of the analysis a broader range of factors (based on the general set-up described in Chapter 5.1) were used as potential determinants of various FDI forms in Australia.[157] These factors included market size (*ausrgdpi, ausempi*), factor costs (*ausrwages1i, ausempi*), trade (*rimpous, rexpous, ausopen, auscdut*), risk factors (*exrus, inrdifus, relinfus, ausindusi*), policy variables (*austax*) and other factors (*outrfdius, man*). For a summary of the factors see Table 6-3. For a definition of the variables and predicted signs refer to Chapter 5.1. The model was stated as:

$$rfdiformsi_{it} = \alpha + \beta_{11}\, ausrgdpi_{it} + \beta_{21}\, ausempi_{it} + \beta_{31}\, ausrwages1i_{it} + \beta_{41}\, rimpous_t + \beta_{51}\, rexpous_t + \beta_{61}\, ausopen_t + \beta_{71}\, auscdut_t + \beta_{81}\, exrus_t + \beta_{91}\, inrdifus_t + \beta_{101}\, relinfus_t + \beta_{111}\, ausindusi_{it} + \beta_{121}\, austax_t + \beta_{131}\, outrfdius_t + \beta_{141}\, man_i + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

Table 6-3

Determinants of Different Forms of US FDI in Australia, Industry-Specific Model	
Dependent Variables	
Different Forms of FDI Flows (Vertical FDI, Horizontal FDI, Platform FDI, Total Sales, Vertical Integration)	*rfidformsi (russales, rlocalsales, rthirdsales, rtotalsales, raffimports)*
Explanatory Variables (based on Chapter 5.2.2 – Industry-Specific FDI from the US in Australia)	
Industry-Specific Host Market Size/Growth	*ausrgdpi*
Industry-Specific Host Wage Rate	*ausrwages1i*

[157] Generally, a model could have been estimated that nests both individual models. However, the reason for the first model was to test how well the industry-specific FDI model for the US (Section 5.2.2) explained the different FDI forms, while the second model was a step to test which additional variables could be relevant if the first model does not explain the different FDI forms.

Trade between Home and Host	*rimpous*
Host Customs Duties	*auscdut*
Home Outward FDI	*outrfdius*
Industry Dummies	*min, food, chem, mach, met, elec, tran, trd, fins*
Market Size or Growth	
Industry-Specific Host Market Size	*ausgdpi*
Industry-Specific Employment	*ausempi*
Factor Costs	
Industry-Specific Host Wage Rate	*ausrwages1i*
Host Labour Supply	*ausuer*
Transport Costs and Protection	
Host Openness	*ausopen*
Trade between Home and Host	*rimpous, rexpous*
Host Customs Duties	*auscdut*
Risk Factors	
Exchange Rate Appreciation, LCU/A$	*exrus*
Interest Rate, Difference between Home and Host	*inrdifus*
Inflation, Relative (Home/Host)	*relinfus*
Industry-Specific Industrial Disputes	*ausindusi*
Policy Variables	
Host Corporate Tax Rate	*austax*
Other Factors	
Home Outward FDI	*outrfdius*
Dummy for Sector	*man*
Data Sources and Summary Statistics: See Appendix A.3, Table A.6 and A.7	

The first industry-specific model of various forms of US FDI in Australia was estimated in exactly the same way as the industry-specific FDI model for US FDI in Australia was estimated, i.e. as a fixed effects model using *ausrgdpi, ausrgdpi(-1), ausrgdpi(-2), ausrwages1i, rimpous, auscdut*, *outrfdius* and *outrfdius(-1)*. The parameters in the model are shown in Table 6-4.

The fit of the model was good for the five estimation equations. R^2s ranged from 82.2% to 96.7% and adjusted R^2s ranged from 78.5% to 96.0%.[158] While the equations for horizontal FDI and total FDI included many significant variables (most of the industry dummies, real wages, customs duties (for total FDI only) and US outward FDI (for horizontal FDI only) were significant), the equations for vertical FDI, platform FDI and vertical integration – despite their high R^2 – included many insignificant variables, indicating misspecification. In addition, *rimpous* was not significant in any of the five equations. The F-statistic showed that the null hypothesis that all the slope coefficients in a regression were zero was rejected in all five cases.

Table 6-4

Estimation Equation I, Industry-Specific Model of Various Forms of US FDI in Australia											
Dependent Variable: Different FDI Forms (*rfdiformsi*) **Sample: Time: 1988 – 1998, t = 11, N = 9, maximum of 99 observations included** **Least Squares (Fixed Effects Estimation)**											
Dependent Variable (real):		**Vertical FDI: Exports to the US (*russales*)**		**Horizontal FDI: Local Sales (*rlocalsales*)**		**Platform FDI: Exports to 3rd Countries (*rthirdsales*)**		**Total FDI: Total Sales (*rtotalsales*)**		**Vertical Integration: Imports from Parent (*raffimports*)**	
		MV: 35, Obs.: 64		**MV: 15, Obs.: 84**		**MV: 38, Obs.: 61**		**MV: 3, Obs.: 96**		**MV: 5, Obs.: 94**	
Variable	**Lags**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
C	**---**	-482.982	-0.951	19,936.760**	4.792	1542.629	1.091	12799.470**	3.118	1,716.496	0.820
ausrgdpi	**0**	-0.031**	-2.565	0.180*	1.529	0.030	0.899	0.184*	1.482	0.047	0.779
	1	0.012	0.665	-0.126	-0.721	0.002	0.037	-0.098	-0.527	-0.043	-0.464
	2	0.004	0.302	0.099	0.833	-0.017	-0.467	0.075	0.587	0.023	0.364

[158] Although the high R^2s are surprising considering the low number of significant explanatory variables, the fit only indicates that the dependent variables can be explained well using this particular set of explanatory variables. This does not indicate that the explanatory variables are better in explaining different forms of FDI than in explaining industry-specific FDI (Chapter 5.2.2), as these equations include different dependent variables.

ausrwages1i	**0**	0.810**	1.904	-12.104**	-3.515	-0.201	-0.170	-7.241**	-2.069	-1.966	-1.101
rimpous	**0**	0.018	1.138	-0.171	-1.072	-0.080*	-1.628	0.051	0.348	-0.025	-0.361
auscdut	**0**	31.493	1.244	505.787**	1.792	-30.760	-0.326	455.464**	2.026	26.162	0.253
outrfdius	**0**	0.000	-0.316	0.024**	1.797	0.005	1.324	0.009	0.719	0.008	1.298
	1	0.000	-0.026	0.029*	1.665	0.004	0.657	0.016	1.138	-0.002	-0.268
min	**---**	---	---	---	---	---	---	---	---	---	---
food	**---**	-286.215	-1.237	10,187.520**	-5.442	478.425	0.735	-7316.279**	-3.941	-458.870	-0.473
chem	**---**	93.228	0.387	10,268.300**	-5.395	1475.432**	2.187	-5830.533**	-3.108	-93.832	-0.096
mach	**---**	-263.165	-1.139	13,076.420**	-7.014	-126.031	-0.194	-11119.720**	-6.018	-376.664	-0.391
met	**---**	-332.318	-1.395	13,925.210**	-7.268	-361.992	-0.542	-12269.340**	-6.520	-531.964	-0.543
elec	**---**	-289.199	-1.253	14,164.020**	-7.597	-505.938	-0.780	-12652.100**	-6.867	-557.869	-0.581
tran	**---**	-200.802	-0.869	-9,596.917**	-5.140	-446.973	-0.687	-7497.226**	-4.058	-315.987	-0.329
trd	**---**	934.455**	2.852	13,335.950**	-4.389	100.420	0.109	-9277.287**	-2.982	387.759	0.248
fins	**---**	95.045	0.494	15,588.430**	-8.839	-952.206**	-1.765	-14466.320**	-8.046	-1,201.909	-1.306
** significant at 10% critical value, * significant at 15% critical value											
R-squared		0.884		0.967		0.908		0.967		0.822	
Adjusted R-sq		0.844		0.959		0.875		0.960		0.785	
SE of regression		73.746		770.563		204.409		858.818		410.428	
Sum squared res		255,608.700		39,782,371.000		1,838,449.000		58,267,827.000		12,970,760.000	
DW stat		2.051		1.051		1.087		0.879		2.466	
F-statistic		22.346		122.174		27.231		144.737		22.176	
Prob (F-statistic)		0.000		0.000		0.000		0.000		0.000	

In order to evaluate the adequacy of the model, a series of diagnostic tests was performed, including the test of hypotheses of correct specification with regard to homoscedasticity, non-autocorrelation and correct functional form (RESET-test). The test results are stated in Table 6-5.

Table 6-5

Diagnostic Tests I (5% critical values), Industry-Specific Model of Various Forms of US FDI in Australia						
		Vertical FDI: Exports to the US	**Horizontal FDI: Local Sales**	**Platform FDI: Exports to 3rd Countries**	**Total FDI: Total Sales**	**Vertical Integration: Imports from Parent**
Heteroscedasticity	**White LR-test**	$\chi^2(8)$ = -87.170 Prob = 1.000	$\chi^2(8)$ = 40.960* Prob = 0.000	$\chi^2(8)$ = -118.240 Prob = 1.000	$\chi^2(8)$ = 57.040* Prob = 0.000	$\chi^2(8)$ = 130.460* Prob = 0.000
Autocorrelation	**F-test**	F(1,47) = 0.018 P = 0.893	F(1,70) = 17.286* P = 0.000	F(1,44) = 2.413 P = 0.128	F(1,86) = 34.570* P = 0.000	F(1,82) = 2.732 P = 0.102
Misspecification	**RESET(1)**	F(1,46) = 4.075* P = 0.049	F(1,66) = 0.462 P = 0.499	F(1,43) = 12.337* P = 0.001	F(1,78) = 0.487 P = 0.488	F(1,76) = 15.171* P = 0.002
	RESET(2)	F(2, 45) = 8.028* P = 0.001	F(2, 65) = 6.892* P = 0.002	F(2, 53) = 7.664* P = 0.002	F(2, 53) = 16.279* P = 0.000	F(2,75) = 129.005* P = 0.000
* significant at 5% critical value						

The hypothesis of homoscedasticity was not rejected at a 5% critical value in the vertical FDI and platform FDI equation, but it was rejected in the horizontal FDI, total FDI and vertical integration equation. The hypotheses of non-autocorrelation and correct functional form were rejected in many cases. Only for vertical FDI, platform FDI and vertical integration was the hypothesis of non-autocorrelation not rejected, while horizontal FDI and total FDI were the only two cases for which the hypothesis of correction functional form (RESET(1)) was not rejected. RESET(2) was rejected for all five equations.[159] Although two of the five equations (vertical and platform FDI) were correctly specified in terms of heteroscedasticity and autocorrelation, the equations had some specification problem when the RESET-test was applied to test for correct functional form.

[159] Experimenting with up to three lags for some of the variables (such as *ausgdpi, ausempi* and *ausrwages1i*) did not improve autocorrelation and RESET. Hence, some determinants must exist that were not included in this model. However, adding a lagged dependent variable also improved autocorrelation.

The second industry-specific model of US form-specific FDI in Australia was estimated using a broader set of variables (*ausgdpi, ausempi*, *ausrwages1i, ausuer, ausopen, rimpous, rexpous, auscdut*, *exrus, inrdifus, relinfus, ausindusi*, *austax*, *outrfdius* and *man*). The parameters in the model were estimated using OLS and are shown in Table 6-6.[160]

Table 6-6

Estimation Equation II, Industry-Specific Model of Various Forms of US FDI in Australia											
Dependent Variable: Different FDI Forms (*rfdiformsi*) **Sample: Time: 1988 – 1998, t = 11, N = 9, maximum of 99 observations included** **Least Squares**											
Dependent Variable:		**Vertical FDI: Exports to the US (*russales*)**		**Horizontal FDI: Local Sales (*rlocalsales*)**		**Platform FDI: Exports to 3rd Countries (*rthirdsales*)**		**Total FDI: Total Sales (*rtotalsales*)**		**Vertical Integration: Imports from Parent (*raffimports*)**	
		MV: 46, Obs.: 64		**MV: 26, Obs.: 84**		**MV: 49, Obs.: 61**		**MV: 14, Obs.: 96**		**MV: 16, Obs.: 94**	
	Lags	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**	**Coeff.**	**t-stat**
C	---	-220.8878	-0.147	-4428.384	-0.175	-4069.530	-0.645	-13085.960	-0.400	136.963	0.024
ausrgdpi	0	-0.021**	-3.059	-0.042	-0.366	-0.002	-0.079	-0.133	-0.939	0.002	0.065
ausempi	0	0.721**	6.557	9.680**	5.449	1.404**	3.077	13.239**	6.390	2.021**	5.827
ausrwages1i	0	0.987**	2.999	15.268**	3.326	1.574	1.093	20.575**	4.986	0.510	0.761
ausuer	0	-28.354	-0.282	-219.045	-0.129	-137.059	-0.323	-260.445	-0.120	235.077	0.635
ausopen	0	71.698	0.447	55.136	0.021	396.850	0.589	262.733	0.078	-277.537	-0.491
rimpous	0	-0.004	-0.030	-0.190	-0.089	-0.502	-0.957	-0.505	-0.196	0.314	0.718
rexpous	0	0.012	0.182	-0.068	-0.062	0.222	0.823	0.111	0.079	-0.040	-0.163
auscdut	0	80.402	0.582	-595.587	-0.259	146.938	0.254	-687.249	-0.237	131.341	0.268
exrus	0	-2139.405	-0.542	-2735.183	-0.042	-1729.229	-0.105	-1410.490	-0.017	3285.095	0.226
inrdifus	0	-3.063	-0.157	-61.002	-0.168	36.487	0.415	-113.436	-0.269	27.588	0.387
relinfus	0	-17.330	-0.323	20.553	0.023	-152.888	-0.671	-143.131	-0.127	120.255	0.637
ausindusi	0	-0.0182	-0.641	0.539	1.424	0.058	0.482	0.198	0.867	0.031	0.839
austax	0	-13.570	-0.745	63.435	0.187	-52.549	-0.658	130.662	0.319	-52.726	-0.762
outrfidus	0	-0.009	-0.896	-0.008	-0.052	-0.003	-0.065	0.011	0.051	0.007	0.201
man	0	-1028.340**	-4.613	-8058.919**	-2.070	-757.858	-0.794	-11918.280**	-2.514	-1348.097**	-1.699
** significant at 10% critical value, * significant at 15% critical value											
R-squared		0.788		0.774		0.621		0.684		0.795	
Adjusted R-squared		0.721		0.724		0.494		0.625		0.756	
S.E. of regression		98.645		1,996.928		411.112		2642.221		436.735	
Sum squared resid		467,082.800		271,000,000.000		7,605,569.000		559,000,000.000		14,877,541.000	
Durbin-Watson stat		1.194		0.240		0.491		0.146		2.206	
F-statistic		11.873		15.536		4.906		11.534		20.224	
Prob (F-statistic)		0.000		0.000		0.000		0.000		0.000	

The fit of this second model was not as good as that of the first model, but R^2s were still reasonably high, ranging from 62.1% to 79.5%. Adjusted R^2s ranged from 49.4% to 75.6%. Despite the high R^2s, the equations included only a few significant variables: *ausempi* was significant in all but the vertical integration equation*, ausrwages1i* and *man* were significant in all but the platform FDI equation and *ausrgdpi* was significant in the vertical FDI equation. The other variables (*ausuer, ausopen, rimpous, rexpous, auscdut, exrus, inrdifus, relinfus, ausindusi* and *austax*) were insignificant in any of the five equations. The F-statistic showed that the null hypothesis that all the slope coefficients in a regression are zero was rejected in all five cases.

Again, the adequacy of the model was evaluated by performing a series of diagnostic tests, including the test of hypotheses of correct specification with regard to homoscedasticity, non-autocorrelation and correct functional form (RESET-test). The test results are stated in

[160] While fixed effects estimation was possible for all five models (the random effects model could not be estimated since the number of cross sections was smaller than the number of coefficients), the results are not stated here since fixed effects estimation did not improve the significance of the explanatory variables and led to misspecification (such as autocorrelation). Industry dummies appeared to be significant in the the horizontal and total FDI equation, but not in the remaining three equations. It was left for further research to find more appropriate specifications of the data generating processes.

Table 6-7. For second model, the results were just as poor as the ones for the first model. The results from the diagnostic tests of the model indicated that the hypotheses of homoscedasticity were not rejected at a 5% critical value in any of the five cases. The hypotheses of non-autocorrelation and correct functional form, however, were rejected in most cases. Only for vertical FDI and vertical integration was the hypothesis of non-autocorrelation not rejected, while platform and total FDI were the only two cases where the hypothesis of correction functional form (RESET(1)) was not rejected. RESET(2) was rejected for all equations but platform FDI. Although two of the five equations (horizontal FDI and vertical integration) were correctly specified in terms of heteroscedasticity and autocorrelation, all equations except for platform FDI had some specification problem they were tested for correct functional form (RESET-test). While the equation for platform FDI was correctly specified in terms of heteroscedasticity and correct functional form, there was some misspecification in the form of autocorrelation in the equation.

Table 6-7

Diagnostic Tests II (5% critical values), Industry-Specific Model of Various Forms of US FDI in Australia						
		Vertical FDI: Exports to the US	**Horizontal FDI: Local Sales**	**Platform FDI: Exports to 3rd Countries**	**Total FDI: Total Sales**	**Vertical Integration: Imports from Parent**
Heteroscedasticity	**White LR-test**	$\chi^2(8)$ = -261.220 Prob = 1.000	$\chi^2(8)$ = -421.950 Prob = 1.000	$\chi^2(8)$ = -343.490 Prob = 1.000	$\chi^2(8)$ = -463.350 Prob = 1.000	$\chi^2(8)$ = -260.710 Prob = 1.000
Autocorrelation	**F-test**	F(1,46) = 3.800 P = 0.057	F(1, 69) = 224.263 P = 0.000	F(1,43) = 12.192 P = 0.001	F(1, 85) = 504.002 P = 0.000	F(1, 81) = 0.388 P = 0.535
Misspecification	**RESET(1)**	F(1,47) = 9.819 P = 0.003	F(1,67) = 4.606 P = 0.036	F(1,44) = 0.122 P = 0.728	F(1,79) = 3.017 P = 0.086	F(1,77) = 13.455 P = 0.000
	RESET(2)	F(2,46) = 8.241 P = 0.001	F(2, 66) = 6.476 P = 0.003	F(2,43) = 0.167 P = 0.847	F(2, 78) = 3.849 P = 0.026	F(2, 76) = 7.097 P = 0.002
* significant at 5% critical value						

6.1.3 RESULTS

Owing to misspecification, one should refrain from reading too much into the results of the analysis of different forms of US FDI flows and one has to be cautious with interpretations. One important result of this analysis is that the five FDI forms and industry-specific US FDI flows differed in terms of their determinants and, therefore, they should best be analysed individually.

Comparing the two models, real wages appeared to be important in determining most FDI forms, but since the models were misspecified and the variables had different signs in the different models (real wages were positive for vertical FDI in the first model and vertical integration and vertical, horizontal and total FDI in the second model, but negative for horizontal, platform and total FDI in the first model), the sign of the effect was unclear. The importance of real wages for all forms of FDI (particularly total FDI) is surprising since this variable should have different effects on different forms of FDI. While it was expected to have a negative effect on vertical and platform FDI, it was expected to have no effect on horizontal FDI (or a positive effect if higher wages reflect a higher skill level). Since the majority of FDI in Australia is horizontal FDI and little FDI is of the vertical or platform variety, real wages should not affect total FDI in the same way as they affect vertical or platform FDI. However, the importance of real wages could also be due to real wages picking up some factors that were not included in the model, suggesting possible specification bias. The other potentially important variables were US outward FDI flows (with a positive effect on horizontal, platform and total FDI in the first model) and industry-specific employment (with a positive effect on horizontal, vertical, platform and total FDI in the second model). Industry-specific GDP could be an important (but possibly negative) determinant of vertical US FDI, while Australian customs duties could (positively) determine total US FDI. The significance of the industry dummies in the first model and the manufacturing dummy in the second model could indicate that fixed effect estimation is most appropriate.

In order to explore which combination of variables should be used to best explain the different FDI forms, a more detailed analysis needs to be carried out, exploring each case individually, testing for different specifications (OLS, fixed effects or random effects estimation) and experimenting with alternative variables until more appropriate specifications are found. Since such analysis goes beyond the scope of this study (this chapter is only a case study with a specific focus on US FDI and does not cover total Australian FDI), it was left for further research. Nevertheless, the variables used in this analysis gave an indication as to which variables might be useful as determinants of the different FDI forms.

6.2 VERTICAL INTEGRATION IN AUSTRALIA

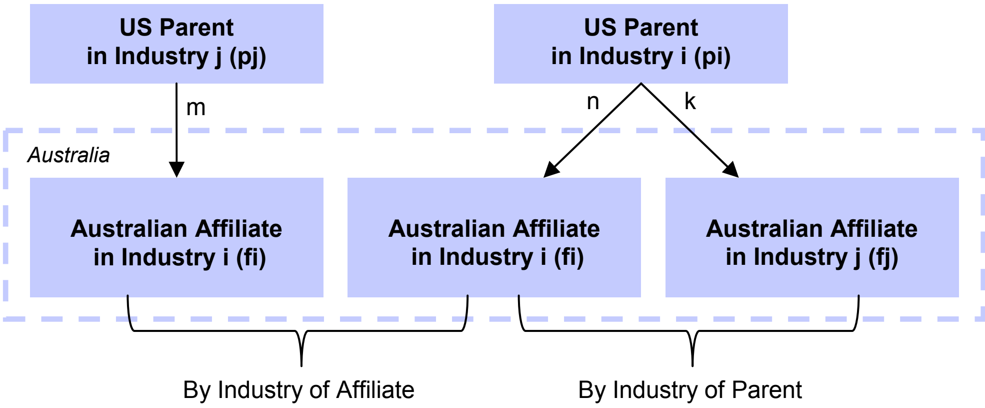
6.2.1 MEASURING THE INTENSITY OF VERTICAL INTEGRATION FOR US MNEs IN AUSTRALIA: METHOD AND DATA DESCRIPTION

Following the analysis of different forms of US FDI flows to Australia, another way to analyse Australian FDI in more detail is to measure the intensity (or proportion) of horizontally integrated MNEs (or horizontal MNEs, HMNEs) relative to vertically integrated MNEs (or vertical MNEs, VMNEs) for US FDI in Australia – as done by Tang (2002).

In HMNEs, the US parents and their foreign affiliates operate in the same industry, i.e. the production activities based in Home are replicated in a Host country. The case where both the US parent and the US affiliate in Australia operate in primary industry i is shown in Figure 6-4. This part of the MNE's operation in Australia can be written as $\sum_n a^t_{fi,pi,n}$, which depicts the operation that can be described using sales, employment or assets (a) of n HMNEs in industry i (i.e. at time t, there are n MNEs where both parents (p) and affiliates (f) operate in industry i).

In VMNEs, US parents and their foreign affiliates operate in different stages of the production process, which are geographically fragmented, so that parents and foreign affiliates may operate in different industries. In Figure 6-5, this describes the case where the US parent and the US affiliate in Australia operate in different industries, e.g. industry j for the parent and i for the affiliate or industry j for the affiliate and i for the parent. This part of MNE operation in Australia can be written as $\sum_m a^t_{fi,pj,m}$ or $\sum_k a^t_{fj,pi,k}$, describing the operation of m VMNEs at time t with parents in industry j and affiliates in industry i, and k VMNEs with parents in industry i and affiliates in industry j.

Overall, in terms of industry of affiliate, the combination of m and n describes all the firms operating in industry i. In terms of the industry of parent, the combination of n and k describes all the firms operating in industry i. The case of diversified MNEs (parents and affiliates operate in many industries without having production linkage) is ignored for this analysis, as it could not be calculated. Hence, this leads to the overestimation of the number of VMNEs.



where:
i, j are industries (Petroleum, Food, etc),
t is the year (1989, 1991, 1996 and 2001),
n is the number of affiliates in industry i whose parents are in industry i,
m is the number of affiliates in industry i whose parents are in industry j,
k is the number if affiliates in industry j whose parents are in industry i and
a is sales, assets or employment in general
F is sales, assets or employment in terms of industry of affiliate
P is sales, assets or employment in terms of industry of parent

So that:

MNEs by industry of affiliate: $F^t_i = \sum_n a^t_{fi,pi,n} + \sum_m a^t_{fi,pj,m}$

MNEs by industry of parent: $P^t_i = \sum_n a^t_{fi,pi,n} + \sum_k a^t_{fj,pi,k}$

Source: based on Tang, 2002, p.480

Figure 6-5: The Primary Industry of US Parent Firms and their Majority-Owned Foreign Affiliates

According to Markusen et al. (1996), one should expect HMNEs to dominate when countries are similar in size and development, trade costs are high and firm-level scale economies are greater than plant-level scale economies, while VMNEs should dominate when countries differ in relative factor endowment. The estimation of horizontal or vertical intensity for FDI, i.e. whether MNEs are horizontally integrated or vertically integrated, is important as different forms of MNEs may have different effects on the Host (or in this case Australian) economy, for instance on trade.

The data used for this analysis were for majority-owned, non-bank affiliates of US-headquartered corporations with operations in Australia collected by the US Bureau of Economic Analysis (BEA) for thirteen years between 1989 and 2001 for the descriptive analysis and for the ten years between 1989 and 1998 for the econometric analysis.[161] While the descriptive part of the analysis focuses on a variety of industries, the empirical analysis employs twelve manufacturing industries and eight non-manufacturing industries. The dataset is similar to the one used by Tang (2002) though her analysis was based on nine Host countries for three years (1994 to 1996), using fourteen manufacturing and three non-manufacturing industries.

---

[161] As in Section 6.1, the sample for the econometric analysis ends in 1998, as the industry classification for the dependent variables changed in 1999.

In contrast with the analysis in Section 6.1, which was based on a variety of datasets related to sales by affiliates, the dataset used in this analysis included a combination of sales, employment and assets by affiliates to explore whether US FDI has led to the creation of HMNEs or VMNEs in Australia. Using the different variables describing MNE operation (i.e. sales, employment and assets) by industry of affiliate as an example[162], Figure 6-6 links Figure 6-1 and Figure 6-5, with Total Affiliate Sales (industry i) being the linkage.

Turning to the calculation of the share of VMNEs, which was based on Tang (2002)'s methodology, the share of VMNEs in terms of industry of affiliate – for those industries where affiliate sales, employment or assets were smaller than sales, employment or assets by parents – could theoretically be calculated as:

$$\theta_i^t = \frac{\sum_k a^t_{fj,pi,k}}{\left(\sum_n a^t_{fi,pi,n} + \sum_k a^t_{fj,pi,k}\right)} = \frac{\sum_k a^t_{fj,pi,k}}{P^t_i}$$

This value could not be calculated with the dataset used for this analysis since the numerator was not directly observable. An alternative was to calculate the lower bound of the value as (1 – F^t_i/P^t_i), as the share of VMNEs was equal to the total minus the share of HMNEs (which is F^t_i/P^t_i). This method included an error of $-\left(\sum_m a^t_{fi,pj,m}\right)/P^t_i$, i.e. the estimated share was $-\left(\sum_m a^t_{fi,pj,m}\right)/P^t_i$ less than θ:

$$(1 - \frac{F^t_i}{P^t_i}) = \frac{\sum_k a^t_{fj,pi,k} - \sum_m a^t_{fi,pj,m}}{P^t_i} < \frac{\sum_k a^t_{fj,pi,k}}{P^t_i} = \theta_i^t$$

The share of VMNEs in terms of industry of affiliate – for those industries where affiliate sales, employment or assets were larger than parent sales, employment or assets – would be:

$$\theta_i^t = \frac{\sum_m a^t_{fi,pj,m}}{\left(\sum_n a^t_{fi,pi,n} + \sum_m a^t_{fi,pj,m}\right)} = \frac{\sum_m a^t_{fi,pj,m}}{F^t_i}$$

Again, this formula could not be calculated with the dataset used for this analysis since the numerator was not directly observable. The lower bound of the value was calculated as (1 – P^t_i/F^t_i) since the share of VMNEs was equal to the total minus the share of HMNEs (which is P^t_i/F^t_i). This included an error of $-\left(\sum_k a^t_{fi,pj,k}\right)/F^t_i$, i.e. the estimated share was $-\left(\sum_k a^t_{fi,pj,k}\right)/F^t_i$ less than θ:

$$(1 - \frac{P^t_i}{F^t_i}) = \frac{\sum_m a^t_{fi,pj,m} - \sum_k a^t_{fj,pi,k}}{F^t_i} < \frac{\sum_k a^t_{fi,pj,m}}{F^t_i} = \theta_i^t$$

[162] For MNE operations (sales, employment and assets) by industry of parent, the figure would look similar, though only one industry on the parent side (industry i) and two industries on the affiliate side (industry i and j) need to be considered, so that total sales in industry i and in industry j need to be split up into affiliate imports, exports to US, exports to third countries and local sales.

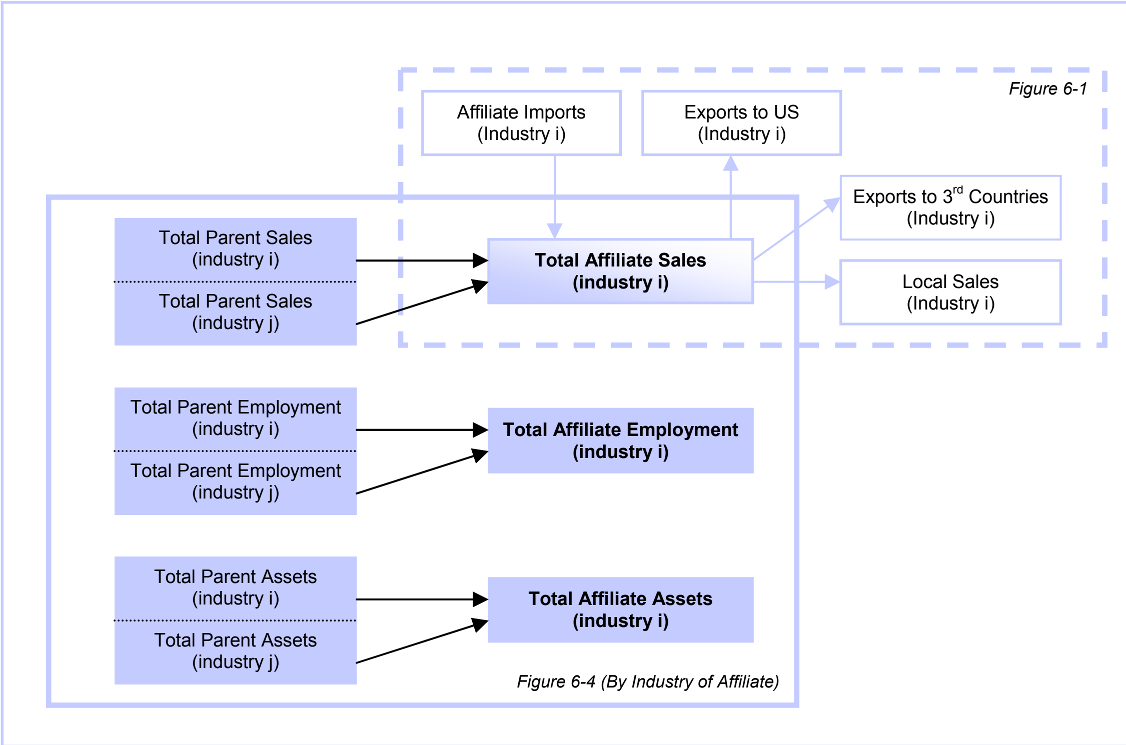


Figure 6-6: Different FDI Measures and their Relationships and the Link between the Industries of US Parent Firms and their Foreign Affiliates

Tang (2002) suggested that the actual share should be derived using the (exchange rate adjusted) data from two consecutive years. This derivation was done based on the assumption that the different-from-parent components and the proportion of VMNEs did not change over the two years, and that the change over time was solely caused by the parallel-to-parent component $\sum_n a^t_{fi,pi,n}$. Applying this method to the Australian data for 1989 to 2001 did not deliver convincing results, so the lower bound of the share of VMNEs in all MNEs was used for further analysis, keeping in mind that an error was included and that actual shares may be larger than those estimated.[163]

Nevertheless, some interesting patterns emerged. Employment, sales or assets of the affiliates in petroleum (or mining in 2001) and manufacturing (except for chemicals) were smaller than employment, sales or assets of the US parents in the relevant industry. Hence, some of the US parents in petroleum or mining had subsidiaries in other industries such as wholesale trade, finance and insurance, services or other industries.

[163] How large the actual shares may be, can be seen when looking at Tang's (2002) result for the VMNEs intensity, which was measured using an approximation that excluded the error term. She then used an average of VMNE intensity for sales, employment and assets for US FDI in Australia between 1994 and 1996 to show that 64% of wholesale trade, 47% of finance and 29% of services MNEs were VMNEs. For the six manufacturing industries analysed, she found that 50% of food, 28% of chemicals, 81% of metals, 65% of industrial machinery, 69% of electronic equipment and 52% of transport equipment MNEs were VMNEs. For eight additional manufacturing industries (here included in other manufacturing), she found that 49% of textile products and apparel, 76% of lumber, wood, furniture and fixtures, 72% of paper, 37% of printing and publishing, 79% of rubber products, 40% of miscellaneous plastics products, 70% of stone, clay and non-metallic minerals and 31% of instruments and related products MNEs were VMNEs.

The share of VMNEs in terms of industry of affiliate (Table 6-8) – for those industries where affiliate sales, employment or assets were smaller than parent sales, employment or assets – was between 4% in the sales of other manufacturing (in 1989 and 1996), 6% of the sales in electrical equipment manufacturing (in 1989) and 81% of the sales in metal manufacturing (in 1996). The share ranged from 1% in the employment in electrical equipment manufacturing (in 1989) to 67% in the employment in metal manufacturing (in 1991) and from 3% of assets in electrical equipment manufacturing (in 1989) to 91% of assets in metal manufacturing (in 1991). Overall, the share of VMNEs was between 9% and 35% in petroleum, 24% and 69% in total manufacturing and 9% to 17% in finance and insurance between 1989 and 2001.

The share of VMNEs in terms of industry of parent (Table 6-9) – for those industries where affiliate sales, employment or assets are larger than parent sales, employment or assets – ranged from 13% in the sales of chemical manufacturing (in 1996) – excluding the 0% in metals and 5% in services in 2001 – to 87% of the sales in wholesale trade (in 1989). The share was between 3% in the employment in chemical manufacturing (in 1996) and 94% in the employment in wholesale trade (in 1989) and between 2% of assets in other manufacturing (in 1989) and 91% of assets in wholesale trade (in 1989). Overall, the share of VMNEs was between 3% and 45% in chemical manufacturing, 60% to 94% in wholesale trade, 18% to 78% in finance and insurance, 5% to 54% in services and 10% and 67% in other industries.

Table 6-8

The Share of VMNEs in Australian Sales, Employment and Assets by US MNEs – in terms of Industry of Affiliate

Lower Bound of Share of Vertical MNEs (θ) if $F_i < P_i$		Petroleum	Manufacturing								Wholesale Trade	Finance and Insurance	Services	Other Industries
			Total	Food	Chemicals	Metals	Industrial Machinery	Eletronic Equipment	Transport Equipment	Other Manufacturing				
Sales	**1989**	0.094	0.275	0.174	---	0.773	0.642	0.059	0.256	0.040	---	---	---	---
	1991	0.102	0.286	0.230	---	0.774	0.575	0.095	0.316	0.090	---	---	---	---
	1996	0.154	0.309	0.160	---	0.809	0.699	0.583	0.215	0.044	---	---	---	---
	2001*	---	*0.385*	---	*0.015*	*0.000*	*0.722*	*0.644*	*0.176*	*0.691*	---	---	---	---
Employment	**1989**	0.183	0.277	0.443	---	0.558	0.485	0.014	0.235	0.054	---	0.085	---	---
	1991	0.179	0.312	0.486	---	0.674	0.376	0.049	0.304	0.087	---	0.103	---	---
	1996	0.288	0.297	0.496	---	0.586	0.396	0.500	0.248	---	---	0.169	---	---
	2001*	---	*0.241*	*0.089*	*0.026*	---	*0.426*	*0.856*	*0.221*	*0.344*	---	---	---	---
Assets	**1989**	0.186	0.425	---	---	---	0.732	0.031	0.668	---	---	---	---	---
	1991	0.291	0.413	0.395	---	0.844	0.702	0.079	0.671	---	---	---	---	---
	1996	0.349	0.464	0.427	---	0.906	0.659	0.819	0.667	0.109	---	---	---	---
	2001*	--	*0.690*	*0.397*	*0.011*	*0.219*	*0.863*	*0.673*	*0.667*	*0.848*	---	---	*0.011*	---
Ratio	**1989**	0.154	0.326	---	---	---	0.620	0.035	0.386	---	---	---	---	---
	1991	0.191	0.337	0.370	---	0.764	0.551	0.074	0.430	---	---	---	---	---
	1996	0.264	0.357	0.361	---	0.767	0.585	0.634	0.377	---	---	---	---	---
	2001*	---	*0.439*	--	*0.017*	---	0.670	0.724	0.355	*0.628*	---	---	---	---

Share of vertical MNEs (θ) = $1 < \theta < (1-F_i/P_i)$
F_i:Sales (Employment, Assets) by Industry of Affiliate
P_i:Sales (Employment, Assets) by Industry of Parent

** The Petroleum category is changed to Mining in 2001 and thus includes a different industry mix. Hence, the industry categories before and after 2001 are not directly comparable.*
Data Source: US Department of Commerce, Bureau of Economic Analysis (BEA), Surveys of US Direct Investment Abroad 1989, 1991, 1996, 2001

For more Industry Detail see Appendix A.4, Table A.8

Table 6-9

The Share of Vertical MNEs in Australian Sales, Employment and Assets by US MNEs – in terms of Industry of Parent														
			Manufacturing											
Lower Bound of Share of Vertical MNEs (θ) if $F_i > P_i$		Petroleum	Total	Food	Chemicals	Metals	Industrial Machinery	Eletronic Equipment	Transport Equipment	Other Manufacturing	Wholesale Trade	Finance and Insurance	Services	Other Industries
Sales	1989	---	---	---	0.282	---	---	---	---	---	0.867	0.303	0.476	0.171
	1991	---	---	---	0.211	---	---	---	---	---	0.846	0.402	0.487	0.278
	1996	---	---	---	0.131	---	---	---	---	---	0.778	0.366	0.448	0.306
	*2001**	*0.745*	---	*0.136*	---	*0.000*	---	---	---	---	*0.730*	*0.337*	*0.048*	*0.093*
Employment	1989	---	---	---	0.081	---	---	---	---	---	0.942	---	0.145	0.380
	1991	---	---	---	0.029	---	---	---	---	---	0.920	---	0.253	0.431
	1996	---	---	---	0.124	---	---	---	---	0.084	0.599	---	0.542	0.674
	*2001**	*0.583*	---	---	---	*0.284*	---	---	---	---	*0.619*	*0.180*	*0.046*	*0.124*
Assets	1989	---	---	---	0.453	---	---	---	---	0.019	0.910	0.675	0.194	0.497
	1991	---	---	---	0.395	---	---	---	---	0.097	0.872	0.696	0.318	0.509
	1996	---	---	---	0.416	---	---	---	---	---	0.624	0.780	0.397	0.254
	*2001**	*0.840*	---	---	---	---	---	---	---	---	*0.765*	*0.419*	---	*0.444*
Ratio	1989	---	---	---	0.272	---	---	---	---	---	0.906	---	0.272	0.349
	1991	---	---	---	0.212	---	---	---	---	---	0.879	---	0.353	0.406
	1996	---	---	---	0.224	---	---	---	---	---	0.667	---	0.462	0.411
	*2001**	*0.723*	---	---	---	---	---	---	---	---	0.705	*0.312*	---	*0.220*

Share of vertical MNEs (θ) = 1 <θ< $(1-P_i/F_i)$
F_i:Sales (Employment, Assets) by Industry of Affiliate
P_i:Sales (Employment, Assets) by Industry of Parent

** The Petroleum category is changed to Mining in 2001 and thus includes a different industry mix.*
Data Source: US Department of Commerce, Bureau of Economic Analysis (BEA), Surveys of US Direct Investment Abroad 1989, 1991, 1996, 2001

For more Industry Detail see Appendix A.4, Table A.9

While limited in their accuracy, these results show that the share of VMNEs is industry-dependent and does not only vary across industries, but also over time. However, the importance of VMNEs should not be ignored. Although HMNEs dominated overall, the assumption that all MNEs (or in this case all US MNEs) are horizontal gives a wrong picture of MNE activity in Australia – if US data are indicative of the total MNE activity.

6.2.2 Model Specification, Estimation and Evaluation

Having discussed the share of vertical US MNEs in Australia in detail (Section 6.2.1), the next part of the analysis of Australian FDI will focus on four different measures of industry-specific VMNE intensity: VMNE intensity for assets, employment, sales and the ratio of the three – in terms of industry of affiliate (*avii*) and industry of parent (*pvii*), i.e. eight dependent variables were analysed (*aviassetsi, aviempi, avisalesi, aviratioi, pviassetsi, pviempi, pvisalesi, pviratioi*).

Industry-specific VMNE intensity (θ) was originally (in Section 6.2.1) defined as a ratio between zero and one. Hence, the variable is bounded. However, in order to estimate the model using OLS, the variable should be unbounded and lie between ∞ and -∞. It was assumed that the original dependent variable (y) could be written as:

$$y = \frac{1}{1+e^{-x}} \text{ for } 0 < y < 1.$$

To get a number between ∞ and -∞, the function needed to be inversed (with x describing the inverse of y):

$$x = \ln(\frac{y}{1-y})$$

So with θ as the original dependent variable that was defined in Section 6.2.1, *vii* could be calculated as:

$$vii = \ln(\frac{\theta}{1-\theta})\,.$$[164]

The dependent variables were ratios and did not need to be deflated. For each series, twenty industries[165] were included for a total of ten years between 1989 and 1998, giving a maximum of 200 observations. The model for VMNE intensity in terms of industry of affiliate includes only fourteen of the industries, giving a maximum of 140 observations, while the model for VMNE intensity in terms of industry of parent includes eight industries, giving a maximum of 80 observations. Most series included a number of missing data points. While the original (θ) series contained values between zero and one, the *vii* series included some negative values.

As was the case with the derivation of the variables, the analysis was conceptually based on Tang (2002)[166] and it used a similar set of determinants[167], but differed in terms of measurement of VMNE intensity. Only two alternative methods were chosen for this analysis, one for VMNE intensity by industry of affiliate (when affiliate operations in one industry were smaller than parent operations), and the other for VMNE intensity by industry of parent (when affiliate operations in one industry were larger than parent operations) instead of a variety of measures for individual cases. The analysis also differed in terms of data (only Australian data were analysed).

[164] While Tang (2002) did not take this approach, it seemed appropriate from an econometric perspective.

[165] The industries were: mining, food, chemicals, machinery, metals, electronics, transport equipment, construction, wholesale trade, restaurants, communications, finance, real estate/business services, transport services, textiles, lumber/wood, paper, printing, rubber products and instruments.

[166] Tang (2002) used the following equation to estimate the ratio of VMNEs: $\theta^t_{ic} = \beta_0 + \beta_1 lfwage^t_{ic} + \beta_2 lgdp^t_c + \beta_3 lpscale^t_i + \beta_4 lfscale^t_i + \beta_5 lfserve^t_c + \beta_6 freight^t_{ic} + \beta_7 tariff_{ic} + \beta_8 eu + \beta_9 nafta + \beta_{10} d94 + \beta_{11} d95 + \mu^t_{ic}$. $lfwage^t_{ic}$ was the log of average employee compensation per worker for industry i, $lgdp^t_c$ was the log value of the absolute difference of GDP per capita between US and Host, $lpscale^t_i$ was the log of plant-level economies of scale measured by the capital expenditure per US parent firm, $lfscale^t_i$ was the log of firm-level economies of scale measured by US parent firms' R&D expenditures-to-sales ratio, $lfserve^t_c$ was the log value of the ratios of MOFA sales in wholesale service and finance industries with respect to total manufacturing sales, $freight^t_{ic}$ was the log of the percentage of freight & insurance charges with respect to total value of imports shipped from c to the US for industry i, $tariff_{ic}$ were industry by country tariffs, EU and NAFTA were EU and NAFTA member country dummies, while *d94* and *d95* were time dummies for preferential trade agreements. The sample included data for nine countries (c, including Australia, Brazil, Canada, France, Germany, Japan, Mexico, the Netherlands and the UK), 17 industries (i, including food, chemicals, machinery, metals, electronics, transport equipment, wholesale trade, finance, services, textiles, lumber/wood, paper, printing, rubber products, plastics products, instruments and stone/clay) and three years (t, 1994 – 1996). The panel model was estimated using OLS, ignoring the possibility of fixed or random effects.

[167] Six variables used in Tang's (2002) analysis that could not be used for the econometric analysis of only one country (differences in GDP per capita between Home and Host, a dummy for EU member countries, a dummy for NAFTA member countries and two time dummies) or were not available in enough detail (freight costs and tariffs) were excluded. Three extra variables (industry-specific employment, GDP and industrial disputes) were added.

The variables used as potential determinants of VMNEs were a combination of factors included in the analysis of industry-specific US FDI – industry-specific employment (*ausempi*), industry-specific GDP (*ausgdpi*), the number of industry-specific disputes (*ausindusi*) – and some of the factors used by Tang (2002)[168] – industry-specific real wages (*ausrwages1i*), plant-level economies of scale (*pscalei*), firm-level economies of scale (*fscalei*) and the value of sales in service industries relative to manufacturing and mining sales (*fserve*) (Table 6-10). Industry-specific transport costs (such as industry-specific tariff rates) should have been included, but data were not available in enough detail.

The effect of industry-specific GDP and employment (two variables reflecting market size) on the intensity of VMNEs is unclear, though FDI in general should be positively affected by both variables. As a risk variable, the number of industrial disputes in different industries were expected to have a negative effect on FDI in general, though it is unclear whether the effect on vertical FDI should be larger than on horizontal FDI. The risk may be greater for vertical FDI, since a dispute for horizontal FDI does not affect Home production, only Host. Real wages were expected to have a negative effect on the intensity of VMNEs, as higher factor costs (or in this case labour costs) should discourage the establishment of VMNEs. However, as real wages should also have a negative effect on establishment of HMNEs, the effect is unclear. If real wages are used as an indicator for skilled labour, it should have a positive effect on FDI in general, though it is unclear whether the effect on the establishment of HMNEs or VMNEs is larger. Industry-specific, plant-level scale economies (measured by the average capital expenditure of a US parent firm in an industry) should have a positive effect on VMNEs, while industry-specific, firm-level scale economies (measured by the ratio of US parent firms R&D expenditure relative to sales), were expected to have a negative effect. For VMNEs plant-level scale economies should be high and firm-level scale economies low (and vice versa for HMNEs). Finally, the VMNE intensity should be higher, the more MNEs are involved in service related activities, i.e. the ratio of sales in service industries relative to manufacturing and mining sales should have a positive sign, since a significant proportion of VMNEs should be service-oriented.

[168] Nine of the ten industries included were the same as for industry-specific FDI from the US in Australia analysed in Section 5.2.2 (mining, food, chemicals, machinery, metals, electronic equipment, transport equipment, trade. finance/insurance and other services). The sample ended in 1998 because the industry classification for the dependent variables changed in 1999. This was not the case for the FDI series, hence a longer time period was used for the analysis of industry-specific US FDI in Australia in Section 5.2.2.

Table 6-10

Determinants of VMNE Intensity in Australia		
	Dependent Variable	**Alternative Variable(s)**
VMNE Intensity or ratio of VMNEs *(vii)*	*avii (aviassetsi, aviempi, avisalesi, aviratioi)*	*pvii (pviassetsi, pviempi, pvisalesi, pviratioi)*
	Explanatory Variables	**Alternative Variable(s)**
Host Market Size/Growth	*ausgdpi*	---
Number of employed persons	*ausempi*	---
Host Wage Rate	*ausrwages1i*	---
Industrial Disputes (Total or No. of Working Days Lost), Host or Relative	*ausindusi*	---
Plant-level economies of scale measured by the capital expenditure per US affiliate	*pscalei*	---
Firm-level economies of scale measured by US affiliate's R&D expenditures-to-sales ratio	*fscalei*	---
Ratios of MOFA sales in wholesale service and finance industries with respect to total manufacturing sales	*fserve*	---
Data Sources and Summary Statistics: See Appendix A.4, Table A.10 and A.11		

Having discussed the variables that will be used in the analysis of VMNE intensity, the model was stated as follows:

$$vii_{it} = \alpha + \beta_{11}\, ausgdpi_{it} + \beta_{21}\, ausempi_{it} + \beta_{31}\, ausrwages1i_{it} + \beta_{41}\, ausindusi_{it} + \beta_{51}\, pscalei_{it} + \beta_{61}\, fscalei_{it} + \beta_{71}\, fserve_{t} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

The model for VMNE intensity by industry of affiliate was first estimated using least squares (Table 6-11), but a specification as a fixed or random effects model was later found to be more appropriate, as both the hypothesis that $u_i = 0$ and the hypothesis that $Var(u) = 0$ were rejected at a 5% critical level (Table 6-12).

Table 6-11

Determinants of VMNE Intensity by Industry of Affiliate, Estimation Results

Dependent Variable: ***avii***
Sample: Time: 1989 – 1998, t = 10, N = 14, maximum of 140 observations included
Least Squares

		aviassetsi		***aviempi***		***avisalesi***		***aviratioi***	
		MV: 48, Obs.: 92		**MV: 38, Obs.: 102**		**MV: 46, Obs.: 94**		**MV: 24, Obs.: 116**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-7.317**	-5.042	0.374	0.112	-5.500**	-3.962	-6.584**	-6.239
ausgdpi	0	0.000	-0.847	0.000**	-2.653	0.000**	-1.920	0.000**	-2.704
ausempi	0	0.001**	2.058	-0.001	-0.998	0.000	-0.043	0.000	1.103
ausrwages1i	0	0.008**	3.984	-0.001	-0.117	0.007**	4.072	0.008**	5.859
ausindusi	0	0.002**	2.000	0.001**	1.894	0.002**	1.681	0.002**	2.163
pscalei	0	-1.126**	-1.716	-0.491	-1.407	0.404	0.762	-0.167	-0.492
fscalei	0	-4.200	-0.151	-20.489	-1.086	2.705	0.105	-6.895	-0.349
fserve	0	0.796	0.782	1.199	1.168	-0.072	-0.063	-0.001	-0.002
** significant at 10% critical value, * significant at 15% critical value									
R-squared			0.297		0.174		0.231		0.342
Adjusted R-squared			0.239		0.113		0.169		0.300
S.E. of regression			1.469		1.062		1.373		1.143
Sum squared resid			181.388		106.051		162.192		141.134
Durbin-Watson stat			0.448		0.712		0.415		0.581
F-statistic			5.079		2.838		3.701		8.028
Prob (F-statistic)			0.000		0.010		0.002		0.000

Table 6-12

Determinants of VMNE Intensity by Industry of Affiliate, Fixed and Random Effects Estimation				
	aviassetsi	***aviempi***	***avisalesi***	***aviratioi***
Fixed Effects Model				
F test that all $u_i = 0$	F(11, 73) = 11.870 Prob > F = 0.000	F(12, 82) = 5.940 Prob > F = 0.000	F(13, 73) = 14.350 Prob > F = 0.000	F(13, 95) = 10.770 Prob > F = 0.000
Random Effects Model				
Breusch and Pagan LM test for random effects (test that Var(u) = 0)	$\chi^2(1) = 81.180$ Prob > χ^2 = 0.000	$\chi^2(1) = 24.300$ Prob > χ^2 = 0.000	$\chi^2(1) = 88.720$ Prob > χ^2 = 0.000	$\chi^2(1) = 73.850$ Prob > χ^2 = 0.000

Since both the fixed and the random effects model could be applied to estimate the model, the Hausman test was conducted as a way to determine which one was more appropriate (Table 6-13).[169] The Null hypothesis was rejected at a 5% critical value for *aviratioi* and *avisalesi*. Hence, the consistent and efficient fixed effects model was used for further estimation. For *aviassetsi* and *aviempi* the Null hypothesis was not rejected, so that those models were estimated as random effects models in order to be both consistent and efficient, though the fixed effects model would still be consistent, but not efficient.

The fit of the fixed effects model was good for the four equations. R^2s ranged from 55.8% to 78.4% and adjusted R^2s ranged from 45.6% to 72.5% (Table 6-14). All equations included some significant and many insignificant variables. The only exception was the *aviassetsi* equation, which included no variable (apart from industry dummies) that was significant at a 10% or 15% critical level. None of *ausgdpi, ausrwages1i, ausindusi, pscalei* and *fserve* were significant in any of the four equations, only *ausempi* and *fscalei* had an effect. The F-statistic showed that the null hypothesis that all the slope coefficients in a regression are zero was rejected in all four cases.

Table 6-13

Determinants of VMNE Intensity by Industry of Affiliates, Hausman Test									
		aviassetsi		***aviempi***		***avisalesi***		***aviratioi***	
Variable	**Lags**	**(b-B) Difference**	**sqrt(diag (V_b-V_B)) S.E.**	**(b-B) Difference**	**sqrt(diag (V_b-V_B)) S.E.**	**(b-B) Difference**	**sqrt(diag (V_b-V_B)) S.E.**	**(b-B) Difference**	**sqrt(diag (V_b-V_B)) S.E.**
ausgdpi	**0**	0.000	0.000	0.000	0.000	0.000	0.000	-0.000	0.000
ausempi	**0**	-0.006	0.003	-0.007	0.003	-0.006	0.003	0.007	0.002
ausrwages1i	**0**	-0.010	0.008	-0.005	0.004	-0.008	0.006	0.010	0.005
ausindusi	**0**	-0.000	0.000	-0.000	0.000	0.000	0.000	-0.000	0.000
pscalei	**0**	-0.251	0.297	-0.114	0.236	-0.586	0.237	-0.365	0.126
fscalei	**0**	-38.088	32.670	-59.157	33.381	-42.180	22.683	-62.810	27.565
fserve	**0**	0.801	0.881	0.064	0.105	0.703	0.757	1.070	0.408

b = consistent under H_0 and H_1; obtained from xtreg
B = inconsistent under H_1, efficient under H_0, obtained from xtreg

Test: H_0: The random effects estimator is consistent and efficient, but the fixed effects estimator will still produce consistent (but not efficient) estimates.
H_1: The effects are uncorrelated with the explanatory variables, the fixed effects estimator is consistent and efficient, but the random effects estimator is now inconsistent.

aviassetsi: $\chi^2(5)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = 3.620, Prob> χ^2= 0.460 → H_0 was not rejected.
aviempi: $\chi^2(4)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = 5.500, Prob> χ^2 = 0.239 → H_0 was not rejected.
avisalesi: $\chi^2(4)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = 14.280, Prob>χ^2 = 0.006 → H_0 was rejected.
aviratioi: $\chi^2(4)$ = (b-B)'[(V_b-V_B)^(-1)](b-B) = 16.610, Prob> χ^2 = 0.005 → H_0 was rejected.

→ Both RE and FE model are consistent, RE model is efficient for *avisalesi* and *aviempi.*
→ RE model is inconsistent, but FE model is consistent for *aviratioi* and *avisalesi.*

[169] For more details refer to Section 5.2.4 Industry-Specific FDI from Japan in Australia.

Table 6-14

Determinants of VMNE Intensity by Industry of Affiliate, Estimation Results of the Fixed Effects Model									
Dependent Variable: *avii* Sample: Time: 1989 – 1998, t = 10, N = 14, maximum of 140 observations included Least Squares (Fixed Effects Estimation)									
		aviassetsi		*aviempi*		*avisalesi*		*aviratioi*	
		MV: 24, Obs.: 116		MV: 48, Obs.: 92		MV: 38, Obs.: 102		MV: 46, Obs.: 94	
Variable	Lags	Coefficients	t-stat	Coefficients	t-stat	Coefficients	t-stat	Coefficients	t-stat
C	---	5.361	0.696	12.095**	2.104	10.022**	1.946	10.226**	2.213
ausgdpi	0	0.000	0.584	0.000	0.050	0.000	-0.476	0.000	-0.246
ausempi	0	-0.004	-1.138	-0.008**	-2.683	-0.007**	-2.557	-0.007**	-2.921
ausrwages1i	0	-0.003	-0.314	-0.006	-0.903	-0.003	-0.480	-0.003	-0.650
ausindusi	0	0.000	-0.450	0.000	0.106	0.000	0.229	0.000	0.036
pscalei	0	-0.788	-1.147	-0.139	-0.275	-0.778	-1.204	-0.240	-0.606
fscalei	0	-78.610	-1.432	-95.671**	-2.020	-84.236**	-1.787	-94.734**	-2.175
fserve	0	0.657	0.531	0.770	0.870	0.560	0.447	0.867	1.166
food	---	---	---	---	---	---	---	---	---
mach	---	2.031**	3.064	1.159**	2.036	3.015**	5.240	1.962**	3.766
met	---	2.965**	4.536	1.253**	2.328	2.752**	4.991	1.875**	3.952
elec	---	0.289	0.385	0.235	0.352	1.383**	2.131	0.465	0.791
tran	---	2.287**	2.330	1.215	1.442	1.705**	1.964	1.839**	2.387
rest	---	-7.874*	-1.587	---	---	-9.245**	-2.591	-10.509**	-3.326
com	---	-4.021	-1.195	-6.920**	-2.574	-5.566**	-2.034	-6.508**	-2.837
fins	---	---	---	-7.733**	-1.819	-3.205	-0.734	-6.483**	-1.747
tras	---	-4.958	-1.354	-5.217**	-1.770	-5.100*	-1.612	-5.190**	-2.024
lum	---	0.604	0.496	1.197**	1.897	3.715**	3.929	1.372**	2.416
pap	---	---	---	-0.496	-0.491	0.030	0.031	-0.300	-0.373
prin	---	0.309	0.255	-0.682	-0.678	0.428	0.389	-0.570	-0.693
rub	---	3.977**	3.280	1.854**	1.845	3.134**	3.111	2.029**	2.376
inst	---	0.723	0.566	0.720	0.673	0.872	0.805	0.419	0.444
** significant at 10% critical value, * significant at 15% critical value									
R-squared			0.748		0.558		0.784		0.734
Adjusted R-squared			0.686		0.456		0.725		0.678
S.E. of regression			0.944		0.832		0.791		0.775
Sum squared resid			65.037		56.752		45.627		57.063
Durbin-Watson stat			1.026		1.235		1.429		1.363
F-statistic			12.042		5.454		13.233		13.111
Prob (F-statistic)			0.000		0.000		0.000		0.000

The fit of the random effects model for *aviassetsi* is as good as the fit of the fixed effects model (Table 6-15) – with a slightly lower R^2 (75.3% compared with 77.9%) and a slightly higher adjusted R^2 (73.4% compared with 72.5%). The same is true for the fit of the random effects model for *aviempi* – the R^2 is slightly lower than that of the fixed effects model (52.1% compared with 55.8%), while the adjusted R^2 is slightly higher (48.6% compared with 45.6%). Although the random effects model was the preferred model according to the Hausman test, it did not include any significant variables either, indicating misspecification.

Table 6-15

Determinants of VMNE Intensity by Industry of Affiliate, Estimation Results of the Random Effects Model					
Dependent Variable: *avii* Sample: Time: 1989 – 1998, t = 10, N = 14, maximum of 140 observations included Least Squares (Random Effects Estimation)					
		aviassetsi		*aviempi*	
		MV: 48, Obs.: 92		MV: 38, Obs.: 102	
Variable	Lags	Coefficients	t-stat	Coefficients	t-stat
C	---	-4.892	-1.440	1.845	0.541
ausgdpi	0	0.000	-0.344	0.000**	-1.938
ausempi	0	0.001	0.764	-0.001	-1.154
ausrwages1i	0	0.006	1.312	0.000	-0.092
ausindusi	0	0.000	-0.327	0.000	0.277

(Table 6-15 continued)

		aviassetsi		*aviempi*	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
pscalei	**0**	-0.581	-0.933	-0.047	-0.104
fscalei	**0**	-44.289	-0.997	-40.850	-1.204
fserve	**0**	-0.022	-0.023	0.710	0.815
food	**---**	-0.658	---	0.005	---
mach	**---**	1.056	---	0.698	---
met	**---**	1.820	---	0.881	---
elec	**---**	-0.691	---	-0.296	---
tran	**---**	1.108	---	0.417	---
rest	**---**	-1.357	---	---	---
com	**---**	-0.082	---	-0.758	---
fins	**---**	---	---	-0.646	---
tras	**---**	-0.881	---	0.332	---
lum	**---**	-1.075	---	0.988	---
pap	**---**	---	---	-1.226	---
prin	**---**	-1.168	---	-1.036	---
rub	**---**	2.079	---	0.710	---
inst	**---**	-1.240	---	-0.571	---
** significant at 10% critical value, * significant at 15% critical value					
R-squared		0.738		0.521	
Adjusted R-squared		0.717		0.486	
S.E. of regression		0.897		0.809	
Sum squared resid		67.519		61.489	
Durbin-Watson stat		0.943		1.083	

In order to evaluate the adequacy of the model, a series of diagnostic tests was performed, including the test of hypotheses of correct specification with regard to homoscedasticity, non-autocorrelation and correct functional form (RESET-test). The test results are illustrated in Table 6-16.

Table 6-16

Determinants of VMNE Intensity by Industry of Affiliate, Diagnostic Tests (5% critical values)					
		aviassetsi	*aviempi*	*avisalesi*	*aviratioi*
Heteroscedasticity	**LR-test**	$\chi^2(11)$ = 116.980* P = 0.000	$\chi^2(11)$ = 67.070* P = 0.000	$\chi^2(11)$ = -67.430 P = 1.000	$\chi^2(13)$ = 100.280* P = 0.000
Autocorrelation	**F-test**	F(1, 74) = 13.328* P = 0.001	F(1, 84) = 5.822* P = 0.018	F(1, 65) = 1.24 P = 0.207	F(1, 97) = 5.793* P = 0.018
Misspecification	**RESET(1)**	F(1, 72) = 0.010 P = 0.921	F(1, 81) = 3.754 P = 0.056	F(1, 72) = 0.001 P = 0.979	F(1, 94) = 2.327 P = 0.131
	RESET(2)	F(2, 71) = 0.132 P = 0.876	F(2, 80) = 2.497 P = 0.089	F(2, 71) = 0.264 P = 0.769	F(2, 93) = 1.305 P = 0.276
Random Effects Model					
Heteroscedasticity	**White LR-test**	---	---	---	---
Autocorrelation	**F-test**	F(1, 74) = 18.413* P = 0.000	F(1, 84) = 11.627* P = 0.000	---	---
Misspecification	**RESET(1)**	F(1, 83) = 2.020 P = 0.159	F(1, 93) = 42.990* P = 0.000	---	---
	RESET(2)	F(2, 82) = 9.102* P = 0.000	F(2, 92) = 39.850* P = 0.000	---	---
* significant at 5% critical value					

Diagnostic tests showed that the hypothesis of homoscedasticity was rejected at a 5% critical value in the four cases estimated using a fixed effects model. The hypothesis of non-autocorrelation was rejected at a 5% critical value in three out of the four cases. Only *avisalesi* did not exhibit autocorrelation. The RESET-test was used to test for misspecification related to the functional form of the model. The hypothesis of correct functional form (RESET(1) and RESET(2)) was not rejected for any of the four equations. Although there was no problem with misspecification according to the RESET-tests, tests for autocorrelation and heteroscedasticity indicated – at least for the equations of *aviassetsi, aviempi* and *aviratioi* – that there was some form of misspecification. However, the fixed effects model for *avisalesi* was – after estimating the equation with White heteroscedasticity-consistent standard errors and covariances – regarded as correctly specified.[170] The random effects model for *aviassetsi* had more problems with misspecification than the fixed effects model for *aviassetsi*: the hypotheses of non-autocorrelation and correct functional form (RESET(1) and RESET(2)) were rejected at a 5% critical value.

Following the same pattern as for the model of VMNE intensity by industry of affiliates, the model of VMNE intensity by industry of parent was first estimated using OLS (Table 6-17), but specification as fixed effects models was later found to be more appropriate. The specification of the model as a random effects model could not be tested since the number of cross-sections was smaller than the number of coefficients (Table 6-18).

Table 6-17

Determinants of VMNE Intensity by Industry of Parent, Estimation Results									
Dependent Variable: ***pvii*** **Sample: Time: 1989 – 1998, t = 10, N = 8, maximum of 80 observations included** **Least Squares**									
		pviassetsi		***pviempi***		***pvisalesi***		***pviratioi***	
		MV: 17, Obs.: 63		**MV: 26, Obs.: 54**		**MV: 23, Obs.: 57**		**MV: 9, Obs.: 71**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	**---**	-2.152	-0.575	-9.034**	-2.412	-7.542**	-3.128	-4.558**	-2.104
ausgdpi	**0**	0.000	1.072	0.000*	1.554	0.000**	2.938	0.000**	2.827
ausempi	**0**	0.001*	1.640	0.004**	3.363	0.003**	4.240	0.002**	3.066
ausrwages1i	**0**	0.002	0.474	0.008*	2.086	0.007**	2.439	0.004*	1.613
ausindusi	**0**	0.000	0.445	0.000	-1.228	0.000	0.102	0.000	0.352
pscalei	**0**	-0.216**	-2.346	-0.056	-0.526	0.029	0.285	-0.148*	-1.547
fscalei	**0**	-50.035**	-1.825	-147.372**	-5.459	-73.139**	-2.423	-57.695**	-2.035
fserve	**0**	-0.792	-0.668	-0.593	-0.581	-3.409**	-1.979	-1.725**	-1.774
** significant at 10% critical value, * significant at 15% critical value									
R-squared			0.353		0.612		0.541		0.415
Adjusted R-squared			0.271		0.553		0.475		0.350
S.E. of regression			1.133		1.110		1.188		1.188
Sum squared resid			70.577		56.692		69.106		-108.754
Durbin-Watson stat			0.567		0.625		0.648		0.722
F-statistic			4.290		10.382		8.236		6.386
Prob (F-statistic)			0.001		0.000		0.000		0.000

Table 6-18

Determinants of VMNE Intensity by Industry of Parent, Fixed and Random Effects Estimation				
	pviassetsi	***pviempi***	***pvisalesi***	***pviratioi***
Fixed Effects Model				
F test that all $u_i = 0$	F(7, 48) = 13.380 Prob > F = 0.000	F(7, 39) = 7.250 Prob > F = 0.000	F(7, 42) = 5.820 Prob > F = 0.000	F(7, 56) = 5.540 Prob > F = 0.000
Random Effects Model				
The number of cross-sections is smaller than the number of coefficients, so the Random Effects Model cannot be estimated.				

The fit of the fixed effects model was good for the four equations (Table 6-19). R^2s ranged from 78.7% to 88.1% and adjusted R^2s ranged from 73.4% to 84.1%. While the equations for *pviassetsi* and *pviempi* included more than one significant variable, the equations

[170] Although standard errors are different, estimating the *avisalesi* equation with White heteroscedasticity-consistent standard errors and covariances does not change which variables are significant, thus the equation is not stated again. However, for completeness the t-statistics, listed in order of the appearance in Table 6-14, are as follows: 2.764, -0.007, -3.128, -0.896, -0.015, -2.132, -3.084, 0.551, 11.006, 10.392, 2.947, 3.306, -2.702, -2.152, -1.076, -2.126, 10.556, 0.523, 1.386, 4.399, 1.841.

for *pvisalesi* and *pviratioi* included – despite their high R^2 – no significant variable (except for the industry dummies), indicating misspecification. The variable *ausrwages1i, ausindusi and pscalei* were not significant in any of the four equations. The F-statistic showed that the null hypothesis that all slope coefficients are zero was rejected in all four cases.

Table 6-19

Determinants of VMNE Intensity by Industry of Parent, Estimation Results of the Fixed Effects Model									
Dependent Variable: *pvii* Sample: Time: 1989 – 1998, t = 10, N = 8, maximum of 80 observations included Least Squares (Fixed Effects Estimation)									
		pviassetsi		***pviempi***		***pvisalesi***		***pviratioi***	
		MV: 17, Obs.: 63		**MV: 26, Obs.: 54**		**MV: 23, Obs.: 57**		**MV: 9, Obs.: 71**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-0.627	-0.170	-0.998	-0.150	4.523	0.675	0.017	0.004
ausgdpi	0	0.000**	-2.169	0.000**	-2.120	0.000	-0.587	0.000	-0.737
ausempi	0	0.006**	1.943	0.003	0.697	0.000	-0.042	0.002	0.408
ausrwages1i	0	0.005	1.449	0.004	0.720	-0.002	-0.403	0.002	0.462
ausindusi	0	0.000	-0.774	0.000	-1.204	0.000	0.064	0.000	0.086
pscalei	0	0.037	0.386	-0.002	-0.023	0.026	0.211	0.004	0.031
fscalei	0	201.954**	2.665	153.253**	1.778	-44.850	-0.449	67.225	0.659
fserve	0	0.330	0.417	1.611*	1.537	1.465	0.682	-0.051	-0.051
min	---	---	---	---	---	---	---	---	---
chem	---	-13.357**	-3.181	-9.830**	-1.870	-3.875	-0.682	-5.230	-1.016
con	---	-4.664**	-2.237	0.457	0.181	-4.041	-1.324	-2.016	-0.984
trd	---	-4.362	-1.230	3.069	0.653	0.523	0.106	0.852	0.199
fins	---	-0.431	-0.196	-1.548	-0.601	-2.498	-0.817	0.068	0.032
rebs	---	-4.125**	-1.722	0.426	0.156	-1.722	-0.516	-1.168	-0.478
tex	---	-8.098**	-2.252	-3.944	-0.863	-1.994	-0.396	-1.995	-0.462
pap	---	-10.956**	-2.783	-6.502	-1.280	-5.523	-0.985	-4.903	-1.017
** significant at 10% critical value, * significant at 15% critical value									
R-squared			0.832		0.767		0.654		0.781
Adjusted R-squared			0.771		0.689		0.568		0.717
S.E. of regression			0.795		0.914		0.969		0.706
Sum squared resid			24.633		35.081		52.554		23.917
Durbin-Watson stat			1.145		1.046		1.054		1.155
F-statistic			13.755		9.863		7.576		12.213
Prob (F-statistic)			0.000		0.000		0.000		0.000

To evaluate the adequacy of the model, a series of diagnostic tests was performed, including the test of hypotheses of correct specification with regard to homoscedasticity, non-autocorrelation and correct functional form (RESET-test). The test results are illustrated in Table 6-20.

Table 6-20

Determinants of VMNE Intensity by Industry of Parent, Diagnostic Tests (5% critical values)					
Fixed Effects Model		***pviassetsi***	***pviempi***	***pvisalesi***	***pviratioi***
Heteroscedasticity	**White LR-test**	$\chi^2(11)$ = 20.300* P = 0.004	$\chi^2(11)$ = 75.440* P = 0.000	$\chi^2(11)$ = 64.510* P = 0.000	$\chi^2(11)$ = 65.940* P = 0.000
Autocorrelation	**F-test**	F(1, 52) = 8.225* 0.006	F(1, 44) = 7.353* 0.010	F(1, 40) = 6.064* 0.018	F(1, 60) = 6.871* P = 0.011
Misspecification	**RESET(1)**	F(1, 47) = 0.655 P = 0.423	F(1, 38) = 1.941 P = 0.172	F(1, 41) = 8.086* P = 0.007	F(1, 55) = 5.032* P = 0.029
	RESET(2)	F(2, 46) = 3.762* P = 0.031	F(2, 37) = 1.960 P = 0.155	F(2, 40) = 4.043* P = 0.025	F(2, 54) = 2.508 P = 0.091
* significant at 5% critical value					

The results from the diagnostic tests of the model showed that the hypothesis of homoscedasticity was rejected at a 5% critical value in all four cases, while the hypothesis of non-autocorrelation was rejected in three out of four cases (*pvisalesi* being the exception). The hypothesis of correct functional form was rejected in most cases. Only for *pviassetsi* (RESET(1) and (2)) and for *pviempi* (RESET(2)) was the hypothesis of correct functional form not rejected. The fixed effects models for *pviratioi, pviassetsi* and *pviempi* were regarded as misspecified, due to heteroscedasticity, autocorrelation and, in most cases, incorrect functional form. The fixed effects model for *pvisalesi* was – after estimating the equation with White heteroscedasticity-consistent standard errors and covariances – at least regarded as correctly specified in terms of autocorrelation, but not in terms of correct functional form.[171] Estimating the model with White heteroscedasticity-consistent standard errors added *ausgdpi* and the industry dummy for real estate and business services (*rebs*) to the list of significant variables, but only at a 15% critical level.

6.2.3 RESULTS

Before discussing the results it should be noted that one should not read too much into the results of the analysis of different measures of VMNE intensity and should to be careful with any further interpretation owing to misspecification problems. Nevertheless, at least the fixed effects models for *avisalesi* and *pvisalesi* were correctly specified and results from the other models had similar outcomes in terms of signs of significant variables.

Industry-specific employment, plant-level and firm-level scale economies reduced the VMNE intensity for sales by industry of affiliate. The same result was found for the misspecified equations for *aviratioi, aviassetsi* (but only for *ausempi* and *fscalei*) and *aviempi* (but only for *fscalei*), while *ausempi* and *fscale* had a positive sign in the *pviassetsi* equation. While the negative sign on firm-level scale economies was expected, the negative sign on plant-level scale economies was surprising. The negative effect on industry-specific employment was not directly expected, but could be explained by the fact that employment might have a positive effect on HMNE intensity, which in turn should reduce VMNE intensity.

Industry-specific GDP and the share of sales in services relative to other sales increased the VMNE intensity for sales by industry of parent. The same result was found for the misspecified equations for *aviassets* and *aviempi* (but in both cases only for *ausgdpi*). The positive sign on *fserve* substantiated the hypothesis that a significant proportion of VMNEs were service-oriented, while the explanation for the positive sign on industry-specific GDP was unclear. Industry-specific GDP should increase MNE activity, but a positive effect on the intensity of HMNEs (reducing VMNE intensity) was also seen as possible. Hence, the sign was somewhat surprising. Other potentially significant variables are real wages (negative in the

[171] The White heteroscedasticity-consistent t-statistics (for the *pvisalesi* equation in Table 6-19), are as follows:

Var	C	*aus-gdpi*	*aus-empi*	*ausrwages1i*	*aus-indusi*	*pscalei*	*fscalei*	*fserve*	*chem*	*con*	*trd*	*fins*	*rebs*	*tex*	*pap*
Coeff	1.740**	0.000*	0.000	-0.001	0.000	0.006	-6.224	0.529*	-1.163**	-0.960**	-0.129	-0.653**	-0.503*	-0.711	-1.330**
t-Stat	2.368	-1.617	0.064	-0.988	-0.124	0.502	-0.425	1.492	-1.821	-3.850	-0.229	-2.216	-1.600	-1.310	-2.195

equation for *aviratioi* and positive in the equation for *pviassetsi*) and industrial disputes (positive in the equation for *pviassetsi*).

Overall, none of the variables could be excluded as a potentially important determinant of VMNE intensity. The significance of the industry dummies and the high R^2 in the fixed effects models made fixed effects estimation the most appropriate representation of the data generating processes. In order to explore which combination of variables should be used to best explain the VMNE intensity, one should carry out more detailed analysis, going through each case individually. Since this analysis is only a case study for US FDI (or US MNE activity) in Australia and not the main focus of this thesis, further analysis is left for further research. Nevertheless, some of the results could be useful in finding the factors that determine VMNE intensity.

6.3 CONCLUSIONS

For the analysis of different forms of US FDI in Australia, two models with industry-specific annual US MNE activity data in Australia between 1988 and 1998 were used. The analysis used various forms of affiliate sales data (measuring total, horizontal, vertical and export-platform FDI, vertical integration and used to calculate VMNE intensity), data on affiliate assets and affiliate employment (used to calculate VMNE intensity) and different sets of explanatory variables.

For the first part of the analysis, two different sets of explanatory variables were used to analyse five FDI forms, i.e. total, horizontal, vertical and export-platform FDI and vertical integration. One included the same determinants as in the analysis of industry-specific FDI from the US in Australia (industry-specific GDP, real wages, Australian imports from the US, Australian customs duties and US total outward FDI flows). The other including a broader range of potential determinants (employment, the Australian unemployment rate, Australian openness, Australian exports to the US, the US-Australian dollar exchange rate, the interest rate difference between the US and Australia, relative inflation, Australian industrial disputes, Australian corporate tax rate and a manufacturing sector dummy in addition to the five variables in the first model). The models were of limited adequacy, as indicated through problems with autocorrelation and misspecification. Nevertheless, real wages, US outward FDI flows, industry-specific employment, GDP and Australian customs duties emerged as potential determinants of different forms of FDI flows. Owing to specification problems, it was impossible to identify where the major differences between the determinants for different FDI forms were, differences seemed to exist. This should be kept in mind for any research in which FDI is analysed as an aggregate variable, as underlying effects may be blurred.

For the second part of the analysis a combination of factors including industry-specific employment, GDP, real wages, industrial disputes, plant- and firm-level scale economies and the value of sales in service industries relative to manufacturing and mining sales was used as potential determinants of the intensity of VMNEs. Again, the model was of only limited adequacy owing to problems with autocorrelation and misspecification. Nevertheless, most included variables (industry-specific employment, GDP, plant-level and firm-level scale economies and the share of service sales relative to other sales) emerged as potentially important determinants of an industry's VMNE intensity.

If those factors have an effect on the form of MNEs, they should also affect the forms of FDI flows used to establish the different types of MNEs (i.e. vertical and horizontal FDI). Hence, the determinants should not have an equal effect on both FDI forms (then they would not significantly affect the VMNE intensity), but must affect one form more than the other. This supports the view that different FDI forms are affected by different factors. Hence, aggregate FDI or total MNE activity should not be treated (or only with clear indication) as a homogeneous variable.

Although explanatory power, correct specification and statistical significance of the last two models analysing different FDI forms is limited and attempts to find a more appropriate model were left for further research (since that this analysis is a case study only and not the main focus of the thesis), the analysis is a useful starting point for more detailed research on the complexity and heterogeneity of FDI in Australia. It is to be hoped that an improvement in the quality of data makes it possible to conduct more detailed research on different forms of Australian FDI from all countries and not only that from the US.

This analysis indicates that investment attraction should focus on the attraction of specific FDI forms – be it country-specific FDI (as discussed in Chapter 4.2), industry-specific FDI (discussed in Chapter 5.2.1), industry- and country-specific FDI (as discussed Chapter 5.2.1 to 5.2.5) or FDI of a particular form (as discussed in this chapter) – rather than FDI in general, since different FDI inflows appear to be determined by different sets of variables. This finding goes well with the fact that the FDI variable is only an aggregation of all the individual investment decisions made by numerous MNEs, which may be affected by different factors and are not a perfectly homogeneous group. However, this finding should not indicate that the analysis of FDI determinants should be based on individual decisions alone. In contrast, as long as data are sufficiently homogeneous (as tested by parameter stability), data should be used in their most aggregated form, as it is more efficient and more important for political decision-making to analyse the determinants and consequences of FDI on the economy as a whole.

An interesting application of the analysis of different forms of US FDI is the recently signed Free Trade Agreement between Australia and the US. While the Free Trade Agreement is commonly seen as beneficial for overall US FDI in Australia, a better analysis should analyse whether it is beneficial for FDI from all industries and for all forms of FDI flows. It should also be analysed whether it affects the FDI composition and is more beneficial for FDI in some industries or for some forms of FDI than for others. This should be contrasted with which industries or FDI forms are preferable, so that appropriate investment attraction strategies can be introduced.

PART II

CONSEQUENCES OF FDI

Chapter 7

Theoretical Models and Empirical Studies of Consequences of FDI

In Part II, the consequences of FDI in Australia are analysed. Chapter 7 presents a review of the relevant theoretical models and econometric studies, including previous studies on the effect of FDI in Australia. The chapter reviews theoretical models and empirical studies, showing that – as with FDI determinants (Chapter 3), there is not one, but many theoretical models discussing the potential consequences of MNE activity and FDI for the investing country (Home) and for the investment destination (Host). This analysis focuses only on the investment destination because the consequences to Home were not considered to be relevant to this study.[172]

Factor price equalisation was seen as the major consequence of capital mobility (including FDI) according to the neoclassical trade theory (discussed in Chapter 3.1.2), though FDI could also lead to a larger capital stock, increased tax revenues, production expansion, increased labour productivity, higher wages, increased employment, technology spillovers and balance-of-payments effects. These were results found according to MacDougall's (1960) neoclassical analysis of FDI effects. He explored what the static effects of foreign-owned capital in a Host country were (in his case Australia) when the following assumption were relaxed one after another: full employment, no taxation, a fixed labour force, a fixed Australian capital stock, no external economies, CRS production functions, perfect competition, terms of trade that are unaffected by capital flows, balance of payments that are unaffected and no policy changes. In contrast, models viewing FDI as investment linked to imperfect competition (discussed in Chapter 3.1.3) showed that FDI could have beneficial effects through the transfer of managerial or entrepreneurial skills. Foreign affiliates could also increase competition and improve the market performance of the monopolistic industries that they were based in.

According to Dunning's OLI framework and the MNE theory (discussed in Chapter 3.1.5), the welfare effects of FDI in Host countries were more difficult to define and depended on various measures including technology spillovers, linkages and other spillover effects, effects on the market structure, employment effects, balance-of-payments and trade effects, effects on

[172] See Lipsey (2002) for a survey of Home country effects of FDI including the effects of outward FDI on Home country total and multinational exports and Home country factor demand. A report by the World Trade Organization (1996) also provides a good summary of the effects of outward FDI on Home country trade and employment.

economic growth and non-economic effects, which, in turn, depended on the political, economic and cultural environment (Table 7-1). Consequences of FDI were conditional on the form of FDI, i.e. on whether FDI is natural resource-seeking, market-seeking, efficiency-seeking or strategic asset-seeking.[173]

Table 7-1

Some Possible Contributions of Inward FDI		
Positive Contributions	**Negative Contributions**	**Host Country Characteristics that favour positive contributions**
1. By providing additional resources, capabilities, viz. capital, technology, management skills, access to markets.	May provide too few, or wrong kind of, resources and assets. Can cut off foreign markets compared with those serviced by domestic firms. Can fail to adjust to localised capabilities and need.	Availability of local resources at low real cost, particularly those complementary to those provided by foreign firms. Minimal structural distortions or institutional impediments strategies that help promote dynamic comparative advantages.
2. By injecting new entrepreneurship, management styles, work cultures and more dynamic competitive practices	An inability of foreign entrepreneurship, management styles and working practices to accommodate or, where appropriate, change local business cultures. The introduction of foreign industrial-relations procedures may lead to industrial unrest. The pursuance of anti-competitive practices may lead to an unacceptable degree of market concentration.	The policies pursued by host Governments to promote local entrepreneurship and a keen and customer-driven work ethic; the character and efficiency of capital markets; the effectiveness of appropriate market-facilitating policies. Larger countries may find it easier to introduce some of these conditions than smaller countries.
3. By a more efficient resource allocation, competitive stimulus and spill-over effects on suppliers and/or customers, FDI can help upgrade domestic resources and capabilities, as well as the productivity of indigenous firms and foster clusters of related activities to the benefit of the participating firms.	Can limit the upgrading of indigenous resources and capabilities by restricting local production to low value-added activities and importing the major proportion of higher value-added intermediate products. May also reduce the opportunities for domestic agglomerative economies by confining its linkages to foreign suppliers and industrial customers.	The form and efficiency of macro-organisational policies and administrative regimes. In particular, the benefits likely to be derived from FDI rest on host Governments providing and adequate legal, commercia and assigning priority to policies that help upgrade human and technological capabilities and encourage regional clusters of related activities, e.g. science and industrial parks.
4. By adding to the host nations' gross domestic product (GDP), via 1-3 above, and by providing additional tax revenue to Governments.	By restricting the growth of GDP via 1-3 above. By transfer pricing or other devices to lower taxes paid to host Governments.	See 1-3 above. Suitable policies of the tax authorities of host Governments to minimise transfer pricing abuse. Countries that have the most to offer TNCs are likely to be the most successful in implementing these policies.

[173] Natural resource-seeking FDI can provide complementary assets (such as technology, management and organisational competence), access to foreign markets, lead to local spin-off effects on industrial customers, raise standards of product quality or foster clusters of resource-based related activities, while market-seeking FDI can provide complementary assets, foster backward supply linkages and clusters of specialised labour markets and agglomerative economies, raise standards of product quality, raise domestic consumer expectations of indigenous competitors or stimulate local entrepreneurship and domestic rivalry. Efficiency-seeking FDI may improve the international division of labour and cross-border networking, entice comparative advantages of Host countries, provide access to foreign markets and/or sources of supply, provide access to foreign markets, raise standards of product quality or aid structural adjustment, while strategic asset-seeking FDI may provide new finance capital and complementary assets, provide access to foreign markets, stimulate local entrepreneurship and domestic rivalry, improve the international division of labour and cross-border networking or entice the comparative advantages of host countries. (Dunning (1996), p.87, Table 4.2)

(Table 7-1 continued)

Positive Contributions	Negative Contributions	Host Country Characteristics that favour positive contributions
5. By improving the balance of payments through import substitution, export-generating or efficiency-seeking investments.	By worsening the balance of payments, through limiting exports and promoting imports and out-competing indigenous firms that export more and import less.	Need to take a long view of importing and exporting behaviour of foreign affiliates. The key issue Is not the balance of payments per se, but the contribution of FDI to economic efficiency, growth and stability. However, countries with a chronic balance-of-payment deficit may find it difficult to liberalise completely their balance-of-payments policies.
6. By linking better the host economy with the global market-place and helping to advance economic growth by fostering a more efficient international division of labour.	By promoting a division of labour based on what the investing firm perceives to be in its global interests, but which may be inconsistent with dynamic advantage as perceived by the host country.	As 3 above – and, in particular, the extent to which host country Governments can pursue policies that encourage investing firms to upgrade their value-adding activities and invest in activities that enhance the dynamic comparative advantage of indigenous resources. The gains from 6 are particularly important for smaller countries.
7. By more directly exposing the host economy to the political and economic systems of other countries; the values and demand structures of foreign households; attitudes to work practices; incentives; industrial relations and foreign workers; and many different customs and behavioural norms of foreign societies.	By causing political, social and cultural unrest or divisiveness; by the introduction of unacceptable values (e.g. with respect to advertising, business customs, labour practices and environmental standards); and by the direct interference of foreign companies in the political regime or electoral process of the host country.	The extent to which a society is strong and stable enough to adjust smoothly to technological and political change. Also, the strength and quality of Government regulations and norms; the nature of the host country's goals and its perceived trade-off between, for instance, economic growth, political sovereignty and cultural autonomy. The difficulties induced by FDI will be greatest in countries which are the most culturally distinct from their trading or investing partners.
Source: Dunning (1996), pp.94-95, Table 4.4		

The new trade theory (discussed in Chapters 3.1.6 and 3.1.7) explored the economic implications of increasing returns to scale, entry barriers, product differentiation, imperfect competition and transport costs. Since FDI was analysed under the MNE theory, the Host welfare effects of FDI were expected to differ from those in the Heckscher-Ohlin model, as FDI led to a different relationship between FDI and trade. Overall, the consequences of FDI were ambiguous. It was inconclusive in theory whether FDI inflows drive out national firms and increase monopoly power or whether they improve domestic efficiency and competitiveness. It was also difficult to determine whether FDI improved the human capital and skill level or whether it merely redistributed income. If, for example, a high level of technological diffusion existed, local skills could be enhanced. If, however, foreign firms hired skilled local managers, they did not increase local skills. FDI could lead to the diffusion of new technology in the Host, but it could also encourage the introduction of inappropriate technologies through manipulative advertising. It was also unclear whether FDI led to the introduction of new efficient methods of corporate governance, or whether it negatively affected the economy by avoiding social accountability. The trade effects of FDI were dependent on whether imports of intermediate inputs increased by more or less than final good imports decreased and on whether FDI was market- or export-oriented and production- or distribution-oriented. Despite these ambiguities, the general consensus from the literature is that the effects are subject to the integration of FDI in the Host economy and the extent of spillovers from technological diffusion, employment, training and competitive efficiency. FDI in enclave industries with few links to the domestic economy is unlikely to produce economy-wide spillovers. Generally, the benefits of FDI are maximised when governments take steps to establish and deepen links of FDI with the local economy, increasing the industrialisation and competitiveness of the economy.

The effect of diversified FDI (discussed in Chapter 3.1.8) on a Host country's welfare is unclear. It could be beneficial to firms if it reduced a firm's risk (either currency risk as in Aliber's (1970) case or factor market risk as in Rugman's (1975 and 1977) case) through firms shifting profits between markets with different risks. Host country's welfare effects are presumably similar to a combination of the effects derived from horizontal or vertical FDI models, since diversified firms can acquire horizontal or vertical MNEs or diversify domestically with their divisions setting up a horizontal or vertical subsidiary overseas. As in the models discussed before, countries may gain from spillover effects, linkages, employment creation, training and new business practices.

In Game Theoretic Frameworks (discussed in Chapter 3.1.9), consequences of FDI are a range of political and economic factors and depend on the relative bargaining strength of the parties involved. One commonly analysed example is the trade-off between increased tax revenue though MNE production and decreased tax revenue through incentives offered to MNEs in order to attract them. Consequences need to be considered over a long-time frame and compared with the effect of alternative investment projects. The distribution of gains is often indeterminate within a range of possible outcomes.

As in the theoretical models explaining the determinants of FDI, the different approaches explaining the consequences of FDI do not necessarily replace each other, but focus on different aspects of the same phenomenon. This may in some cases lead to different conclusions about the effects of FDI, while in other cases similar consequences can be explained by different models. While trade effects were discussed in detail in the early Heckscher-Ohlin and the later vertical, horizontal and diversified FDI models, technology spillovers, productivity growth, market structure and competition were important in models using monopolistic competition and ownership advantages to explain FDI. Employment effects were (directly or indirectly) analysed in most models, since local production – even if undertaken by a foreign firm – uses local manpower.

Similarly, empirical studies analysing the effect of FDI focused on specific consequences (such as effects on employment, technology transfer, market structure, domestic investment, economic growth, trade, consumers and the environment), which could be the outcome of a variety of different theories. Therefore, empirical models were discussed by the consequence analysed (not by the theoretical model tested, as done in Chapter 3). This approach seemed appropriate since the empirical analysis in Chapters 4 to 6 showed that FDI could not be explained by a single theoretical model, but by a variety of different variables.

In order to review theoretical models on the consequences of FDI and the findings of relevant empirical studies, the following eight effects are discussed:[174]

1. Effects of FDI on General Welfare and Tax Revenue

[174] One could add the impact of FDI on consumers as a ninth effect, but not much theoretical detail was available and not many empirical studies analysed this factor explicitly. However, FDI may have beneficial effects through increased variety and reduced prices. The selection of theoretical models and empirical studies is not intended to be complete because a considerably larger literature exists for most of the issues discussed. However, the models and studies referred to in this chapter are indicative of the wider range of results available.

2. Effects of FDI on Economic Growth
3. Effects of FDI on Domestic Investment
4. Effects of FDI on Trade
5. Effects of FDI on Employment, Training and Wages
6. Effects of FDI on Technology and Productivity Growth
7. Effects of FDI on Market Structure and Competition
8. Effects of FDI on the Environment

7.1 GENERAL THEORETICAL MODELS AND EMPIRICAL STUDIES OF CONSEQUENCES OF FDI

7.1.1 EFFECTS OF FDI ON GENERAL WELFARE AND TAX REVENUE (INCLUDING TRANSFER PRICING)

Most models focusing on the effects that FDI has on a Host country's general welfare showed that FDI could increase national welfare (particularly through increased tax revenue), but an overall positive effect was not always certain and was subject to policy actions. Countries could lose out on tax revenue when incentives were paid to MNEs or when transfer-pricing was an issue. Transfer-pricing describes the repatriation of profits on income from foreign affiliates to their Home countries – officially as a compensation for technology transfers, paid as royalties or licence fees (Kopits, 1976).

Based on neoclassical trade theory, Kemp (1962) showed that countries could increase welfare benefits from FDI by introducing an optimal tax (similar to the concept of an optimal tariff in trade theory) on foreign-owned capital to curb the capital inflow, rather than by encouraging foreign capital with, for instance, a subsidy.[175] The effect that FDI had on general welfare was also analysed in new trade theory models. In Markusen (1984)'s general equilibrium model, which was based on a combination of national enterprises and MNEs with multi-plant operations, the welfare effect was uncertain. Although Host countries could lose out on monopoly rents that were captured by MNEs instead of national enterprises, they could gain through increased competition and by retaining a share of the MNE's profits via tax.

Horstmann and Markusen (1987b) explored the welfare implications of trade policy actions such as banning FDI, banning imports and differential taxation on FDI when analysing a model with imperfect product markets and moral hazard. Welfare was measured by government revenue and the change in consumer surplus (through a change in the availability and price of

[175] Closely related research includes Jasay (1960) and Pearce and Rowan (1966). Since they focused on welfare effects in the Home country rather than the Host country, they are not discussed in this analysis.

goods). Assuming FDI to be banned, welfare was determined by whether licensing or exporting was chosen – with licensing assumed to be the better welfare option. When imports were banned through high enough tariffs, welfare was determined by whether investing or licensing was chosen – with licensing again assumed to be the better welfare option. When the government decided to penalise foreign firms through taxation, two outcomes were possible: welfare improved when MNEs did not switch back to exporting or welfare did not change when MNEs absorbed the tax or switched to licensing.

In Horstmann and Markusen's (1992) model of the investment decision as a Cournot output game, the welfare distribution depended on the equilibrium outcome: countries with a single Home firm had the highest welfare level, followed by countries with a two-firm duopoly (i.e. a Home firm and an MNE), while countries with a single MNE had the lowest welfare level. Governments could affect welfare by manipulating the firms' output game, providing direct or indirect support (such as tax credits) for R&D and education or using strategic trade policy. In reality, adequate strategic trade policies are difficult to find. Welfare effects can be complex and policies can have counterintuitive effects, which were shown by varying the parameter values.

Markusen (2001)[176] analysed the welfare effect in a model with double-sided moral hazard and a choice between exporting, FDI and licensing. Since the Host country's welfare was highest for FDI (followed by licensing and export), countries wanted MNEs to invest. However, once MNEs had chosen to invest, countries tried to maximise local rent capture (such as consumer surplus due to lower prices after investment and the local agent's rent share) by minimising the level of defection penalty paid to the government by the defecting party (either the MNE when it dismissed the agent after one period or the local agent if it copied the MNE's technology) to a level where MNEs just entered. MNEs only shifted from licensing to FDI when they perceived licensing contracts as too costly.

Welfare effects in the Knowledge-Capital Model, which was based on Markusen et al. (1996) and Markusen (1997 and 2002), depended on the determinants of MNE activity, i.e. differences in relative endowments, country size, high and low transport costs and optional FDI ban, and was conditional on firm types (which was determined by the parameter values for those factors). Welfare effects of investment liberalisation with high trade costs were positive for skill-labour abundant Host countries, while welfare effects of investment liberalisation with low trade costs were positive for small and skilled-labour abundant or large countries. While smaller countries gained from investment liberalisation, large countries could lose owing to differences in size and in relative factor endowments. Generally, Host countries gained, while Home countries lost from investment liberalisation.

In Game Theoretic Frameworks, the Host country's welfare was analysed as a trade-off between increased tax revenue through MNE production and lost tax revenue due to incentives paid to MNEs. A similar idea had already been used by neoclassical trade theory and in Dunning's OLI framework. The former predicted that Host countries gained through a larger

[176] The model was based on Ethier and Markusen (1996), which did not discuss the Host country's welfare.

capital stock and increased tax revenues through foreign profits, provided that investment was not induced by lower taxes (MacDougall, 1960). Streeten (1969) claimed that foreign investment created government revenue and helped to fill the foreign exchange or savings gap, while Caves (1971) argued that Host welfare increased through corporate income taxes. According to Dunning's (1993) OLI framework, the national value added by MNEs in a Host country, i.e. direct and indirect taxes or duties paid by MNEs, depended on the bargaining power of Host and MNE, the use of government incentives to attract FDI (including profit tax rebates and subsidies on energy or labour costs, lower interest rates, reduces sales taxes, import protection, less stringent environmental regulations and the promotion of a favourable industrial climate) and the MNE's ability to manipulate transfer pricing to evade national taxation.

In their Game Theoretic Framework, Raff and Srinivasan (1998) argued that benefits from import-substituting FDI included increased tax revenue, employment creation, better manpower training and access to new technologies and management skills. Governments may give up some tax revenue to attract FDI, signalling favourable business conditions to uninformed investors. When countries attract investment from foreign firms by offering investment incentives – in the case of Bond and Samuelson (1986) using tax holidays – Host countries lose out on tax revenue in the short-run, but maximise tax revenue in the long-run. If MNEs do not enter countries if there are no tax incentives (in which case tax revenue and subsidy costs are zero), countries are better off attracting MNEs that pay lower (or no) taxes in earlier periods and higher taxes in later periods of the investment. Subsidies given to MNEs could thus be welfare-improving. However, this system only works when countries are the high-productivity countries they claim to be, so that MNEs do not pull out after one period of tax holiday.

Barros and Cabral (2001) explained that 'subsidised entry followed by exit' could be due to a lack of commitment and asymmetric information, which a contractual no-exit clause could solve. Brander and Spencer (1987), who used the tariff-jumping argument as the main determinant of FDI, analysed how endogenous tariffs and taxes (subject to credibility constraints) and unemployment in the Host country affect the optimal welfare level of FDI. In their model, they showed that when there was unemployment, the Host government could attract more FDI and maximise national welfare with a credible threat to increase applied tariff rates on imports rather than taxes on local production. FDI was more beneficial than exports, as it increased national welfare by producing government revenue through taxes and reducing unemployment. Analysing positive externalities through technology transfer instead of unemployment led to similar results.

Mudambi (1999) argued that although countries gained from MNE investment through increased tax bases, increased local living standards and development prospects in relatively backward areas, the gains depended on the type of investment support used, which is determined by strategic risk-return considerations. Countries can increase gains by targeting appropriate MNEs and tailoring more appropriate (and potentially less expensive) support packages. Black and Hoyt's (1989) model of a competition between two cities bidding for firms showed that using public services (school aids or institutes) to attract investment reduced social welfare, while direct payments to the firms (subsidies) was welfare-improving.

When there is transfer-pricing, Host countries may lose out on tax revenue. In order to avoid high taxes, firms transfer more money than justifiable as payments for technology, services or intermediate goods from Host (if it makes high profits there) to Home (if it makes low profits there). Transfer-pricing was discussed by Hymer (1960), Lall (1973) and Kopits (1976). Hymer argued that it was uncertain whether transfer payments (including rents, royalties, interest and profit) were less, equal or more than the income generated through FDI, so that the overall welfare effect was unclear. Lall analysed conditions under which the intra-firm trade price (the price foreign affiliates pay for intermediate and finished goods, but not technology or services) differed from the equivalent arm's length price. He found that maximising present profits (including differences in taxes, tariffs and subsidies between Home and Host and exchange rate speculations) as well as minimising risk and uncertainty (including threats to profits, political and social pressure) mattered. It the transfer price differed from the equivalent arm's length price, the positive welfare effect through FDI could be lost, as governments lose out on taxes, shareholders lose out on profits, trade unions are deprived of higher wages, consumers pay higher prices and producers are hurt by the worsening foreign exchange situation. Kopits argued that MNEs could set transfer prices higher than necessary to avoid high foreign taxes, reducing welfare effects by reducing Host's potential tax revenue and worsening its balance-of-payments position.

The effects of FDI on general welfare and tax revenue are not well explored in empirical studies. Since it is impossible to add up all individual effects and analyse the general welfare effect of FDI, most empirical studies focus on specific welfare aspects such as economic growth, domestic investment, trade, employment, wages, productivity, market structure or the environment – as will be discussed in Chapters 8.2 to 8.9. More complex general equilibrium models could potentially be used to analyse the effect of investment liberalisation, though they tend to be applied more generally for welfare effects of trade liberalisation in goods, incorporating different assumptions for investment barriers, but not exploring them independently.

Research on the effect of FDI on tax revenue is similarly limited. While the effects of taxes and tax incentives on FDI are widely discussed, the effect of FDI on tax revenue has not been explored well. One exception is a study by Gropp and Kostial (2000), in which they analysed how tax regimes affected FDI inflows and how FDI flows affected the corporate tax base. While the correlation between FDI flows and corporate income tax revenue was not obvious when looking at the OECD average, FDI inflows had a strong positive effect on the profit tax base – and thus on the tax revenue (assuming that, given a constant statutory tax rate, tax revenue is a function of the changes in the tax base) – when panel data from 19 OECD countries were analysed. Using a sample of EU countries, the results were substantiated. Furthermore, IDA Ireland (2005), the Irish investment promotion agency, stated that IDA-supported companies employed 128,946 people, spent EUR 15.5 billion in the Irish economy (including payroll costs, Irish materials and services) from their annual sales of EUR 72 billion (i.e. direct expenditure accounts for 21.5% of sales), exported goods and services valued at EUR 68 billion and paid over EUR 2.7 billion in corporate tax in 2004. For a summary of the empirical studies discussed above see Table 7-2.

Table 7-2

Effects of FDI on Tax Revenue			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Corporate Income Tax Revenue	Positive	Positive	Gropp and Kostial (2000)
			IDA Ireland (2005)

7.1.2 EFFECTS OF FDI ON ECONOMIC GROWTH

The effect of FDI on economic growth has been analysed directly or indirectly (e.g. growth through increased productivity growth, as will be discussed in more detail in Chapter 7.1.6) in numerous studies. FDI is generally expected to increase economic growth.

Treating FDI as part of general investment, i.e. the change in a country's capital stock and not FDI in particular, macroeconomic investment theory can be applied to explain theoretically the Host country effects of FDI. General investment (defined as "the purchase of capital goods – machines or buildings – from the commodity market"[177]) is part of GDP (if GDP is defined as a function of consumer expenditure, gross private investment, government consumption and investment and net exports) and can thus directly affect it. If modelled as part of a firm's production function, capital makes a direct contribution to production. Increasing capital directly increases output, though with a diminishing marginal product of capital.[178]

The key question is not whether investment has a positive effect on GDP (and thus its temporary growth rate) – this link should be obvious – but whether FDI has a long-term GDP growth effect and whether FDI increases overall investment (increasing GDP) or whether FDI replaces some domestic investment (not increasing a country's GDP). The latter issue will be discussed in Chapter 7.1.3. To answer the first question, one has to go back to macroeconomic growth theory, according to which there is an optimum capital stock in equilibrium. Capital should be growing at a constant rate to stay on the balanced growth path in the long-term.[179] If FDI inflows continue over time, the economy's balanced growth path changes every time FDI (if seen as additional investment) enters the economy, permanently increasing the output per worker and temporarily increasing the output growth per worker – though it might seem like a

[177] Barro (2000), p.318.
[178] Romer (2001), p.9. The production function can be written as: $Y(t) = F(K(t), A(t)L(t))$ where output (Y) is a function of capital (K), labour (L) and knowledge or the effectiveness of labour (A) over time. A and L enter multiplicatively. AL is referred to as effective labour.
[179] Romer (2001), p.14-17.

permanent increase in the growth rate if the increase occurs every time FDI flows into the economy.[180]

Turning to models analysing the effects of FDI in particular, Vernon's Product Cycle Hypothesis (Vernon, 1966) gave a cost-based rationale for the switch from exporting to foreign-based production, showing that the switch from importing to exporting (as the production of maturing and standardised goods is located in Host countries) increases Host's economic growth. While Aharoni's Behavioural Theory (Aharoni, 1966) focused mainly on the determinant side of FDI, FDI (in particular in less developed countries) was also found to increase economic growth. FDI could help to recognise and promote opportunities, providing the Host country with capital, know-how and management. Kindleberger (1969) looked at the effects of FDI by contrasting public opinion and prejudices about MNEs and FDI with "true" effects, arguing that most fears were unjustified and exaggerated. FDI generally had positive effects on economic growth through new technology, which were often large enough to make leaders in developing countries become anxious to attract FDI and to provide investment incentives to influence MNEs' investment decisions.

Expanding Dunning's OLI framework by linking the international business literature with endogenous growth theory, Ozawa and Castello (2003) showed that Host governments (managers of location advantages) need to cooperate with MNEs (managers of ownership advantages) to find the most efficient match between location and ownership advantages, leading to ongoing business expansion, development and economic growth, which could help to fill developmental gaps. However, Host countries could also be adversely affected by becoming dependent on MNEs and losing their cultural identity.

Turning to empirical studies on economic growth effects of FDI, the general consensus is that FDI can increase growth if economies already have some growth potential. FDI is often an important component of a country's GDP[181]. A positive relationship between FDI and economic growth (GDP or per capita GDP) has been supported by many empirical studies. The direction of causation between FDI and economic growth, however, is not always clear and depends on various factors including factor endowment, geographical location, infrastructure, education and market size or a country's trade regime. Moreover, FDI has been found to have a larger effect on growth than domestic investment, due to the effect of FDI on productivity growth (as shown in Chapter 7.1.6).

Empirical studies analysing the effects of FDI on economic growth were often estimated as panel models using data from a set of developed and developing countries over a time period of ten to 25 years: While Blomström et al. (1994), Balasubramanayam et al. (1996), Soto (2000) and Zhang (2001) looked at samples of developing countries only, Campos and Kinoshita (2002) analysed data from Central and Eastern European economies in transition, Borensztein et al. (1998), De Mello (1999), Carkovic and Levine (2000) and Alfaro et al. (2001)

---

[180] The effects are comparable to a rise in the savings rate. See Romer (2001), p.17-19.

[181] Value added of foreign affiliates as a percentage of GDP was especially high in Hong Kong (98.5%), Nigeria (86.8%) and Honduras (70.7%). For Australia, the ratio was 17.4%, the 16th highest in the world and the sixth highest in the developed world. See UNCTAD (2002), p.275.

used a combination of OECD and non-OECD countries. Studies focusing on the relationship between FDI and economic growth in one country include Chakraborty and Basu's (2002) study on India and Shan's (2002) study on China.

Looking at developing countries only, Blomström et al. (1994) showed that FDI Granger-caused economic growth in higher income developing countries, but not in poorer ones where education, labour force participation and initial income level were more important for growth. Economic growth was also faster, the lower the 1960 income level (i.e. conditional convergence) was. Soto (2000) examined the growth effect of various categories of private capital flows, showing that FDI significantly boosted per capita income growth in the Host country after a one-year lag. A 10% rise in the FDI/GNP ratio increased the long-run steady-state income level by 3% and the short-term per capita income by 1%. Campos and Kinoshita (2002) found FDI to have a significantly positive effect on economic growth, which was robust after correcting for reverse causality, endogeneity and omitted variable bias. : Testing the 'Bhagwati (1994) hypothesis', which states that FDI is more beneficial to countries following export promoting strategies than to countries following an import substituting strategy, Balasubramanayam et al. (1996) found that growth-enhancing effects of FDI were stronger in countries with an export-promoting trade policy than in those with an import-substituting trade policy. Zhang (2001), who explored the causal pattern between FDI and economic growth, found that the extent to which FDI was growth-enhancing was conditional on country-specific characteristics, including the trade regime. Although there were cross-country variations, FDI generally promoted economic growth when countries adopted liberalised trade regimes, improved education, encouraged export-oriented FDI and maintained macroeconomic stability. In his study, FDI boosted economic growth in Hong Kong, Indonesia, Singapore, Taiwan and Mexico.

Using a sample of OECD and non-OECD countries, Borensztein et al. (1998) found FDI to stimulate per capita GDP growth and to have a larger effect than domestic investment. The direction of causation between FDI and growth depended on factor endowments, geographical location, infrastructure, education and on whether scale effects existed. FDI caused growth through productivity spillovers, though growth also depended on a country's capacity to absorb these spillovers. In addition, Alfaro et al. (2001) found that FDI increased economic growth, and that the link was causal, when local financial markets were sufficiently well developed. De Mello (1999) analysed the effects of FDI on output and productivity growth, finding that FDI caused technological progress and that foreign investors increased the Host country's productivity in the long-run. Whether FDI led to economic growth, however, was dependent on whether FDI and domestic investment were complements or substitutes. Carkovic and Levine (2000) estimated a dynamic panel data model using gross FDI and found that the exogenous component of FDI did not have a significant effect on per capita GDP or productivity growth. The results were robust even after controlling for the level of human capital and financial development.

Looking at the relationship of FDI and economic growth in a single country, Shan (2002) used a VAR approach to analyse the interrelationships between Chinese quarterly FDI flows and other economic variables (including economic growth). He showed that a two-way-causality between FDI and output growth existed, though the effect of FDI on output growth was weaker than that of output growth on FDI. Output growth was also more sensitive to shocks in its own past values and to energy consumption than to shocks in FDI. Chakraborty and Basu (2002) explored the two-way link between annual FDI inflows and economic growth for India, applying a structural cointegration model with vector error correction mechanism. They found that FDI was positively affected by GDP (in levels form) and negatively affected by the share of import duty in total tax revenue, though they could not find a reverse causality, as FDI did not affect GDP.[182] Furthermore, they found the technology transfer brought in by FDI to be labour displacing, creating excess labour supply and reducing unit labour costs.

For a summary of the empirical studies discussed above see Table 7-3. Overall, FDI had a significantly positive effect on economic growth in most empirical studies. Only two studies were not able to substantiate the link. However, in some studies the link was conditional on the business environment in the Host country.

Table 7-3

Effects of FDI on Economic Growth			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Economic Growth	Positive	Positive (in developing countries)	Blomström et al. (1994)
		Positive (in developing countries)	Soto (2000)
		Positive (in developing countries, but stronger effect in export promoting than in import substituting developing countries)	Balasubramanayam et al. (1996)
		Positive (in developing countries, depends on trade regime, education, export-orientation of FDI and macroeconomic stability)	Zhang (2001)
		Positive (in economies in transition)	Campos and Kinoshita (2002)
		Positive (in a mixed sample, positive through productivity spillovers, but depends on factor endowments, geographical location, infrastructure, education and scale effects)	Borensztein et al. (1998)
		Positive (in a mixed sample, depends on degree of complementarity and substitution between FDI and domestic investment)	De Mello (1999)
		Not significant (in a mixed sample)	Carkovic and Levine (2000)
		Positive (in a mixed sample, depends on whether local financial markets are sufficiently well developed)	Alfaro et al. (2001)
		Positive (in India, less significant than the effect of economic growth on FDI)	Shan (2002)
		Not significant (in China)	Chakraborty and Basu (2002)

7.1.3 EFFECTS OF FDI ON DOMESTIC INVESTMENT

The effect of FDI on domestic investment has been extensively analysed in empirical studies, but not well derived in theoretical models. Hymer (1960), who considered FDI as investment linked to imperfect competition, MNEs and 'monopolistic advantages', is one exception. He argued that FDI had beneficial effects through an increased international flow of managerial and entrepreneurial skills, though Host countries also feared expropriation and control through

[182] This seems a slightly odd result, as it suggests that China's economic growth can be explained in terms of domestic regulation rather than FDI.

foreign MNEs. Overall, FDI increased welfare due to increased domestic investment (through local borrowing and acceleration effects, as MNEs increased the demand for other commodities) and lower prices (in particular when MNEs were vertically integrated, as this solved the bilateral monopoly problem).

Looking at empirical evidence, FDI could significantly affect a country's gross domestic capital formation (GFCF)[183], but could also affect domestic investment indirectly by crowding it in (stimulating its entry) or crowding it out (inducing its exit). According to UNCTAD (2000), FDI and domestic investment could be either complements or substitutes. FDI had a crowding-in effect when MNEs introduced new goods and services and created local supply links, but had a crowding-out effect when MNEs increased competition and drove out domestic firms. A number of empirical studies analysed which effect dominates. Most studies found support for the hypothesis that FDI has a crowding-in effect, though some studies did not find any significant links and others found evidence for a crowding-out effect.

The relationship between FDI and domestic investment was analysed in different ways: while in some studies panel data for a set of developing or developed countries was used – see Bosworth et al. (1999), Agosin and Mayer (2000) and Razin (2002) for a sample of developing countries, De Mello (1999) for a mixed sample and Lipsey (2000) for a sample of developed countries only – Van Loo (1977), Hejazi (2002) and Kim and Seo (2003) focused on individual countries, with Hejazi (2002) looking at industry-specific data.

In the case of developing countries, Bosworth et al. (1999), who explored the effect of capital inflows on domestic investment, found FDI to increase domestic investment and to have a larger effect than portfolio investment or bank loans. According to Razin (2002), FDI had a significantly positive long-run effect on domestic investment, which was larger than the effect of portfolio investment and loan inflows. Agosin and Mayer (2000) found evidence for strong crowding-in of domestic investment by FDI for Africa and to a lesser extent for Asia, but also evidence for strong crowding-out of domestic investment by FDI in Latin America, showing that the effect of FDI was not always favourable.

Looking at a mixed panel, De Mello (1999) analysed the effect of FDI on capital accumulation, finding a strong complementarity between FDI and domestic investment in the broad panel (indicating that FDI caused domestic investment), but not in the OECD panel (indicating some degree of substitutability between FDI and domestic investment in developed countries). In contrast to that, Lipsey (2000), who looked at developed countries, found little evidence for the effect of FDI on domestic capital formation: FDI had a negative, yet insignificant effect on capital formation.

Looking at individual countries' experiences, Van Loo (1977) and Hejazi (2002) explored the relationship of FDI and domestic investment in Canada, while Kim and Seo (2003) analysed Korean data. In an early study, Van Loo (1977) looked at the relationship between annual

[183] FDI Inflows as a percentage of gross domestic capital formation average 1997 to 1999 was highest for Belgium/Luxembourg (90.9%), Sweden (78.9%) and Trinidad and Tobago (52.3%). For Australia, the ratio was 7.1%, the 16th lowest (59th highest) in the world and the sixth lowest (14th highest) in the developed world. See UNCTAD (2002), p.275.

aggregate FDI and domestic investment in Canada. FDI had a positive direct effect on Canadian capital formation ($1 of FDI led to an increase of $1.43 in total investment), but a negative indirect effect (through exports, imports and consumption) on investment. The net effect was considerably less than the initial direct effect (between $0.54 and $0.99). Using a panel of annual industry-level data, Hejazi (2002) analysed the link between FDI and domestic capital formation in Canada. Inward FDI increased total and non-service industry domestic investment, but no significant effect for service industries was found.[184] Using quarterly data, Kim and Seo (2003) analysed the relationship between FDI, domestic investment and economic growth in Korea, estimating a VAR and applying impulse response and variance decomposition to examine the dynamic interaction between the three variables. FDI had a negative, yet insignificant effect on domestic investment. When domestic investment was allowed to be contemporaneously endogenous, the response was positive, but not statistically significant. In contrast, domestic investment had a significantly negative effect on FDI. FDI had a significantly positive effect on economic growth, while, in turn, economic growth increased FDI.

For a summary of the empirical studies discussed above see Table 7-4. Most empirical studies found a significantly positive relationship between FDI and domestic investment. Only two studies did not substantiate the link, and one study found a negative link between the two variables. FDI and domestic investment therefore appear to be complements in most cases.

[184] "For all components of GFCF, the estimated impact of a one dollar increase in inward FDI is an increase of about 45 cents in capital formation in non-service industries. For machinery and equipment capital formation, the estimated impact is 22 cents, while it is 19 cents for engineering construction capital formation and only 6 cents for building construction capital formation." Hejazi (2002), p.33.

Table 7-4

Effects of FDI on Domestic Investment			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Domestic Investment	? (Positive if complements, negative if substitutes)	Positive (in developing countries, larger effect than through portfolio or loan inflows)	Bosworth et al. (1999)
		Positive for African & Asian developing countries Negative for Latin American developing countries	Agosin and Mayer (2000)
		Positive (in developing countries, larger effect than through portfolio or loan inflows)	Razin (2002)
		Positive (in a mixed sample)	De Mello (1999)
		Not significant (in developed countries)	Lipsey (2000)
		Positive (in Canada)	Van Loo (1977)
		Not significant (in Korea)	Kim and Seo (2003)
		Positive (in Canadian industries, positive for all industries and non-service industries, but not for service industries)	Hejazi (2002)

7.1.4 EFFECTS OF FDI ON TRADE

The link between FDI and trade is a key relationship that has been analysed in most FDI models, since FDI (resulting in local production) is seen as an alternative to exporting. MNE activity may affect the Host country's balance of payments through increased imports or exports. The overall trade effect is unclear and depends on how much MNEs import and export, which, in turn, depends on whether FDI is horizontal or vertical, market- or export-oriented, production- or distribution-oriented.

Neoclassical trade theory predicted FDI to have adverse effects on the balance of payments and on the terms of trade, though the latter were unlikely to be large (MacDougall, 1960). An improvement of the terms of trade was also mentioned by Vernon (1966), Streeten (1969) and Kindleberger (1969) – in the latter case assuming that FDI takes place in export-increasing or import-decreasing industries. In contrast, Hymer who – similar to Kindleberger – viewed FDI as investment linked to imperfect competition, MNEs and the concept of 'monopolistic (or ownership) advantage' claimed that the benefits from the balance-of-payments effect were debatable. What happened to imports depended on the income generated by FDI and Host's marginal propensity to import. As imports of FDI were generally exactly equal to the return for equity interest, no free foreign exchange was provided.

According to Dunning's (1993) OLI framework and MNE theory, FDI was likely to have an effect on the balance of payments by changing the composition of trade: intra-industry trade replaces inter-industry trade. The extent depends on whether the investment is intended to increase efficiency (related to product specialisation, differentiation and scale economies) or to acquire strategic assets (related to rationalisation and location advantages).

In Krugman (1983)'s version of the Proximity-Concentration Hypothesis, in which firms decided whether to trade production knowledge directly or indirectly by trading commodities (depending on the costs), FDI was seen as an alternative to exporting, so that they never occurred simultaneously. In other new trade theory models the effect of FDI on trade depended on whether intermediate input imports increased by more or less than final good imports decreased and on whether FDI was market- or export-oriented. According to Markusen (1984)'s general equilibrium model, MNE activity led to trade creation and thus had a positive effect on the Host country's trade performance. In his general equilibrium model with simultaneous FDI and exports, Helpman (1984 and 1985) discussed the effect of FDI on trade as the only welfare effect. MNEs in human-capital-abundant Home countries produced headquarters services as firm-specific factors and exported those services and intermediate goods to their subsidiary (intra-firm trade). Hence, service and input imports in Host rose, while final good imports fell. When the end-product was shipped back from Host to Home, exports also rose. When the rise in intermediate good imports outweighed the reduction of end-product imports, the relationship was complementary.

Ethier (1986) used a general equilibrium model with an endogenised internalisation decision of the firm specific factor. FDI and intra-industry trade were found to be larger the more similar factor endowments were and the larger the uncertainty between facing agents was. FDI and intra-industry trade were complements, since firms invested and traded intermediate inputs simultaneously. The causality in the FDI-trade relationship was unclear, as both could coexist. FDI also altered the trade pattern, since intra-industry trade replaced inter-industry trade.

Simultaneous trade flows of intermediate goods and final products were also discussed in the theory of international fragmentation of production.[185] In Jones and Kierzkowski's (1990) model, where the production process was split into several production blocks based in different locations and connected through service links, the effects of FDI on the Host country depended on whether the rise in service and intermediate good imports outweighed the reduction of end-product imports, and whether the local specialised production block generated exports. According to Brainard (1993), the FDI-export relationship depended on the trade-off between transport costs and increasing returns to scale (IRS). Two-way FDI between equally endowed trading partners occurred when trade costs were high compared with the IRS advantage. FDI, thus motivated by the proximity of markets, substituted for intra-industry trade, while causing intra-firm trade to rise.

Markusen and Venables (1998 and 2000) showed in their Cournot oligopoly model and their Dixit-Stiglitz monopolistic competition model, in which they analysed how (horizontal) MNE activity, the trade pattern and affiliate production were related to country characteristics, plant-level scale economies and trade costs, that welfare always improved when Host countries were small or skilled-labour-scarce, but decreased when they were large or skilled-labour-abundant. In small countries, the price index fell and local production increased with FDI, while the price index increased in the large country. Affiliate sales and trade were substitutes, as affiliate sales displaced trade following investment liberalisation.

In Zhang and Markusen's (1999) vertical FDI model, the FDI/GNP ratio was decreasing in Host country size when there were trade costs, so that small countries found it hard to attract FDI due to the limited size of their local markets for final outputs. However, when countries managed to attract FDI, their welfare depended on the amount of intermediate inputs shipped to

[185] Papers on international fragmentation by Dixit and Grossman (1982), Sanyal and Jones (1982), Deardorff (2001), and Jones and Kierzkowski (1990, 2001) also considered the effects of FDI, focusing on the FDI-trade relationship.

affiliates (affiliate imports) relative to the amount of final outputs shipped back to parent companies (affiliate exports). While affiliate imports and final good imports were substitutes, FDI also increased Host exports.

In Markusen's (1997 and 2002) Knowledge-Capital Model, trade and affiliate production could be substitutes or complements, depending on whether affiliate production was for local sale or export. Host exports and affiliate production were substitutes for similar countries (horizontal FDI) and complements for different countries (vertical FDI), while final good imports were replaced by the import of headquarters services.

According to Hanson et al.'s (2001) discussion of production- versus distribution-oriented FDI, the welfare effect also depended on the FDI form. Production-oriented FDI had a larger effect on Host country trade than distribution-oriented FDI, which increased imports by more than exports (as no goods were produced or further processed in the Host country). Distribution-oriented FDI was closer to exporting (from Home to Host) than to FDI in the traditional sense (i.e. investment for local production). Since exporting had a smaller welfare effect than local production, distribution-oriented FDI had a smaller welfare effect than production-oriented FDI. The welfare effect of diversified FDI is presumably similar to a combination of the effects derived from horizontal or vertical FDI models, since diversified firms may acquire horizontal or vertical MNEs or diversify domestically with their divisions setting up horizontal or vertical subsidiaries. As in the new trade theory models, countries can gain from increased trade.

Turning to empirical studies of consequences of FDI on trade, the initial effect of FDI on the Host country's balance of payments was generally positive, while the medium-term effect was negative (though small), as MNEs increased imports of intermediate goods and services and began to repatriate profits. There was a stronger complementarity between FDI and Host country exports than between FDI and imports. FDI also helped to promote openness and trade, especially since MNEs were more export-oriented than domestic firms. FDI in the export-oriented industries is often vital for the overall development. In Costa Rica, Hungary and Mexico, the top three MNE exporters accounted for 29%, 26% and 13%, respectively, of total exports. In China, the share of foreign affiliates in exports rose from 17% in 1991 to 50% in 2001 (UNCTAD, 2002). In Malaysia, 88% of the total capital in the electronics sector, a major export sector, was foreign-owned in the late 1990s (OECD, 1998), while rapid growth in flower exports (mainly produced by foreign affiliates) made Kenya the leading flower supplier of the European Union (UNCTAD, 2002).

A variety of methods have been applied in empirical studies to analyse the relationship of FDI and trade, including panel models with data on trade with a number of countries, time series models with aggregate data for a single country and plant-level or industry-specific data for a single country.

A positive correlation between aggregate FDI inflows and Host aggregate exports was found in panel data models by Pain and Wakelin (1998) and Liu et al. (2001) and in time series models by Wong (1988) and O'Sullivan (1993). Pain and Wakelin (1998) analysed the relationship between FDI and exports using aggregate data for OECD countries, finding FDI to have a positive effect on the export performance of Host countries. Liu et al. (2001) explored the relationship between FDI, exports and imports in China, using annual bilateral (aggregate) trade data for China and 19 Home countries and regions. They estimated a VAR to examine the dynamic interaction between the three variables. Inward FDI had a positive effect on Chinese exports to Home, increasing the growth of Chinese imports and, in turn, inducing Chinese inward FDI. The direct link from FDI to Chinese import growth was positive, but insignificant. Wong (1988) provided a test of the relationship between international factor mobility and the volume of trade using aggregate annual US data in a general equilibrium setting. Capital inflows increased exports, but had no significant effect on imports. O'Sullivan (1993) explored the link between FDI and exports, using Irish annual aggregate data. FDI positively affected Irish exports, contributing to export expansion and diversification and helping to transform the Irish economy from an agricultural-oriented traditional economy to an industrial-oriented modern economy.

Using plant-level data and looking at the export performance of foreign subsidiaries, Lall and Streeten (1977) showed that MNEs were more export-oriented than local firms. Lall (1977) conducted a survey of manufacturing firms in six developing countries, showing that MNEs or foreign-controlled firms exported a larger share of their sales than locally controlled firms. Only 3.8% of local firms exported more than 30% of their sales compared with 4.5% of MNEs. 26.1% of MNEs did not export compared with 38.5% of local firms. Barry and Bradley (1997) also looked at the export performance of foreign affiliates themselves, arguing that FDI had a growth-enhancing effect in Host countries. They qualitatively (not empirically) analysed FDI and trade using Irish aggregate and plant-level data, arguing that FDI induced structural changes and led to economic growth in Ireland. A significant share of FDI was export-oriented (foreign plants export 86% to 96% of their output) and most of the FDI into Irish manufacturing involved the construction of new state-of-the-art factories on greenfield sites.

Studies on export spillovers from MNEs to domestic firms (i.e. MNEs cause domestic firms to become more export-oriented) included Aitken et al. (1997) and Sousa et al. (2000). Aitken et al. (1997) examined a panel of 2,104 Mexican manufacturing plants operating in different industries and found that a high industry concentration of MNE activity increased the probability that domestic firms export. Sousa et al. (2000) extended Aitken et al.'s (1997) analysis, exploring firm-level data from 3,662 UK manufacturing firms. Increased competition through MNEs increased the probability that domestic firms export, supporting the existence of positive export spillover effects from MNEs to domestic firms.

While some studies on FDI and Host countries' imports showed that FDI either reduced imports or had no effect, there was also some empirical research showing that FDI increased Host country imports. In their survey of six developing countries, Lall and Streeten (1977) did not find a significant difference between the share of imports over sales between MNEs and non-MNEs. While the same percentage of MNEs and non-MNEs (23.9%) imported more than 50% of the value of their sales, more MNEs than non-MNEs imported between 10% and 50% of the value of their sales (67% and 62% respectively), and more non-MNEs than MNEs imported less than 10% of the value of their sales (14.1% and 9.1% respectively). Wong (1988), as mentioned before, did not find a significant link between FDI and imports in the US. Liu et al. (2001) found the relationship between FDI and imports in China to be positive, but insignificant. FDI increased imports indirectly, since FDI had a significantly positive effect on exports, which, in turn, had a significantly positive effect on imports.

Graham and Krugman (1993) looked at the trade behaviour of MNEs in the US, showing that FDI increased intermediate input imports by more than it reduced final good imports, as MNEs were import-intensive. MNEs with imports of $18,000 worth of materials per worker imported more than domestic firms with imports of $7,000 per worker. Zejan (1989) conducted a survey of majority-owned foreign affiliates of 118 Swedish manufacturing MNEs to explore the intra-firm trade between Swedish parent firms and their foreign affiliates. The ratio of affiliate (Host) imports over affiliate total sales was higher, the higher the parent's R&D expenditure and the higher the Host country's per capita income, and lower the higher the parent's degree of multinationality (measured as the ratio of the firms' foreign assets to their assets in Sweden) was – when affiliates were founded by acquisition or when the Host country imposed import restrictions.

For a summary of the empirical studies discussed above see Table 7-5. FDI was found to have a positive effect on exports – either by increasing exports directly, by establishing subsidiaries that are more export-oriented than local firms or by affecting the export orientation of local firms. The effect of FDI on imports was less clear with most studies not being able to find a significant link between FDI and imports and only one study finding a significantly positive effect.

Table 7-5

Effects of FDI on Trade			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Exports	Nil (if FDI is not different to domestic investment) or Positive (if FDI is export-oriented)	Positive	Wong (1988)
		Positive	Liu et al. (2001)
		Positive	O'Sullivan (1993)
		Positive	Pain and Wakelin (1998)
		MNEs are more export-oriented than local firms	Lall and Streeten (1977)
		MNEs are more export-oriented than local firms Also: evidence of export-oriented FDI	Barry and Bradley (1997)
		Positive export spillover effects from MNEs to local firms	Aitken et al. (1997)
		Positive export spillover effects from MNEs to local firms	Sousa et al. (2000)

(Table 7-5 continued)

Variable	Theoretically predicted effect	Effect of FDI or MNE activity found	Source
Imports	Negative (if local production replaces imports of final goods) or Positive (if imports of intermediate inputs increase by more than final good imports decrease)	Not significant	Lall and Streeten (1977)
		Not significant	Wong (1998)
		Not significant (but indirect positive effect through increased exports)	Liu et al. (2001)
		Positive (MNEs are import-intensive, so imports of intermediate inputs are likely to increase by more than final good imports decrease)	Graham and Krugman (1993)
		Affiliate imports are higher the higher R&D expenditure & Host country's p.c. income but lower the higher the parents' degree of multinationality, in acquired firms & in Host countries with import restrictions)	Zejan (1989)

7.1.5 EFFECTS OF FDI ON EMPLOYMENT, TRAINING AND WAGES

Employment creation and the effect on wages are other important effects analysed in most theoretical models. Since FDI is investment leading to local production and thus employment, it is generally seen as having a positive effect on employment, training and wages.

According to the Neoclassical Trade Theory, FDI increases welfare through a larger capital stock and increased employment (MacDougall, 1960). Since capital and labour are the two factors of production in the Heckscher-Ohlin model, and capital moves due to higher returns on capital in the Host than in the Home economy, the other major consequence of FDI is factor price equalisation (e.g. of wages). Mundell (1957) showed that factor mobility created by international factor price differentials substituted for goods trade and led to factor price equalisation on the goods and factor markets, with relative prices equal to the value in free trade equilibrium. According to Streeten (1969), foreign investment also led to the creation of direct and indirect employment, the training of workers, the creation of new skills, the provision of management, the training of local managers and an increase in domestic wages.

While the focus on FDI shifted towards models assuming imperfect (instead of perfect) competition, the Heckscher-Ohlin Model remained in use to analyse effects on factor prices. Feenstra and Hanson (1996), for example, expanded the analysis by looking at the effect of vertical FDI on wages. They applied a North-South model (where South, the Host of FDI, was unskilled-labour-abundant and North, the Home of FDI, was skilled-labour-abundant – instead of usual assumption of countries being labour- or capital-abundant), using a general equilibrium framework to show that FDI in South increased the relative wage of skilled labour in both countries. The ratio of skilled to unskilled labour used in the total production in both Home and Host increased. When relative wages of skilled labour increased in both countries, the price index of the Northern inputs relative to that of the South increased.

Vernon (1966) and Aharoni (1966) viewed FDI as beneficial for Host's employment, know-how and management, while benefits through manpower training and skill transfer were also discussed in several imperfect competition models, including Caves (1971), Buckley and Casson (1976). According to Dunning's OLI framework (1993), FDI led to the creation of direct and indirect jobs (through spillover effects and linkages) – though whether these jobs were better than employment in local firms depended on the Host economy, market structure, culture and human resource development (i.e. determinants of FDI). The welfare effect depended on whether labour markets were free of structural distortions and on whether a favourable cultural ethos and an appropriate educational and technological infrastructure were in place. According to Markusen's (1997 and 2002) Knowledge-Capital Model (with differences in relative endowments and country size, high and low transport cost and optional FDI ban), real prices of skilled labour in Host went up when countries shifted towards more skilled-labour-intensive activities.

Although neither Hanson et al. (2001) nor Ekholm et al. (2003) or Grossman and Helpman (2002a and 2002b) specified the welfare effect of production- versus distribution-oriented FDI, export-platform FDI and international outsourcing (i.e. vertical specialisation, when differentiated final goods are produced using product-specific intermediate inputs), those models showed that FDI was not only horizontal or vertical, but that both types were present and welfare depended on which FDI form dominates. Both Hanson et al. (2001) and Ekholm et al. (2003) claimed that when countries were different (e.g. in terms of market size, factor prices or productive capacity), vertical and export-platform FDI dominated, while horizontal FDI dominated between similar countries. Vertical FDI led to a reduction in an international wage differential and altered relative wages within countries (including the Host country), while horizontal FDI raised income in both the Home and the Host country, but did not change the income distribution (Hanson et al, 2001). Using Hanson et al's (2001) specification, the welfare effect also depended on whether investment was production- or distribution-oriented, since production-oriented FDI had a larger effect on employment creation and training than distribution-oriented FDI, which created little employment and led to limited skill transfer.

There were also a variety of Game Theoretic Frameworks analysing the effect of FDI on increased employment or reduced unemployment. Brander and Spencer (1987)'s model of endogenous tariffs and taxes and unemployment showed that FDI increased national welfare through tax revenue and reduced unemployment through an increase in local production. In Haaparanta's (1996) principal-agent model of competition between multiple governments, subsidies could increase FDI in high-wage countries (competing with low-wage countries), though the increase was not certainty. FDI was seen as beneficial purely because it increased employment (or reduced unemployment). No other effects were taken into account. Mudambi (1999) argued that although Host countries gained from increased employment in relatively backward areas, the overall gains depended on the type of investment support.

Haufler and Wooton (1999) showed that both taxes and tariffs worked in favour of large countries, so that small countries found it hard to attract FDI – even with lower taxes. However, taking factor effects into account changed the model slightly: when there was unemployment, small countries had larger per capita gains from FDI than large countries, so that they were willing to increase incentives (or lower taxes) to attract FDI, increasing the gap between the large and the small countries' best offer and thus attracting some FDI. So the Host country's welfare benefit depended on whether per capita gains (through increased employment) outweighed the reduced tax revenue.

According to Haaland and Wooton (1999) investment incentives offered by Host governments were economically justifiable, since the subsidy cost was offset by FDI, creating employment, and generating demand for domestic intermediate inputs (which were produced with IRS technology and knowledge spillovers from one intermediate firm to another). In the long-term, FDI could lead to the establishment of a thriving modern sector due to agglomeration effects and could be “the springboard for a country’s industrial development”[186]. Haaland and Wooton (2001a) assumed that the investment decision was determined by a combination of investment subsidies (inducing a firm’s entry) and labour market rigidities or redundancy payments (when the firm disinvested). While lower subsidies and higher redundancy payments (which made it harder for firms to leave) were more appealing to the Host country, MNEs preferred the opposite. Although MNEs initially created employment, it was possible that they lay off workers afterwards, reversing the welfare effect. Hence, the Host country’s welfare depended on how low it could set the subsidy and how high it could set the redundancy payments, while still attracting the employment-creating investment. Adding the employment level to the model did not change the outcome.

Haaland and Wooton (2001b) observed a trade-off between the value of extra employment and the cost of investment incentives. Countries with attractive labour-market conditions (a flexible labour market and low opportunity wages) experienced a net gain from investment, though the gain depended on the bargaining power of the parties involved. Countries with inflexible labour markets and high unemployment still attracted low-risk firms (when they offered large subsidies), while countries with flexible labour markets and low unemployment attracted high-risk firms (as those firms could pull out easily). Both types of countries could benefit from employment creation, though the overall welfare was subject to the subsidy size – in the first case – or to the length of the firm’s stay – in the second case.

Turning to empirical studies of the consequences of FDI on human capital, FDI had a positive effect in many empirical studies (typically based on industry-specific or plant-level data in a single country). MNEs could fill critical management gaps, create employment and transfer skills to local workers, managers and domestic firms. However, effects in individual cases depended on the MNEs’ practices, on the regulatory environment in Host countries and the initial skill level of local employees. The skill transfer was larger the higher the initial skill level was. The extent of labour spillovers also depended on whether the technical skills were firm-specific or generally applicable.

Empirical evidence also showed that FDI raised labour productivity and increased wages and/or employment through an increased capital stock. However, the overall effects of FDI on employment were unclear. Although MNEs created (direct and indirect) employment by setting

[186] Haaland and Wooton (1999), p.632.

up subsidiaries, often accounting for substantial shares of a Host country's employment[187], the quality of these jobs was sometimes questionable. Some of the jobs displaced employment in domestic firms, and thus did not have beneficial effects for the economy, though this was difficult to test empirically. For a summary of potential effects see Table 7-6.

Table 7-6

Range of Potential Effects of Inward FDI on Quantity, Quality and Location of Employment				
Area of Impact	**Direct**		**Indirect**	
	Positive	**Negative**	**Positive**	**Negative**
Quantity	Adds to net capital and creates jobs in expanding industries.	FDI through acquisition may result in rationalisation and job loss.	Creates jobs through forward and backward linkages and multiplier effects in local economy.	Reliance on imports or displacement of existing firms results in job loss.
Quality	Pays higher wages and has higher productivity.	Introduces practices in, e.g. hiring and promotion that are considered undesirable.	Spill-over of "best practice" work organisation to domestic firms.	Erodes wage levels as domestic firms try to compete.
Location	Adds new and perhaps better jobs to areas with high unemployment.	Crowds already congested urban areas and worsens regional imbalances.	Encourages migration of supplier firms to areas with available labour supply.	Displaces local producers, adding to regional unemployment, if foreign affiliates substitute for local production or rely on imports.

Source: UNCTAD (1994), p.167, Table IV.1.

Chen (1983a), Gershenberg (1987) and the Department of Trade and Industry (1995) used survey data to analyse the employment effects empirically, finding a variety of positive effects on training and employment creation. Chen (1983a) conducted a survey of Hong Kong manufacturing firms, showing that the number of MNEs undertaking training programs and their training expenditures as a percentage of value added were significantly higher than those for domestic firms in the garment, plastics and toys and electronics industries, though no significant difference existed in the textiles industry. Gershenberg (1987) analysed MNEs and the training and spread of managerial skills in Kenya, looking at career data for top and middle level managers in manufacturing firms, and found that MNEs offered more training to their managers than private local firms did. The Department of Trade and Industry (1995) issued a report on the spillover effects of FDI on the UK economy. After analysing 30 manufacturing case study firms, it was estimated that these inward investors generated a total of 21,515 jobs (717 per firm), while the net effect (i.e. taking account of displacement of local employment opportunities) was 13,983 (466 per firm). Every 100 direct jobs created 19.5 indirect jobs at the local level. Improvements to the local labour supply and labour quality through training provision were also important.

Globerman et al. (1994), Lipsey (1994), Feliciano and Lipsey (1999), Lipsey and Sjöholm (2003) and Conyon et al. (1999) looked at firm-level data to compare wages paid by foreign affiliates and domestic firms in different industries. They generally found foreign affiliates to pay higher wages than domestic firms, though the difference was sometimes explained by other

[187] Hungary (27.4%), Belgium/Luxembourg (24.6%) and South Africa (23%) were the countries with the highest employment of foreign affiliates as a percentage of total employment. For Australia, the ratio was 12.2%, the ninth highest in the world and the sixth highest in the developed world. See UNCTAD (2002), p.275.

factors. Globerman et al. (1994) analysed Canadian industry-specific wages and value-added per worker and found those to be higher in foreign-owned firms (affiliates of US, European or Japanese MNEs) than in local firms in the same industry, though they also found that this difference disappeared when controlling for firm size and capital intensity.

Lipsey (1994) used BEA data to compare wages by MNE affiliates with wages by domestic firms in the US. On average, foreign-owned firms paid 10-12% higher wages than domestic firms, though this difference was only 6-7% in manufacturing compared with 12-15% in other industries. Although foreign firms employed a higher proportion of employees in administrative and auxiliary establishments, the occupational mix only accounted for a small proportion of the wage differential. The wage differentials were also due to foreign firms locating in higher-wage industries (mainly manufacturing where, when taken separately, the wage differential was smaller) in lower-wage states, being larger and employing a higher proportion of high-skilled workers than domestic firms did, though “foreignness” accounted for some of the wage differential. Feliciano and Lipsey (1999) later expanded the dataset and found a 30% wage differential between wages paid by domestic firms and foreign-owned firms, though most of this differential was related to firm size and industry-composition. All of the manufacturing wage differential could be explained by firm size, state and industry characteristics, while 7-8% of the wage differential in other industries could not be explained.

Lipsey and Sjöholm (2003) analysed the link between FDI and wages in Indonesian manufacturing using a questionnaire of over 19,000 plants. Wages in foreign-owned firms were 12% higher for blue collar workers and 20% higher for white collar workers than in domestic firms. There was strong evidence that the higher wage in foreign firms was due to higher labour quality (e.g. higher education), while only a small proportion of the differential was associated with plant characteristics. Conyon et al. (1999) found that wages in formerly domestic firms increased by 3.4% to 4.2% after foreign acquisition due to increased labour productivity.

Aitken et al. (1995) and Figlio and Blonigen (2000) analysed the effect of FDI on industry-specific average wages, generally finding a positive relationship. Aitken et al. (1995) found average wages to be higher the higher an industry’s foreign ownership level was. However, the average wage growth was due to higher wages in the foreign firms and a large wage differential between foreign-owned and domestic firms for Mexico and Venezuela. Only for the US was the positive effect on industry-specific wages due to both higher wages in foreign firms and wage spillovers to domestic firms. The wage differential was smaller, but it still existed. Even after controlling for size, geographic location, skill mix and capital intensity of the industry, the wage differential persisted. Figlio and Blonigen (2000) examined the effect of FDI on wages in local communities in South Carolina using detailed county-level panel data. Real wages for workers in the same industry and county increased more when a foreign manufacturing affiliate was established than with domestic investment. However, FDI also had the unwanted effect of lowering the per capita county-government expenditure and redistributing money away from public school expenditure.

Feenstra and Hanson (1997), Blonigen and Slaughter (2001), Griffith and Simpson (2001) and Driffield and Girma (2003) focused on the effect of FDI on wage inequality. They discussed the effects of FDI on both skilled and unskilled labour, with unclear results overall. Feenstra and Hanson (1997) analysed a panel dataset covering a number of Mexican states, industries and time periods to show that there was a link between foreign capital inflow (FDI) and an increase in the relative wage for skilled labour (compared with unskilled labour), as growth in FDI was positively correlated with an increase in the demand for skilled labour (relative to unskilled labour). Blonigen and Slaughter (2001) explored the effect of US FDI on wage inequality using US manufacturing data, but no significant positive relationship between FDI and the skilled wage share in the total wage bill, which was used as an indicator of within-industry skill upgrading, was found. In contrast, Japanese greenfield investment reduced the demand for skilled labour (relative to unskilled labour). Griffith and Simpson (2001) looked at plant-level data for the UK manufacturing industry. The share of skilled labour and wages for both skilled and unskilled labour were higher in foreign-owned firms than in local firms, which was consistent with the finding that productivity in foreign affiliates was higher than in local firms.

Driffield and Girma (2003) used annual data for 895 plants in the UK electrical and electronic industry to estimate a simultaneous dynamic panel data framework. Wages for skilled workers were 7.6% higher in foreign firms than in domestic firms, while the wage differential for unskilled workers was 6%. There was also evidence of wage spillovers through MNEs, though these were limited to industries and regions that affiliates were based in. Wage spillovers existed since foreign firms increased the demand for both skilled and unskilled labour, thereby increasing wages overall. However, for skilled labour, domestic firms increased wages to keep key staff, so that the effect was more pronounced on skilled than on unskilled wages.

For a summary of the empirical studies discussed above see Table 7-7. Overall, empirical studies found FDI to have a significantly positive effect on training, employment creation and average industry-specific wages. Wages in foreign affiliates were higher than those in local firms. The effect of FDI on wage inequality was not as clear, with one study finding a positive effect but another finding no significant effect.

Table 7-7

Effects of FDI on Employment, Training and Wages			
Variable	**Theoretically predicted effect of FDI**	**Effect of FDI or MNE activity found**	**Source**
Training programs & expenditures	---	More in MNEs than in domestic firms	Chen (1983a)
Training and spread of managerial skills	---	More in MNEs than in domestic firms	Gershenberg (1987)
Indirect employment creation	Positive	Positive (5 direct jobs → 1 indirect job)	Department of Trade and Industry (1995)
Wages & Value-added per worker	Higher in MNEs	Higher than in domestic firms (but no difference when controlling for firm size & capital intensity)	Globerman et al. (1994)

(Table 7-7 continued)

Variable	**Theoretically predicted effect of FDI**	**Effect of FDI or MNE activity found**	**Source**

Wages	Higher in MNEs	Higher than in domestic firms (larger differential for non-manufacturing than for manufacturing firms)	Lipsey (1994)
		Higher than in domestic firms (but no difference in manufacturing when controlling for establishment and industry- composition, while difference in non-manufacturing persists)	Feliciano and Lipsey (1999)
		Higher than in domestic firms (larger differential for white collar than for blue collar workers' wages)	Lipsey and Sjöholm (2003)
		Higher after acquisition of domestic firms by foreign firm	Conyon et al. (1999)
Industry-specific average wages	Positive	Higher average wages if foreign ownership in an industry is higher. Wage spillovers to domestic firms in the US, but not in Mexico or Venezuela	Aitken et al. (1995)
		Increasing average wages if foreign firm is established	Figlio and Blonigen (2000)
Wage inequality (relative wage of skilled labour)	Positive	Positive (for the relative wages in a given state and industry)	Feenstra and Hanson (1997)
		No effect overall, but negative effect on skilled labour demand in the case of Japanese greenfield investment	Blonigen and Slaughter (2001)
Share of skilled labour & wages (skilled & unskilled)	Higher share & wages in MNEs	Higher than in domestic firms	Griffith and Simpson (2001)
Wages (skilled & unskilled)	Higher in MNEs	Higher than in domestic firms	Driffield and Girma (2003)

7.1.6 EFFECTS OF FDI ON TECHNOLOGY AND PRODUCTIVITY GROWTH

While technology transfer in relation to FDI was mentioned in some neoclassical trade models, it was mainly the models viewing FDI as investment linked to imperfect competition and monopolistic advantages that showed that FDI led to the transfer of managerial or entrepreneurial skills.

MacDougall (1960) showed in his neoclassical trade model that Host countries could benefit through production expansion and positive externalities related to technology diffusion. Similarly, Streeten (1969) claimed that foreign investment contributed to Host welfare through technology transfer. According to Caves' (1971) imperfect competition model, in which product differentiation was the monopolistic advantage, Host welfare increased through uncaptured productivity spillovers such as new skills, technologies, production and marketing techniques.

Buckley and Casson (1976) viewed knowledge and skills as the source of market imperfection and the reason why firms chose to internalise production. Since MNEs were able to bypass imperfect external markets for knowledge and diminish barriers to the production and diffusion of knowledge, they became developers and transferors of knowledge and skills, creating benefits for both Home and Host countries. However, weaknesses of MNE-based production and knowledge transfer were the potential replication of research activities by major players and hence the wasteful use of limited research resources, a high price for knowledge and difficulties to introduce discriminatory pricing of knowledge (e.g. by dividing markets nationally or regionally and selling licences to small and restricted markets at a low price). The major problem of internalisation of production for Host governments was that the foreign affiliate's ultimate locus of authority was in the Home country, so that the affiliate had only limited autonomy and MNE activities could not be harmonised with Host's social and economic policies (such as training labour, inducing regional migration of workers, reducing the use of unpriced natural resources). In order to maximise Host welfare, MNEs needed to cooperate with Host governments. Buckley and Casson (1981) added that since MNEs switch from exporting to investing (i.e. exports positively cause FDI), FDI reduced final good imports in Host, replacing them with the import of knowledge and local production of final goods.

Teece (1981 and 1985) argued that countries would gain (or at least not lose) from FDI if governments developed investment safeguards (such as penalties or bonds) to stop MNEs from early withdrawal or delayed expansion, which would make resources dedicated to the investment (such as roads, electric utilities or specialised workers) redundant. However, Host countries could always benefit through information disclosure, as governments and workers needed to be informed before projects commenced to be able to plan for them. Magee (1977) saw positive welfare effects mainly in technology transfer through MNEs, though their extent was affected by patent systems and trademark laws. Casson (1987) also focused on technology transfer, adding that MNEs could be agents of social change, affecting the cultural and economic environment in which they operate.

While early studies showed that FDI increased allocative and technical efficiency and led to technology transfer and diffusion, detailed theoretical models analysing spillovers did not appear until the late 1970s. Findlay (1978) viewed FDI as the transfer of a "package" (including capital, management and new technologies), arguing that FDI is different to pure capital movements. He treated domestic and foreign capital as distinct factors of production and combined the "relative backwardness" hypothesis (by including a relative backward Host region and an advanced Home region) and the "contagion" hypothesis, endogenising "the rate of technological change in the backward region as a function of the degree to which it is exposed to foreign capital" (Findlay 1978, p.7)) to show how MNE activity led to the diffusion of new technologies. Technology was modelled as having a public good nature, while technology diffusion was subject to a variety of factors including Host's educational level, market structure, the terms of royalties and licensing agreements and patent laws.

Koizumi and Kopecky (1977) explicitly modelled how FDI led to technology transfer (such as the transfer of technical skills and managerial expertise with public good nature). Technology was assumed to be a public good and its transfer depended on the foreign ownership share in the Host country's capital stock. When the foreign capital stock increased, Host's marginal product of capital rose relative to Host's interest rate (through the technology transfer). As a result, Host's domestic capital accumulation increased until the marginal product of capital was equal to the interest rate, which affected Host's capital intensity, though the process was not always instantaneous. The model showed that the foreign capital stock and thus the capital intensity were affected by the Host country's indebtedness and changes in its savings ratio.

Das (1987) modelled technology transfer from MNEs to domestic firms by assuming that MNEs had monopoly power and superior technology, which leaked through to competitive native firms in Host once MNEs set up subsidiaries in the Host country. He showed that MNEs always benefited from setting up subsidiaries through increased profits and outputs because of their monopoly power (and despite the technology 'leakage'), while the effect on profits and output of Host firms was ambiguous, depending on demand and supply elasticity. Even when Host firms did not gain in terms of profits, they did gain in terms of efficiency. Overall, the Host country was assumed to benefit from MNE activity (even when native firms did not gain), as prices declined due to improved technology and efficiency.

Wang and Blomström (1992) developed a model in which technology transfer through MNEs was an endogenous equilibrium phenomenon, explaining how local firms (taking time to learn) and policies (supporting local firms in their learning process) affected the technology transfer. Technology diffusion was either costless (through technology spillovers) or costly (if induced by market competition). Technology was seen as a key determinant of economic growth, international competitiveness and trade performance and as such beneficial to Host countries. However, the average age of technologies transferred was negatively related to the development stage of an economy, i.e. subsidiaries in developed countries received the latest technologies, while subsidiaries in developing countries did not.

According to Dunning's (1993) OLI framework, direct and indirect effects of MNEs of technology and innovatory capacity of the Host depended on institutional environment and economic structure. Costs and benefits from FDI depended on whether MNEs set up fully-owned subsidiaries or entered joint ventures, strategic alliances, subcontracting arrangements or inter-governmental cooperation. Inter-firm linkages and spillover effects depended on factors including market structure and characteristics, the Host country's policies, the extent and nature of the ownership advantage, existing supply and absorptive capabilities of local firms, the location specific environment for the absorption, diffusion and accumulation of new knowledge and technology, the investment type and the MNEs' global strategies.

According to Hanson et al.'s (2001) model of production- and distribution-oriented FDI, the welfare effect depended on how much of the investment is production- and how much was distribution-oriented. Production-oriented FDI had a larger effect on the Host country due to spillover effects, linkages and new business practices than distribution-oriented FDI, which led to a limited transfer of technology, skills and business practices.

Turning to empirical studies of the consequences of FDI on technology and productivity growth, the effect was empirically ambiguous. While many empirical studies (typically based on industry-specific or plant-level data) supported the hypothesis of positive inter- and intra-industry effects on productivity, there was some evidence that no such productivity spillovers existed. However, adding other variables to the analysis – such as a certain threshold of development (a minimum of education, investments in R&D or infrastructure), a certain trade regime (export-promotion trade policy), the level of industrialisation and technology or geographical factors – helped to explain these contradictory results.

Focusing on technology spillovers, studies of manufacturing firms in several Host countries – including studies by Caves (1974b), Blomström and Persson (1983), Chen (1983b), Fairchild and Sosin (1986), Görg and Strobl (2000) and Branstetter (2000) – provided evidence that FDI had positive spillover effects on domestic firms. Caves (1974b) analysed data on Australian and Canadian manufacturing industries in the 1960, finding higher foreign shares of industry assets to positively affect the value added per worker in Australian domestic firms (though the result was based on only 23 observations). However, no significant link between foreign ownership and relative productivity levels was found in Canada. Blomström and Persson (1983)'s study of several manufacturing industries in Mexico showed that intra-industry technology spillovers existed and value added in domestic plants was positively affected by an industry's foreign employment share.

Chen (1983b) estimated technology diffusion rates, using a survey of 369 firms in four major manufacturing industries in Hong Kong. He observed a close and positive relationship between FDI and an industry's technical progress. Fairchild and Sosin (1986) conducted interviews with general or production managers from domestic and foreign manufacturing firms in Latin America. They found foreign ownership to have positive effects on technical activity and performance, though the effects were smaller than often assumed. No significant effects were found on the implementation of new technologies. Görg and Strobl (2000) examined plant survival over time (used as an indicator of technology spillovers) in a sample of 12,812 manufacturing plants in Ireland[188]. MNEs increased domestic firms' life expectancy in high-tech industries, while no life-enhancing effect were found in low-tech industries. Looking at knowledge spillovers, Branstetter (2000) used firm-level data to analyse these spillovers from Japanese firms investing in the US, finding that FDI increased the knowledge spillover flow from and to Japanese investors.

Looking at productivity (instead of technology) spillovers, studies by Keller and Yeaple (2003) and Girma et al. (2004) showed that FDI had positive productivity spillover effects, while other empirical studies, such as Haddad and Harrison (1993) for Moroccan manufacturing and Aitken and Harrison (1999) for Venezuela, found weaker links between the presence of MNEs and the productivity of domestic firms.

Keller and Yeaple (2003) analysed the effect that FDI and imports had on a sample of 1,115 US manufacturing firms. Both FDI and imports had productivity spillovers, though the evidence was stronger for FDI. It was estimated that FDI spillovers accounted for 14% of the productivity growth in those US firms between 1987 and 1996. Girma et al. (2004) used firm-level panel data for 4,600 UK manufacturing firms to analyse productivity spillovers from FDI through horizontal, forward and backward linkages, from export- versus market-oriented FDI and depending on firms' export activities. Although there was no evidence for productivity spillovers through horizontal linkages, there was evidence of forward productivity spillovers from market-oriented MNEs to domestic firms and of backward productivity spillovers from MNEs to domestic firms, though the extent depended on how export-oriented MNES were.

Haddad and Harrison (1993) used a firm-level dataset for Moroccan manufacturing firms to test whether FDI led to positive productivity spillovers. They rejected the hypothesis of spillovers as productivity growth was smaller in sectors with a larger foreign presence, although foreign firms had a higher level of overall multi-factor productivity. While domestic firms did not

[188] The total sample of 12,812 plants referred to a changing set of indigenous plants over time. 4,039 plants existed in 1973 and 5,830 in 1996. Of those that existed in 1973 only 1,418 remained in 1996, indicating a considerable plant turnover.

benefit from FDI, joint ventures did. Aitken and Harrison (1999) tested the effect of MNEs on productivity growth, looking at manufacturing plant-level data from Venezuela. Although domestic firms exhibited higher productivity in sectors with a larger foreign share, there were no spillovers, since MNE affiliates systematically located in more productive sectors. Harris and Robinson (2002) compared the performance of UK manufacturing plants acquired by MNEs with that of domestic or domestically acquired firms, finding that MNEs took over the most productive domestic plants, but that productivity decreased after acquisition, rejecting the hypothesis that MNEs increased firms' productivity.

Studies analysing labour productivity effects – including studies by Blomström (1986), Blomström and Wolff (1993), Globerman (1979), Kokko (1994) and Conyon et al. (1999) – found a positive link between FDI and labour productivity or labour productivity growth. Blomström (1986) analysed Mexican data, showing that the larger an industry's foreign employment share was, the faster was the rate of convergence towards the level of labour productivity in the corresponding US industry. Blomström and Wolff (1993) used a similar dataset, finding that industries with higher foreign output shares had higher labour productivity growth in domestic firms.

According to Globerman (1979), who analysed Canadian manufacturing industries, labour productivity differences were positively correlated with an industry's foreign ownership, capital intensity, plant-level scale economies, labour quality and average working hours per employee. Kokko (1994) analysed plant-level data from a number of Mexican manufacturing industries. Foreign firms increased the average labour productivity in domestic firms, but spillover effects differed across industries and were less likely in industries with 'enclave' characteristics (such as large technology gaps). Conyon et al. (1999) showed that UK firms acquired by foreigners increased profitability and grew after foreign acquisition. Labour productivity increased by 14% due to acquisition, even after controlling for capital intensity, fixed assets, fixed firm effects and autonomous technical changes (via time dummies).

For a summary of the empirical studies discussed above see Table 7-8. Most empirical studies found a significantly positive relationship between FDI and technology spillovers/ diffusion, knowledge spillovers and productivity spillovers. However, there were also three studies that found no significant or negative effects on productivity through FDI. Furthermore, a positive link between FDI and the labour productivity level and growth was found.

Table 7-8

Effects of FDI on Technology and Productivity Growth			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Technology Spillovers	Positive	Positive in Australia (positive effect on value-added per worker in domestic firms), but not significant in Canada	Caves (1974b)
		Positive (higher value-added in domestic firms the higher foreign ownership in an industry)	Blomström and Persson (1983)
Technology Diffusion	Positive	Positive	Chen (1983b)
Technical Activity & Performance	Positive	Positive (but no significant effects on implementation of new technologies)	Fairchild and Sosin (1986)
Domestic Firms' Life Expectancy (indicating technology spillovers)	Positive	Positive in high-tech industries, but not significant in low-tech industries	Görg and Strobl (2000)
Knowledge Spillovers	Positive	Positive	Branstetter (2000)

Productivity Spillovers	Positive	Positive (and stronger evidence for FDI than for imports)	Keller and Yeaple (2003)
		Not significant for spillovers through horizontal linkages, but Positive for forward spillovers by market-oriented MNEs to domestic firms and backward spillovers between all MNEs and domestic firms	Girma et al. (2004)
		Not significant	Haddad and Harrison (1993)
		Not significant	Aitken and Harrison (1999)
Productivity	Positive	Not significant or negative (productivity decreases after acquisition)	Harris and Robinson (2002)
Labour Productivity Growth	Positive	Positive (faster convergence to US level in MNEs than in domestic firms)	Blomström (1986)
		Positive	Blomström and Wolff (1993)
Labour Productivity	Positive	Positive (higher productivity the higher foreign ownership in an industry)	Globerman (1979)
		Positive (but may differ across industries)	Kokko (1994)
		Positive (higher after acquisition)	Conyon et al. (1999)

7.1.7 EFFECTS OF FDI ON MARKET STRUCTURE AND COMPETITION

While the effects of FDI on market structure and competition have been analysed in several theoretical models, the results were unclear overall. FDI could improve domestic efficiency and increase competition for local entrepreneurs (moving the relevant industry towards a perfect competition scenario), but could also drive out national firms and increase monopoly power.

According to Streeten (1969), whose model was based on a neoclassical framework, foreign investment contributed through the growth of local entrepreneurship (as suppliers), a change in the market structure and the establishment of contacts with overseas banks and other organisations. However, since effects could be either positive or negative, he also emphasised the importance of government involvement to maximise the Host (in his case developing) country's welfare benefits. Caves (1971) focused on the importance of product differentiation as a monopolistic advantage, analysing the industrial pattern and welfare effects of FDI. Industries in which FDI occurred had an oligopolistic market structure, i.e. consisted of a few large firms, due to the existence of scale economies. Setting up foreign affiliates increased competition and improved the Host country's market performance – independently of the market structure before the investment – due to the pricing and product strategy of the affiliates, which needed to have some advantage in unit costs and profitability over domestic firms to enter the market in the first place. According to Vernon's Product Cycle Hypothesis (Vernon, 1966), competition for local entrepreneurs increased when Host countries switched from importing to exporting, as the production of maturing and standardised goods was located in the Host country. Dunning (1993) argued that MNEs had an effect on market structure and the efficiency of value-added activity, though the extent depended on the entry mode, the investment type, the existing market structure and economic policies in the Host country.

According to the new trade theory, it was inconclusive whether FDI inflows drive out national firms and increase monopoly power or whether they increase domestic efficiency and competitiveness. Grossman (1984) linked FDI, international trade and the formation of a 'class of entrepreneurs', modelling firm formation in an open economy. FDI could be harmful in less developed countries when it inhibited the formation of local entrepreneurship through increased competition, the lowering of local prices and a reduction in the local entrepreneurial class size. The entrepreneurs with the highest skills became workers in foreign affiliates, since wage income fell by less than the entrepreneurial income. National income declined if no taxes were in place because profits from FDI accrued to foreigners.

According to Horstmann and Markusen's (1987a) Proximity Concentration Hypothesis, there is a trade-off between maximising proximity to customers and concentrating production in order to achieve scale economies so that MNEs locate in industries with large firm-specific and large trade costs, but relatively small plant-level scale economies. Whether FDI has a positive welfare effect was conditional on whether foreign firms added competition or whether they only transferred rents that would have otherwise been earned by local firms.

Turning to empirical studies of consequences of FDI on market structure and competition, the findings from empirical studies were as unclear as the conclusions from theoretical models. Empirical studies looking at the competition effect included Dunning (1958) and Barrios et al. (2004), who used plant-level data for individual countries. The effect on industrial concentration was analysed by Chen (1983b), who used plant-level data, and Rosenbluth (1970), Wilmore (1976), Evans (1977) and Driffield (2001), who used industry-specific data.

Looking at the effect of FDI on competition, Dunning (1958) – in the first comprehensive study of consequences of inward FDI – examined a sample of US-owned firms in the UK. Most foreign firms were either the dominant producers or part of a small group of leading producers in an industry. Barrios et al. (2004) examined plant-level panel data for the Irish manufacturing industry and found that FDI increased competition (measured by number of local firms). Although increased competition initially deterred domestic firms from entering, positive externalities gradually outpaced this initial negative effect, so that FDI had an overall positive effect on the development of local firms.

Analysing the effect of FDI on industrial concentration, Chen (1983b) explored the market structure of the Hong Kong manufacturing sector (though his analysis focused on technology diffusion). The presence of foreign firms was found to be higher in more concentrated industries and where the profitability of innovation was higher, though the causal link was not clearly stated. Rosenbluth (1970) analysed the link between foreign ownership and concentration in Canadian manufacturing and non-manufacturing industries, finding a significantly positive correlation between foreign control and industry concentration. Moreover, the average size of foreign controlled firms was larger than that of domestic firms. Wilmore (1976), who looked at Guatemalan industries with at least one foreign leading firm, also found a positive link between an industry's level of concentration and foreign ownership.

Evans (1977) analysed the link between FDI and industrial concentration comparing pharmaceutical industry data from Brazil, other developing countries and the US. He found evidence for the "Miniature Replica' Hypothesis (according to which industries with a high degree of foreign ownership in developing countries were less concentrated than equivalent industries in developed countries), but not for the 'Technology or Market Size' Hypothesis (according to which industrial concentration in developing countries was higher than in the larger markets of developed countries). Hence, FDI seemed to reduce industrial concentration. In order to explore the effect of inward investment on the Host market structure, Driffield (2001) used industry-specific data from the UK. FDI reduced industry-specific market concentration and increased the competitive pressure on domestic industries, thus reducing the welfare loss due to monopoly power. MNEs – due to their technical or firm-specific advantages – entered industries where domestic entry was not feasible and could thus solve market failure.

For a summary of the empirical studies discussed above see Table 7-9. Studies analysing the effects of FDI on market structure and competition gave mixed results. While some studies found FDI to have increased competition due to diminishing industrial concentration, there were also studies that found the opposite, showing that effects depend on the sample analysed and they vary between countries.

Table 7-9

Effects of FDI on Market Structure and Competition			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Competition	Positive or Unclear	Negative (MNEs tend to be dominant or leading producers)	Dunning (1958)
		Positive	Barrios et al. (2004)
Industrial Concentration	Negative or Unclear	More MNEs in concentrated industries, but not necessarily positive link from FDI to industrial concentration	Chen (1983)
		Negative	Evans (1977)
		Negative	Driffield (2001)
		Positive (MNEs tend to be larger than domestic firms)	Rosenbluth (1970)
		Positive	Wilmore (1976)

7.1.8 EFFECTS OF FDI ON THE ENVIRONMENT

The effect of FDI on the environment is an example of a non-economic effect that FDI can have. The effect is unclear, as it depends on the assumptions made in the theoretical model used to explain the link and on the policy actions undertaken by the Host country.

Explaining the link between trade, capital mobility and the environment, Copeland and Taylor (1997) set up a Heckscher-Ohlin type model with two countries (a rich capital-abundant North and a poor labour-abundant South) and two goods (a capital- and pollution-intensive good and a labour-intensive good). When factor abundance determined the trade pattern, the capital-abundant North produced pollution-intensive goods despite stricter pollution regulation. When, however, the income gap between North and South was too large, income differences determined the trade pattern and the pollution-intensive production was shipped to the South, thereby increasing world pollution levels. Capital mobility (foreign investment) also increased pollution, as capital and the production of the capital- and pollution-intensive good were shipped to the less strictly regulated South.

The link between FDI and the environment could also be explained indirectly with FDI leading to economic growth (as explained in Chapter 8.2), and, in turn, affecting the environment, as explained by the Environmental Kuznets Curve (EKC). The EKC is a relationship based on empirical analysis assuming that an inverted U-shaped relationship exists between a country's per capita income and its environmental deterioration.[189] In order to find a theoretical explanation for the EKC, Copeland and Taylor (2003) developed a general equilibrium model with two factors (capital and labour), two goods (including one that generates pollution during production) and interaction between government policy and private sector behaviour. They claimed that not only per capita incomes, but also other national characteristics (including natural resources and capital abundance) determined pollution levels, as they affected pollution demand. Taking trade into account showed that the effects were unclear, as trade affected the environment via scale, composition and technique effects, varying across countries. Hence, the link between growth and the environment was not as clear as indicated by empirical work.

According to Dunning's (1993) OLI framework, non-economic (political, cultural and environmental) effects depended on government intervention, the formulation of standards and investment regulation and the existence of market failure. In an OECD (1997) report on the relationship between economic globalisation (including FDI) and the environment, it was argued that there was not enough evidence to conclude that FDI led to environmental degradation of Host economies. MNEs met environmental standards more often than domestic companies. Although there were some examples of MNEs having moved outdated facilities from developed

[189] See, for example, Grossman and Krueger (1995) who conducted an empirical analysis of 42 countries to test the link between per capita income and various environmental indicators including air pollution, the state of the oxygen regime in river basins, faecal contamination of river basins and the contamination of river basins by heavy metal. Environmental deterioration decreased with increasing per capita income after an initial rise. The turning point was an estimated $8000 per capita.

to developing countries[190], the Pollution Haven Hypothesis (arguing that MNEs moved to Host countries due to lax environmental regulations) did not appear to be true since environmental costs were a significant determinant of resource-seeking and not market- or platform-seeking FDI and overall accounted for only a small part of total production costs (2-3%). While pollution intensity had increased in developing countries, the more likely reason behind it was the shift into manufacturing industries, which is a normal part of the development process. Another argument is that FDI led to more trade and openness (including openness for foreign technology and capital), which led to a cleaner set of industries and an improvement of Host's environmental performance. Hence, pollution havens existed – if at all – in protectionist economies, while open economies that operated straightforward, transparent and efficient environmental programs gained, not lost, from FDI.

Most empirical studies approached the subject indirectly, exploring the determinants of FDI to find out what FDI type countries attracted, which, in turn, could indicate what the consequences of FDI on the Host country's environment were. Gentry and Fernandez (1997) asked Fortune 500 Chief Financial Officers (CFOs) and analysts from eight different sectors to value environmental factors in their investment decision. They found that the effect of environmental factors was limited, but could become more important in the future. Kolstad and Xing (1998) used data on a number of manufacturing industries in developed and developing countries to test whether lax environmental regulation had an effect on FDI. The laxity of environmental regulation was a significant FDI determinant in industries with high pollution control costs, but not in other industries. Hence, negative environmental effects were possible in countries that attract industries with high pollution control costs.

Keller and Levinson (1999) explored the relationship of changing environmental standards and FDI inflows in US states using a panel dataset of 958 plants. They found evidence for a small deterrent effect of environmental regulations in pollution-intensive industries, but no evidence for large or widespread effects. Smarzynska and Wei (2001) tested for the Pollution Haven Hypothesis of FDI using firm-level data of 534 MNEs with investment projects in various transition economies. Again, some evidence for a positive relationship between lax environmental regulations and FDI was found, but overall evidence was weak and not robust. Bora (2002) analysed the pollution intensity of majority-owned foreign affiliates of US MNEs, finding that developed countries had the highest share of pollution-intensive production (including chemicals, primary and fabricated metals) in total affiliate production, while Jamaica, Belgium, Canada, Panama and Australia had the highest proportion of pollution-intensive production relative to Host country production (mainly reflecting their comparative advantages).

For a summary of the empirical studies discussed above see Table 7-10. Overall, the effects of FDI on the environment were unclear. While there was some evidence that FDI led to environmental degradation when Host countries had lax environmental regulation,

[190] Mabey and McNally (1999) listed as examples the tanning industry in Brazil, Argentina, South Africa and Eastern Europe, the phosphate and nitrogen fertiliser industry in Russia, Morocco, Tunisia, North Africa, the Middle East and China, the iron and steel industry in Central and Eastern Europe, Russia, Brazil, China and Korea and the mining sector in Papua New Guinea, Indonesia, the Philippines, Vietnam and the Solomon Islands.

environmental factors were also found of limited significance in terms of affecting the investment decision. The environmental effect of FDI depended on the individual case analysed.

Table 7-10

Effects of FDI on the Environment			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Environmental degradation	?	Higher in countries with lax environmental regulation (as they attract industries with high pollution control costs)	Kolstad and Xing (1998)
		Slightly higher in states with lax environmental regulation (as they attract pollution-intensive industries)	Keller and Levinson (1999)
		Slightly higher in countries with lax environmental regulation (as they attract more pollution-intensive industries)	Smarzynska and Wei (2001)
		? (environmental factors were not found to be significant in investment decision)	Gentry and Fernandez (1997)
		? (Pollution-intensive production is higher in developed countries and countries with a comparative advantage in relevant industries)	Bora (2002)

7.2 AUSTRALIAN EMPIRICAL STUDIES OF CONSEQUENCES OF FDI

Studies of company surveys have commonly been used to analyse effects of MNE activity in Australia and include a survey of US MNEs by Brash, surveys of Japanese MNEs by Hutchison and Nicholas (1994) and Nicholas and Purcell (2001), and surveys of international MNEs by the ABS (1998) and Nicholas et al. (2003).

In his field study on FDI in Australia for which US manufacturing companies were interviewed, Brash (1966) not only asked about investment motives, but also about investment effects related to training, wages, R&D, technology, productivity and trade. US affiliates provided training to Australian workers. 51 (76%) of the 67 companies surveyed even sent personnel to the US for training (in particular in scientific or technical fields). US affiliates in Australia also offered higher wages and salaries in all industries (except food, drink and tobacco) compared with the Australian industry average (including US affiliates). Thirty-nine percent of companies (employing 72% of workers in US affiliates) conducted research, but only 1.4% of the workforce was engaged in research and 0.6% of total sales revenue was spent on research. The companies conducting research were typically 100% US-owned. US parent company technology and technology transfer was seen as vital to Australian operations by 76% of companies. The value of production per employee (except for industrial chemicals and motor vehicle construction) and the value of plant and machinery per employee (except for food, drink and tobacco) in US affiliates were also higher than the Australian industry averages. The ratio of imported materials and finished goods to sales was high: more than 10% of the companies imported over 50% of the value of their sales and almost 50% of companies imported more than 20% of the value of their sales. In contrast, the ratio of exports to sales was low: 28% of companies did not export and another 48% of companies exported only between 0.01% and 2.99% of the value of their sales. Only 9% exported more than 10% of the value of their sales. Most companies (48 of 67) named New Zealand as an export destination, followed by South-

East Asia (named by 26 firms), Australian Territories and Pacific Islands (both named by 14 firms).[191] Only two firms indicated exports going to the US, while a further nine firms exported to Continental Europe and the UK, showing that US firms in Australia produced primarily for the local market and/or for exports to countries in the region. However, the wider effects of FDI on the Australian economy were speculative.

Later company surveys by Hutchison and Nicholas (1994), Nicholas and Purcell (2001), the ABS (1998) and Nicholas et al. (2003) focused more on the business or management side of the effects of MNE activity. Hutchinson and Nicholas (1994) surveyed a mix of domestic firms, Japanese and non-Japanese MNEs in the Australian manufacturing industry to explore the link between Japanese FDI and technology transfer and to compare it with technology transfers by US and UK MNEs and observed technology transfer. They found that most of technology transfer in Japanese MNEs was related to product and process technology (more than for non-Japanese MNEs), while human capital and workplace management skills were the third most important ownership advantage transferred from parent firms to affiliates, but they were equally important to Japanese and non-Japanese MNEs. In contrast, trademark and marketing knowledge was less important in Japanese than in non-Japanese MNEs. Japanese affiliates also undertook less R&D than non-Japanese MNEs, relying heavily on parent R&D. Furthermore, Japanese affiliates had very formal contracts with their parent firms for the payment for transferred know-how.

Nicholas and Purcell (2001) later tested whether Japanese manufacturing MNEs transferred work and subcontracting practices to their subsidiaries in Australia, using survey data from 1993 and 1997. No significant long-term learning and deepening in work practices and organisation were found. The majority of inputs (57%) used by Japanese subsidiaries were provided by Australian suppliers and no significant transplantation of Japanese suppliers was observed.

The ABS (1998) Business Growth and Performance Survey – cited by the Department of Foreign Affairs and Trade (1999) – showed that “firms with more than 50% foreign investment were more likely to pay more employee compensation, export more, have more links to other businesses and make greater use of business improvement programs.”[192]

Nicholas et al. (2003) surveyed 270 foreign affiliates (of mixed origin and active in different industries) in Australia, analysing their effect. MNE activity was found to have benefited Australia in terms of economic growth and development, though not all types of subsidiaries had the same effect. “Active” subsidiaries (i.e. subsidiaries making product changes, investing in R&D, participating in regional and global networks and learning from the Australian experience) were the major source of growth and innovation, but beneficial affiliates (“active” and “receptive” subsidiaries) accounted for only 40% of the subsidiaries. Overall, subsidiaries were mainly focused on domestic production or local distribution of foreign goods and services. Regional headquarters, integration into regional subsidiary networks and export platforms were rated of

[191] The 67 firms surveyed could name more than one export destination.
[192] Department of Foreign Affairs and Trade (1999), p.48. Based on ABS (1998), unpublished data.

low to medium importance. Only 35% of subsidiaries were part of a global or regional input or output network. R&D activity and product innovation in Australia were also limited as subsidiaries relied on the transfer of parent competencies and most subsidiaries made no or only limited changes to parent's products and services (30% of subsidiaries did not undertake R&D, 31% spent less than A$ 0.5 million on R&D and 64% of subsidiaries had less than four R&D employees).

For a summary of the Australian company surveys discussed above see Table 7-11. Those company surveys found FDI to have positive effects on a variety of factors including training, wages, technology transfer, productivity and inter-firm linkages, but only little evidence on R&D and innovation and no significant effect on work practices was found. The effect on trade was unclear.

Table 7-11

Consequences of FDI in Australia based on Company Surveys			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Employment, Training and Wages			
Training	Positive	Positive (local training & training of Australian workers in the US)	Brash (1966)
Industry-specific wages	Positive	Higher than average wages	Brash (1966)
Wages	Positive	More employee compensation than domestic firms	ABS (1998)
Learning & work practices	Positive	No significant long-term learning and deepening in work practices	Nicholas and Purcell (2001)
Technology Transfer and Productivity Growth			
R&D	Positive	Some R&D undertaken (more in 100% owned affiliates)	Brash (1966)
		Little R&D undertaken (affiliates rely on parent company's R&D)	Hutchison and Nicholas (1994)
R&D and Innovation	Positive	Some R&D undertaken (70% of firms undertake R&D, but R&D is more important in "active" subsidiaries, i.e. 20% of all subsidiaries)	Nicholas et al. (2003)
Technology transfer	Positive	Positive (mainly product & process technology transfer, little evidence of transfer of trademark & marketing knowledge)	Hutchison and Nicholas (1994)
		Positive	Brash (1966)
Productivity	Positive	Positive (higher value of production per employee and value of plant than industry average)	Brash (1966)
Market Structure and Competition			
Inter-firm linkages	Positive	More inter-firm linkage than domestic firms	ABS (1998)
Trade			
Trade	?	Affiliates have high imports to sales ratio, but relatively low exports to sales ratio	Brash (1966)
Exports	?	Exports more than in domestic firms	ABS (1998)

According to Layton and Makin's (1993) econometric estimates based on an economy-wide production function relating aggregate output to inputs of capital, labour and technology, foreign capital inflows (rather than FDI) during the 1980s, raised national income by more than would have been the case otherwise. Between 1984/85 and 1988/89, the cumulated net benefit to the average Australian was around A$ 740 (1984/85 dollars). Makin (1998) supported that result. Using a similar model, he estimated the macroeconomic income gain from foreign investment for Australia as the product of the real value of net foreign investment and the difference between the product of foreign capital and the real cost of foreign capital. Between 1981/82 and 1991/92, the national income gain was between A$ 0.65 billion and A$ 2.56 billion per annum. Real national income in Australia was A$ 18 billion (5.1% of real GDP in 1991/92) and real per capita income was around A$ 1,065 higher than it would have been without the foreign investment of the early 1980s. However, since foreign investment also increased productivity, national income gains could have been higher than that.

Donovan and Mai (1996) used MEGABRE, a multi-region, multi-commodity, intertemporal, general equilibrium model, to show that foreign investment had a beneficial effect on trade, as it made Australia more capital-intensive and thus strengthened Australia's comparative advantage in capital-intensive industries such as mining. Regional foreign investment liberalisation enhanced the benefits from regional trade liberalisation.

According to Fisher et al. (1998), nearly 20% of net investment was foreign. Foreign investment increased overall investment, leading to increased national output, employment and income. Of every dollar of output generated through investment in Australia, 96% was retained in Australia and only 4% was remitted overseas. One half of every dollar was paid as income to workers (thereby creating jobs) and around 12.5% was paid in the form of indirect and income taxes (thereby funding infrastructure). They found that 52% of the return to foreign investment was reinvested back into the Australian economy. Based on calculations using an ORANI model of the Australian economy, a reduction in investment could reduce Australian labour productivity, wages, national output and income (up to 20% if all net foreign investment were stopped).

Bora (1998) – as cited by the Department of Foreign Affairs and Trade (1999) – showed that FDI had a positive effect on employment and employment conditions. It was stated that "establishments, both wholly and partially foreign-owned, on average were more export oriented, pay higher wages, employ more skilled workers, be more productive, and are more likely to use international benchmarking than their Australian counterparts. A robust wage premium of 3.6% was associated with most foreign-owned firms and partially foreign-owned firms. Foreign-owned export firms paid employees 14% more than Australian-owned firms. After allowing for differences in skill levels, skilled employees received 6% more and unskilled employees received 2.5% more than those employed by Australian-owned firms."[193]

For a summary of the Australian econometric studies discussed above see Table 7-12. Those econometric studies found FDI to be beneficial to the Australian economy with positive effects on wages, skilled employment, technology transfer, productivity, GDP, output and trade.

Considering the importance of the issue and the amount of research done internationally[194], research on the consequences of FDI for the Australian economy is very limited and only based on surveys or aggregate data. Moreover, most empirical studies or surveys are now dated. This thesis makes a major contribution by looking at the effects of FDI in Australia in more detail (using aggregate and industry-specific data) and for a longer time period to see whether the previous results can be substantiated or whether any negative effects

---

[193] Department of Foreign Affairs and Trade (1999), pp.47-48.

[194] "In 1991, the United Nations Centre on Transnational Corporations (now UNCTAD Division on Transnational Corporations and Investment identified over 3000 books, reports and articles published between 1988 and 1990 alone (UNCTC, 1991)." (Dunning (1996), p.97).

can be found. As the consequences vary from country to country, more Australia-specific research is needed to find out what the consequences (the costs and benefits) of FDI are, so that appropriate policies can be formulated.

Table 7-12

Consequences of FDI in Australia based on Econometric Studies			
Variable	**Theoretically predicted effect**	**Effect of FDI or MNE activity found**	**Source**
Employment, Training and Wages			
Wages	Positive	Positive (reduction of FDI would reduce wages)	Fisher et al. (1998)
Wages (skilled and unskilled)	Positive	Higher wages than domestic firms	Bora (1998)
Employment	Positive	More skilled workers employed than in domestic firms	Bora (1998)
Technology Transfer and Productivity Growth			
Technology Spillovers	Positive	Positive in Australia (positive effect on value-added per worker in domestic firms)	Caves (1974)
Labour Productivity	Positive	Positive (reduction of FDI would reduce labour productivity)	Fisher et al. (1998)
Productivity	Positive	Positive (more productive than domestic firms)	Bora (1998)
Economic Growth			
GDP or National income	Positive	Positive (through foreign investment, not FDI in particular)	Layton and Makin (1993)
GDP or National income	Positive	Positive (through foreign investment, not FDI in particular)	Makin (1998)
National income and output	Positive	Positive (reduction of FDI would national output and income)	Fisher et al. (1998)
Trade			
Trade	?	Positive Trade Effects (FDI strengthens Australia's comparative advantage in capital-intensive industries)	Donovan and Mai (1996)
Exports	?	Positive (foreign firms are more export-oriented than domestic firms)	Bora (1998)

CHAPTER 8

ANALYSIS OF CONSEQUENCES OF AGGREGATE FDI IN AUSTRALIA –

CAUSAL LINKS BETWEEN FDI, DOMESTIC INVESTMENT, ECONOMIC GROWTH AND TRADE

8.1 INTRODUCTION

Before performing an econometric analysis of Australian aggregate data in order to explore which effects FDI has on variables including domestic investment, economic growth and trade, one should have a look at some descriptive statistics to put this analysis into perspective. Overall, the combination of ABS surveys, BEA data and Invest Australia data suggests that FDI should have a positive effect on economic growth and domestic investment, but may have a negative effect on Australia's trade performance, increasing imports by more than exports.

According to the ABS (2004a), foreign affiliates accounted for a substantial share of Australian GDP and investment. Foreign-owned businesses in Australia contributed A$ 78.1 billion to value added (21% of total value added) and A$ 12.6 billion to gross fixed capital formation (25% of all gross fixed capital formation) of all industries except agriculture, forestry and fishing in 2000/01. US-owned businesses contributed A$ 33.9 billion of value added, while UK businesses accounted for A$ 17.1 billion.

According to BEA data on US FDI in Australia (see Chapter 6.1.1, Figure 6-2), the gross product of US majority-owned affiliates in Australia in 2001 was US$ 18.4 billion, accounting for 5% of Australian GDP. Overall, majority foreign-owned businesses made a significant contribution to the Australian economy and value added (21%), particularly in mining and manufacturing where MNEs contributed 45% and 34% of industry value added, respectively (ABS, 2004a). According to the ABS (2004a), a study of mining firms in 1997-98 also showed that foreign-owned businesses made a larger contribution to industry turnover than Australian-owned businesses.

Foreign MNEs have made a significant contribution to Australia's trade performance. According to an ABS (2004b) report, Australian businesses exported goods and services valued at A$ 124.4 billion in 2002/03. A substantial share (A$ 61.4 billion or 49%) were exports by foreign-owned firms, including A$ 19.6 billion by UK firms, A$ 17.7 billion by US firms, A$ 7.2 billion by Japanese firms, A$ 3 billion by Swiss firms, A$ 2.2 billion by French firms and A$ 1.4 billion by German firms. The main commodities exported by foreign-owned businesses were mineral fuel, lubricant and related materials (A$ 12.4 billion), crude materials, inedible except fuel (A$ 9.2 billion), machinery and export equipment (A$ 8.5 billion), while the main services exported were transport services (A$ 3 billion), other business services (A$ 1.9 billion) and computer, information and communication services (A$ 1.4 billion).

In the same year, Australian businesses imported goods and services worth A$ 142.4 billion. Foreign-owned firms accounted for a massive A$ 93.2 billion (65%) of those imports, thus being responsible for a trade deficit of A$ 31.8 billion – compared with a trade surplus of A$ 13.8 billion for domestic businesses. US firms imported goods and services valued at A$ 31.7 billion, Japanese firms A$ 17.4 billion, UK firms A$ 14.3 billion, German firms A$ 6.7 billion and Dutch firms A$ 2.0 billion. Hence, US firms alone accounted for a trade deficit of A$ 14 billion and Japanese firms for a trade deficit of A$ 10.2 billion, while UK firms had a trade surplus of A$ 5.3 billion in 2002/03. Wholesalers (A$ 37.8 billion), manufacturers (A$ 35.7 billion) and retailers (A$ 2.8 billion) were the main foreign-owned importing businesses. Machinery and transport equipment (A$ 35.7 billion) and chemicals and related products (A$ 10.9 billion) are the main commodities imported by foreign-owned businesses. Main services imported were transport and communication services (A$ 7.4 billion), other business services (A$ 1.9 billion) and royalties and license fees (A$ 1.5 billion).

Looking at trade of foreign affiliates in more detail, it was found that exports by foreign-owned firms to their Home country (A$ 13.5 billion or 22%) accounted for a considerable share of total exports by foreign-owned businesses, while imports by foreign-owned firms from their country of ownership (A$ 34.5 billion, 37%) were even higher (ABS, 2004b).

Further examples illustrate the effect that MNE activity or FDI has on Australian trade: BEA data on US FDI in Australia (see Chapter 6.1.1, Figure 6-2) showed that although the majority (83% or US$ 48.8 billion) of total sales by US majority-owned affiliates in Australia in 2001 were local sales, US affiliates exported goods and services valued at US$ 1.712 billion (3% of total sales) to the US and US$ 8.029 billion (14% of total sales) to third countries. In the same year, US majority-owned affiliates used imports worth US$ 4.7 billion for further processing. Hence according to BEA data, US majority-owned affiliates alone accounted for 15% of Australian exports and 7% of Australian imports in 2001. Those data did not substantiate the notion that foreign, and in particular US firms, created a trade deficit, since they created a trade surplus of US$ 5.041 billion in the year analysed.

Between 2002 and 2004, Invest Australia attracted 105 new projects valued as A$ 14.8 billion, which were expected to generate in excess of A$ 1.2 billion in export earnings (i.e. on average every A$ 12.3 invested create A$1 in exports earnings).[195] Single projects can have a big impact on the Australian economy: Toyota Motor Corporation Australia (based in Altona, Victoria) was the winner of the 2003 Australian Export Award in the 'Large Advanced Manufacturer' Category, after having exported 66,000 vehicles to over 30 countries valued at A$ 1.5 billion in that year.[196]

Looking at country-specific real FDI in Australia (see Chapter 4.2) and country-specific real Australian export and import data could also help to get a better understanding of the relationship between trade and FDI in Australia (Figure 8-1). One can get (at least qualitatively) an idea about whether the FDI-trade relationship follows a similar pattern for the location or whether differences exist. The US, the UK, Japan, the Netherlands and Germany – as the five major investors in Australia – were chosen for this purpose.[197] In addition, Europe (including Belgium/Luxembourg, France, Germany, Ireland, Italy, the Netherlands, Sweden, Switzerland and the UK) and Asia-Pacific (including China, Hong Kong, India, Japan, Korea, Malaysia, New Zealand, the Philippines, Singapore and Thailand) were chosen as major groups.[198] The list of major import markets during that period (the US, Japan, China, the UK, Germany) looked similar to the list of major investors (the US, Singapore, the UK, the Netherlands, Japan, Belgium/Luxembourg and Germany), while the list of major export markets (Japan, the US, Korea, New Zealand and China) looked somewhat different[199]. Overall, the US, Japan, the UK and Germany are the four countries with which Australia has strong FDI and trade (import and export) links.

The similarity between FDI sources and major import markets is in line with the theory that FDI mainly comes from MNEs that have previously exported their goods to Australia (i.e. Australian import sources). The link could indicate that foreign affiliates, once established, also export intermediate goods to Australia, further strengthening the FDI-import link. However, looking at Figure 8-1, no clear link was found. Total FDI and FDI from Japan, Germany, Europe and Asia-Pacific experienced a positive trend, while FDI from the US, the UK and the Netherlands was volatile and had a negative trend between 1992 and 2001, though the average FDI flow was still positive for that period. In contrast, real imports increased in all cases.

The theoretical link between FDI and exports is not as clear as the link between FDI and imports. While foreign affiliates in Australia might export their goods produced in Australia, they do not necessarily ship them back to Home (describing vertical FDI), but rather to third countries (describing export platform FDI). Figure 8-1 does not show any clear pattern either. While real

---

[195] Invest Australia. 2004. Inflow: Australia's Investment News Issue 13, 23.08.2004. www.investaustralia.gov.au

[196] Department of Innovation, Industry and Regional Development, Victoria/Australia. 2003 Governor of Victoria Export Awards, 21.10.2003. www.awards.export.vic.gov.au

[197] In terms of average real FDI flows between 1992 and 2001, Singapore and Belgium/Luxembourg should be added to the list of major investors (see Chapter 2.3.2).

[198] One could add North America as a third group, but since the US dominates this group (Canada is the only other country), it was not included in this analysis.

[199] For Data Sources on real country-specific imports and exports see Appendix A.2.

exports increased in all cases, FDI continuously increased in some cases and was volatile in others. Obviously, imports and exports are variables that are affected by not only FDI, but many other factors, so that the link may be hard to identify.

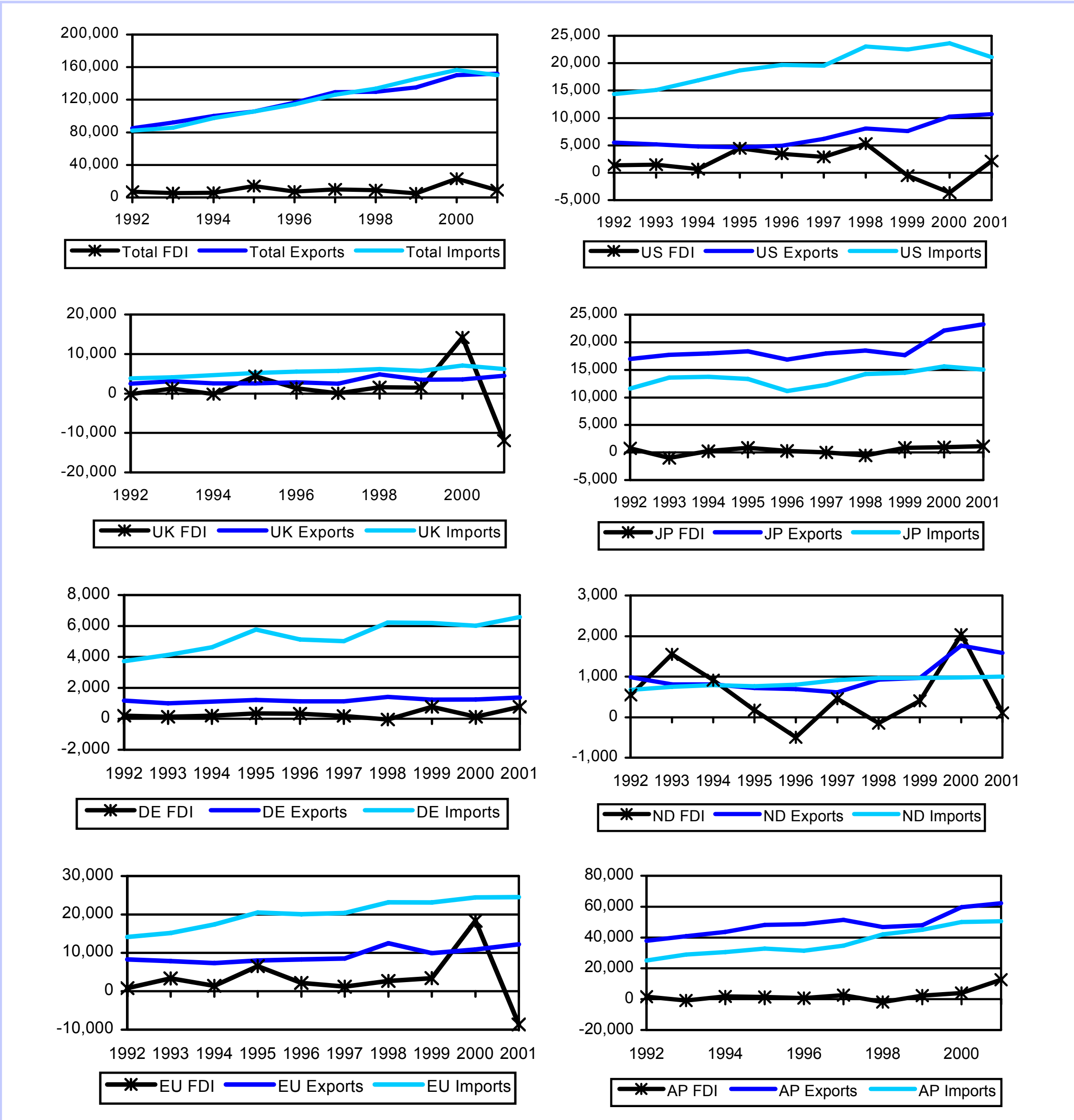


Figure 8-1: Annual country-specific real FDI, Exports and Imports (in A$ million), 1992 to 2001

Looking at trade between affiliated enterprises indicates that this form of trade has increased over time (Figure 8-2). Imports by affiliates have increased slightly as a percentage of total imports (from 0.4% in 1992 to 0.6% in 2000 and 0.5% in 2001), while exports by affiliates dropped somewhat in importance relative to total exports (from 0.7% in 1992 to 0.4% in 2001), though since the latter should be more related to outward FDI and the export of services between Australian MNEs and their subsidiaries overseas, the development is of no concern in relation to this analysis. The positive development of imports by affiliates, however, is likely to have been caused by Australian inward FDI.

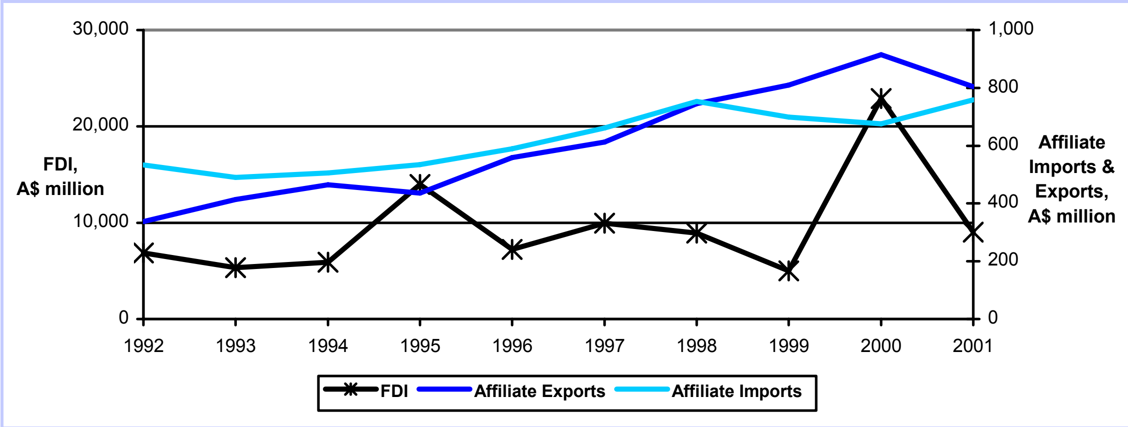


Figure 8-2: Real Trade (Exports and Imports) in Services between Affiliated Enterprises (in A$ million), 1992 to 2001

An alternative to the analysis of country-specific FDI and trade links is the analysis of industry-specific FDI and trade links. For this purpose, data on industry-specific real FDI in Australia (used in Chapter 5) and industry-specific real Australian exports and imports were used (Figure 8-3). Since trade data were not available in enough detail or with industry classifications different to those of FDI, only agriculture, mining, manufacturing and services could be analysed (though even for agriculture and mining only export data were available).

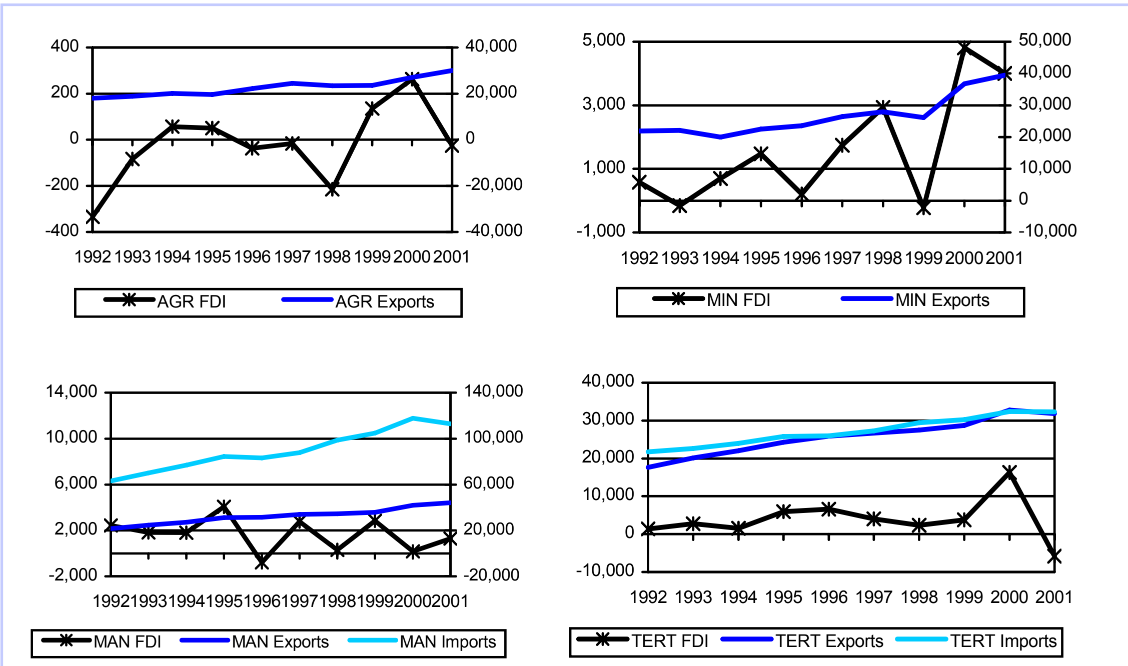


Figure 8-3: Annual industry-specific real FDI, Exports and Imports (in A$ million), 1992 to 2001

Trends for FDI, exports and imports between 1992 and 2001 were generally positive – the only exception was manufacturing FDI (though the average FDI flow was still positive). While real imports and exports continuously increased in all cases, industry-specific FDI was volatile. As for country-specific data, no clear pattern emerged, which may be because other factors and not only FDI affect imports and exports, making it hard to identify any links between those variables.

8.2 DATA

In order to explore of the consequences of Australian FDI, a dynamic relationship between FDI, domestic investment, economic growth and trade (including imports and exports) in Australia, the five time series illustrated in Figure 8-4, were analysed. Since economic theory is limited in its ability to determine the dynamic relationship of the five variables and provides only limited guidance to empirical work, a statistical approach was chosen to analyse their relationship and to let the data speak for themselves.

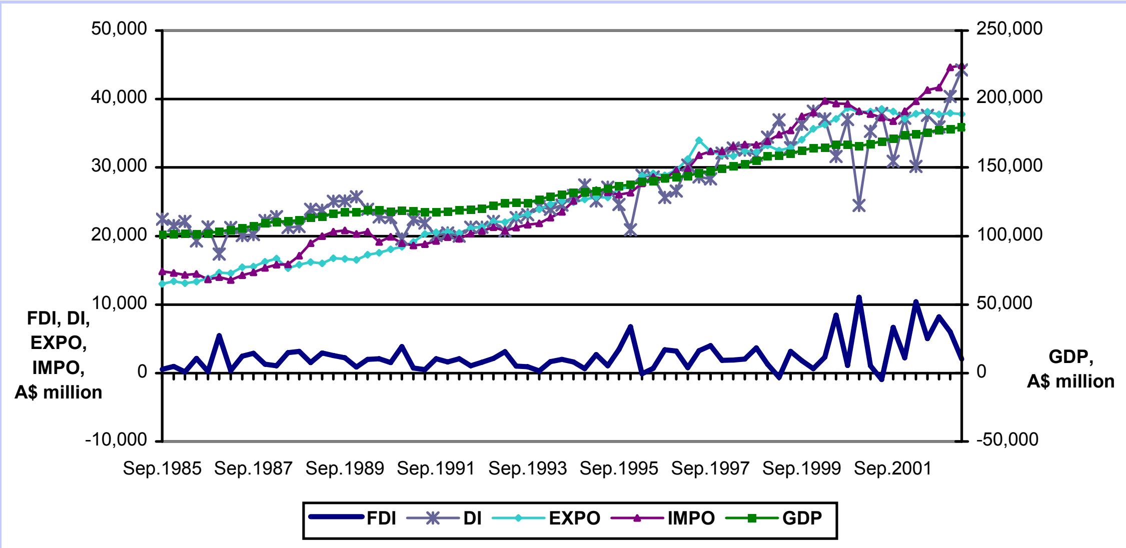


Figure 8-4: Quarterly data on FDI, GDP, Domestic Investment, Exports and Imports in Australia, Q3/1985 to Q1/2003

This approach was inspired by a number of studies, including Liu et al's (2001) analysis of the dynamic relationship between Chinese FDI, imports and exports, Chakraborty and Basu's (2002) structural cointegration model of Indian FDI and economic growth, Shan's (2002) VAR approach analysing the interrelationships between Chinese FDI and other economic variables including economic growth and Kim and Seo's (2003) analysis of the relationship between Korean FDI, domestic investment and economic growth (all of which were discussed in Chapter 7.1) as well as Pfaffermayr's (1994) analysis of Austrian outward FDI and exports.

For the analysis of the dynamic relationship between FDI, domestic investment, GDP, exports and imports in Australia, a multivariate Vector Autoregression (VAR) model was estimated, using quarterly real data for the period Q1/1985 to Q2/2003, giving 72 observations. The FDI, imports, exports and GDP datasets are the same as those in Chapter 4.1 (quarterly FDI model). The FDI series includes three negative values (in Q1/1996, Q1/1999 and Q2/2001), depicting disinvestments. The FDI and domestic investment series were deflated using the price index for private gross fixed capital expenditure (plant & equipment) with 2000/01 prices as a deflator. The GDP, exports and imports series were used in real form (in 2000/01 prices) and seasonally adjusted.

Thus, there were five dependent variables: real FDI (*ausrfdi*), real domestic investment (*ausrdi*), real imports (*ausrimpo*), real exports (*ausrexpo*) and GDP (*ausrgdp*), which, at the same time, acted as the five explanatory variables used in the model (Table 8-1).

Table 8-1

Consequences of Quarterly Aggregate FDI in Australia, VAR Model	
Dependent and Explanatory Variables	**Variable**
Real Foreign Direct Investment	*ausrfdi*
Real Domestic Investment (Gross Fixed Capital Formation)	*ausrdi*
Real Imports	*ausrimpo*
Real Exports	*ausrexpo*
Real Gross Domestic Product (GDP)	*ausrgdp*
Data Sources: See Appendix A.5	

The five variables were treated symmetrically and endogenously since the possibility that FDI affected domestic investment, GDP, imports and exports and that those variables affected FDI or that the variables affected each other needed to be considered. Each variable was expressed as a linear combination of lagged values of itself and lagged values of the other variables. The lag specification seemed reasonable, since it may take a number of time periods for the dependent variables to adjust to changes in the explanatory variables.

Quarterly aggregate FDI, GDP, exports, imports and domestic investment were specified as functions of the following form:

$$ausrfdi_t = f(ausrfdi_{t-1},\ldots, ausrfdi_{t-i}, ausrdi_{t-1}, \ldots, ausrfdi_{t-i}, ausrimpo_{t-1}, \ldots, ausrimpo_{t-i}, ausrexpo_{t-1}\ldots, ausrexpo_{t-i}, ausrgdp_{t-1},\ldots, ausrgdp_{t-i})$$

$$ausrdi_t = f(ausrfdi_{t-1},\ldots, ausrfdi_{t-i}, ausrdi_{t-1}, \ldots, ausrfdi_{t-i}, ausrimpo_{t-1}, \ldots, ausrimpo_{t-i}, ausrexpo_{t-1}\ldots, ausrexpo_{t-i}, ausrgdp_{t-1},\ldots, ausrgdp_{t-i})$$

$$ausrimpo_t = f(ausrfdi_{t-1},\ldots, ausrfdi_{t-i}, ausrdi_{t-1}, \ldots, ausrfdi_{t-i}, ausrimpo_{t-1}, \ldots, ausrimpo_{t-i}, ausrexpo_{t-1}\ldots, ausrexpo_{t-i}, ausrgdp_{t-1},\ldots, ausrgdp_{t-i})$$

$$ausrexpo_t = f(ausrfdi_{t-1},\ldots, ausrfdi_{t-i}, ausrdi_{t-1}, \ldots, ausrfdi_{t-i}, ausrimpo_{t-1}, \ldots, ausrimpo_{t-i}, ausrexpo_{t-1}\ldots, ausrexpo_{t-i}, ausrgdp_{t-1},\ldots, ausrgdp_{t-i})$$

$$ausrgdp_t = f(ausrfdi_{t-1},\ldots, ausrfdi_{t-i}, ausrdi_{t-1}, \ldots, ausrfdi_{t-i}, ausrimpo_{t-1}, \ldots, ausrimpo_{t-i}, ausrexpo_{t-1}\ldots, ausrexpo_{t-i}, ausrgdp_{t-1},\ldots, ausrgdp_{t-i})$$

Before setting up the model, one should have a brief look at the different explanatory variables in the VAR Model and give reasons for the predicted effect of each variable. Not all possible combinations will be discussed, since this study focuses on FDI and its effects.

FDI is expected to either positively or negatively affect domestic investment (depending on whether two variables are substitutes or complements). Furthermore, FDI is expected to have a positive effect on GDP, a positive or negative effect on imports (depending on whether FDI increases intermediate good imports by more or less than it reduces final good imports) and a positive effect on exports (if MNEs are more export-oriented than domestic firms). Domestic investment could either positively or negatively affect FDI, depending on whether domestic investment is an indicator for a favourable business environment of whether it crowds out FDI inflows. As discussed in Chapter 4.1, exports were expected to have a positive effect on FDI, as MNEs may switch from trade to local production, while the effect of imports is unclear. While the two variables were insignificant in the quarterly FDI model discussed in Chapter 4.1, openness of the Australian economy increased FDI. GDP was expected to increase FDI (or at least on horizontal FDI), since serving a market directly becomes more efficient relative to exporting, the larger the market is. Following the same line of thought, economic growth should encourage FDI. In the analysis of determinants of quarterly FDI in Chapter 4.1, the first difference of GDP increased FDI.

8.3 MODEL SPECIFICATION AND ESTIMATION

Having discussed the relevant variables used in the analysis, the model can be stated as follows: [200]

$$\begin{bmatrix} ausrfdi_t \\ ausrdi_t \\ ausrimpo_t \\ ausrexpo_t \\ ausrgdp_t \end{bmatrix} = \begin{bmatrix} \Phi_{11}(L) & \Phi_{12}(L) & \Phi_{13}(L) & \Phi_{14}(L) & \Phi_{15}(L) \\ \Phi_{21}(L) & \Phi_{22}(L) & \Phi_{23}(L) & \Phi_{24}(L) & \Phi_{25}(L) \\ \Phi_{31}(L) & \Phi_{32}(L) & \Phi_{33}(L) & \Phi_{34}(L) & \Phi_{35}(L) \\ \Phi_{41}(L) & \Phi_{42}(L) & \Phi_{43}(L) & \Phi_{44}(L) & \Phi_{45}(L) \\ \Phi_{51}(L) & \Phi_{52}(L) & \Phi_{53}(L) & \Phi_{54}(L) & \Phi_{55}(L) \end{bmatrix} \begin{bmatrix} ausrfdi_t \\ ausrdi_t \\ ausrimpo_t \\ ausrexpo_t \\ ausrgdp_t \end{bmatrix} + \begin{bmatrix} c_1 \\ c_2 \\ c_3 \\ c_4 \\ c_5 \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \\ e_{5t} \end{bmatrix}$$

(where *ausrfdi*$_t$ is the FDI series, *ausrdi*$_t$ is the domestic investment series, *ausrimpo*$_t$ is the import series, *ausrexpo*$_t$ is the export series and *ausrgdp*$_t$ is the GDP series, Φ_{11}, Φ_{12},… Φ_{55} are lag polynomials, (c_1, c_2,…c_5) are the intercepts, and (ε_{1t}, ε_{2t}, …ε_{5t}) ~ N(0, Σ) are white noise error terms).

This can also be written as:[201]

$$Y_t = \Phi_1 Y_{t-1} + \mathrm{K} + \Phi_p Y_{t-p} + c + \varepsilon_t = \sum_{i=1}^{p} \Phi_i Y_{t-i} + c + \varepsilon_t$$

(with Y_t = *ausrfdi*$_t$, *ausrdi*$_t$, *ausrimpo*$_t$, *ausrexpo*$_t$, *ausrgdp*$_t$, where Y_t is a (5x1) vector of [*ausrfdi*$_t$, *ausrdi*$_t$, *ausrimpo*$_t$, *ausrexpo*$_t$, *ausrgdp*$_t$], Φ_i is a (5x5) matrix of parameters, c is a (5x1) vector of intercepts and ε_t ~ N(0, Σ) are white noise error terms).

As a first step of setting up the model, the appropriate lag lengths of the five variables included (*ausrfdi*$_t$, *ausrdi*$_t$, *ausrimpo*$_t$, *ausrexpo*$_t$, *ausrgdp*$_t$) needed to be found. To be consistent with the models that were used to analyse the determinants of FDI, the Schwarz Information Criterion (SC) should be used to choose the appropriate lag lengths. The SIC was minimised for the inclusion of only one lag, as was the Hannan-Quinn Information Criterion. Since the variables may not only have short-term, but also medium- to long-term effects on other

200 Johnston and DiNardo (1997), p.287 and Eviews (2001), p.519.

201 In the error correction equation, c captures trends in variables that do have trends. Hence no further trend is included at this stage.

variables, the inclusion of more than one lag – since one lag in levels form is equivalent to no lag in first differences – may be a better representation of the data generating process. According to alternative measures (including the Akaike Information Criterion, the LR test statistic and the Final Prediction Error), the appropriate lag length was four lags, four lags were chosen for each variable in the model. For test results see Table 8-2, for the estimation of the VAR in levels form see Table 8-3.

Table 8-2

VAR Lag Order Selection Criteria						
Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-3092.938	NA	9.99E+33	92.475	92.640	92.541
1	-2731.859	657.488	4.40E+29	82.444	83.431*	82.834*
2	-2706.034	43.170	4.35E+29	82.419	84.229	83.135
3	-2682.074	36.476	4.63E+29	82.450	85.082	83.492
4	-2650.035	43.993*	3.99E+29*	82.240*	85.695	83.607
* Indicates lag order selected by the criterion						

Table 8-3

Consequences of Quarterly Aggregate FDI in Australia, VAR Model Estimation											
Dependent Variables: *ausrfdi*, *ausrdi*, *ausrimpo*, *ausrexpo*, *ausrgdp* **Least Squares. Observations (adjusted): 67 (Q3/1986 to Q1/2003)**											
		ausrfdi **Equation**		***ausrdi*** **Equation**		***ausrimpo*** **Equation**		***ausrexpo*** **Equation**		***ausrgdp*** **Equation**	
Variable	**Lags**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**
aurfdi	**1**	0.020	0.038	0.997**	1.762	0.167	1.019	0.332**	1.931	0.512**	2.688
	2	1.423**	2.076	-1.648**	-2.273	-0.007	-0.035	-0.424**	-1.927	-0.712**	-2.917
	3	-0.377	-0.491	0.763	0.940	-0.149	-0.633	-0.192	-0.778	-0.020	-0.072
	4	-1.154**	-1.860	1.062*	1.618	-0.043	-0.224	-0.059	-0.294	0.351*	1.588
ausrdi	**1**	0.344	0.658	0.647	1.170	0.141	0.881	0.305**	1.818	0.491**	2.638
	2	1.371**	2.078	-1.576**	-2.257	-0.001	-0.007	-0.442**	-2.082	-0.616**	-2.622
	3	-0.362	-0.497	0.707	0.916	-0.128	-0.574	-0.075	-0.319	-0.024	-0.092
	4	-0.813	-1.377	0.695	1.113	-0.017	-0.095	0.056	0.296	0.268	1.272
ausrimpo	**1**	-1.105**	-1.921	1.204**	1.979	0.662**	3.756	-0.199	-1.078	0.067	0.326
	2	-0.644	-0.950	0.689	0.960	0.313*	1.509	0.422**	1.938	0.062	0.257
	3	1.304**	1.749	-1.954**	-2.476	-0.424**	-1.856	-0.087	-0.362	-0.006	-0.022
	4	-0.599	-0.944	0.731	1.087	-0.008	-0.043	0.124	0.608	-0.044	-0.193
ausrexpo	**1**	0.036	0.078	-0.217	-0.441	0.063	0.443	0.901**	6.038	-0.128	-0.775
	2	0.807	1.250	-0.668	-0.978	-0.184	-0.929	-0.050	-0.240	0.365*	1.586
	3	-1.001*	-1.605	1.047*	1.586	0.198	1.037	-0.160	-0.796	-0.305	-1.375
	4	0.402	0.878	-0.241	-0.497	-0.100	-0.714	0.129	0.879	0.417**	2.556
ausrgdp	**1**	-0.554	-1.347	0.767**	1.762	0.105	0.834	-0.161	-1.220	0.930**	6.351
	2	-0.218	-0.379	-0.028	-0.047	0.021	0.119	0.118	0.638	-0.126	-0.616
	3	0.668	1.195	-0.471	-0.796	0.224	1.306	0.235	1.310	0.377**	1.893
	4	0.332	0.863	-0.414	-1.016	-0.166	-1.411	-0.180*	-1.459	-0.365**	-2.665
C	**---**	-19,596.880**	-1.778	13,772.370	1.181	-11,998.890**	-3.553	1,712.526	0.484	11,429.790**	2.912
** significant at 10% critical value, * significant at 15% critical value											

(Table 8-3 continued)

	ausrfdi **Equation**	***ausrdi*** **Equation**	***ausrimpo*** **Equation**	***ausrexpo*** **Equation**	***ausrgdp*** **Equation**
R-squared	0.459	0.999	0.996	0.995	0.916
Adjusted R-squared	0.224	0.880	0.995	0.993	0.999
S.E. of regression	2,078.869	2,199.891	637.128	668.091	740.572
Sum squared resid	199,000,000.000	223,000,000.000	18,672,892.000	20,531,903.000	25,228,523.000
F-statistic	1.951	25.194	642.708	498.238	3,193.792
Log likelihood	-594.323	-598.114	-515.088	-518.268	-525.168
Akaike AIC	18.368	18.481	16.003	16.098	16.304
Schwarz SC	19.059	19.172	16.694	16.789	16.995
Mean dependent	2,557.311	27,242.010	26,861.600	26,221.390	137,020.100
S.D. dependent	2,359.375	6,349.866	8,907.432	8,228.055	23,047.280

The five equations explained between 45.9% and 99.9% of the variation of the relevant variable (or between 22.4% and 99.9% in terms of adjusted R^2). The equations of *ausrdi*, *ausrimpo* and *ausrexpo* appeared to be the best representations of the data generating process, while the equation for *ausrfdi* had little explanatory power.

The next step was to test whether the variables were stationary. From Figure 8-1 it appeared likely that some of the variables were nonstationary and should therefore not be used in levels form. Instead of testing whether variable should be used in differences inside the equation (as done in Chapters 4 and 5), all variables were tested for stationarity individually. It was not feasible to test each variable inside the five equations, although it was argued in Chapter 4.1 that the theoretical value of the transformation of some variables into first differences can be questioned in some cases.

As an alternative, an augmented Dickey Fuller test, testing for the presence of a unit root, was used to test for differencing. For this test, it was assumed that the data generating process could be represented by the following equation:[202]

$$\Delta y_t = \mu_0 + \mu_1 t + \gamma y_{t-1} + \sum_{i=1}^{p-1} \delta_i \Delta y_{t-i} + \varepsilon_t$$ with y_t = *ausrfdi*$_t$, *ausrdi*$_t$, *ausrimpo*$_t$, *ausrexpo*$_t$

or

ausrgdp$_t$; t = trend; μ, γ and δ = coefficients

Dickey-Fuller Tests can then be performed by testing combined restrictions on the coefficients in this equation. The test is applied to regressions run in the following two forms[203]:

1. $\Delta y_t = \mu_0 + \gamma y_{t-1} + \sum_{i=1}^{p-1} \delta_i \Delta y_{t-i} + \varepsilon_t$ with H_o: $\mu_0 = \gamma = 0$ as a test for unit root and intercept,

2. $\Delta y_t = \mu_0 + \mu_1 t + \gamma y_{t-1} + \sum_{i=1}^{p-1} \delta_i \Delta y_{t-i} + \varepsilon_t$

   with H_o: $\mu_0 = \mu_1 = \gamma = 0$ as a test for unit root, intercept and deterministic trend.

The order of autoregressive corrections ($u_t = \sum_{i=1}^{p-1} \delta_i \Delta y_{t-i} + \varepsilon_t$) was chosen automatically by Eviews). For each time series, it was initially tested whether the series was stationary when an intercept was included in the equation. When the hypothesis of a unit root was not rejected, it was tested whether the series was trend-stationary, i.e. whether it was stationary when it included an intercept and a trend. When the hypothesis was not rejected either, the time series was differenced once. It was then tested whether the series in first differences was stationary when an intercept was included in the equation, etc. Following the same procedure as for level series, the testing continued until the hypothesis of a unit root was not rejected and the time series were stationary. The results of the Augmented Dickey-Fuller test for *ausrfdi*, *ausrdi*, *ausrimpo*, *ausrexpo* and *ausrgdp* are illustrated in Table 8-4.

---

[202] Pfaffermayr (1994), pp.340-341.

[203] The test for unit root and no intercept or trend was ignored, as it is usually reasonable to include an intercept in the equation. For completeness, the test for unit root and no intercept or trend would be

$\Delta_1 y_t = \gamma y_{t-1} + \sum_{i=1}^{p-1} \delta_i \Delta y_{t-i} + \varepsilon_t$ with H_o: γ =0 as a test for a unit root only.

For the FDI series, the unit root hypothesis was rejected at a 10% level when an intercept was included, indicating that the series was stationary and should be used in levels form. For the domestic investment, import, export and GDP series, the unit root hypothesis was not rejected at a 10% level when an intercept or an intercept and a trend were included. After differencing the series once, the hypothesis of a unit root was rejected at a 10% level in all four cases when an intercept was included. Hence, the variables should be used in first differences as they were now stationary. The plots of *ausrfdi, Δausrdi, Δausrimpo, Δausrexpo* and *Δausrgdp* are illustrated in Figures 8-5 and 8-6.

Table 8-4

Unit Root Testing (Augmented Dickey Fuller Test), VAR Model						
Variables	**Lag length (automatic based on SIC, maxlag = 8)**	**t-stat**	**10% CV**	**Prob**	**H_0**	**Result**
ausrfdi	0	-8.074*	-2.590	0.000	Unit root & Intercept	*ausrfdi* is stationary
ausrdi	1	-1.888	-3.166	0.650	Unit root & trend	*ausrdi* → *Δausrdi*
Δausrdi	0	-9.496*	-2.590	0.000	Unit root & Intercept	*Δausrdi* is stationary
ausrimpo	2	-2.579	-3.166	0.291	Unit root & trend	*ausrimpo* → *Δausrimpo*
Δausrimpo	1	-3.459*	-2.590	0.012	Unit root & Intercept	*Δausrimpo* is stationary
ausrexpo	0	-2.471	-3.166	0.341	Unit root & trend	*ausrexpo* → *Δausrexpo*
Δausrexpo	0	-8.467*	-2.590	0.000	Unit root & Intercept	*Δausrexpo* is stationary
ausrgdp	0	-1.183	-3.166	0.906	Unit root & trend	*ausrgdp* → *Δausrgdp*
Δausrgdp	0	-6.623*	-2.590	0.000	Unit root & Intercept	*Δausrgdp* is stationary
* significant at 10% critical value						

Following the unit root testing, the possibility that a long-run relationship between some of the variables exists was considered. If this was the case, the model should not be estimated as a VAR model with variables in first differences and would be misspecified as such. It should rather be estimated as a Vector Error Correction (VEC) model, including an error correction term to correct for short-run deviations from the long-run relationship, restoring the equilibrium between the levels of the cointegrated variables.

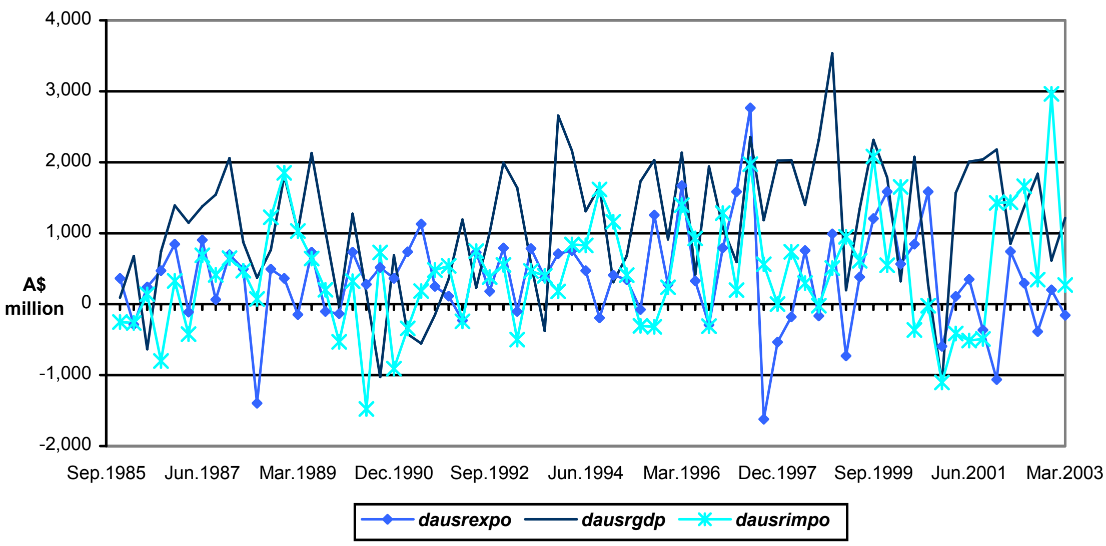


Figure 8-5 Quarterly data on the first Differences of GDP, Exports and Imports in Australia, Q3/1985 to Q1/2003

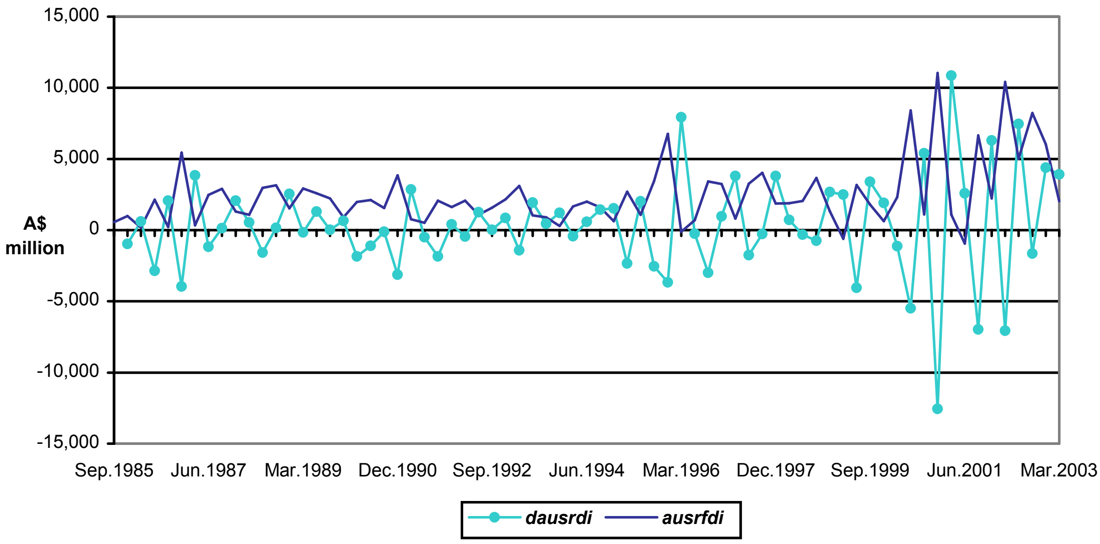


Figure 8-6 Quarterly data on FDI and the first Differences of Domestic Investment in Australia, Q3/1985 to Q1/2003

The VEC model – inclusive of the error correction term $\alpha\beta'Y_{t-1}$, but for simplification initially without the constant c that was part of the VAR specification – was written as:

$$\Delta Y_t = \alpha\beta' Y_{t-1} + \sum_{i=1}^{p-1} \Phi_i \Delta Y_{t-i} + \varepsilon_t$$

The term $\alpha\beta'Y_{t-1}$, consisting of a combination of the adjustment (or loading) matrix α[204], the cointegrating vector β and the first lags of the variables included in the model (Y_{t-1}), described the cointegrating relations and – for two cointegrating relationships – could also be written in the following form:[205]

$$\alpha\beta' Y_{t-1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{32} \\ \alpha_{41} & \alpha_{42} \\ \alpha_{51} & \alpha_{52} \end{bmatrix} \begin{bmatrix} \beta_{11} & \beta_{21} & \beta_{31} & \beta_{41} & \beta_{51} \\ \beta_{12} & \beta_{22} & \beta_{32} & \beta_{42} & \beta_{52} \end{bmatrix} \begin{bmatrix} ausrfdi_{t-1} \\ ausrdi_{t-1} \\ ausrimpo_{t-1} \\ ausrexpo_{t-1} \\ ausrgdp_{t-1} \end{bmatrix} = \begin{bmatrix} \alpha_{11} ec_{1,t-1} + \alpha_{12} ec_{2,t-1} \\ \alpha_{21} ec_{1,t-1} + \alpha_{22} ec_{2,t-1} \\ \alpha_{31} ec_{1,t-1} + \alpha_{32} ec_{2,t-1} \\ \alpha_{41} ec_{1,t-1} + \alpha_{42} ec_{2,t-1} \\ \alpha_{51} ec_{1,t-1} + \alpha_{52} ec_{2,t-1} \end{bmatrix}$$

where the error correction (*ec*) terms are:

$$ec_{1,t-1} = \beta_{11} ausrfdi_{t-1} + \beta_{21} ausrdi_{t-1} + \beta_{31} ausrimpo_{t-1} + \beta_{41} ausrexpo_{t-1} + \beta_{51} ausrgdp_{t-1}$$

and

$$ec_{2,t-1} = \beta_{12} ausrfdi_{t-1} + \beta_{22} ausrdi_{t-1} + \beta_{32} ausrimpo_{t-1} + \beta_{42} ausrexpo_{t-1} + \beta_{52} ausrgdp_{t-1}.$$

Identifying restrictions can be imposed on the adjustment matrix α and the cointegrating vector β, though the latter is more relevant for defining the long-term relationship between variables.

A cointegration test was performed to see whether this group of nonstationary variables had any long-run equilibrium relationship, i.e. whether a stationary linear combination (called a

[204] The adjustment or loading matrix "contains weights attached to the cointegrating relations in the individual equations of the model". Lütkepohl (2004), p.90.
[205] Lütkepohl (2004), p.90.

cointegrating equation) of two or more nonstationary time series existed. The methodology developed in Johansen (1991, 1995) was used to test for cointegration.

If a VAR of order p is written as:

$$Y_t = \sum_{i=1}^{p} \Phi_i Y_{t-i} + \varepsilon_t$$

(where Y_t is a k-vector of nonstationary I(1) variables (in this case k = 5), which have a cointegrating relationship),

then the VEC model could be written as:[206]

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t \text{ [207]} \quad \text{with} \quad \Pi = \sum_{i=1}^{p} \Phi_i - I \text{ and } \Gamma_i = -\sum_{i=1}^{p-1} \Phi_i .$$

If the coefficient matrix ∏ has reduced rank r < k (here: r < 5), then there exist (k x r) matrices α and β (here: (5 x r) matrices) each with rank r such that ∏ = αβ' and $\beta' Y_t$ is I(0). r is the number of cointegrating relations (the cointegrating rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the VEC model. Johansen's method is to estimate the ∏ matrix from an unrestricted VAR and to test whether the restrictions implied by the reduced rank of ∏ can be rejected.

In order to carry out the cointegration test, an assumption needs to be made regarding the trend underlying the data. In this case, the level data Y_t are assumed to have linear trends ($\alpha_\perp \gamma_0$), but the cointegrating equations have only intercepts[208]:

$$H(r): \Pi Y_{t-1} = \alpha(\beta' Y_{t-1} + \rho_0) + \alpha_\perp \gamma_0$$

Two tests are commonly used to determine the number of cointegrating vectors: the trace test and the maximum-eigenvalue test. To determine the number of cointegrating relations r (conditional on the assumptions made about the trend), one can proceed sequentially from r = 0 to r = k-1 (here: r = 4) until failing to reject, when using the trace test. The trace and maximum eigenvalue tests are sequences of LR-tests of the null hypothesis H_0: r = i against H_1: r > i for i = 0, 1, …, k-1.[209] The cointegration test results are stated in Table 8-5. Since the Johansen test rejected rank 0 and 1 at a 5% critical value for the trace and the maximum-eigenvalue test, there were two cointegrating relations.

---

206 EViews (2001), pp.527-528.

207 This specification is just an alternative way of writing: $\Delta Y_t = \alpha\beta' Y_{t-1} + \sum_{i=1}^{p-1} A_i \Delta Y_{t-i} + c + \varepsilon_t$.

208 The term $\alpha_\perp$ describes the null space of α such that $\alpha'\alpha_\perp$=0. The term $\alpha_\perp\gamma_0$ includes what was the constant c in the VAR. Using the alternative (more restricted) specification of intercepts in the cointegrating equations and no deterministic trend in Y_t ($H'(r): \Pi Y_{t-1} = \alpha(\beta' Y_{t-1} + \rho_0)$) does not affect the test result. Other specifications did not seem to be appropriate. The assumption of no intercept in the cointegrating equation, for example, should only be used if all series have zero mean, which is not the case in this model. And since the series were not trend-stationary, a linear trend in the cointegrating equation or quadratic trends in the level data was no plausible specification. Eviews (2001), pp.529-530.

209 Chakraborty and Basu (2002) recommended that one should rely on the evidence based on the maximum eigenvalue test if the results from the trace and the maximum eigenvalue test differ, since the results of the latter test are more reliable in small samples. They based this suggestion on Banerjee et al. (1986 and 1993).

Table 8-5

Consequences of Quarterly Aggregate FDI in Australia, Johansen Cointegration Test			
Variables: *ausrfdi*, *ausrdi*, *ausrimpo*, *ausrexpo*, *ausrgdp*, Lags interval (in first differences): 1 to 3 Observations (adjusted): 67 (Q3/1986 to Q1/2003)			
Unrestricted Cointegration Rank Test (Trend assumption: Linear deterministic trend)			
Hypothesized No. of CEs	Eigenvalue	Trace Statistics	5% CV
None *	0.514	102.032*	68.520
At most 1 *	0.364	53.705*	47.210
At most 2	0.225	23.360	29.680
At most 3	0.078	6.241	15.410
At most 4	0.012	0.793	3.760
* denotes rejection of the hypothesis at the 5% level. Trace test indicates 2 cointegrating equations at the 5% level			
Hypothesized No. of CEs	Eigenvalue	Max Eigenvalue Statistics	5% CV
None *	0.514	48.327*	33.460
At most 1 *	0.364	30.346*	27.070
At most 2	0.225	17.119	20.970
At most 3	0.078	5.447	14.070
At most 4	0.012	0.793	3.760
* denotes rejection of the hypothesis at the 5% level. Max-eigenvalue test indicates 2 cointegrating equations at the 5% level			

The two cointegrating relations were described by two sets of restrictions. To ensure that FDI was described and estimated as a stationary variable in levels form, the first restriction was β_{11}=1, β_{21}=0, β_{31}=0, β_{41}=0 and β_{51}=0. The second restriction had to exclude FDI and describe a long-term relationship between domestic investment, imports, exports and GDP that is based on a theoretical hypothesis about the possible linkage between the four variables. One possibility is the normalisation of GDP, for which GDP was specified as a function of domestic investment, imports and exports (β_{12}=0 and β_{52}=1). This specification was based on GDP being defined as a function of consumer expenditure, gross private investment, government consumption and investment and net exports (i.e. exports minus imports) – as discussed in Chapter 7.1.1.

Using these restrictions, the VEC model could be estimated. The parameters are stated in Table 8-6. The five equations explained between 32.5% and 68.2% of the variation of the relevant variable (or between 9.1% and 57.2% in terms of adjusted R^2). The equations of *ausrfdi,* and *ausrdi* appeared to be the best representations of the data generating process, while the equation for *ausrexpo* had little explanatory power.

Table 8-6

Consequences of Quarterly Aggregate FDI in Australia, VEC Model Estimation				
Dependent Variables: *ausrfdi*, *ausrdi*, *ausrimpo*, *ausrexpo*, *ausrgdp* Least Squares. Observations (adjusted): 67 (Q3/1986 to Q1/2003)				
Cointegration Restrictions: β_{11}=1, β_{12}=0, β_{13}=0, β_{14}=0 and β_{15}=0 and β_{21}=0 and β_{25}=1.				
	Cointegrating Equation 1		**Cointegrating Equation 2**	
	Coeff.	**t-stat**	**Coeff.**	**t-stat**
ausrfdi(-1)	1.000	na (restriction imposed)	0.000	na (restriction imposed)
ausrdi(-1)	0.000	na (restriction imposed)	0.156	0.579
ausrimpo(-1)	0.000	na (restriction imposed)	-2.237	-5.831
ausrexpo(-1)	0.000	na (restriction imposed)	-0.424	-1.547
ausrgdp(-1)	0.000	na (restriction imposed)	1.000	na (restriction imposed)
C	-2,558.852	---	69,996.020	---

		***Δausrfdi* Equation**		***Δausrdi* Equation**		***Δausrimpo* Equation**		***Δausrexpo* Equation**		***Δausrgdp* Equation**	
Variable	**Lags**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**	**Coeff**	**t-stat**

CE 1	---	-0.976**	-4.141	1.011**	4.042	0.069	0.831	-0.151**	-2.066	-0.088	-1.291
CE 2	---	0.382**	2.282	-0.294**	-1.659	-0.142**	-2.399	-0.006	-0.120	0.171**	3.522
ausrfdi	**1**	-0.067	-0.109	0.129	0.199	0.488**	2.246	0.490**	2.572	0.289*	1.624
	2	1.334**	2.124	-1.547**	-2.320	-0.274	-1.228	0.093	0.477	0.263*	1.443
	3	0.910*	1.433	-0.753	-1.118	-0.329*	-1.462	-0.048	-0.243	0.107	0.580
Δausrdi	**1**	0.075	0.140	0.002	0.003	0.546**	2.848	0.301**	1.792	0.173	1.101
	2	1.256**	2.243	-1.414**	-2.380	-0.140	-0.705	-0.122	-0.701	0.179	1.104
	3	0.681	1.119	-0.507	-0.786	-0.232	-1.073	-0.150	-0.795	0.064	0.361
Δausrimpo	**1**	-0.141	-0.245	0.501	0.819	-0.155	-0.756	-0.307**	-1.717	0.068	0.404
	2	-0.709	-1.182	1.052**	1.654	-0.127	-0.598	0.134	0.720	0.349**	2.004
	3	0.799	1.319	-1.151**	-1.792	-0.124	-0.576	0.046	0.244	-0.114	-0.646
Δausrexpo	**1**	0.122	0.263	-0.354	-0.719	-0.301**	-1.826	0.014	0.094	0.098	0.725
	2	0.845**	1.824	-0.897**	-1.823	0.080	0.485	-0.042	-0.291	-0.061	-0.457
	3	-0.285	-0.648	0.297	0.636	-0.239*	-1.529	-0.210*	-1.538	0.158	1.239
Δausrgdp	**1**	-0.581	-1.398	0.756**	1.715	0.194	1.318	-0.178	-1.375	-0.085	-0.702
	2	-0.680**	-1.548	0.546	1.172	0.037	0.235	-0.021	-0.157	-0.104	-0.814
	3	-0.032	-0.083	0.103	0.247	0.419**	3.016	0.193*	1.585	0.128	1.120
C	---	616.541	0.791	-451.226	-0.545	722.007**	2.612	461.332**	1.905	165.979	0.733
** significant at 10% critical value, * significant at 15% critical value											
R-squared		0.676		0.682		0.460		0.325		0.539	
Adjusted R-squared		0.564		0.572		0.273		0.091		0.379	
S.E. of regression		2,197.292		2,331.412		778.835		682.466		637.798	
Sum squared resid		237,000,000.000		266,000,000.000		29,722,635.000		22,822,260.000		19,932,509.000	
F-statistic		6.014		6.191		2.457		1.389		3.369	
Log likelihood		-600.151		-604.121		-530.660		-521.810		-517.275	
Akaike AIC		18.452		18.571		16.378		16.114		15.978	
Schwarz SC		19.045		19.163		16.970		16.706		16.571	
Mean dependent		-1.541		373.390		1,167.209		365.179		454.134	
S.D. dependent		3,326.257		3,564.141		913.367		715.848		809.304	

Since some of the variables were not significant, tests for the exclusion of some lags were performed to see whether there the lag length was misspecified. Although the final lag included of *Δausrfdi* and *Δausrimpo* (i.e. lag 3) was not significant when tested for jointly in all five equations and lag 3 of *Δausrdi* and *Δausrexpo* was only significant at a 15% critical value, lag 3 of *Δausrgdp* was significant at a 10% critical value and so was lag 3 of all variables when tested for joint exclusion in all five equations (Table 8-7). The same was true for the previous lags. Lag 1 and 2 should be included when testing for joint exclusion of all five variables in all five equations. However, some of lags of the variables were not significant when lag exclusion of the variables was tested for individually. Nevertheless, the lag length was correctly specified.

Table 8-7

χ^2-test for lag exclusion, VEC Model Estimation						
Variable	***Δausrfdi***	***Δausrdi***	***Δausrimpo***	***Δausrexpo***	***Δausrgdp***	**Joint**
Lag 1	$\chi^2(5) = 3.057$ P = 0.691	$\chi^2(5) = 5.379$ P = 0.371	$\chi^2(5) = 6.374$ P = 0.272	$\chi^2(5) = 10.657$** P = 0.059	$\chi^2(5) = 22.128$** P = 0.000	$\chi^2(25) = 50.854$** { = 0.002
Lag 2	$\chi^2(5) = 7.892$ P = 0.162	$\chi^2(5) = 8.076$ P = 0.152	$\chi^2(5) = 14.080$** P = 0.015	$\chi^2(5) = 13.792$** P = 0.017	$\chi^2(5) = 5.438$ P = 0.365	$\chi^2(25) = 56.082$** P = 0.000
Lag 3	$\chi^2(5) = 8.114$ P = 0.150	$\chi^2(5) = 8.897$* P = 0.113	$\chi^2(5) = 5.282$ P = 0.382	$\chi^2(5) = 8.941$* P = 0.111	$\chi^2(5) = 16.462$** P = 0.006	$\chi^2(25) = 50.85$** P = 0.002
** significant at 10% critical value, * significant at 15% critical value						

8.4 MODEL EVALUATION

In order to evaluate the adequacy of the VEC model, a series of diagnostic tests was performed, including the test of hypothesis of correct specification with regard to non-autocorrelation and homoscedasticity. The hypotheses of non-autocorrelation and homoscedasticity were not rejected at a 5% critical value. The model seemed to be correctly specified. The test of correct functional form (RESET-test) or the test of parameter stability could not be performed for the overall model in Eviews due to the way the model was set up.

Table 8-7

Diagnostic Tests (5% critical values), VEC Model					
		Test	Test-Statistic	5% Critical value	Probability
Heteroscedasticity	**White**	White LR-test	$\chi^2(510)$= 534.566	---	0.218
Autocorrelation (LM Test)	**Lag 1**	LM-test	$\chi^2(25)$ = 27.158	37.652	0.348
	Lag 1-2	LM-test	$\chi^2(25)$ = 27.432	37.652	0.335
	Lag 1-3	LM-test	$\chi^2(25)$ = 23.469	37.652	0.550
	Lag 1-4	LM-test	$\chi^2(25)$ = 24.885	37.652	0.469

* significant at 5% critical value
Note: cannot do RESET or Parameter Stability Test (Chow Forecast Test) in the VEC model.

Resuming with further tests to see whether this model was appropriately specified and which results could be derived from it, the next step was the analysis of the dynamic relationship between the five variables. In order to analyse whether there was a causal link between two variables (for instance *ausrfdi* and *Δausrdi*) and whether an endogenous variable can be treated as exogenous, Granger-causality tests were performed. The tests are generally (i.e. in a standard VAR model) performed as F-tests of the joint hypothesis that the coefficients of the lagged causal variables are significantly different from zero. The dynamic relationship between variables can be tested for any pair of variables: *ausrfdi* and *Δausrdi*, *ausrfdi* and *Δausrimpo, Δausrdi* and *Δausrimpo*, etc. The tests are operationalisations of the Granger-causality concept[210]:

H_0: *Δausrdi* → *ausrfdi:* $\Phi_{12,i} = 0$, i =1,…L

H_0: *ausrfdi* → *Δausrdi:* $\Phi_{21,i} = 0$, i =1,…L

(where $\Phi_{12,i}$ and $\Phi_{21,i}$ are lag polynomials, as described in Chapter 8.3, and L is the lag order, which, in this case, is three).

Since this model was set up as a VEC model and not as a VAR model, not only the lag variables, but also the variables in the cointegrating equations were taken into account. Since the VEC model with the restrictions could be written as:

$$\Delta Y_t = \alpha(\beta' Y_{t-1} + \rho_0) + \alpha_\perp \gamma_0 + \sum_{i=1}^{p-1} \Gamma_i \Delta Y_{t-i} + \varepsilon_t$$

with

$$\alpha\beta' Y_{t-1} = \begin{bmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \\ \alpha_{31} & \alpha_{32} \\ \alpha_{41} & \alpha_{42} \\ \alpha_{51} & \alpha_{52} \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & \beta_{22} & \beta_{32} & \beta_{42} & 1 \end{bmatrix} \begin{bmatrix} ausrfdi_{t-1} \\ ausrdi_{t-1} \\ ausrimpo_{t-1} \\ ausrexpo_{t-1} \\ ausrgdp_{t-1} \end{bmatrix},$$

[210] Pfaffermayr, 1994, p.339 and Johnston and DiNardo (1997), pp.296-297.

a joint F-test of $\Phi_{12}(L) = 0$ and $\alpha_{12}\beta_{22}=0$ had to be conducted to test for the causal link from *Δausrdi* to *ausrfdi*, and not just for $\Phi_{12}(L) = 0$ alone.[211] Toda and Phillips (1994) referred to the first half of the hypothesis ($\Phi_{12}(L) = 0$) as "short-run noncausality" and the second half of the hypothesis ($\alpha_{12}\beta_{22}=0$) as "long-run noncausality". Similarly, to test for the causal link from *ausrfdi* to *Δausrdi*, a joint F-test of $\Phi_{21}(L) = \alpha_{21} = 0$ was conducted.[212] Tests for causal links between the remaining variables followed the same concept. The test results are stated in Table 8-8.[213]

Table 8-8

Granger-Causality Test, VEC Model Estimation						
Equation	**H_0: exclude**	**Variables**				
		ausrfdi* & *Δausrfdi	***ausrdi* & *Δausrdi***	***ausrimpo* & *Δausrimpo***	***ausrexpo* & *Δausrexpo***	***ausrgdp* & *Δausrgdp***
ausrfdi	CE & lags	$\chi^2(4) = 28.052$**	$\chi^2(4) = 8.703$**	$\chi^2(4) = 13.126$**	$\chi^2(4) = 5.873$	$\chi^2(4) = 10.228$**
Δausrdi	CE & lags	$\chi^2(4) = 29.933$**	$\chi^2(4) = 9.086$**	$\chi^2(4) = 14.612$**	$\chi^2(4) = 6.418$	$\chi^2(4) = 7.489$*
Δausrimpo	CE & lags	$\chi^2(4) = 4.547$	$\chi^2(4) = 3.699$	$\chi^2(4) = 21.619$**	$\chi^2(4) = 3.834$	$\chi^2(4) = 20.276$**
Δausrexpo	CE & lags	$\chi^2(4) = 12.216$**	$\chi^2(4) = 7.563$*	$\chi^2(4) = 6.224$	$\chi^2(4) = 3.515$	$\chi^2(4) = 6.365$
Δausrgdp	CE & lags	$\chi^2(4) = 18.909$**	$\chi^2(4) = 17.650$**	$\chi^2(4) = 7.146$*	$\chi^2(4) = 7.351$*	$\chi^2(4) = 17.650$**
CE: Cointegrating Equation (CE 1 in case of FDI, CE2 in the case of *Δausrgdp, Δausrdi, Δausrexpo* and *Δausrimpo*) 10% Critical Value for $\chi^2(4) = 7.779$ ** significant at 10% critical value, * significant at 15% critical value						

The pairwise Granger causality tests showed that at a 10% critical level, causal links were found in thirteen of the 25 possible cases (from *ausrfdi* to *ausrfdi*, *Δausrdi*, *Δausrexpo* and *Δausrgdp*, from *Δausrdi* to *ausrfdi, Δausrdi* and *Δausrgdp*, from *Δausrimpo* to *ausrfdi, Δausrdi* and *Δausrimpo* and from *Δausrgdp* to *ausrfdi*, *Δausrimpo* and *Δausrgdp*). A further four causal links were found at a 15% critical level (from *Δausrdi* to *Δausrexpo,* from *Δausrimpo* to *Δausrgdp,* from *Δausrexpo* to *Δausrgdp* and from *Δausrgdp* to *Δausrdi*). No causal link was found in the remaining eight cases. Most importantly, *ausrfdi* had significant direct effects on

---

211 One did not have to test $\alpha_{11}*\beta_{12}=0$ since one of the restrictions was that β_{12} is equal to 0.

212 One did not have to test $\alpha_{22}*\beta_{21}=0$ since one of the restrictions was that β_{21} is equal to 0. Furthermore, β_{11} was set to be 1, so only one only had to test $\alpha_{21}=0$ instead of $\alpha_{21}*\beta_{11}=0$.

213 If H_0 is not rejected, the failure to reject may be caused by both α and β being equal to 0, in which case the correct critical value should be lower than previously assumed (the different critical value is not an issue when the hypothesis is already rejected at a higher critical value). This could be the case for *ausrdi* & *Δausrdi* in the *Δausrexpo* equation and for *ausrexpo* & *Δausrexpo* in the *Δausrexpo* equation, since neither the hypothesis $\alpha_{42}=\beta_{22}=0$ nor the hypothesis of $\alpha_{42}=\beta_{42}= 0$ was rejected at a 10% critical value (the test statistics were: $\chi^2(2) = 0.308$, P = 0.857 and $\chi^2(2) = 2.272$, P = 0.321 respectively).

Toda and Phillips (1993 and 1994) suggested a sequential procedure in this case. For the first case (*ausrdi* & *Δausrdi* in the *Δausrexpo* equation), let: H_0: $\phi_{42}(L) = 0$ and $\alpha_{42}\beta_{22}=0$, H_1: $\phi_{42}(L) = 0$, H_2: $\alpha_{42}=0$, H_3: $\beta_{22}=0$ and H_4: $\alpha_{42}\beta_{22}=0$. Now the sequential testing procedures to be considered are the following:

(1) Test H_2. If H_2 is rejected, test H_0, otherwise test H_1.

(2) Test H_3. If H_3 is rejected, test H_0, otherwise test H_1.

(3) Test H_1. If H_1 is rejected, reject the hypothesis of noncausality, otherwise test H_2 and H_3. If both are rejected, test H_4, otherwise accept the hypothesis of noncausality.

In this case, H_2 and H_3 was not rejected ($\chi^2(1) = 0.020$, P = 0.889 and $\chi^2(1) = 0.289$, P = 0.591 respectively), while H_1 was rejected at a 10% critical value ($\chi^2(3) = 7.497$, P = 0.058), so that the hypothesis of noncausality was rejected.

In the second case (*ausrexpo* & *Δausrexpo* in the *Δausrexpo* equation), the same procedure can be followed with H_0: $\phi_{44}(L) = 0$ and $\alpha_{42}\beta_{42}=0$, H_1: $\phi_{44}(L) = 0$, H_2: $\alpha_{42}=0$, H_3: $\beta_{42}=0$ and H_4: $\alpha_{42}\beta_{42}=0$. Here, H_2, H_3 and H_1 were not rejected ($\chi^2(1) = 0.020$, P = 0.889, $\chi^2(1) = 2.255$, P = 0.133 and $\chi^2(3) = 3.515$, P = 0.319 respectively), so that the hypothesis of noncausality was accepted.

Hence, *ausrdi* & *Δausrdi* could be viewed as having an effect on *Δausrexpo*, while *ausrexpo* & *Δausrexpo* could not. Since *ausrdi* & *Δausrdi* were already significant at a 15% critical value, the result did not change the overall conclusions.

Δausrdi, *Δausrexpo*, *Δausrgdp* and itself (*ausrfdi*), but not on *Δausrimpo*. However, *ausrfdi* also had various indirect effects on all variables including *Δausrimpo*.

8.5 RESULTS

In order to investigate in more detail the quantitative impact of an exogenous increase in *ausrfdi* on *Δausrdi, Δausrimpo, Δausrexpo, Δausrgdp* and itself and the impact of an exogenous increase in the other variables and the dynamic adjustment of the system to these exogenous shocks, impulse response analysis and variance decomposition were used. The results of the impulse response analysis, illustrating one variable's response to an innovation in the other, are shown in Table 8-9 and Figures 8-3 to 8-8.

Using the impulse response analysis to calculate the effect in the short-run (e.g. after one or two periods) and the long-run (e.g. after twelve, sixteen or twenty periods), it was possible to put signs to the significant links established in the Granger-causality analysis. For results see Table 8-9. In the short-run (after two periods), the significant variables had the following signs: *ausrfdi* had a positive effect on itself, but reduced domestic investment growth, export growth and GDP growth. *Δausrdi* increased domestic investment growth and GDP growth, but reduced FDI and export growth. *Δausrimpo* increased domestic investment growth, import growth and GDP growth, but reduced FDI. *Δausrexpo* reduced GDP growth. Finally, *Δausrgdp* increased FDI, domestic investment growth and GDP growth, reduced import growth. The long-run effects (after about twelve periods) were the same, apart from *ausrfdi*, which now has a positive effect on *Δausrdi* and *Δausrgdp*. Both *Δausrdi and Δausrimpo* now have a positive effect on *ausrfdi* and *Δausrgdp* has a positive effect on *Δausrimpo*.

Table 8-9

Quarterly FDI Equation, Observed (Accumulated Impulse Response) and Predicted Effects
Cholesky Ordering: *ausrfdi, ausrdi, ausrimpo, ausrexpo, ausrgdp*

Variable	Effect on	1 period	2 periods	4 periods	8 periods	12 periods	16 periods	20 periods	Long-run effect	Expected Sign
ausrfdi	***ausrfdi***	2,197.292	1,945.963	2,907.033	3,274.661	4,035.350	4,114.198	4,315.295	+	?
	Δausrdi	0.000	-287.024	431.685	225.579	2.204	162.209	15.035	+	- or +
	Δausrimpo	0.000	-508.281	-950.782	-1,873.997	-2,129.543	-2,321.216	-2,486.322	(n.s.: -)	- or +
	Δausrexpo	0.000	-59.906	-66.238	-401.986	-377.779	-467.301	-504.176	-	+
	Δausrgdp	0.000	-126.323	-117.815	213.116	50.913	65.564	146.711	+	+
Δausrdi	***ausrfdi***	-2,197.128	-1,895.595	-2,839.629	-1,614.494	643.551	3,692.906	7,145.564	+	?
	Δausrdi	779.813	2,056.333	3,492.429	8,288.752	13,125.720	17,926.470	22,757.480	+	?
	Δausrimpo	0.000	512.448	827.671	225.852	-1,286.509	-3,378.030	-5,775.245	(n.s. -)	?
	Δausrexpo	0.000	-69.302	-497.733	-1,230.149	-2,326.889	-3,526.947	-4,820.739	- (*)	?
	Δausrgdp	0.000	292.667	806.764	2,489.014	4,335.525	6,182.350	8,067.493	+	?
Δaus-rimpo	***ausrfdi***	-166.072	-266.958	-548.345	-498.884	969.411	2,189.745	3,850.327	+	+
	Δausrdi	317.606	724.153	2,025.854	4,704.929	7,210.517	10,315.750	13,056.930	+	?
	Δausrimpo	527.572	883.471	1,390.642	1,266.903	1,306.271	1,032.918	450.761	+	?
	Δausrexpo	0.000	31.131	-62.968	-643.505	-1,037.419	-1,629.051	-2,275.098	(n.s.: -)	?
	Δausrgdp	0.000	54.611	516.704	2,696.859	4,486.179	6,384.552	8,527.840	+ (*)	?
Δaus-rexpo	***ausrfdi***	-93.322	-81.043	-219.821	-1,796.402	-3,667.029	-6,042.028	-8,504.826	(n.s.: -)	+
	Δausrdi	42.700	157.897	30.015	-67.639	-289.842	-332.188	-461.171	(n.s.: -)	?
	Δausrimpo	189.170	248.730	483.215	1,345.617	2,800.030	4,476.592	6,243.645	(n.s.: +)	?

	Δausrexpo	647.644	1,274.238	2,359.248	4,398.910	6,714.990	9,027.095	11,381.500	(n.s.: +)	?
	Δausrgdp	0.000	-116.400	-260.535	-385.669	-673.930	-940.675	-1,157.445	- (*)	?
Δaus-rgdp	***ausrfdi***	145.718	369.354	455.519	1,806.530	3,401.375	5,342.537	7,589.465	+	+
	Δausrdi	374.314	1,217.878	2,978.725	7,636.918	13,107.780	18,646.130	24,217.080	+ (*)	+
	Δausrimpo	-120.690	-206.848	-89.080	398.531	772.685	830.456	872.994	+	-
	Δausrexpo	171.581	196.363	183.881	198.306	134.907	-47.715	-208.019	(n.s.: +)	+
	Δausrgdp	633.431	1299.741	2912.595	6,564.988	10,387.360	14,499.060	18,490.300	+	?
n.s.: not significant, (*) only significant at 15% critical value										

Figures 8-7 to 8-11 illustrate the dynamic effects that each variable (*ausrfdi, Δausrdi, Δausrimpo, Δausrexpo* and *Δausrgdp*) had on the remaining variables and itself.

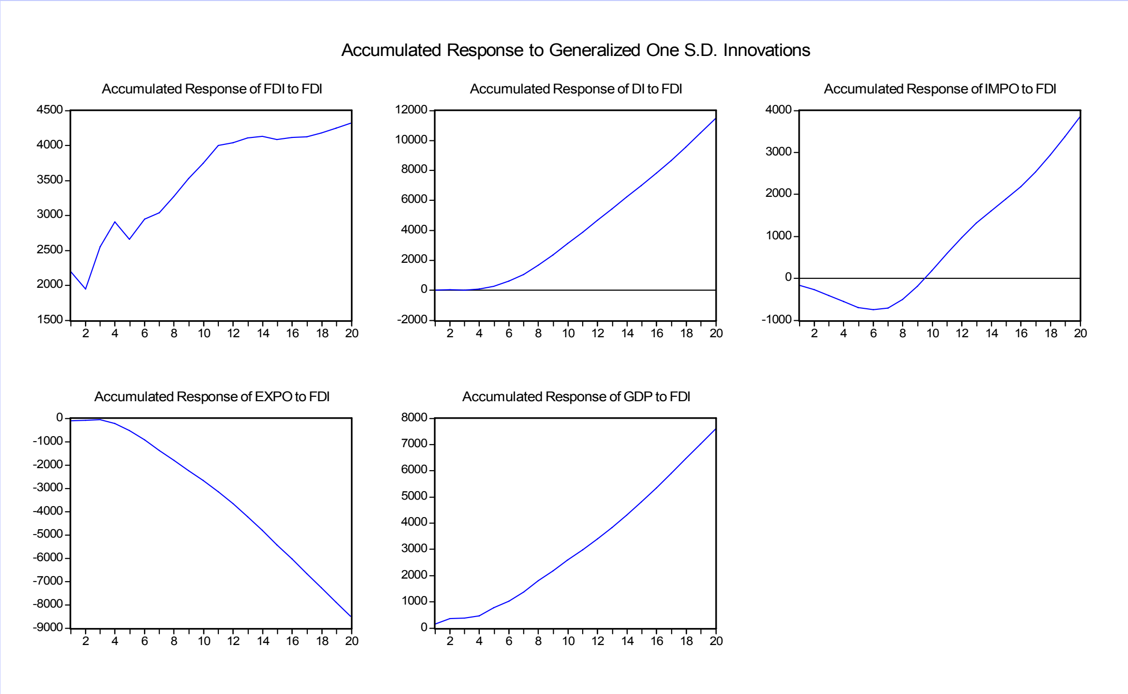


Figure 8-7: Impulse Response, Accumulated Response to an Innovation in FDI

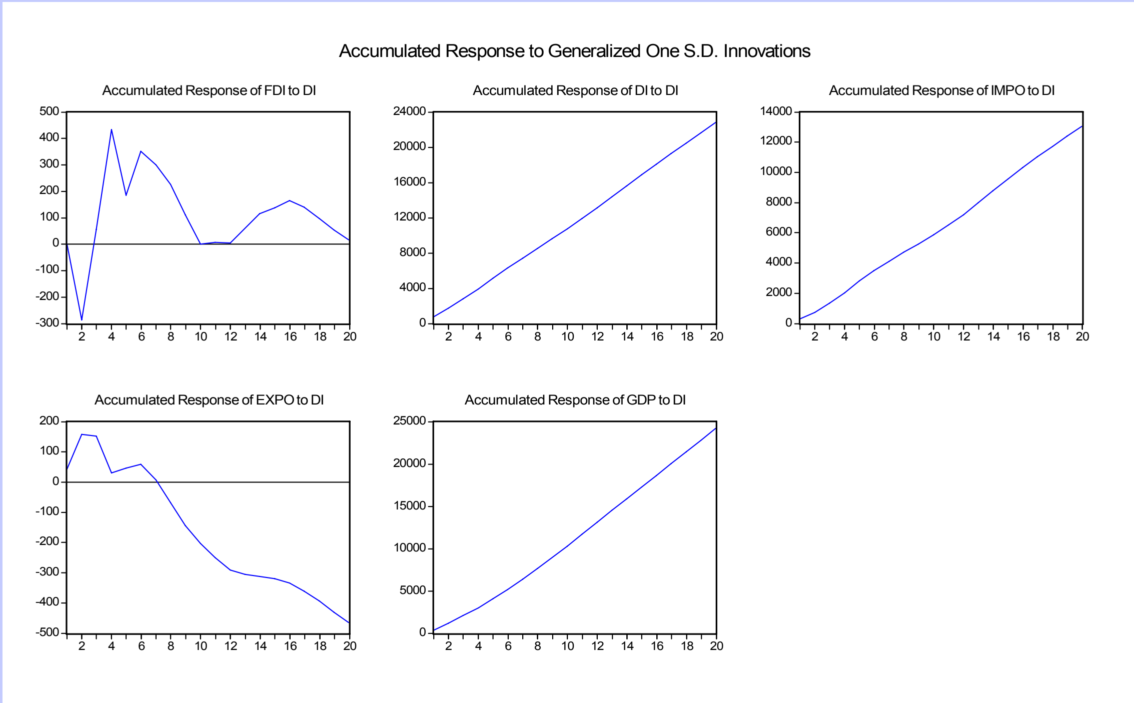


Figure 8-8: Impulse Response, Accumulated Response to an Innovation in Domestic Investment

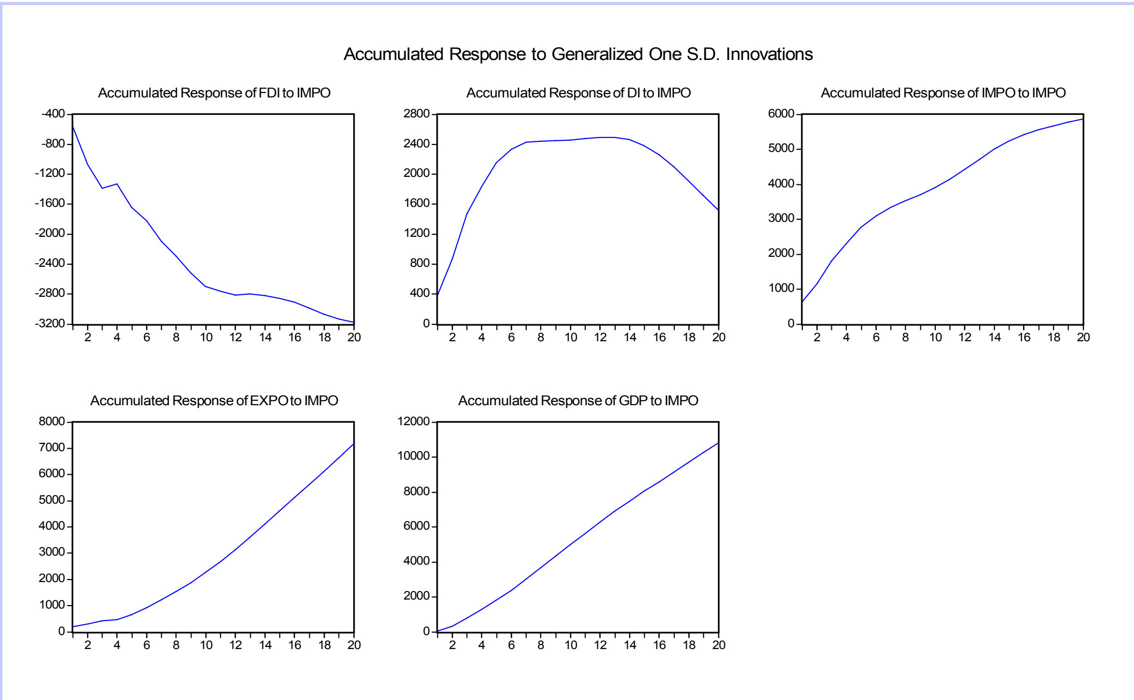


Figure 8-9: Impulse Response, Accumulated Response to an Innovation in Imports

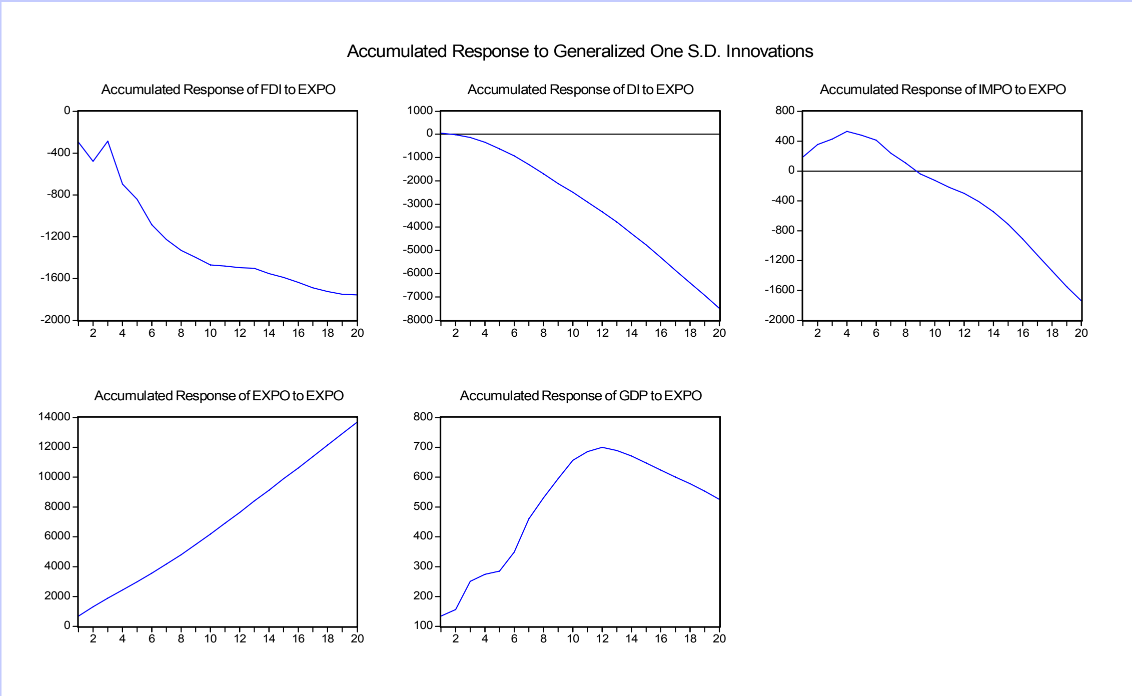


Figure 8-10: Impulse Response, Accumulated Response to an Innovation in Exports

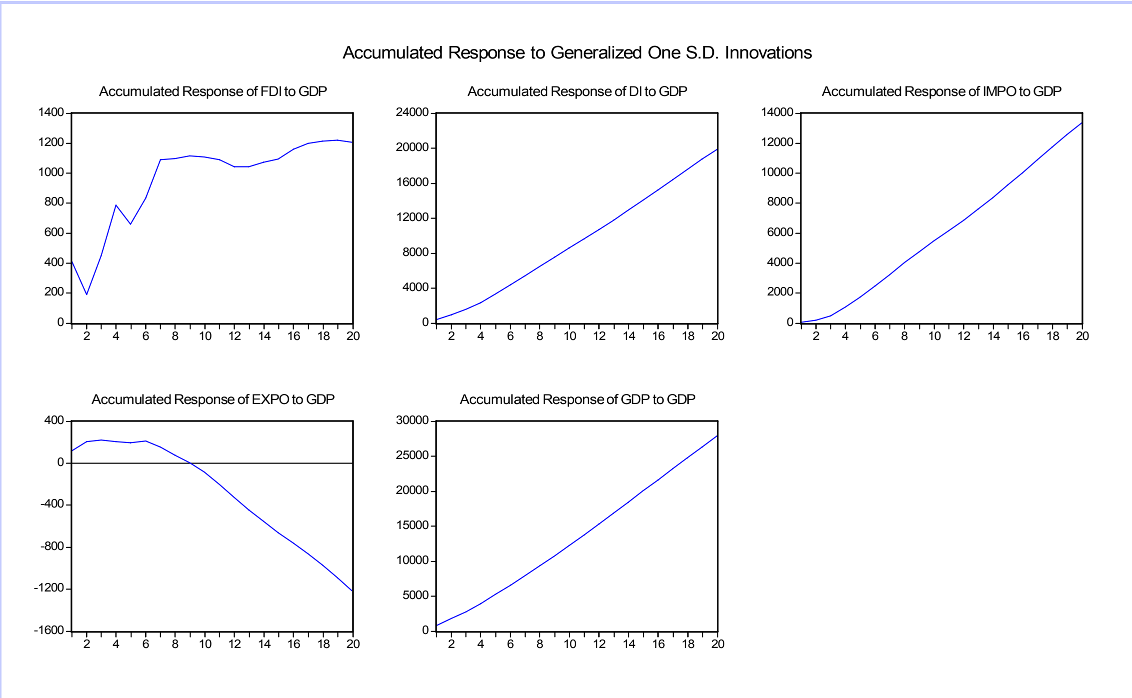


Figure 8-11: Impulse Response, Accumulated Response to an Innovation in GDP

In addition, Figure 8-12 illustrates the results from the impulse response analysis stated in Table 8-9. It shows the significant direct and indirect effects of FDI on other variables. In the short-run, an increase in *ausrfdi* led to a direct increase in *Δausrdi*, leading to an increase in *Δausrgdp* and *Δausrdi* and a reduction of *Δausrexpo* and *ausrfdi.* Since *ausrfdi* led to a direct reduction of itself, all previous direct and indirect effects through an initial change in *ausrfdi* were reversed. *ausrfdi* also led to a direct reduction of *Δausrexpo*, leading to a reduction in *Δausrgdp,* so that *ausrfdi* indirectly increased *Δausrgdp*. Finally, *ausrfdi* led to a direct reduction of *Δausrgdp*, which, in turn, led to and increase in *Δausrgdp* and *Δausrimpo*, but a reduction of *ausrfdi*. The increase in *Δausrimpo* led to an increase in *ausrfdi*, *Δausrgdp* and *Δausrdi*, but a reduction of *Δausrimpo*. Hence, *ausrfdi* indirectly led to a reduction of *Δausrgdp* and *Δausrdi* and both an increase and a reduction of *Δausrimpo* and itself. Overall, FDI had positive direct effects on domestic investment growth and positive indirect effects on all variables. FDI also had negative direct effects export growth, GDP growth and itself and negative indirect effects on all variables. In the short-run, the overall effects of a change in FDI were unclear.

In contrast to the short-run, an increase in *ausrfdi* led to a direct increase in *Δausrdi* in the long-run, leading to a reduction in *Δausrexpo*, but an increase in *ausrfdi*, *Δausrdi* and *Δausrgdp*. As in the short-run, *ausrfdi* led to a direct reduction of *Δausrexpo*, leading to a reduction in *Δausrgdp,* so that *ausrfdi* indirectly increased *Δausrgdp*. Finally, *ausrfdi* led to a direct increase of *Δausrgdp*, leading to an increase in *Δausrgdp, ausrfdi* and *Δausrimpo*. The increase in *Δausrimpo*, in turn, led to an increase in *Δausrimpo, ausrfdi, Δausrgdp* and *Δausrdi.* Overall, FDI had positive direct effects on itself, domestic investment growth and GDP growth and positive indirect effects on all variables except for export growth. In contrast, FDI had negative direct and indirect effects export growth.

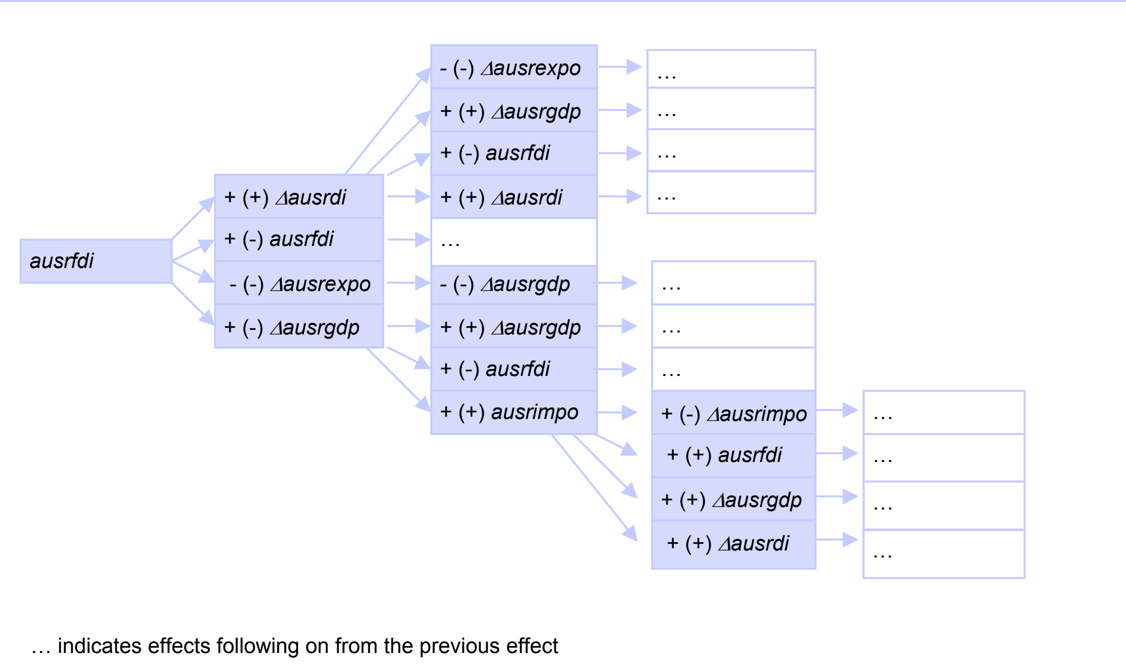


Figure 8-12: Long-run (Short-run) effects of an increase in FDI

Finally, variance decomposition estimated the forecast error components for each variable that originated from the orthogonalised innovations to the system, i.e. the variation in an endogenous variable was separated into the component shocks to the VEC model. The variance decomposition provided information about the relative importance of each random innovation in affecting the variables.[214] Table 8-9 shows that the one-step-ahead forecast error of FDI was completely determined by its own innovations. After four quarters, 82.2% of the estimated forecast standard error of FDI was induced by innovations of FDI. The ratio decreased only slightly after twenty periods (to 77.0%). Hence, most of the variation of FDI should be explained by factors not included in the model. This seemed a reasonable assumption, since in Part I of this thesis it was concluded that variety of factors were needed to explain FDI.

After four periods, innovations in FDI also induced 54.8% of the standard error of *Δausrdi*, but only 4.1% of *Δausrimpo*, 2.2% of *Δausrexpo* and 1.7% of *Δausrgdp*. These ratios changed considerably to 26.0%, 11.2%, 33.3% and 6.6% respectively after twenty periods. Own innovations explained a significant share of the variation in the long-run of most variables included: 55.1% for *Δausrdi*, 48.5% for *Δausrexpo* and 33.6% for *Δausrgdp*, but only 4.3% for *Δausrimpo*. Altering the order of the variables in the VEC model could change the variance decomposition significantly, and, in this case, was based on the assumption that *ausrdi, ausrimpo, ausrexpo* and *ausrgdp* did not affect *ausrfdi* contemporaneously, *ausrimpo, ausrexpo* and *ausrgdp* did not affect *Δausrdi* contemporaneously, *ausrexpo* and *ausrgdp* did not affect *ausrimpo* contemporaneously and *ausrgdp* did not affect *ausrexpo* contemporaneously.

Table 8-9

Variance Decomposition, VEC Model
Cholesky Ordering: *ausrfdi, ausrdi, ausrimpo, ausrexpo, ausrgdp*

Variance Decompo-sition of:	Effect on	Forecast Horizon						
		1 period	2 periods	4 periods	8 periods	12 periods	16 periods	20 periods
ausrfdi	***ausrfdi***	100.000	93.140	82.229	77.563	77.422	77.151	76.982
	Δausrdi	0.000	1.569	5.213	6.072	6.217	6.285	6.332
	Δausrimpo	0.000	4.919	6.405	9.086	9.118	9.242	9.324
	Δausrexpo	0.000	0.068	4.632	4.719	4.583	4.599	4.595
	Δausrgdp	0.000	0.304	1.522	2.560	2.660	2.723	2.767
	Σ	2,197.292	2,291.624	2,558.662	2,684.626	2,729.410	2,736.269	2,742.211
Δausrdi	***ausrfdi***	88.812	65.499	54.835	34.102	27.561	26.104	26.028
	Δausrdi	11.188	29.799	32.998	52.777	57.145	56.643	55.161
	Δausrimpo	0.000	3.497	5.289	3.898	4.790	6.419	7.863
	Δausrexpo	0.000	0.064	4.266	3.308	3.340	3.377	3.435
	Δausrgdp	0.000	1.141	2.612	5.915	7.165	7.458	7.513
	Σ	2,331.412	2,740.250	3,147.839	4,161.887	5,122.262	6,053.406	6,943.027
Δaus-rimpo	***ausrfdi***	6.780	5.297	4.086	2.904	8.590	8.982	11.177
	Δausrdi	24.798	37.336	58.806	57.576	55.871	58.218	55.673
	Δausrimpo	68.422	56.813	29.333	11.184	7.095	5.063	4.348
	Δausrexpo	0.000	0.136	0.507	1.918	1.708	1.915	2.104
	Δausrgdp	0.000	0.418	7.268	26.418	26.736	25.822	26.698
	Σ	637.798	844.310	1,376.413	2,255.879	2,841.162	3,447.998	3,976.170
Δaus-rexpo	***ausrfdi***	1.870	0.997	2.157	19.270	24.739	30.439	33.345
	Δausrdi	0.391	1.698	1.933	1.127	0.833	0.541	0.423
	Δausrimpo	7.683	4.425	4.477	8.037	12.985	15.576	17.103
	Δausrexpo	90.055	91.356	89.690	70.578	60.531	52.667	48.476
	Δausrgdp	0.000	1.524	1.744	0.988	0.912	0.777	0.652
	Σ	682.466	942.814	1,250.504	1,860.784	2,500.824	3,118.584	3,664.065
Δaus-rgdp	***ausrfdi***	3.501	3.914	1.661	3.940	4.600	5.521	6.573
	Δausrdi	23.098	46.792	51.080	55.965	59.344	59.451	59.498
	Δausrimpo	2.401	1.208	0.625	0.658	0.503	0.339	0.255
	Δausrexpo	4.853	1.651	0.697	0.261	0.150	0.122	0.104
	Δausrgdp	66.146	46.435	45.936	39.175	35.403	34.567	33.571
	Σ	778.835	1,349.150	2,168.708	3,745.485	5,084.569	6,221.373	7,191.441

[214] Pfaffermayr (1994), p.345 and Johnston and DiNardo (1997), p.301.

8.6 CONCLUSIONS

For the first analysis of the consequences of Australian FDI, a model with aggregate quarterly real FDI flow data for the period between Q3/1985 and Q2/2003 were used to analyse the dynamic relationship of FDI with a set of endogenous variables including the change of GDP, domestic investment, imports and exports. The model was estimated as a VEC model, on which Granger-causality tests, impulse response analysis and variance decomposition were applied to analyse the causal links between the five variables in general and the way in which FDI affected the other variables in particular.

A combination of ABS surveys, BEA data and Invest Australia data suggested that FDI in Australia had a positive effect on economic growth and domestic investment, but a possible negative effect on Australia's trade performance (increasing imports by more than exports). In contrast, previous econometric studies (discussed in Chapter 7.2) indicated that Australian FDI only has positive effects on such variables as national income or output, exports and trade. The results from this analysis suggested that the long-term effects of an increase in FDI were an increase in domestic investment growth (or more precisely: the change in domestic investment), GDP growth and FDI itself, but also a reduction in export growth. Through its effect on GDP growth, FDI also led to an increase in import growth. Taking indirect effects into account, FDI led to GDP growth, leading to an increase in domestic investment growth, GDP growth, import growth and FDI, but to a reduction of export growth.

FDI had the expected positive effect on economic growth. The link was strong in the long-run, since both direct and indirect effects were positive, but FDI directly and indirectly (over reduced export growth and reduced FDI) affected GDP growth in the short-run. The crowding-out effect of domestic investment through FDI was not substantiated for Australia, as FDI and domestic investment were complement, but the direct and indirect positive effects on domestic investment growth in the long-run were qualified by taking into account the indirect negative effect in the short-run (through decreased GDP and FDI).

The effect of FDI on the Australian trade performance was more difficult to summarise. No evidence was found of FDI directly increasing export or import growth. In contrast, an increase in FDI directly reduced export growth in the short- and long-run. While only negative indirect effects were found in the long-run, FDI had both positive and negative indirect effects on export growth in the short-run. This strong negative link could suggest that MNEs were less export-oriented than domestic firms. The claim that "FDI promotes export growth"[215], established by some case studies, was not supported when looking at aggregate data, as FDI reduced export growth. Import growth was not directly affected by FDI, but GDP growth appeared to increase import growth in the long-run (but not the short-run). In the short-run, both positive and negative indirect effects of FDI on import growth were found. Hence, the question of whether FDI

215 Commonwealth of Australia (1999), p.xi

increases intermediate good imports by more than it reduces final good imports could not be tested, as no direct effects were found. Looking at the overall trade performance, FDI did not seem to be beneficial to the Australian economy. Since there was evidence that FDI indirectly increased import growth and directly and indirectly reduced export growth, it was concluded that FDI had negative effects on Australia's trade balance.

Comparing the findings of this econometric analysis with the results of the econometric studies on which it was based, the evidence is mixed. While some of the previous results were supported (e.g. the positive effect of FDI on economic growth found by Shan (2002)), others were not substantiated (e.g. the positive effect of FDI on exports found by Liu et al. (2001)). Most links were more evident for Australia than in previous studies (Chakraborty and Basu (2002) did not find a significant link between FDI and economic growth, Kim and Seo (2003) did not find a significant link between FDI and domestic investment and Liu et al. (2001) did not find a significant link between FDI and imports).

Overall, the positive effects of FDI on economic growth and, to some degree, domestic investment supported the Australian government's view that FDI is a favourable source of capital for the Australian economy. The claim that FDI is favourable for Australia's balance-of-payments position was not supported by this econometric analysis. FDI did not have a positive effect on Australian exports and did not reduce imports. The contrary was observed, a claim that went well with the results from the ABS (2004b) report, in which foreign-owned firms were found to increase the Australian trade deficit. Hence, such an important issue should be analysed in more detail and not judged by case studies alone.

CHAPTER 9

ANALYSIS OF CONSEQUENCES OF INDUSTRY-SPECIFIC FDI IN AUSTRALIA – EFFECTS OF FDI ON EMPLOYMENT, WAGES, PRODUCTIVITY AND MARKET STRUCTURE

After having looked at the links between aggregate FDI, domestic investment, trade and GDP in Australia, industry-specific data were used to look at industry-specific employment, wages, labour productivity and industry concentration in Australia as four additional factors that could be affected by FDI and for which sufficient data were available to make such an analysis possible. The four models, which were used to explore the effect of industry-specific FDI in Australia, will be discussed in the following four sections. Sections 9.1 to 9.4 include introduction and data discussion, model specification, estimation and evaluation. Section 9.5 summarises and concludes.

9.1 ANALYSIS OF THE EFFECTS OF INDUSTRY-SPECIFIC FDI ON EMPLOYMENT IN AUSTRALIA

9.1.1 INTRODUCTION AND DATA

MNEs have made a significant contribution to employment in Australia over time. According to the ABS (2004a), an estimated 7,864 foreign-owned businesses in Australia employed 783,300 workers (12% of all employees in Australia – the ninth highest ratio in the world and the sixth highest in the developed world[216]) in 2000/01, i.e. one employee for A$ 0.27 million of FDI stock.[217]

A number of examples illustrate the job-creating nature of Australian FDI. Between 2002 and 2004, Invest Australia attracted 105 new projects valued as A$ 14.8 billion, which were expected to create or safeguard around 9,500 jobs (i.e. an average of A$ 1.6 million per job and an 61.9 jobs per project).[218] The 391 projects reported by OCO Consulting (Table 2-15) led to a total of 21,547 jobs, i.e. every project created an average of 55.1 jobs. Considering only projects for which job information was available (i.e. ignoring the 35 projects without employment information), the number increased to 60.5 jobs per project. Furthermore, based on a total capital investment of US$ 62.4 billion in that time period, one job was created for every US$ 2.9 million of capital investment. However, this number was somewhat biased, since 35 projects without employment information accounted for US$ 53.4 billion of capital investment. Excluding those projects, one job was created for every US$ 0.42 million invested.

Comparing those results with BEA data on US FDI in Australia (see Table 6-1) between 1983 and 2000, the average US non-banking affiliates employed between 298 (in 1994) and 538 (in 1989) employees. In 2000, the number was 380 employees per affiliate. Total employment by US non-banking affiliates in Australia varied between 251,100 and 396,800. The number of affiliates was between 685 and 900. One job existed for every US$ 0.03 million to US$ 0.1 million of capital invested. What was unclear was the number of indirect jobs created, whether employment in foreign affiliates displaced employment in domestic firms and the quality of those jobs. However, foreign affiliates paid higher wages than domestic firms. In 2000, employee compensation in US affiliates was on average A$ 57,951 per employee, compared with Australian annual wages of A$ 33,173 (based on average weekly earnings of A$ 638).

The first model analysing the consequences of industry-specific FDI looked at industry-specific employment. Since the main focus of this analysis was the link between FDI and employment, the time periods covered were determined by the availability of industry-specific FDI data from all countries in Australia (the same dataset as used in Chapter 5.2.1). Data were available for ten years between 1992 and 2001 and eleven cross-sections[219], giving a maximum of 110 observations. Figure 9-1 shows employment, employment growth and real annual FDI in Australia between 1992 and 2001. While there was no clear link between employment and real annual FDI, employment growth (first differences of the employment series) seemed to follow the same movement as FDI for some of the time periods, but not for others.

[216] UNCTAD (2002), p.275.

[217] Based on an FDI stock of A$ 215,187 million in 2000/01. Source: ABS 5302.0, Time Series Spreadsheet, Table 28.

[218] Invest Australia. 2004. Inflow: Australia's Investment News Issue 13, 23.08.2004. www.investaustralia.gov.au

[219] The eleven industries are agriculture, mining, manufacturing, construction, wholesale trade, retail trade (wholesale and retail trade were combined as trade in Chapter 5.2.1), hospitality, finance and insurance, business services, transport services and utilities.

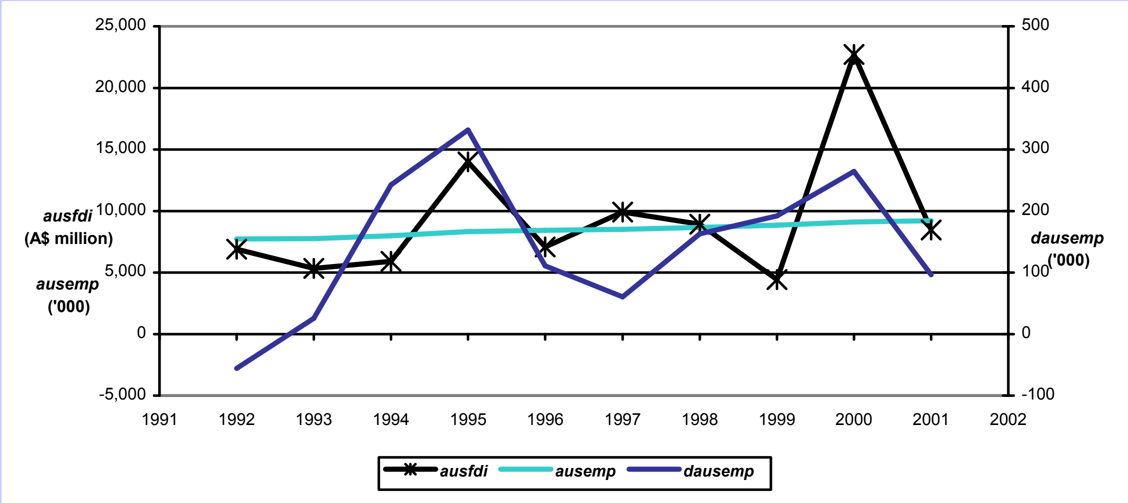


Figure 9-1: Real annual aggregate FDI Inflows and total Employment and Employment Growth in Australia, 1991 to 2002

While in Chapter 7.1.5, some studies on the employment effect of FDI were discussed, not much was said about other factors relevant to the employment level or to employment growth. Since industry-specific data were chosen to analyse industry-specific employment, the explanatory variables had to be chosen accordingly. Some of the variables used in the models discussed in Chapter 7.1.5 were either not available, or they did not seem reasonable to use for industry-specific data, or the specific set of variables used seemed too limited. Hence, a combination of both FDI and non-FDI related literature was used to find a set of potential explanatory variables.

A combination of FDI and other capital, market size, labour market conditions and labour characteristics, risk factors and industry dummies was used to explain industry-specific employment. While the focus was on the link between industry-specific employment and FDI, other factors were included since FDI could not be viewed as the only determinant of industry-specific employment, but as one of many determinants. Although the employment equation should ideally take account of positive or negative "spillover effects" (i.e. when MNEs create indirect employment or drive out local firms), it was not possible to measure those effects with the available data. The model was stated as:

emp = f(*fdii, capital, market, profits, lab, rwages, prod, hours, qual, inr, inf, indus, sector)*

where the variables are as listed and defined below:

emp — defined as in Chapter 5.1, i.e. *ausempi,*

fdii — real annual industry-specific FDI in Australia, defined as in Chapter 5.1, i.e. *ausrfdii*, or measured by real industry-specific FDI stock in Australia (*ausrfdisti*),

capital — real industry-specific domestic investment (*ausrdii*) or industry-specific capital intensity (*auskli*),

market	defined as in Chapter 5.1, i.e. *ausgdpi*, or measured by industry-specific real sales (*ausrsalesi*),
profits	industry-specific profit margin (*ausprofmargi*), calculated as the percentage of operating income as operating profit before tax in an industry,
lab	labour demand, defined as labour supply in Chapter 5.1, i.e. *ausuer, ausjobvac* or *ausjobvaci*,
rwages	defined as in Chapter 5.1, i.e. *ausrwages1i* or *ausrwages11i,*
hours	the average number of hours worked in an industry (*ausavhouri*) or, alternatively, the total number of hours worked in an industry (*austhouri*),
prod	defined as in Chapter 5.1, i.e. *auslp1i* or *auslp2i,*[220]
qual	industry-specific labour quality measured by percentage of salary earners with tertiary education in an industry (*auslq1i*) or the percentage of salary earners with more than high school degree in an industry (*auslq2i*),
inr	defined as in Chapter 5.1, i.e. *ausbb30,*
inf	defined as in Chapter 5.1, i.e. *ausinf,*
indus	defined as in Chapter 5.1, i.e. *ausindusi,*
sector	defined as in Chapter 5.1, i.e. *prim, man* or *tert.*

In summary, FDI and other capital was represented by *fdii* and *capital*, market size by *market* and *profits*, labour market conditions and labour characteristics by *lab, rwages, prod, hours* and *qual*, risk factors by *inr, inf* and *indus* and other factors by *sector*. For a summary see Table 9-1.

Table 9-1

Determinants of Industry-Specific Employment in Australia		
	Dependent Variable	**Alternative Variable**
Employment		
Industry-specific Employment *(emp)*	*ausempi*	---
	Explanatory Variable	**Alternative Variable**
FDI and Other Capital		
Industry-specific FDI *(fdii)*	*ausrfdii*	*ausrfdisti*
Industry-specific Domestic Investment or Capital Intensity *(capital)*	*ausrdii*	*auskli*
Market Size		
Industry Sales or Size *(market)*	*ausgdpi*	*ausrsalesi*
Industry Profits *(profits)*	*ausprofmargi*	---
Labour Market Conditions and Labour Characteristics		
Labour Demand (Australian Unemployment Rate or Number of Job Vacancies)*(lab)*	*ausuer*	*ausjobvac, ausjobvaci*
Industry-specific Wages *(rwages)*	*ausrwages1i*	*ausrwages11i*
Labour Productivity *(prod)*	*auslp1i*	*auslp2i*
Hours worked *(hours)*	*ausavhouri*	*austhouri*
Industry Labour Quality *(qual)*	*auslq1i*	*auslq2i*

[220] If labour productivity (*auslp1i*, defined as *ausempi/ausgdpi*) is used in a model including both *ausempi* and *ausgdpi*, collinearity is a problem. One has to either choose a different combination of variables or ensure that the variables are not all used in levels form. For the final estimation model (Table 9-4, Model C), not *auslp1i*, *ausempi* and *ausgdpi* were chosen, but *Δauslp1i, Δausempi* and *Δausgdpi.*

(Table 9-1 continued)

Risk Factors		
Australian Interest Rate *(inr)*	*ausbb30*	---
Australian Inflation Rate *(inf)*	*ausinf*	---
Australian Industrial Disputes *(indus)*	*ausindusi*	---
Industry Dummies		
Industry Dummies *(sector)*	*prim, man, tert*	*agr, min, man, con, who, ret, rest, tras, fins, rebs, uti*
Data Sources: See Appendix A.6.		

Data sources and descriptive statistics of the variables can be found in Appendix A.6 (Table A-15 and A-16). As for the industry-specific FDI model, three kinds of variables could be included: variables that vary over cross-sections and time, variables that vary over time and variables that vary over cross-sections. Additional variables that could be important in explaining industry-specific employment, but were not used for this analysis due to availability problems include institutional agreements (laws, contracts, collective negotiations and unions), the attitude towards hiring and firing, unemployment benefits, retirement plans and labour market flexibility.[221]

Before estimating the model, the explanatory variables in the industry-specific employment model and their potential substitutes are discussed and reasons for the predicted effect of each variable are given. Industry-specific real FDI flows were expected to increase employment, since subsidiaries need to employ workers. However, FDI may drive out domestic competition, so that FDI-induced employment replaces employment in domestic firms with an unclear overall employment effect. As for the inflow of foreign capital, an increasing domestic capital stock in an industry (i.e. domestic investment) and the construction of new firms or the purchase of new machinery should increase employment. However, employment could be reduced if some of the labour was replaced with more efficient, labour-saving machinery.

Industry-specific GDP or real sales should have a positive effect, since more people are employed in larger industries (i.e. industries with more value-added or larger sales). Increased economic activity (economic growth) should increase employment, since employment should rise in growth industries. An industry's average profit margin should also have a positive effect on employment, as firms with higher profit margins can afford to employ more workers or avoid laying off workers.

The employment effect of labour demand and wages is unclear, since the two variables interact. Employment should increase because of increased labour demand (measured by a lower unemployment rate or a higher number of job vacancies), particularly since higher labour demand may lead to higher wages. High employment levels may lead to employees having

[221] The variables were chosen based on Piana (2001), according to whom employment levels depended on economic activity (GDP), labour productivity, institutional arrangements, education/skills level and wages. Some examples of empirical studies analysing the determinants of employment are: Bhaumik et al. (2004), who explained the average growth rate of the labour force of MNEs using FDI, resource availability in the Host country, the institutional environment in the Host country, MNE experience and motivation and industry characteristics; Chletsos (2004), who explained labour demand using GDP, investment, public deficits and social expenditures (such as pensions, unemployment benefits and education expenditure); Cullison (1979), who used real wage, disposable income per capita, GDP, the relative price of food and unemployment benefits to explain labour force participation; and Daveri and Filippin (2002), who used real wage growth, total factor productivity and capital to explain employment growth.

more power in wage negotiations, thus increasing their remuneration, while higher real wages should directly reduce the incentive for firms to employ workers. Furthermore, higher wages may increase labour supply, as more people may be willing to work for higher real wages. While this increased labour supply could drive down wages, it could also increase employment.[222]

The effect of labour productivity on employment is also unclear. Higher productivity could either be a sign for workers being replaced by more efficient machinery or could lead to good to increased employment, since goods can be produced more efficiently (e.g. by wasting fewer materials), increasing the profit margin or adding further value to the products, so that they can be sold at higher prices, leading to increased profits, expansion and employment growth. The same is true for a higher number of hours worked per employee and the skill level of workers. When workers work longer hours or are more skilled, they may be more productive, reducing overall employment. However, they could also increase profits by producing goods more efficiently or by improving product quality and raising prices, thereby increasing employment.

Risk factors that could potentially affect employment include the inflation rate, the interest rate and the number of industrial disputes. A higher inflation rate could increase risk and increase nominal wages, thus reducing labour demand, but increasing labour supply, which, in turn, may affect employment. The effect of higher interest rates is ambiguous, as they may either reduce profits (if higher loan repayments need to be made) or increase profits (if capital is invested), possibly increasing production and employment. The incidence of industrial disputes increases the investment risk and should thus reduce investment and profitability, thereby reducing employment.

Industry dummies may be of use if some of the variation of industry-specific employment can only be explained by general differences between the different industries, i.e. differences that cannot be explained by the other explanatory variables in this model.

If alternative variables could be used, the ones with the best fit were chosen. Current and lagged values were included when significant, while insignificant variables were not included. As in the industry-specific FDI model (Chapter 5), explanatory variables were included with lags when this increased the fit of the model. The number of lags was restricted to a maximum of three due to the limited number of time periods used. A lagged dependent variable was experimented with and included in order to solve the problem of autocorrelation that occurred without its inclusion.

[222] While this could indicate endogeneity, labour supply was not both found to be significant in the model, and only wages were included. Hence, the labour supply linkage could not be supported.

9.1.2 MODEL SPECIFICATION AND ESTIMATION

For the first of the four models in which the effect of industry-specific FDI in Australia between 1992 and 2001 was analysed, a function of a lagged dependent variable (*ausempi(-1)*), FDI and other capital (*ausrfdii* and *ausrdii*), market size (*ausrgdpi* and *ausprofmargi*), labour market conditions and labour characteristics (*ausrwages11i* and *auslp1i*) and risk factors (*ausinr* and *ausinf*) performed best in explaining industry-specific employment in Australia (*ausempi*) (Table 9-4, Model A). The model was stated as:

$$ausempi_{it} = \alpha + \beta_{11}\, ausempi_{it-1} + \beta_{21}\, ausrfdii_{it} + \beta_{31}\, ausrdii_{it} + \beta_{32}\, ausrdii_{it-1} + \beta_{33}\, ausrdii_{it-2} + \beta_{41}\, ausrgdpi_{it} + \beta_{42}\, ausrgdpi_{it-1} + \beta_{51}\, ausprofmargi_{it} + \beta_{61}\, ausrwages11i_{it} + \beta_{62}\, ausrwages11i_{it-1} + \beta_{71}\, auslp1i_{it} + \beta_{72}\, auslp1i_{it-1} + \beta_{81}\, ausinr_{t} + \beta_{82}\, ausinr_{t-1} + \beta_{91}\, ausinf_{t} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model should best be estimated using least squares, fixed effects or random effects estimation).

Since the model was estimated using panel data, it was tested whether a specification as a fixed effects model or a random effects model was more appropriate than using least squares (Table 9-2). While the model appeared to be correctly specified as a fixed effects model, it exhibited autocorrelation when estimated. The solution was to choose a smaller number of significant industry dummies (in this case *agr* and *rebs*) instead of the whole set of industry dummies (Table 9-4, Model B).[223] The specification of the model as a random effects model could not be tested, as the number of cross-sections was smaller than the number of coefficients.

Table 9-2

Fixed and Random Effects Estimation, Industry-Specific Employment Model		
Fixed Effects Model		
F test that all $u_i = 0$	F(10, 57) = 2.030	Prob > F = 0.046
Random Effects Model		
The number of cross-sections is smaller than the number of coefficients, so the Random Effects Model cannot be estimated.		

The next step was to analyse whether any of the variables should be used in first differences. Based on the results from a test for differencing – as applied to the country- and industry-specific FDI models (Chapters 4 and 5) – *ausinr* was used in levels form, while *ausrgdpi, ausprofmargi, auslp1i* and *ausrwages11i* were differenced once. The variable *ausrdii* was differenced twice, since the hypothesis that the variables should be used in second differences was not rejected at a 10% critical value (Table 9-3). The dependent variable *ausempi* had to be differenced once, which made theoretical sense, since FDI flows (amongst other factors) could affect employment growth instead of employment level (refer to Figure 9-1

[223] Including only two industry dummies instead of the whole set of industry dummies seemed appropriate since both models had a similar fit (R^2 of 64.7% instead of 71.3% and adjusted R^2 of 59.3% instead of 62.8% after differencing).

for a comparison of the three time series). The model including *Δausempi, ΔΔausrdii, Δausrgdpi, Δausprofmargi, Δauslp1i* and *Δausrwages11i* was used for further estimation.

The industry-specific employment model for Australia using *Δausempi* as the dependent variable was then estimated as a combination of two variables in levels form without lags (*ausrfdii, ausinf*), one variable in levels form with lags (*ausinr*), four variables in first difference without lags (*Δausrgdpi, Δausprofmargi, Δauslp1i* and *Δausrwages11i*), one variable in second difference without lags (*ΔΔausrdii*) and two industry dummies (*agr* and *rebs*), i.e. eleven variables in total.

Table 9-3

Test for Differencing, Industry-Specific Employment Model			
Variable	**χ^2 (Prob)**	**χ^2 (Prob)**	**χ^2 (Prob)**
ausempi	1.070 (0.301)	---	---
ausrfdii	---	---	---
ausrdii	0.320 (0.572)	0.137 (0.711)	---
ausrgdpi	1.118 (0.290)	---	---
ausprofmargi	1.845 (0.174)	---	---
ausrwages11i	0.996 (0.318)	---	---
auslp1i	1.250 (0.264)	---	---
ausinr	5.793* (0.016)	7.070* (0.008)	8.095* (0.004)
ausinf	---	---	---
Result	*ausempi* → *Δausempi* *ausrdii* → *Δausrdii* *ausrgdpi* → *Δausrgdpi* *ausprofmargi* → *Δausprofmargi* *auslp1i* → *Δauslp1i* *ausrwages11i* → *Δausrwages11i*	*Δausrdii* → *ΔΔausrdii*	---
* significant at 10% critical value			

The parameters of the model – estimated using least squares – are shown in Table 9-4, Model C. The industry-specific employment model explained almost two thirds of the variation of employment growth (R^2 of 64.7% and an adjusted R^2 of 59.3%). Nine of the eleven explanatory variables were significant at a 10% critical value. The remaining two (*ΔΔausrdii* and the current value of *ausinr*) were significant at a 15% critical value. The F-test showed that all slope coefficients combined were not equal to zero.

Table 9-4

Industry-Specific Employment Equation											
Sample: Time: 1992 – 2001, t = 10 (t = 8 after adjusting endpoints), N = 11. Missing values = 3. Included observations: 85 Least Squares, White Heteroscedasticity Consistent Standard Errors & Covariance											
Model A: Model with variables in levels form				**Model B: Model with variables in levels form (including industry dummies)**				**Model C: Model after differencing (including industry dummies)**			
Dependent Variable: *ausempi*				**Dependent Variable: *ausempi***				**Dependent Variable: *Δausempi***			
Variable	**Lags**	**Coeff.**	**t-stat**	**Variable**	**Lags**	**Coeff**	**t-stat**	**Variable**	**Lags**	**Coeff**	**t-stat**
C	---	-53.575**	-2.869	**C**	---	-31.974**	-1.919	**C**	---	-29.213**	-2.279
ausempi	**1**	1.028**	62.751	***ausempi***	**1**	1.019**	55.196	**---**	---	---	---
ausrfdii	**0**	-0.006**	-2.678	***ausrfdii***	**0**	-0.003*	-1.557	***ausrfdii***	**0**	-0.006**	-5.461
ausrdii	**0**	-0.001	-0.563	***ausrdii***	**0**	0.001	0.498	***ΔΔausrdii***	**0**	-0.001*	-1.501
	1	0.002**	1.808		**1**	0.001	0.756		---	---	---
	2	-0.002	-0.754		**2**	-0.001	-0.696		---	---	---
ausrgdpi	**0**	0.007**	4.207	***ausrgdpi***	**0**	0.004**	2.028	***Δausrgdpi***	**0**	0.003**	1.787
	1	-0.007**	-4.037		**1**	-0.004**	-2.213		---	---	---

(Table 9-4 continued)

Model A: Model with variables in levels form				Model B: Model with variables in levels form (including industry dummies)				Model C: Model after differencing (including industry dummies)			
Variable	**Lags**	**Coeff.**	**t-stat**	**Variable**	**Lags**	**Coeff**	**t-stat**	**Variable**	**Lags**	**Coeff**	**t-stat**
ausprof-margi	**0**	2.559**	2.235	***ausprof-margi***	**0**	2.501**	2.608	***Δausprof-margi***	**0**	2.831**	2.741
	1	-2.390**	-1.952		**1**	-1.889**	-1.706		**---**	---	---
aus-rwages11i	**0**	-0.002*	-1.657	***aus-rwages11i***	**0**	-0.003**	-2.380	***Δaus-rwages11i***	**0**	-0.002**	-2.958
	1	0.002**	1.834		**1**	0.002**	1.972		**---**	---	---
auslp1i	**0**	-0.002**	-3.284	***auslp1i***	**0**	-0.001**	-2.253	***Δauslp1i***	**0**	-0.001**	-3.066
	1	0.002**	3.303		**1**	0.001**	2.298		**---**	---	---
ausinr	**0**	-2.338	-1.317	***ausinr***	**0**	-2.818*	-1.645	***ausinr***	**0**	-2.570*	-1.488
	1	6.332**	3.027		**1**	6.797**	3.240		**1**	6.516**	3.045
ausinf	**0**	4.698**	2.999	***ausinf***	**0**	4.589**	3.349	***ausinf***	**0**	4.194**	3.465
---	**---**	---	---	***agr***	**---**	-21.811**	-2.187	***agr***	**---**	-12.691**	-2.354
---	**---**	---	---	***rebs***	**---**	34.362**	3.679	***rebs***	**---**	31.150**	4.004
** significant at 10% critical value, * significant at 15% critical value											
R-squared			0.998	**R-squared**			0.998	**R-squared**			0.647
Adjusted R-squared			0.997	**Adjusted R-squared**			0.998	**Adjusted R-squared**			0.593
S.E. of regression			18.864	**S.E. of regression**			16.779	**S.E. of regression**			16.928
Sum squared resid			23,842.110	**Sum squared resid**			18,298.750	**Sum squared resid**			20,633.280
Durbin-Watson stat			2.129	**Durbin-Watson stat**			2.573	**Durbin-Watson stat**			2.291
F-statistic			1,980.517	**F-statistic**			2,226.389	**F-statistic**			11.983
Prob (F-statistic)			0.000	**Prob (F-statistic)**			0.000	**Prob (F-statistic)**			0.000

9.1.3 MODEL EVALUATION

In order to evaluate the adequacy of the industry-specific employment model, a series of diagnostic tests was performed, testing the hypotheses of correct specification with regard to non-autocorrelation, homoscedasticity (White-test) and correct functional form (RESET-test). The test results are presented in Table 9-5. While the hypothesis of non-autocorrelation was not rejected, the hypothesis of homoscedasticity was rejected at a 5% critical value, which is why White heteroscedasticity-consistent standard errors and covariances were used. The hypothesis of correct functional form (RESET(1) and RESET(2)) was also rejected, indicating some misspecification, though its form remained unclear.[224]

Table 9-5

Diagnostic Tests (5% critical values), Industry-Specific Employment Model					
		Test	**Test-Statistic**	**5% Critical value**	**Probability**
Heteroscedasticity	**White LR-test**	$\chi^2(9)$	17.523*	16.919	0.041
Autocorrelation	**F-test**	F(1,72)	1.898	3.970	0.173
Misspecification	**RESET(1)**	F(1,72)	7.376*	3.970	0.008
	RESET(2)	F(2,71)	9.000*	3.130	0.000
* significant at 5% critical value					

Furthermore, it was tested whether parameters were stable or whether there was a shift in the parameters over time or a difference between industries. In order to test for parameter stability over time, the model was split into two subsamples, one for 1994 to 1997 and for 1998 to 2001, i.e. the sample was divided into half. The results for the estimation of the two

[224] Although correct functional form appeared to be a problem, transforming the variables into log form and/or experimenting with alternative variables did not solve the problem. Transforming the variables leads to the generation of too many missing values, so that for the case of Model C in Table 9-4, one could only include 47 instead of 85 observations.

subsamples are stated in Table 9-6, Model A and B. The model performed equally well for each subsample (R^2 of 67.1% for the first subsample compared with an R^2 of 64.8% for the second subsample), though only three variables were significant at a 10% critical value in the first subsample compared with six in the second. FDI was one of the three variables that were significant in both cases and had a negative sign. The hypothesis of parameter stability was not rejected at a 5% critical value (Table 9-7). A dummy variable for the period 1998 to 2001 was insignificant, indicating that the intercept did not change (Table 9-6, Model C).

Table 9-6

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific Employment Model							
Dependent Variable: ***Δausempi*** Sample: Cross-Sections: N = 11 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: 1994 – 1997 Sample (t = 4)		Model B: 1998 – 2001 Sample (t = 4)		Model C: Total Sample, 1994 – 2001 (t = 8)	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-1471.611	-0.410	-16.340	-0.435	-16.606	-0.624
ausrfdii	0	-0.004**	-2.511	-0.006**	-4.088	-0.006**	-5.513
ΔΔausrdii	0	-0.001	-0.756	-0.001	-1.135	-0.001*	-1.535
Δausrgdpi	0	0.002	0.681	0.005*	1.646	0.003**	1.851
Δausprofmargi	0	1.649	0.800	3.397**	2.623	2.857**	2.788
Δausrwages11i	0	-0.003	-1.440	-0.002**	-2.179	-0.003**	-2.894
Δauslp1i	0	-0.001**	-1.743	-0.001**	-2.024	-0.001**	-2.973
ausinr	0	28.945	0.354	-3.759	-1.027	-3.353	-1.445
	1	136.861	0.427	5.752**	1.986	5.976**	2.548
ausinf	0	27.291	0.472	3.587	1.060	3.839**	2.827
agr	---	-9.942	-1.190	-15.988**	-2.016	-12.713**	-2.424
rebs	---	37.994**	3.154	21.598*	1.504	30.793**	3.899
t1998	---	---	---	---	---	-4.370	-0.557
** significant at 10% critical value, * significant at 15% critical value							
R-squared			0.671		0.648		0.649
Adjusted R-squared			0.541		0.527		0.589
S.E. of regression			16.721		19.408		17.000
Sum squared resid			7,828.497		12,053.810		20,518.740
Durbin-Watson stat			1.777		2.254		2.305
F-statistic			5.186		5.349		10.925
Prob (F-statistic)			0.000		0.000		0.000

Table 9-7

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific Employment Model				
	Test	**F-Statistic**	**Critical value**	**Probability**
Parameter Stability (1998 – 2001)	F(12,60)	0.265	1.920	0.993

Although the hypothesis of parameter stability was not rejected when testing for changes over time, parameter stability was tested for industry-specific subsamples. The data were split into three industry subsamples (for primary, secondary and tertiary industries). Since manufacturing was the only secondary industry, primary and secondary industries were combined and compared with the subsample of tertiary industries (for estimation results see Table 9-8, Model A and B). The parameter estimates that were produced using the subsamples differed in terms of signs and significance of variables. Only two variables were significant for the primary and secondary subsample compared with nine for the tertiary subsample. The models also differed in their explanatory power (an R^2 of 46.2% and an adjusted R^2 of 4.8% for the primary and secondary subsample compared with an R^2 of 77.1% and an adjusted R^2 of 72.5% for the tertiary subsample). FDI flows were only significant (and negative) for the tertiary subsample. The F-test showed that all slope coefficients combined were not significant for the primary and secondary industry subsample, though they were significant for the tertiary industry subsample. When testing for parameter stability, the primary and the tertiary industry subsamples were significantly different to the rest of the sample (Table 9-9). Hence, parameter variability across industries was an issue and affected the slope coefficients rather than the intercept, as both *prim* and *tert* were insignificant when included in the model instead of the two industry dummies, *agr* and *rebs* (Table 9-8, Model C).

Table 9-8

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific Employment Model							
Dependent Variable: *Δausempi* Sample: Time: 1994 – 2001, t = 8 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: *prim, man* Sample (N = 3)		**Model B: *tert* Sample (N = 8)**		**Model C: Total Sample (N = 11)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	**---**	-41.550*	-1.717	-31.747**	-2.009	-38.206**	-2.474
ausrfdii	**0**	0.000	0.081	-0.004**	-3.612	-0.005**	-4.076
ΔΔausrdii	**0**	0.000	0.038	-0.001	-1.131	-0.001	-1.352
Δausrgdpi	**0**	0.008**	3.279	0.007**	3.641	0.007**	4.844
Δausprofmargi	**0**	0.923	0.385	2.123**	1.879	1.982**	1.698
Δausrwages11i	**0**	0.000	0.181	-0.003**	-3.199	-0.003**	-2.682
Δauslp1i	**0**	-0.001	-1.000	-0.003**	-4.269	-0.001**	-2.503
ausinr	**0**	-5.603	-1.284	-2.681*	-1.545	-2.313	-1.317
	1	8.685**	2.223	6.623**	2.772	6.025**	3.282
ausinf	**0**	4.148	1.472	4.221**	3.070	4.185**	2.802
agr	**---**	2.006	0.108	---	---	---	---
rebs	**---**	---	---	18.455**	2.393	---	---
prim	**---**	---	---	---	---	6.368	0.707
tert	**---**	---	---	---	---	8.119	1.012
** significant at 10% critical value, * significant at 15% critical value, † adjusted R-squared as stated							
R-squared			0.462		0.771		0.551
Adjusted R-squared			0.048†		0.725		0.482
S.E. of regression			19.752		14.580		19.094
Sum squared resid			5,071.668		10,415.680		26,249.150
Durbin-Watson stat			2.503		2.130		1.937
F-statistic			1.116		16.516		8.019
Prob (F-statistic)			0.418		0.000		0.000

Table 9-9

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific Employment Model				
	Test	**F-Statistic**	**5% Critical value**	**Probability**
PRIM Sample	F(10, 64)	10.751*	1.980	0.000
TERT Sample	F(10, 64)	3.434*	1.980	0.001
Random Coefficients Model	Cannot be estimated: near singular matrix			
* significant at 5% critical value				

9.1.4 RESULTS

Industry-specific real FDI flows had a small, but unexpected negative effect on industry-specific employment growth.[225] Other variables that lowered employment growth were the change of domestic investment growth, real wage growth and labour productivity growth. In contrast, GDP

[225] The hypothesis that *ausrfdii* is insignificant (i.e. that its coefficient is equal to zero) was rejected at a 10% critical value: F(1,72) = 9.070, Prob = 0.004.

growth, profit margin growth, the Australian inflation rate and the Australian interest rate (after one lag, but not when only the current value was considered) had a positive effect on employment growth (Table 9-10).

Table 9-10

Industry-Specific Employment Model, Observed and Predicted Effects					
	Short-run effect (current value)		Long-run effect (after 1 lag)		Expected Sign
ausrfdii	-0.006	-	-0.006	-	+ or ?
ΔΔausrdii	-0.001	-	-0.001	-	+ or ?
Δausrgdpi	0.003	+	0.003	+	+
Δausprofmargi	2.831	+	2.831	+	+
Δausrwages11i	-0.002	-	-0.002	-	-
Δauslp1i	-0.001	-	-0.001	-	-
ausinf	4.194	+	4.194	+	?
ausinr	-2.570	-	3.946	+	?

Repeating the analysis, but replacing real FDI flows with the change in real FDI stocks[226], substantiated the significantly negative effect on employment growth, though the model using the change in real FDI stocks had a somewhat lower fit (R^2 of 61.4% and adjusted R^2 of 55.5%), indicating that using real FDI flow data was the more appropriate choice for the model.[227]

9.1.5 CONCLUSIONS

For the first analysis of consequences of industry-specific FDI in Australia, which focused on the employment effect of FDI, a model was estimated with industry-specific employment for the period 1994 to 2001 and a set of explanatory variables including not only industry-specific FDI, but also domestic investment, industry size, industry profits, labour demand, number of firms, wages, labour productivity, labour quality, inflation rate, interest rate and industrial disputes representing capital, market size and growth, labour market conditions and labour characteristics and risk factors. Most variables – except for labour demand, number of firms, number of hours worked, labour quality and industrial disputes – were significant. Employment, industry profits, wages and labour productivity were used in first differences, while domestic investment was used in second differences.

Industry-specific real FDI flows had a small, but unexpected negative effect on industry-specific employment growth, i.e. employment growth was reduced as more FDI entered the Australian economy. One possible explanation for this outcome is that foreign firms are more capital-intensive than domestic firms and substitute some of the labour with capital, thereby slowing down employment growth.

---

[226] This was done since FDI inflows are not exactly equal to the change in FDI stocks. FDI stock data are accounting balance sheet data adjusted by the companies to take into account the revaluation of assets or liabilities, goodwill write-offs and currency fluctuations up to that end date. These adjustments do not apply to flows data, so adding flows data to previous stock data does not give a true estimate of the current FDI stock.

[227] The coefficient on *Δausrfdisti* was -0.003 instead of -0.006 for *ausrfdii*, while the hypothesis that *Δausrfdisti* is insignificant was rejected at a 10% critical value: F(1,72) = 29.824, Prob = 0.000.

Looking at the signs of the remaining explanatory variables substantiates this theory, though the growth rate of domestic investment growth also reduced employment growth. GDP growth had the expected positive effect on employment growth, as production expansion requires an increase of employees. Profit growth led to employment growth, indicating that increased profits leads to production expansion, leading to increased employment. In contrast, real wage growth reduced employment growth, indicating that higher costs slow down employment growth. Labour productivity growth reduced employment growth, as fewer workers are needed for a given output and output growth may occur with fewer additional workers, for instance, due to improved management techniques or to more machinery. The interest rate had a positive effect on employment growth, which was explained by its effect on capital. As an increasing interest rate should reduce the incentive to invest more capital in machinery, increased output may be achieved by increasing employment. The positive sign on inflation rate was explained by its effect on wages and thus on labour demand and supply. While increasing nominal wages may increase labour supply, they also reduce labour demand. However, if inflation does not affect real wages and increases labour supply, real wages may fall, which could explain the positive effect on employment growth. Taking the industry dummies into account, employment growth was lower in agriculture and higher in real estate and business services than in other industries. Overall, an increase in capital (foreign and domestic) led to a substitution for labour, while market growth (GDP growth and increased profitability), interest rate and inflation rate led to employment growth. Higher costs (wage growth) and increased efficiency (labour productivity growth) slowed down the employment growth.

9.2 ANALYSIS OF THE EFFECTS OF INDUSTRY-SPECIFIC FDI ON WAGES IN AUSTRALIA

9.2.1 INTRODUCTION AND DATA

In the second model of the consequences of industry-specific FDI, the effect on industry-specific wages was analysed. Industry-specific wages were measured by average weekly earnings deflated by the consumer price index (*ausrwages1i*) or adjusted for changes in labour productivity (*ausrwages11i*), i.e. the same variables as used in Chapter 5. Since the main focus of this analysis was the link between FDI and wages, the time periods covered – as in the previous model – were determined by the availability of industry-specific FDI data in Australia. Data were available for ten years between 1992 and 2001 and eleven cross-sections, giving a maximum of 110 observations. Figure 9-2 shows real wages (*ausrwages11* – the aggregate of the variable (*ausrwages11i*) that was later chosen for the analysis), real wage (*ausrwages11*) growth and real annual FDI in Australia between 1992 and 2001. No clear link between real wages and real annual FDI flows or real wage growth (first differences of the real wage series) and real annual FDI flows existed.

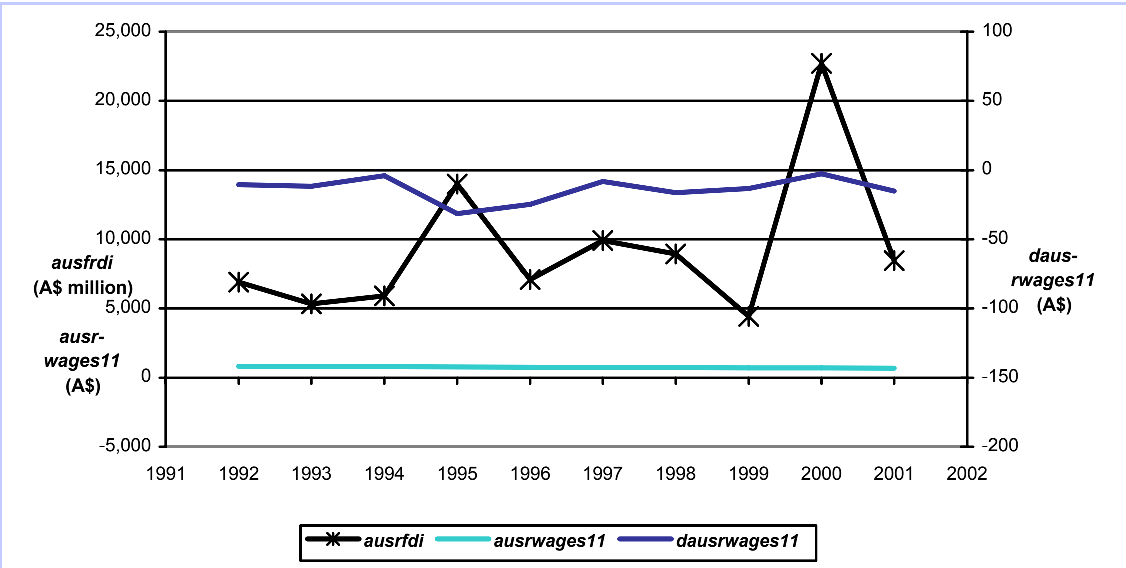


Figure 9-2: Real annual aggregate FDI Inflows and total Real Wage and Real Wage Growth in Australia, 1991 to 2002

As was the case of industry-specific employment in Section 9.1, the analysis of the effects of industry-specific FDI on Australian wages was based on Chapter 7.1.5, in which some studies on the wage effect of FDI were discussed. According to those studies additional variables that have effects on wages were the percentage of male workers, human resource management practices, capital intensity, differences in scale of operation (Globerman et al., 1994), unionisation rate, firm size, skill level, industry percentage of female workers (Feliciano and Lipsey, 1999), education, energy and inputs per worker, percentage of female workers, firm size (Lipsey and Sjöholm, 2003), labour productivity, firm size, industry average wages, profitability, industry concentration (Conyon et al., 1999), capital stock, royalty payments, output price and regional prices (Aitken et al., 1995). Since industry-specific data were chosen to analyse industry-specific wages, the explanatory variables had to be chosen accordingly. Both FDI and non-FDI related literature was used to find a set of potential explanatory variables.[228]

A combination of FDI and other capital, market size, labour market conditions and labour characteristics, risk factors and industry dummies was used to explain industry-specific real wages. While the focus is on the link between industry-specific real wages and FDI, other factors were included since FDI could not be seen as the only determinant of industry-specific real wages, but as one of many determinants. The model was stated as:

rwages = f(*fdii, capital, market, profits, emp, lab, rwagesus, prod, hours, qual, fem, inf, indus, sector)*

where the variables are as listed and defined below:

rwages	defined as in Section 9.1, i.e. *ausrwages1i* or *ausrwages11i,*
fdii	defined as in Section 9.1, i.e. *ausrfdii* or *ausrfdisti*,
capital	defined as in Section 9.1, i.e. *ausrdii* or *auskli,*
market	defined as in Section 9.1, i.e. *ausrgdpi* or *ausrsalesi,*
profits	defined as in Section 9.1, i.e. *ausprofmargi*,
emp	defined as in Section 9.1, i.e. *ausempi,*
lab	defined as in Section 9.1, i.e. *ausuer, ausjobvac* or *ausjobvaci*,
rwagesus	the US industry wages as a guideline for international industry-specific wage levels (*rwagesusi*),
prod	defined as in Section 9.1, i.e. *auslp1i* or *auslp2i,*
hours	the average number of hours worked in an industry (*ausavhouri*) or the total number of hours worked in an industry (*austhouri*),
qual	defined as in Section 9.1, i.e. *auslq1i* or *auslq2i*,
fem	the industry percentage of female workers (*ausfemi*),
inf	defined as in Section 9.1, i.e. *ausinf,*
indus	defined as in Section 9.1, i.e. *ausindusi,*
sector	defined as in Section 9.1, i.e. *prim, man* or *tert.*

In summary, FDI and other capital was represented by *fdii* and *capital*, market size by *market*, *profits* and *emp*, labour market conditions and labour characteristics by *lab, rwagesus, prod, hours*, *qual* and *fem,* risk factors by *inr, inf* and *indus* and other factors by *sector*. For a summary see Table 9-11. Data sources and descriptive statistics of the variables discussed can

[228] Variables were chosen based on the studies discussed in Chapter 7.1.5 and Piana (2001), according to whom wage levels depended on strength balances between employees and employers, previous and current profitability of employers, labour productivity increases, sales and employment perspectives, shortage of workers or abundance of unemployed, past and forecasted inflation trends and – for certain jobs – international wage levels and immigration. Other important factors were average working hours, gender, age, experience, occupation and the industry involved.

be found in Appendix A.6 (Table A-15 and A-16). Variables that could be important in explaining industry-specific wages, but were not used for this analysis due to availability problems include factors affecting the workers' bargaining strength and outside income (i.e. income when not working), such as institutional agreements, unemployment benefits and retirement plans.

Before estimating the model, the explanatory variables in the industry-specific wage model and their potential substitutes are discussed and reasons are given for their predicted effects. Based on the empirical results discussed in Chapter 7.1.5, industry-specific real FDI flows were expected to increase real wages, assuming that foreign affiliates are more productive than domestic firms and/or are willing to pay higher wages to attract quality workers. An increasing domestic capital stock (through domestic or foreign investment), the construction of new firms or the purchase of new machinery should increase labour demand and thus real wages. Furthermore, an increase in capital makes labour more productive, which should be reflected by higher real wages. However, employment could also be reduced if some of the labour was replaced with more efficient, labour-saving machinery, thus decreasing labour demand and reducing real wages.

Table 9-11

Determinants of Industry-Specific Wages in Australia		
	Dependent Variable	**Alternative Variable**
Wages		
Industry-specific Wages *(ausrwagesi)*	*ausrwages11i*	*ausrwages1i*
	Explanatory Variable	**Alternative Variable**
FDI and Other Capital		
Industry-specific FDI *(fdii)*	*ausrfdii*	*ausrfdisti*
Industry Capital Intensity *(capital)*	*ausrdii*	*auskli*
Market Size		
Industry Sales or Size *(market)*	*ausrgdpi*	*ausrsalesi*
Industry Profits *(profits)*	*ausprofmargi*	---
Industry Employment *(emp)*	*ausempi*	---
Labour Market Conditions and Labour Characteristics		
Labour Demand (Australian Unemployment Rate or Number of Job Vacancies) *(lab)*	*ausuer*	*ausjobvac, ausjobvaci*
US Industry Wages (*rwagesus*)	*rwagesusi*	---
Labour Productivity (*prod*)	*auslp1i*	*auslp2i*
Hours Worked (*hours*)	*ausavhouri*	*austhouri*
Industry Labour Quality (*qual*)	*auslq1i*	*auslq2i*
Industry Percentage of Female Workers (*fem*)	*ausfemi*	---
Risk Factors		
Australian Inflation Rate *(inf)*	*ausinf*	---
Industrial Disputes *(indus)*	*ausindusi*	---
Industry Dummies		
Industry Dummies	*prim, man, tert*	*agr, min, man, con, who, ret, rest, tras, fins, rebs, uti*
Data Sources: See Appendix A.6		

An industry's average profit margin should have a positive effect on wages, as firms with higher profit margins can afford to either employ more workers (increasing labour demand) or pay higher wages. Industry-specific GDP or sales should also increase wages, as increased economic activity should have a positive effect on employment (labour demand should rise in growth industries) and thus on wages. Higher employment or employment growth was expected to have a positive effect on real wages through increased labour demand and possibly industry-specific economic growth. High employment levels may also give more power to employees in wage negotiations, thus increasing their remuneration.

Increased labour demand (measured by a lower unemployment rate or a higher number of job vacancies) was expected to have a positive effect on real wages, while international wage levels could act as guidelines, so that higher US industry-specific wages could be positively related to higher Australian industry-specific wages. Labour characteristics including labour productivity[229], the average number of hours worked in an industry and labour quality or the average skill level in an industry should all have a positive effect on real wages, while the industry percentage of female workers should affect it negatively, since wages for female employees tend to be lower than those for male employees.

Risk factors that could potentially affect employment include the inflation rate and the number of industrial disputes. A higher inflation rate could increase risk and increase nominal wages, thus reducing labour demand, but increasing labour supply and therefore affecting real wages, while the incidence of industrial disputes in an industry increase the investment risk and should thus reduce investment and profitability, thus reducing real wages. However, a higher number of industrial disputes could also reflect more power for employees in wage negotiations, increasing their remuneration. Industry dummies could be important if some of the variation of industry-specific wages can only be explained by general differences between industries, i.e. differences not explained by other variables in the model.

If alternative variables could be used, the ones with the best fit were chosen. Current and lagged values were included when significant, while insignificant variables were not included in the model. Explanatory variables were included with lags when this increased the fit of the model. The number of lags was restricted to a maximum of three owing to the limited number of time periods. A lagged dependent variable was experimented with and included in order to solve the problem of autocorrelation that occurred without its inclusion.

[229] If labour productivity (*auslp1i*, defined as *ausempi/ausrgdpi*) is used in a model including both *ausempi* and *ausrgdpi,* there would be problem of collinearity. The same is true if labour productivity was measured by *auslp2i* (defined as *austhouri/ausrgdpi*) and both *austhouri* and *ausrgpi* were included. Hence, one has to either choose a different combination of variables or ensure that the variables are not all used in levels form. For the industry-specific wage model, *auslp2i* was chosen as the variable measuring labour productivity, while *ausempi* and *ausrgdpi* were used as first differences (*Δausempi* and *Δausrgdpi*) for the final estimation model (Table 9-14, Model C).

9.2.2 MODEL SPECIFICATION AND ESTIMATION

For the second of four models in which the effect of industry-specific FDI in Australia between 1992 and 2001 was analysed, a function of a lagged dependent variable (*ausrwages11i(-1)*), FDI (*ausrfdii*), market size (*ausrgdpi* and *ausempi*), labour market conditions and labour characteristics (*auslp2i* and *femi*) and risk factors (*ausinf* and *ausindus*) performed best in explaining industry-specific real wages (*rwages11i*) (Table 9-14, Model A). The model was stated as:

$$ausrwages11i_{it} = \alpha + \beta_{11}\,ausrwages11i_{it-1} + \beta_{21}\,ausrfdii_{it} + \beta_{22}\,ausrfdii_{it-1} + \beta_{31}\,ausrgdpi_{it} + \beta_{32}\,ausrgdpi_{it-1} + \beta_{33}\,ausrgdpi_{it-2} + \beta_{41}\,ausempi_{it} + \beta_{42}\,ausempi_{it-1} + \beta_{51}\,auslp2i_{it} + \beta_{52}\,auslp2i_{it-1} + \beta_{53}\,auslp2i_{it-2} + \beta_{61}\,ausfemi_{it} + \beta_{62}\,ausfemi_{it-1} + \beta_{71}\,ausinf_{t} + \beta_{81}\,ausindusi_{it} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model was estimated using least squares, fixed effects or random effects estimation).

The model was estimated using least squares and no effects after the specification of the model as a fixed effects model was not found to be appropriate and its estimation led to autocorrelation. The specification of the model as a random effects model could not be tested, as the number of cross-sections was smaller than the number of coefficients (Table 9-12). Individual industry dummies were insignificant.

Table 9-12

Fixed and Random Effects Estimation, Industry-Specific Wages Model		
Fixed Effects Model		
F test that all $u_i = 0$	$F(10, 59) = 1.910$	Prob > F = 0.062
Random Effects Model		
The number of cross-sections is smaller than the number of coefficients, so the Random Effects Model cannot be estimated.		

After testing whether variables should be differenced or used in levels form, most variables included with at least one lag, i.e. *ausrfdii, ausrgdpi, ausempi* and *auslp2i*, were differenced once. Only *ausfemi* was used in levels form (Table 9-13). The dependent variable (*ausrwages11i*) was also differenced, which made theoretical sense, since FDI flows (amongst other factors) could affect level and growth of real wages. The model including $\Delta rwages11i$, $\Delta ausrfdii$, $\Delta ausrgdpi$, $\Delta ausempi$ and $\Delta auslp2i$ was used for further estimation.

The industry-specific wage model for Australia using $\Delta ausrwages11i$ as the dependent variable was then estimated as a combination of two variables in levels form without lags (*ausindusi, ausinf*), one variable in levels form with lags (*ausfemi*), two variables in first differences without lags ($\Delta ausrfdii$, $\Delta ausempi$) and two variables in first differences with lags ($\Delta ausrgdpi$, $\Delta auslp2i$), i.e. ten variables in total. The parameters of the model – estimated using least squares – are shown in Table 9-14, Model B. The industry-specific wage model explained over half of the variation of real wage growth (R^2 of 56.9% and an adjusted R^2 of 51.1%). Six of the ten explanatory variables were significant at a 10% critical value. Of the remaining four, *ausindusi* was significant at a 15% critical value, while the current values of *Δausrgdpi, Δauslp2i* and *ausinf* were not significant. The variable *ausinf* was included because it was a significant variable before differencing, while *Δausrgdpi* and *Δauslp2i* were included because their lags were significant at a 10% critical value. The F-test showed that all slope coefficients combined were not equal to zero.

Table 9-13

Test for Differencing, Industry-Specific Wages Model		
Variable	**χ^2 (Prob)**	**χ^2 (Prob)**
ausrwages11i	1.774 (0.183)	--
ausrfdii	1.938 (0.164)	---
ausrgdpi	1.032 (0.310)	5.976* (0.015)
ausempi	0.043 (0.835)	---
auslp2i	0.022 (0.881)	5.913* (0.015)
ausfemi	4.404* (0.036)	8.303* (0.004)
ausindusi	---	---
ausinf	---	---
Result	*ausrwages11i* → *Δausrwages11i* *ausrfdii* → *Δausrfdii* *ausrgdpi* → *Δausrgdpi* *ausempi* → *Δausempi* *auslp2i* → *Δauslp2i*	---
* significant at 10% critical value		

Table 9-14

Industry-Specific Wages Equation									
Sample: Time: 1992 – 2001, t = 10 (t = 8 after adjusting endpoints), N = 11. Missing values = 3. Included observations: 85 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Dependent Variable: *ausrwages11i*					**Dependent Variable: *Δausrwages11i***				
Variable	**Lags**	**Coeff.**	**t-stat**	**Prob**	**Variable**	**Lags**	**Coeff**	**t-stat**	**Prob**
C	---	343.141	0.453	0.652	**C**	---	-777.404	-1.237	0.220
ausrwages11i	1	0.973**	48.876	0.000	***Δausrwages11i***	---	---	---	---
ausrfdii	0	0.024	0.119	0.906	***Δausrfdii***	0	-0.160**	-1.682	0.097
	1	0.418**	2.807	0.007		---	---	---	---
ausrgdpi	0	0.162	0.810	0.421	***Δausrgdpi***	0	0.016	0.099	0.921
	1	0.403*	1.656	0.102		1	0.427**	3.330	0.001
	2	-0.588**	-3.701	0.000		---	---	---	---
ausempi	0	-39.767**	-4.389	0.000	***Δausempi***	0	-44.080**	-3.447	0.001
	1	39.609**	4.229	0.000		---	---	---	---
auslp2i	0	27.395	0.283	0.778	***Δauslp2i***	0	25.966	0.331	0.741
	1	-354.546**	-3.671	0.001		1	-307.606**	-4.429	0.000
	2	329.127**	3.767	0.000		---	---	---	---
ausfemi	0	-31,383.020	-1.308	0.195	***ausfemi***	0	-42,641.260**	-1.688	0.096
	1	34,190.490	1.423	0.159		1	45,811.130**	1.805	0.075
ausindusi	0	0.526*	1.665	0.101	***ausindusi***	0	0.422*	1.503	0.137
ausinf	0	-221.386**	-1.873	0.065	***ausinf***	0	-185.388	-1.416	0.161
** significant at 10% critical value, * significant at 15% critical value									
R-squared				0.993	**R-squared**				0.569
Adjusted R-squared				0.992	**Adjusted R-squared**				0.511
S.E. of regression				1,699.842	**S.E. of regression**				1,711.810
Sum squared resid				199,000,000.000	**Sum squared resid**				217,000,000.000
Durbin-Watson stat				2.356	**Durbin-Watson stat**				2.378
F-statistic				684.359	**F-statistic**				9.764
Prob (F-statistic)				0.000	**Prob (F-statistic)**				0.000

9.2.3 MODEL EVALUATION

In order to evaluate the adequacy of the industry-specific wage model, a series of diagnostic tests (testing for non-autocorrelation, homoscedasticity and correct functional form) was performed. The test results are presented in Table 9-15. The hypothesis of homoscedasticity was rejected at a 5% critical value, which is why White heteroscedasticity-consistent standard errors and covariances were used. In contrast, the hypothesis of non-autocorrelation was not rejected at a 5% critical value, so autocorrelation was not an issue. The hypothesis of correct functional form was not rejected when applying the RESET(1)-test, but was rejected at a 5% critical value for RESET(2).[230]

Table 9-15

Diagnostic Tests (5% critical values), Industry-Specific Wages Model					
		Test	Test-Statistic	5% Critical value	Probability
Heteroscedasticity	**White LR-test**	$\chi^2(10)$	61.646*	18.307	0.000
Autocorrelation	**F-test**	F(1,73)	1.820	3.980	0.182
Misspecification	**RESET(1)**	F(1,73)	2.832	3.980	0.097
	RESET(2)	F(2,72)	3.501*	3.130	0.035
* significant at 5% critical value					

In order to test for parameter stability over time, the model was divided into half (a subsample for 1994 to 1997 and one for 1998 to 2001). The estimation results for the two subsamples are stated in Table 9-16, Model A and B. The model performed equally well for each subsample (R^2 of 65.4% for the first subsample compared with an R^2 of 66.0% for the second subsample) and better than for the overall sample (which had an R^2 of only 56.9%), though the significance of individual variables varied. While the signs of the significant variables did not vary, the signs of some of the insignificant variables did. The F-test showed that all slope coefficients combined were not significant for both subsamples. While Δ*ausrfdii* was significant at a 10% critical value in the first subsample, it was insignificant in the second subsample. Testing for parameter stability, the hypothesis of parameter stability was not rejected at a 5% critical value (Table 9-17), i.e. the subsamples were not significantly different. A dummy variable for the period 1998 to 2001 was insignificant, indicating that the intercept did not change (Table 9-16, Model C).

230 Transforming the variables into log form and/or experimenting with alternative variables did not solve the problem, but led to the generation of too many missing values, so that for the case of Model B in Table 9-14, only included 34 instead of 85 observations.

Table 9-16

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific Wages Model							
Dependent Variable: ***Δausrwages11i*** Sample: Cross-Sections: N = 11 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: 1994 – 1997 Sample (t = 4)		Model B: 1998 – 2001 Sample (t = 4)		Model C: Total Sample, 1994 – 2001 (t = 8)	
Variable	Lags	Coefficients	t-stat	Coefficients	t-stat	Coefficients	t-stat
C	---	325.203	0.351	-320.229	-0.317	-740.980	-1.188
Δausrfdii	0	-0.292**	-2.019	-0.089	-0.825	-0.162*	-1.650
Δausrgdpi	0	-0.205	-1.159	0.175	0.730	0.019	0.121
	1	0.211	0.915	0.343**	2.081	0.432**	3.272
Δausempi	0	-37.497**	-4.062	-43.255**	-2.570	-44.436**	-3.513
Δauslp2i	0	-103.462	-0.772	38.360	0.295	26.949	0.339
	1	-185.042**	-2.358	-291.196**	-2.841	-306.688**	-4.388
ausfemi	0	-23,018.060	-0.792	-59,682.800*	-1.488	-41,790.520*	-1.606
	1	25,603.400	0.890	60,373.650*	1.512	44,932.000**	1.718
ausindusi	0	0.589**	3.273	-1.047	-1.331	0.412*	1.463
ausinf	0	-368.723**	-2.572	-12.301	-0.077	-177.906	-1.372
T1998	---	---	---	---	---	-106.027	-0.300
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.654		0.660		0.569	
Adjusted R-squared		0.539		0.557		0.504	
S.E. of regression		1,293.803		1,908.012		1,722.695	
Sum squared resid		50,217,824.000		120,000,000.000		217,000,000.000	
Durbin-Watson stat		2.001		2.309		2.368	
F-statistic		5.679		6.412		8.771	
Prob (F-statistic)		0.000		0.000		0.000	

Table 9-17

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific Wages Model				
	Test	F-Statistic	Critical value	Probability
Parameter Stability (1998 – 2001)	F(11,63)	1.741	1.950	0.085

While there was no parameter instability over time, it was possible that parameter variability was present when comparing industry-specific subsamples. As in Section 9.1.3, the dataset was split into two industry subsamples (for primary/manufacturing and tertiary industries). See estimation results are shown in Table 9-18, Model A and B. The parameter estimates that were produced using the subsamples differed in significance. While eight variables were significant at a 10% critical value for the primary and secondary subsample, only five variables were significant for the tertiary subsample. While the signs of the significant variables did not vary, the signs of some of the insignificant variables did. The two subsamples differed in relation to the explanatory power of the model (an R^2 of 90.4% for primary and secondary subsample compared with an R^2 of 56.2% for the tertiary subsample). The variable Δ*ausrfdii* was only significant (and negative) for the primary and secondary industry subsample, but not for the tertiary subsample. The F-test showed that all slope coefficients combined were significant in the both subsamples. When testing for parameter stability, the subsamples of primary and tertiary industries were significantly different to the rest of the sample (Table 9-19), indicating that there was parameter variability across industries. The parameter variability did not only affect the slope coefficients, it also affected the intercept, since the dummy for tertiary industries (but not the primary industries dummy) was significant (Table 9-18, Model C).

Table 9-18

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific Wages Model							
Dependent Variable: *Δausrwages11i* Sample: Time: 1994 – 2001, t = 8 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: *prim, man* Sample (N = 3)		**Model B: *tert* Sample (N = 8)**		**Model C: Total Sample (N = 11)**	
Variable	**Lags**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-3,930.099*	-1.639	-414.904	-0.486	-1,629.569**	-2.233
Δausrfdii	0	-0.452**	-3.862	-0.067	-0.756	-0.163**	-1.803
Δausrgdpi	0	-0.934**	-5.192	0.240	1.186	0.045	0.289
	1	0.159	0.813	0.365**	1.935	0.450**	3.484
Δausempi	0	5.011	0.491	-53.728**	-4.565	-47.103**	-3.772
Δauslp2i	0	170.911**	2.304	-37.744	-0.382	10.033	0.128
	1	-260.499**	-4.486	-224.703**	-3.344	-316.092**	-4.581
ausfemi	0	-88,269.620**	-3.188	-48,104.760**	-1.822	-46,358.910**	-1.831
	1	108,133.500**	3.914	49,713.690**	1.889	48,960.570**	1.933
ausindusi	0	0.985**	3.031	-1.323	-1.201	0.447*	1.516
ausinf	0	-470.084**	-2.641	-53.696	-0.405	-175.981	-1.380
prim	---	---	---	---	---	880.889	1.410
tert	---	---	---	---	---	1,177.520**	1.917
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.904		0.562		0.587	
Adjusted R-squared		0.831		0.474		0.518	
S.E. of regression		1,336.817		1,506.741		1,699.254	
Sum squared resid		23,232,019.000		114,000,000.000		208,000,000.000	
Durbin-Watson stat		2.421		2.208		2.494	
F-statistic		12.272		6.414		8.516	
Prob (F-statistic)		0.000		0.000		0.000	

Table 9-19

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific Wages Model				
	Test	**F-Statistic**	**5% Critical value**	**Probability**
PRIM Sample	F(11, 63)	7.194*	1.950	0.000
TERT Sample	F(11, 63)	5.547*	1.950	0.000
Random Coefficients Model	Cannot be estimated: near singular matrix			
* significant at 5% critical value				

9.2.4 RESULTS

The change in industry-specific real FDI flows had a small and unexpected negative effect on industry-specific real wage growth, i.e. a higher growth in FDI flows reduced real wage growth.[231] Possible explanations for the negative effect of FDI on real wage growth could be that foreign firms are more capital-intensive than domestic firms and tend to replace labour with capital or that they invest in industries where labour market deregulation has proceeded furthest. Other variables that reduced real wage growth were employment growth, the industry's share of female workers (in the short-run, but not after one lag) and the Australian inflation rate, while GDP growth, labour productivity growth, the industry's share of female workers (after one lag, but not when only the current value is considered) and the number of industrial disputes had a positive effect (Table 9-20).

[231] The hypothesis that *Δausrfdii* is insignificant (i.e. that its coefficient is equal to zero) was rejected at a 10% critical value: F(1,74) = 2.829, Prob = 0.097.

Table 9-20

Industry-Specific Wages Model, Observed and Predicted Effects					
	Short-run effect (current value)		Long-run effect (after 1 lag)		Expected Sign
Δausrfdii	-0.160	-	-0.160	-	+
Δausrgdpi	0.016	+	0.443	+	+
Δausempi	-44.080	-	-44.080	-	+
Δauslp2i	25.966	+	281.640	+	+
ausfemi	-42,641.260	-	3,169.870	+	-
ausindusi	0.422	+	0.422	+	?
ausinf	-185.388	-	-185.388	-	+

Repeating the analysis, but using the change in real FDI stocks instead of real FDI flows (or the change of the change in real FDI stock instead of the change in real FDI flows), was not successful: despite having a negative sign, real FDI stocks or the change of those were not significant within the framework of the industry-specific wage model. The model using real FDI stocks also had a somewhat lower fit than the model using real FDI flows (R^2 of 52.1% and adjusted R^2 of 46.2%).[232]

9.2.5 CONCLUSIONS

For the second analysis of the consequences of industry-specific FDI in Australia, which focused on the real wage effect of FDI, a model was estimated with industry-specific real wages for the period 1994 to 2001 and a set of explanatory variables including industry-specific FDI growth, industry growth, employment growth, domestic investment, labour productivity growth, industry percentage of female employment, number of industrial disputes and inflation rate, representing capital, market size, labour characteristics and risk factors. Domestic investment, industry profits, labour demand, US industry wages, average working hours and labour quality were not significant.

Industry-specific FDI growth had a small, but unexpected negative effect on industry-specific real wage growth, i.e. real wage growth was reduced as more FDI entered the Australian economy. Although FDI was expected to have a positive effect on labour productivity, the capital intensity of production in foreign affiliates indicates that some labour is replaced by more efficient, labour-saving machinery, so that labour demand is lower than in comparable domestic firms, which has a negative effect on wage growth. However, the model before differencing revealed a positive link between real wages (instead of wage growth) and FDI (instead of FDI growth), indicating that real wages are higher in industries with large FDI inflows.

GDP growth increased wage growth, indicating that economic growth increases labour demand and thus wages. Employment growth had an unexpected negative effect on wage

232 The coefficient on *ΔΔausrfdisti* was -0.052 instead of -0.160 for *Δausrfdii*, while the hypothesis that *ΔΔausrfdisti* is insignificant was not rejected at a 10% critical value: F(1,81) = 0.711, Prob = 0.402. Using the *Δausrfdisti* and *Δausrfdisti(-1)* instead of *ΔΔausrfdisti* did not prove to be successful either. The coefficients were -0.065 and 0.042, but both were insignificant. The hypothesis that *Δausrfdisti* and *Δausrfdisti(-1)* are jointly insignificant could not to be rejected at a 10% critical value: F(2,80) = 0.352, Prob = 0.704.

growth. While industry-specific employment or employment growth was expected to increase real wages, reflecting increased labour demand and economic growth, the negative effect represented a trade-off between employment growth and wage growth. Increased employment could, for instance, reduce the labour productivity per employee (or increase it at a decreasing rate, i.e. there may be a decreasing marginal product of labour), reducing the wage growth. Labour productivity growth had a positive effect on wage growth, indicating that increased productivity reflects a rise in the output per hour and thus a rise in the value of labour, leading to higher wages. Contrary to the hypothesis that female employees receive lower wages, the industry share of female employees had a positive effect on wage growth, reflecting perhaps some catching-up process.

The number of industrial disputes seemed to reflect increased power for employees in wage negotiations, explaining why industrial disputes had a positive effect on wage growth. The Australian inflation rate (measuring market risk) had a negative sign on wage growth, indicating that firms are cautious in times of increased risk and do not increase wages by as much as in stable times. Inflation could also reflect higher prices for intermediate goods or other inputs, giving firms less room to increase wages. Overall, an increase in FDI, employment growth and inflation reduced wage growth, while market growth, labour productivity growth, the industry share of female employees and industrial disputes encouraged wage growth.

9.3 ANALYSIS OF THE EFFECTS OF INDUSTRY-SPECIFIC FDI ON LABOUR PRODUCTIVITY IN AUSTRALIA

9.3.1 INTRODUCTION AND DATA

FDI is commonly assumed to increase a country's labour productivity. While it will be analysed in more detail whether that is the case for Australia, one should first have a look at the available data (Table 9-21). Comparing the labour productivity of businesses in Australia (including foreign-owned businesses) to the labour productivity of majority-owned US businesses gave some interesting results: the average labour productivity and the labour productivity of most single industries over time was higher for US-owned businesses than for all Australian businesses combined. Between 1994 and 2002, the labour productivity gap was smallest in food and real estate/business services (labour productivity in US-owned businesses was similar to that in Australian businesses) and largest in mining (labour productivity in US-owned businesses was 3.2 times higher than in Australian businesses). Overall, US-owned businesses were 1.5 times more productive than Australian businesses.

This productivity gap could be explained by US businesses being more intensive in inputs other than labour (e.g. more capital-, technology- or energy-intensive) compared with the average Australian business. Since the availability of cheap labour is not one of Australia's strengths, US businesses would not choose to set up labour-intensive operations in Australia, but focus more on other areas within an industry. Since US businesses can choose from a variety of countries competing for their investments, they would set up labour-intensive operations where labour is cheap. Hence, the output per employee in US-owned businesses in Australia may be higher partly because they operate in areas within an industry that use fewer employees than the industry average. Nevertheless, some of the productivity gap could be due to increased efficiency.

Another factor that commonly affects labour productivity or productivity growth in general is R&D. A study of Australian research and experimental development in 1999/2000 found that *"foreign-owned businesses spent almost as much on research and experimental development as Australian-owned businesses. The manufacturing industry experienced the largest levels of research and experimental development activity, with foreign-owned and Australian-owned businesses contributing equally. Foreign-owned businesses dominated research and experimental development activity by wholesale and retail businesses, both in terms of research and experimental development expenditure and human resources devoted to research and experimental development.* […] *In the computer services industry, both Australian-owned and foreign-owned businesses increased economic activity by roughly the same magnitude so that, as with the 1998-99 study, the 2000-01 study found that foreign-owned businesses provided a similar level of employment to Australian-owned businesses, but they accounted for more than half the income. In both studies, majority USA-owned businesses had the largest economic* *activity of foreign-owned businesses to the extent that they were comparable to Australian-owned businesses in terms of employment and exceeded Australian-owned businesses in terms of income."*[233]

Table 9-21

Comparison of Labour Productivity in Australian and US-owned Businesses in Australia															
				Secondary Industries				**Tertiary Industries**							
A$ '000 (*auslp1i = ausrgdpi/ ausempi*)		**All Industries**	**Mining**	**Total Manufacturing**	**Food**	**Metals**	**Industrial Machinery**	**Utilities**	**Construction**	**Wholesale Trade**	**Retail Trade**	**Restaurants**	**Transport Services**	**Finance and Insurance**	**Real Estate & Business Services**
Labour Productivity of Majority-Owned US Businesses in Australia	**1994**	98.0	---	84.7	73.5	75.1	63.5	---	---	94.0	---	---	---	131.9	---
	1995	103.9	---	95.2	78.6	76.2	69.3	---	---	115.1	---	---	---	169.2	---
	1996	99.7	---	86.7	61.7	42.0	58.2	---	---	106.5	---	---	---	132.2	---
	1997	112.0	---	99.3	73.6	80.0	61.8	---	---	112.8	---	---	---	243.8	---
	1998	120.1	---	108.6	71.1	79.2	70.3	---	---	119.6	---	---	---	156.3	---
	1999	120.5	821.9	115.3	73.1	150.2	63.9	355.2	---	250.4	---	---	---	156.8	---
	2000	124.9	1791.9	141.6	101.1	228.2	74.5	692.9	---	122.3	---	---	---	122.4	---
	2001	133.9	1850.5	146.1	97.7	261.9	100.6	708.5	---	226.2	---	---	---	86.8	---
	2002	120.0	1045.5	138.5	67.3	214.8	89.3	573.7	---	271.9	---	---	---	79.8	---
Average Australian Labour Productivity	**1994**	69.5	306.7	61.8	73.9	52.9	56.6	167.7	53.5	54.5	23.8	31.7	69.2	123.6	71.1
	1995	69.2	328.5	61.5	69.5	54.8	58.3	185.3	51.7	57.4	24.1	30.2	71.2	130.1	65.5
	1996	71.3	337.8	63.4	75.2	55.9	56.6	214.2	52.6	63.0	24.1	31.4	75.0	131.8	65.5
	1997	73.3	365.5	64.0	77.3	56.2	57.3	241.1	56.5	67.1	25.6	31.4	76.6	136.0	67.8
	1998	75.7	361.0	68.2	79.9	58.7	65.9	248.5	60.3	67.1	25.8	31.9	78.8	144.4	66.2
	1999	77.6	410.0	70.0	86.4	59.4	64.5	255.9	59.7	68.9	26.5	34.3	75.8	164.6	69.6
	2000	78.1	424.6	69.4	90.3	55.6	63.2	261.7	55.6	82.1	27.0	32.4	81.6	159.9	68.3
	2001	79.1	443.3	71.6	87.7	63.4	64.5	248.9	54.8	86.7	27.2	33.0	82.7	157.7	71.4
	2002	80.6	412.9	73.8	86.7	65.9	65.1	253.4	61.4	88.2	27.6	32.9	91.9	165.3	73.1
Average Ratio	**1994-2002**	1.5	3.2	1.7	1.0	2.3	1.2	2.3	---	2.2	---	---	---	1.0	---
Note: Labour Productivity was calculated as output per worker, as data on output per hour were not available in the case of US businesses in Australia.															
Data Sources: see Appendix A.6 and US Department of Commerce, Bureau of Economic Analysis (BEA), Surveys of US Direct Investment Abroad															

The third model analysing the consequences of industry-specific FDI looked at industry-specific labour productivity. The main focus of this analysis was the link between FDI and labour productivity, so that the time periods were again determined by the availability of industry-specific FDI data in Australia. Data were available for ten years between 1992 and 2001 and eleven cross-sections, giving a maximum of 110 observations. Industry-specific labour productivity was measured by output per worker (*auslp1i*), which is defined as industry-specific GDP divided by industry-specific employment. An alternative measure is output per hour worked (*auslp2i*), which is defined as industry-specific GDP divided by total number of hours worked in an industry (i.e. the same variables previously used in Chapter 5). Figure 9-3 shows labour productivity (*auslp1* – the aggregate of the variable (*auslp1i*) that was later chosen for the analysis), labour productivity growth (*dauslp1*) and real annual FDI in Australia between 1992 and 2001. No clear link between labour productivity and real annual FDI flows or labour productivity growth (first differences of labour productivity) and real annual FDI flows existed, though labour productivity growth experienced some downward trends in 1995 and 2000, which were the years when FDI flows peaked.

---

[233] ABS (2004a), p.4.

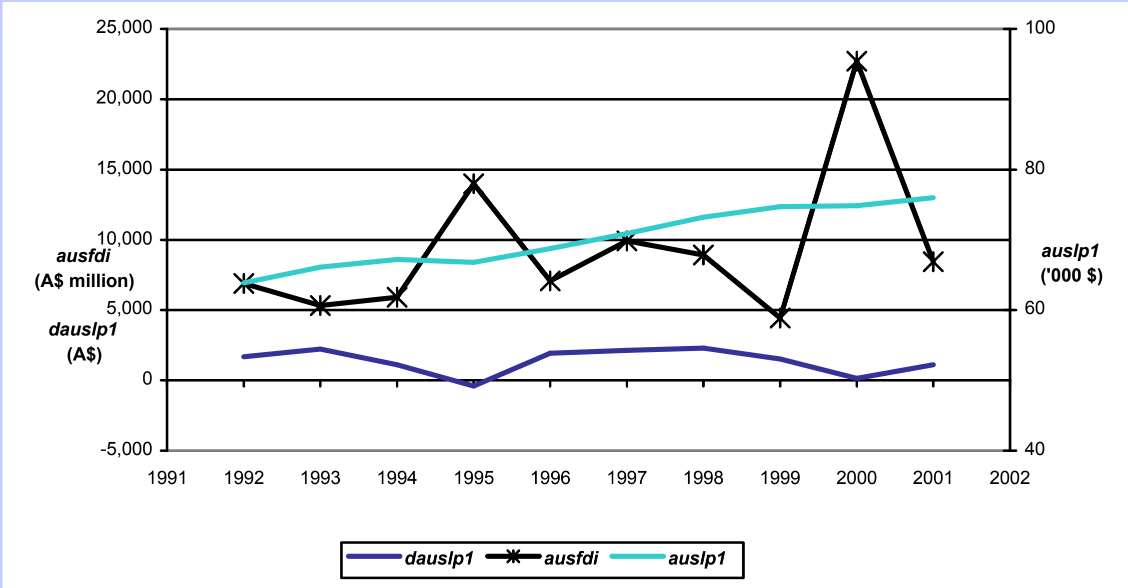


Figure 9-3: Real annual aggregate FDI Inflows and total Labour Productivity and Labour Productivity Growth in Australia, 1991 to 2002

The analysis of the labour productivity effects of industry-specific FDI was based on Chapter 7.1.6, in which some studies looking at the effect of FDI on technology and productivity growth were discussed. According to those studies additional variables that have effects on labour productivity were industry concentration and market growth (Blomström, 1986), the change in the number of establishments in an industry and the change in the number of small firms, GDP growth, the productivity gap between Mexico and the US, industry concentration, GDP growth per employee (Blomström and Wolff, 1993), an industry's capital intensity, plant-level scale economies, labour quality, average hours per employee (Globerman, 1979), wages, firm size (assets and employment), profitability, industry concentration and autonomous technical changes (Conyon et al., 1999). As in the industry-specific employment and wage models, a broader approach (based on FDI and non-FDI related literature) was chosen to find a set of possible explanatory variables. By definition (that is, if labour productivity is defined as output per worker), labour productivity rises if GDP increases faster than employment. So in general, any variable affecting industry-specific GDP or industry-specific employment could be relevant.[234]

[234] The variables were chosen based on Piana (2001), according to whom productivity growth depended on capital accumulations through investments, the long-lasting process of technology diffusion, domestic innovative efforts, imitations of organisational and technological modes of production from world-class practises, enhanced divisions of work, the development of physical and social infrastructure, higher levels of education and a higher involvement and motivation of workers in the production processes. Examples of empirical studies analysing the determinants of productivity or productivity growth include: Connolly et al. (2004), who explained Australian labour productivity growth (for productivity defined as output per hour) using non-financial capital stock, the share of IT & R&D in total non-financial capital stock, the skilled employment share, the percentage of employees covered by federal enterprise and individual agreements, the real share price index, the real interest rate, the quarterly rainfall index, the business internal and external funding flow rate, the terms of trade, the nominal rate of protection for the manufacturing industry and construction for the Sydney Olympic Games; Bartelsman and de Groot (2004), who summarised various studies on productivity growth and found own inputs (R&D, ICT and non-ICT capital and skilled workers), innovation (public R&D, foreign R&D spillovers, firm cooperation and knowledge flows in clusters and embodied technology flows), human capital (participation and skill upgrading) the financial system

A combination of FDI and other capital, market size and structure, labour market conditions and labour characteristics, international influences, risk factors and industry dummies was used to explain industry-specific labour productivity. While the focus was on the link between labour productivity and FDI, other factors were included since FDI could not be seen as the only determinant of industry-specific labour productivity, but as one of many determinants. The model was stated as:

prod = f(*fdii, capital, market, emp, profits, conc, scale, R&D, lab, rwages, hours, comp, qual, trade, intprod, inr, inf, indus, sector)*

where the variables are as listed and defined below:

prod	defined as in Section 9.1, i.e. *auslp1i* or *auslp2i,*
fdii	defined as in Section 9.1, i.e. *ausrfdii* or *ausrfdisti*,
capital	defined as in Section 9.1, i.e. *ausrdii* or *auskli*,
market	defined as in Section 9.1, i.e. *ausgdpi* or *ausrsalesi*,
emp	defined as in Section 9.1, i.e. *ausempi,*
profits	defined as in Section 9.1, i.e. *ausprofmargi*,
conc	industry concentration, measured by the industry share of large firms (*auslfirmsi*) or small firms (*aussfirmsi*) or by large firms' industry value added as a percentage of industry value added (*ausconc1i*), large firms' assets as a percentage of industry assets (*ausconc2i*), large firms' sales as a percentage of industry sales (*ausconc3i*) or large firms' employment as a percentage of industry employment (*ausconc4i*),
scale	plant-level scale economies, measured by average affiliate employment in an industry (*ausscalei*),
R&D	industry R&D intensity, measured by R&D expenditure as a percentage of industry-specific GDP (*ausrd1i*) or by human resources devoted to R&D as a percentage of industry-specific employment (*ausrd2i*),
lab	defined as in Section 9.1, i.e. *ausuer, ausjobvac* or *ausjobvaci*,
rwages	defined as in Section 9.1, i.e. *ausrwages1i* or *ausrwages11i,*
comp	percentage of firms using computers in an industry (*auscompi*),
qual	defined as in Section 9.1, i.e. *auslq1i* or *auslq2i*,
hours	defined as in Section 9.2, i.e. *ausavhouri* or *austhouri*,
trade	defined as in Chapter 5.1, i.e. *ausimpinti, ausexpinti* or *ausopeni*
intprod	average international (OECD and US) labour productivity growth (*oecdlpgr* and *uslpgr*)
inr	defined as in Section 9.1, i.e. *ausinr,*

(venture capital, equity markets, banking system and corporate governance), product market competition (property rights, ease of entry and regulation in markets for goods and services), labour market flexibility (labour market regulation and wage bargaining system) and the property market (town and planning regulation) to be determinants of total factor productivity growth; and Oulton (1998), who explained differenced in labour productivity different firms using ownership characteristics, including whether a firm is domestic (UK) owned, US owned and other foreign owned.

inf defined as in Section 9.1, i.e. *ausinf,*

indus defined as in Section 9.1, i.e. *ausindusi,*

sector defined as in Section 9.1, i.e. *prim, man* or *tert.*

In summary, FDI and other capital was represented by *fdii* and *capital*, market size and structure by *market*, *emp, profits* and *conc*, economies of scale by *scale* and *R&D*, labour market conditions and labour characteristics by *lab, rwages, hours, comp* and *qual,* international influence by *trade* and *intprod*, risk factors by *inr, inf* and *indus* and other factors by *sector*. For a summary see Table 9-22. Data sources and descriptive statistics of the variables discussed can be found in Appendix A.6 (Table A-15 and A-16). Variables that could be important in explaining industry-specific labour productivity, but were not used for this analysis owing to availability problems include the diffusion process of new technologies (often imported from abroad), domestic innovative efforts, the development of the physical and social infrastructure, the imitations of organisational and technological modes of production from world-class practices, a higher involvement and motivation of workers in the production processes, stimulating work environment and the removal of obstacles to effective work on firm level and – according to a study by Connolly et al. (2004) – federal enterprise and individual agreements, the real share price index, the quarterly rainfall index, the business internal and external funding flow rate, the terms of trade and an industry's nominal rate of protection.

Table 9-22

Determinants of Industry-Specific Labour Productivity in Australia		
	Dependent Variable	**Alternative Variable**
Labour Productivity		
Industry-specific Labour Productivity (*prod*)	*auslp1i*	*auslp2i*
	Explanatory Variable	**Alternative Variable**
FDI and Other Capital		
Industry-specific FDI (*fdii*)	*ausrfdii*	*ausrfdisti*
Industry Capital Intensity (*capital*)	*ausrdii*	*auskli*
Market Size and Structure		
Industry Sales or Size (*market*)	*ausrgdpi*	*ausrsalesi*
Industry Employment *(emp)*	*ausempi*	---
Industry Profits (*profits*)	*auprofmargi*	---
Industry Concentration or Industry Share of Large (Small) Firms (*conc*)	*auslfirmsi,*	*aussfirmsi, ausconc1i, ausconc2i, ausconc3i, ausconc4i*
Economies of Scale		
Industry Scale Economies (*scale*)	*ausscalei*	---
Industry R&D Intensity (*R&D*)	*ausrd1i*	*ausrd2i*

(Table 9-22 continued)

Labour Market Conditions and Labour Characteristics		
Labour Demand *(lab)*	*ausuer*	*ausjobvac, ausjobvaci*
Industry-specific Wages (*rwages*)	*ausrwages1i*	*ausrwages11i*
Industry Average or Total Working Hours (*hours*)	*ausavhouri*	*austhouri*
Industry computer usage (comp)	*auscompi*	---
Industry Labour Quality (*qual*)	*auslq1i*	*auslq2i*
International Influence		
Industry Trade (*trade*)	*ausexpinti, ausimpointi*	*ausopeni*
International Labour Productivity Growth (*intprod*)	*oecdlpgr*	*uslpgr*
Risk Factors		
Australian Interest Rate (*inr*)	*ausinr*	---
Australian Inflation Rate (*inf*)	*ausinf*	---
Australian Industrial Disputes *(indus)*	*ausindusi*	---

Industry Dummies		
Industry Dummies (*sector*)	*prim, man, tert*	*agr, min, man, con, who, ret, rest, tras, fins, rebs, uti*
Data Sources: See Appendix A.6		

Before estimating the model, the different explanatory variables in the industry-specific labour productivity model are discussed and reasons are given for their predicted effects. Based on the empirical results discussed in Chapter 7.1.6 and the data described in Table 9-21, industry-specific real FDI flows were expected to increase the industry's average labour productivity, as foreign affiliates were expected to be more productive than domestic firms. This could be due to more efficient management, methods and production processes or because production in foreign affiliates is on average more capital-intensive than in domestic firms. An increasing domestic capital stock (i.e. domestic investment) and the construction of new firms or the purchase of new machinery should make workers more productive and thus increase labour productivity.

By definition (that is, if labour productivity is defined as output per worker), industry-specific GDP or real sales should reflect an increase in labour productivity if employment remains constant. If employment increases, labour productivity only increases when output growth exceeds employment growth. If employment increases by more than output, labour productivity can decrease. Furthermore, if economic growth leads to increased production efficiency or capital investment, labour productivity should increase. The average profit margin in an industry should have a positive effect on wages or employment, affecting labour productivity with an unclear effect, as it also depends on the share of profits used to buy new equipment. High industrial concentration or a high share of large firms was expected to have a negative effect on labour productivity, as less competition can reduce the pressure on firms to produce goods in the most efficient way. Labour productivity was expected to increase with increased competition, as this forces firms to become more efficient in order to compete. Scale economies and R&D expenditure were expected to have a positive effect on efficiency and thus on labour productivity, so that industries with higher scale economies and R&D expenditure should be more productive than industries in which small-scale firms dominate.

Generally, any factor that can affect employment can affect labour productivity (labour productivity was defined as output per employee or per hour worked). The effect of labour demand and wages on employment is unclear owing to the interaction between the two variables. Employment may increase owing to increased labour demand and increase wages, while increased wages increase labour supply, but reduce the incentive for firms to employ workers. If those variables affect employment, they could also affect labour productivity, though the sign of the effect is unclear. If labour productivity is defined as output per employee, a higher number of hours worked should have a positive effect on labour productivity. If labour productivity is defined as output per hour, labour productivity only increases if output increases by more than the number of hours worked. Furthermore, there should be a positive link between computer usage, labour quality and labour productivity. When workers are more efficient (owing to the use of computers) or more skilled, they should also be more productive.

International linkages (such as an industry's import-intensity, export-intensity or openness) or international labour productivity growth should have a positive effect on labour productivity, as firm that have to compete with world-class practices need to be more efficient and productive. They also come in contact with new technologies and improved techniques from abroad, which they then can implement themselves.

Risk factors that may affect output or employment and thus labour productivity include the inflation rate, interest rate and the number of industrial disputes. A higher inflation rate could increase risk and nominal wages, thus reducing labour demand, but increasing labour supply, which, thereby affecting employment. Increasing input prices may also reduce the value-added. Higher interest rates should reduce investment (thus reducing production and employment), but increase profits (thus increasing production and employment), while the incidence of industrial disputes in an industry increase the investment risk and should thus reduce investment and profitability, reducing employment. Since risk factors may affect both output and employment, there may be effects on labour productivity, but the signs are unclear. Industry dummies may be of use if some of the variation of industry-specific employment can only be explained by general differences between the different industries, i.e. differences not explained by other variables.

If alternative variables could be used, the ones with the best fit were chosen. Current and lagged values were included when significant, while insignificant variables were not included. Explanatory variables were included with lags when this increased the fit of the model. The number of lags was restricted to a maximum of three owing to the limited number of time periods. A lagged dependent variable was experimented with and included in order to solve the problem of autocorrelation that occurred without its inclusion.

9.3.2 MODEL SPECIFICATION AND ESTIMATION

For the third of the four models in which the effect of industry-specific FDI in Australia between 1992 and 2001 was analysed, industry-specific labour productivity was estimated as a function of a lagged dependent variable (*auslp1i(-1)*), industry-specific FDI (*ausrfdii*), the industry's capital-labour ratio (*auskli*), industry-specific GDP (*ausrgdpi*), the industry's share of small firms (*aussfirmsi*), industry-specific labour quality (*auslq1i*), openness in an industry (*ausopeni*), the Australian interest rate (*ausinr*) and an industry's number of industrial disputes (*ausindusi*) (Table 9-25, Model A). The model was stated as:

$$auslp1i_{it} = \alpha + \beta_{11}\, auslp1i_{it-1} + \beta_{21}\, ausrfdii_{it} + \beta_{22}\, ausrfdii_{it-1} + \beta_{31}\, auskli_{it} + \beta_{32}\, auskli_{it-1} + \beta_{41}\, ausrgdpi_{it} + \beta_{42}\, ausrgdpi_{it-1} + \beta_{51}\, aussfirmsi_{it} + \beta_{61}\, auslq1i_{it} + \beta_{71}\, ausopeni_{it} + \beta_{81}\, ausinr_{t} + \beta_{91}\, ausindusi_{it} + \beta_{92}\, ausindusi_{it-1} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model should best be estimated using least squares, fixed effects or random effects estimation).

The model was estimated using least squares and no effects, since the specification of the model as a fixed effects model was not appropriate and its specification led to autocorrelation. The specification of the model as a random effects model could not be tested, as the number of cross-sections was smaller than the number of coefficients (Table 9-23). As in the industry-specific wage model, including industry dummies was not appropriate, as their inclusion led to autocorrelation.

Table 9-23

Fixed and Random Effects Estimation, Industry-Specific Labour Productivity Model		
Fixed Effects Model		
F test that all u_i = 0	F(9, 66) = 1.750	Prob > F = 0.096
Random Effects Model		
The number of cross-sections is smaller than the number of coefficients, so the Random Effects Model cannot be estimated.		

Testing whether the data series should be differenced once or whether the hypothesis that the variable should be used in first differences is rejected at a 10% critical value, it was found that of the four variables included with one lag, only *ausindusi* had to be differenced once, *ausrfdii, auskli* and *ausrgdpi* were used in levels form (Table 9-24).

Table 9-24

Test for Differencing, Industry-Specific Labour Productivity Model		
Variable	**χ^2 (Prob)**	**χ^2 (Prob)**
auslp1i	0.011 (0.918)	---
ausrfdii	7.599* (0.006)	7.838* (0.005)
auskli	3.052* (0.081)	4.220* (0.040)
ausrgdpi	5.611* (0.018)	7.188* (0.009)
aussfirmi	---	---
auslq1i	---	---
ausopeni	---	---
ausinr	---	---
ausindusi	0.104 (0.747)	---
Result	*auslp1i* → *Δauslp1i* *ausindusi* → *Δausindusi*	---
* significant at 10% critical value		

As in the industry-specific employment and wage model, the dependent variable (in this case *auslp1i*) had to be differenced once, which made theoretical sense, since FDI flows (amongst other factors) could affect both labour productivity and labour productivity growth. The model including *Δauslp1i* and *Δausindusi* was used for further estimation.

The industry-specific labour productivity model for Australia with *Δauslp1i* as the dependent variable was then estimated as a combination of four variables in levels form without lags (*aussfirmsi, auslq1i, ausopeni* and *ausinr*), three variables in levels form with lags (*ausrfdii, auskli* and *ausrgdpi*) and one variable in first difference without lags (*Δausindusi*), i.e. eleven variables in total. The parameters of the model – estimated using least squares – are shown in Table 9-25, Model B. The model had a very good fit, explaining 84.6% of the variation of labour productivity growth, while the adjusted R^2 was almost as high (82.3%). Nine of the eleven explanatory variables were significant at a 10% critical value, while the remaining two (the first lag of *ausrfdii* and *ausinr*) were significant at a 15% critical value. The F-test showed that all slope coefficients combined were not equal to zero.

Table 9-25

Industry-Specific Labour Productivity Equation									
Sample: Time: 1992 – 2001, t = 10 (t = 9 after adjusting endpoints), N = 10. Missing values = 4. Included observations: 86 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Dependent Variable: *auslp1i*					**Dependent Variable: *Δauslp1i***				
Variable	**Lags**	**Coeff.**	**t-stat**	**Prob**	**Variable**	**Lags**	**Coeff**	**t-stat**	**Prob**
C	---	-9,025.200**	-2.766	0.007	**C**	---	-6,554.496	-1.204	0.232
auslp1i	1	0.997**	34.362	0.000	**---**	---	---	---	---
ausrfdii	0	0.618**	3.143	0.002	***ausrfdii***	0	0.639**	3.126	0.003
	1	0.393*	1.501	0.138		1	0.429*	1.664	0.100
auskli	0	178.977**	13.524	0.000	***auskli***	0	175.840**	14.183	0.000
	1	-172.153**	-13.748	0.000		1	-170.561**	-12.064	0.000
ausrgdpi	0	1.665**	5.237	0.000	***ausrgdpi***	0	1.688**	5.185	0.000
	1	-1.723**	-5.369	0.000		1	-1.751**	-5.288	0.000
aussfirmsi	0	127.150**	4.293	0.000	***aussfirmsi***	0	105.099**	2.324	0.023
auslq1i	0	-96.725**	-1.807	0.075	***auslq1i***	0	-96.551**	-1.840	0.070
ausopeni	0	12.887**	2.181	0.032	***ausopeni***	0	11.158**	2.196	0.031
ausinr	0	-272.842	-1.357	0.179	***ausinr***	0	-311.035*	-1.471	0.145
ausindusi	0	2.862**	2.731	0.008	***Δausindusi***	0	2.933**	2.782	0.007
	1	-3.187**	-2.123	0.037		---	---	---	---
** significant at 10% critical value, * significant at 15% critical value									
R-squared				0.999	**R-squared**				0.846
Adjusted R-squared				0.999	**Adjusted R-squared**				0.823
S.E. of regression				3,433.186	**S.E. of regression**				3,397.890
Sum squared resid				849,000,000.000	**Sum squared resid**				854,000,000.000
Durbin-Watson stat				2.454	**Durbin-Watson stat**				2.443
F-statistic				5,882.842	**F-statistic**				36.955
Prob (F-statistic)				0.000	**Prob (F-statistic)**				0.000

9.3.3 MODEL EVALUATION

In order to evaluate the adequacy of the industry-specific labour productivity model, a series of diagnostic tests was performed. The test results are presented in Table 9-26. The hypothesis of homoscedasticity was rejected at a 5% critical value, which is why White heteroscedasticity-consistent standard errors and covariances were used when estimating the model. The hypothesis of non-autocorrelation was not rejected at a 5% critical value, so autocorrelation was not an issue.[235] The hypothesis of correct functional form was not rejected either when applying the RESET(1)- or RESET(2)-test, so that the model was an appropriate specification of the data generating process.

Table 9-26

Diagnostic Tests (5% critical values), Industry-Specific Labour Productivity Model					
		Test	**Test-Statistic**	**5% Critical value**	**Probability**
Heteroscedasticity	**White LR-test**	$\chi^2(11)$	27.262*	19.675	0.012
Autocorrelation	**F-test**	F(1,83)	2.928	3.960	0.091
Misspecification	**RESET(1)**	F(1,73)	0.610	3.980	0.437
	RESET(2)	F(2,72)	0.383	3.130	0.683

235 By excluding the first lag of *ausrfdii*, one could have reduced the probability of the model exhibiting autocorrelation (the AR(1) test would have been: F(1, 84) = 1.367, Prob = 0.245), but a 5% critical level was seen as appropriate enough.

* significant at 5% critical value

In order to test for parameter stability, the model was divided in half (with subsamples for 1993 to 1997 and for 1998 to 2001).[236] The results for the estimation of the two subsamples individually are stated in Table 9-27, Model A and B.

Table 9-27

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific Labour Productivity Model							
Dependent Variable: *Δauslp1i* Sample: Cross-Sections: N = 10 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: 1993 – 1997 Sample (t = 5)		**Model B: 1998 – 2001 Sample (t = 4)**		**Model C: Total Sample, 1993 – 2001 (t = 9)**	
	Lags	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	-23,377.050**	-3.674	-19,029.110**	-4.376	-3,198.290	-0.370
ausrfdii	0	1.255**	2.597	1.033**	3.835	0.606**	2.622
	1	0.605*	1.568	1.366**	2.730	0.451**	1.772
auskli	0	250.556**	7.048	227.099**	7.470	174.543**	14.016
	1	-249.741**	-6.420	-217.474**	-7.008	-169.079**	-12.116
ausrgdpi	0	2.223**	7.239	0.774*	1.702	1.713**	5.123
	1	-2.356**	-7.090	-0.789**	-1.752	-1.772**	-5.239
aussfirmsi	0	235.377**	5.147	207.077**	5.372	103.879**	2.270
auslq1i	0	-75.829	-1.226	-43.588	-0.613	-102.533**	-1.879
ausopeni	0	9.163**	2.080	-11.464	-0.954	10.932**	2.205
ausinr	0	423.600	0.755	-179.406	-0.558	-672.018	-1.084
Δausindusi	0	3.181**	3.495	16.645**	3.201	2.871**	2.999
T(1998 – 2001)	---	---	---	---	---	-1,555.287	-0.757
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.931		0.912		0.849	
Adjusted R-squared		0.909		0.877		0.824	
S.E. of regression		2,275.875		3,066.091		3,386.381	
Sum squared resid		176,000,000.000		263,000,000.000		837,000,000.000	
Durbin-Watson stat		1.971		2.284		2.466	
F-statistic		41.893		26.316		34.231	
Prob (F-statistic)		0.000		0.000		0.000	

The model performed equally well for each subsample (R^2 of 93.1% for the first subsample and 91.2% for the second subsample) and better than in the overall sample (with an R^2 of only 84.6%). Most variables were significant at a 10% critical value. Neither *auslq1i* nor *ausinr* was significant for either of the two subsamples, while *ausopeni* was only insignificant for the second subsample. The F-test showed that all slope coefficients combined were significant for both subsamples. The coefficient on *ausrfdii* was positive and significant at a 10% critical value in both samples, while *ausrfdii(-1)* was only significant at a 15% critical value in the second sample, though *ausrfdii(-1)* was still significant at a 10% critical value in the first sample. Testing for parameter stability, the hypothesis of parameter stability was rejected at a 5% critical value (Table 9-28), indicating that the two subsamples differed significantly from each other. In contrast, a dummy variable for the period 1998 to 2001 was insignificant, indicating that intercept did not change significantly across time (Table 9-27, Model C).

Table 9-28

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific Labour Productivity Model

[236] Since there are nine instead of eight time periods in this model, an even split is obviously not possible, so that one subsample has to include four, the other five time periods. The sample was split between 1997 and 1998 to be consistent with the previous models.

	Test	F-Statistic	Critical value	Probability
Parameter Stability (1998 – 2001)	F(12,62)	2.826	1.920	0.004

Knowing that the parameters were not stable over time, parameter stability across industries was tested for by splitting the sample into two subsamples (for primary/manufacturing and tertiary industries). The estimation results are shown in Table 9-29, Model A and B.

Table 9-29

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific Labour Productivity Model							
Dependent Variable: *Δauslp1i* Sample: Time: 1993 – 2001, t = 9 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: *prim, man* Sample (N = 3)*		**Model B: *tert* Sample (N = 7)**		**Model C: Total Sample (N = 10)**	
	Lags	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	---	---	---	-6,025.794**	-2.079	-4,913.693	-0.852
ausrfdii	0	0.499	0.467	0.703**	6.595	0.624**	2.823
	1	-0.564	-0.687	0.694**	4.292	0.424*	1.554
auskli	0	201.749	8.698	163.879**	11.265	175.686**	14.039
	1	-181.172	-8.815	-160.484**	-11.189	-170.668**	-11.998
ausrgdpi	0	2.368	4.186	1.354**	5.043	1.708**	5.153
	1	-2.352	-3.411	-1.423**	-5.130	-1.797**	-5.205
aussfirmsi	0	201.585	0.376	74.460**	2.215	110.236**	2.505
auslq1i	0	-2,252.181	-0.526	-52.487	-0.939	-70.324	-1.122
ausopeni	0	182.127	0.272	8.305**	2.092	10.735**	2.140
ausinr	0	-115.351	-0.106	5.580	0.037	-367.088*	-1.464
Δausindusi	0	3.515	2.388	-0.314	-0.152	2.914**	2.738
prim	---	---	---	---	---	-1,209.626	-0.522
tert	---	---	---	---	---	-1,424.502	-0.706
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.843		0.897		0.847	
Adjusted R-squared		0.744		0.873		0.819	
S.E. of regression		5,933.963		1,776.690		3,436.970	
Sum squared resid		563,000,000.000		148,000,000.000		851,000,000.000	
Durbin-Watson stat		2.453		2.363		2.452	
F-statistic		8.567		37.215		30.588	
Prob (F-statistic)		0.000		0.000		0.000	
* Model A could only be estimated when no intercept was included.							

The parameter estimates produced using the subsamples differed in terms of sign and significance of variables. While eight of the eleven variables were significant at a 10% critical value for the tertiary subsample, none of the explanatory variables was significant for the primary and manufacturing subsample. Nevertheless, the two subsamples did not differ much in their explanatory power (an R^2 of 84.3% for the primary/secondary subsample compared with an R^2 of 89.7% for the tertiary subsample). Both *ausrfdii* and *ausrfdii(-1)* were only significantly positive for the tertiary industry subsample, but insignificant for the primary/manufacturing subsample. The F-test showed that all slope coefficients combined were significant for both subsamples. When testing for parameter stability, the tertiary subsample was significantly different to the rest of the sample (Table 9-30), indicating that parameter variability did not only exist over time, but also across industries. Industry dummies for primary and tertiary industries were insignificant (Table 9-29, Model C).

Table 9-30

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific Labour Productivity Model				
	Test	**F-Statistic**	**5% Critical value**	**Probability**

PRIM Sample	Cannot be estimated			
TERT Sample	F(11, 64)	2.790*	1.950	0.005
Random Coefficients Model	Cannot be estimated: near singular matrix			
* significant at 5% critical value				

9.3.4 RESULTS

The change in industry-specific real FDI flows had the expected positive effect on industry-specific labour productivity growth.[237] Other variables that affected labour productivity growth positively were the capital-labour ratio, industry-specific GDP (in the short-run, but not after one lag), the share of small firms in an industry[238], the openness of an industry and the change in the number of industry-specific industrial disputes, while labour quality, the Australian interest rate and industry-specific GDP (after one lag) reduced labour productivity growth (Table 9-31).

Repeating the analysis, but using the change in real FDI stocks instead of real FDI flows, supported the result of a significantly positive effect on labour productivity growth, though the model using the change in real FDI stocks had a slightly lower fit (R^2 of 83.3% and adjusted R^2 of 80.7%), indicating that using real FDI flow data was more appropriate for the model.[239] Using *auslp2i* instead of *auslp1i* gave the same results in terms of the effect of FDI on labour productivity growth (Table 9-32). The coefficients on *ausrfdii* and *ausrfdii(-1*) were positive, and the hypothesis that *ausrfdii* and *ausrfdii(-1*) were jointly insignificant (i.e. that both coefficients were equal to zero) was rejected at a 10% critical value.[240]

Table 9-31

Industry-Specific Labour Productivity Model, Observed and Predicted Effects					
	Short-run effect (current value)		**Long-run effect (after 1 lag)**		**Expected Sign**
ausrfdii	0.639	+	1.068	+	+
auskli	175.840	+	5.279	+	+
ausrgdpi	1.688	+	-0.063	-	+
aussfirmsi	105.099	+	105.099	+	+
auslq1i	-96.551	-	-96.551	-	+
ausopeni	11.158	+	11.158	+	+
ausinr	-311.035	-	-311.035	-	?
Δausindusi	2.933	+	2.933	+	-

Table 9-32

Industry-Specific Labour Productivity Equation II									
Sample: Time: 1992 – 2001, t = 10 (t = 9 after adjusting endpoints), N = 10. Missing values = 4. Included observations: 86 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Dependent Variable: *auslp2i*					**Dependent Variable: *Δauslp2i***				
Variable	**Lags**	**Coeff.**	**t-stat**	**Prob**	**Variable**	**Lags**	**Coeff**	**t-stat**	**Prob**

[237] The hypothesis that *ausrfdii* and *ausrfdii(-1)* are jointly insignificant (i.e. that both coefficients are equal to zero) was rejected at a 10% critical value: F(2,74) = 5.065, Prob = 0.009.

[238] The industry share of large firms (*auslfirmsi*) could have been included instead of *aussfirmsi*. The fit of the model would have been as good (R^2 of 84.6%) and *auslfirmsi* would have been significant as well, but with a negative sign (coefficient: -103.872, t-stat: -2.250) instead of a positive sign as for *aussfirmsi* (coefficient: 105.099, t-stat: 2.324).

[239] The coefficients on *Δausrfdisti* and *Δausrfdisti(-1)* were 0.375 and 0.250 respectively instead of 0.639 and 0.429 for *ausrfdii* and *ausrfdii(-1)*, while the hypothesis that *Δausrfdisti* and *Δausrfdisti(-1)* are jointly insignificant was rejected at a 10% critical value: F(2,72) = 3.057, Prob = 0.053.

[240] F(2,75) = 2.952, Prob = 0.058.

C	---	-3.477	-0.980	0.331	**C**	---	1.037	0.359	0.721
auslp2i	1	0.933**	16.550	0.000	**---**	---	---	---	---
ausrfdii	0	0.000**	2.955	0.004	***ausrfdii***	0	0.000**	2.423	0.018
	1	0.000**	1.847	0.069		1	0.000**	1.727	0.088
auskli	0	0.080**	6.944	0.000	***Δauskli***	0	0.081**	11.010	0.000
	1	-0.073**	-6.342	0.000		---	---	---	---
ausrgdpi	0	0.001**	4.623	0.000	***ausrgdpi***	0	0.001**	4.256	0.000
	1	-0.001**	-4.740	0.000		1	-0.001**	-4.460	0.000
aussfirmsi	0	0.071**	2.218	0.030	***aussfirmsi***	0	0.023	0.876	0.384
auslq1i	0	-0.030	-0.866	0.390	***auslq1i***	0	0.003	0.648	0.519
ausopeni	0	0.006*	1.564	0.122	***ausopeni***	0	-0.035	-0.891	0.376
ausinr	0	-0.300**	-1.902	0.061	***ausinr***	0	-0.304**	-1.915	0.059
ausindusi	0	0.001**	2.171	0.033	***Δausindusi***	0	0.001**	2.241	0.028
	1	-0.001	-1.144	0.257		---	---	---	---
** significant at 10% critical value, * significant at 15% critical value									
R-squared				0.998	**R-squared**				0.669
Adjusted R-squared				0.997	**Adjusted R-squared**				0.625
S.E. of regression				2.318	**S.E. of regression**				2.340
Sum squared resid				386.991	**Sum squared resid**				410.563
Durbin-Watson stat				1.972	**Durbin-Watson stat**				1.991
F-statistic				2,480.171	**F-statistic**				15.185
Prob (F-statistic)				0.000	**Prob (F-statistic)**				0.000

9.3.5 CONCLUSIONS

For the third analysis of consequences of industry-specific FDI in Australia, which focused on the labour productivity effect of FDI, a model was estimated with industry-specific labour productivity growth for the period 1992 to 2001 and a set of explanatory variables including industry-specific FDI, capital intensity, industry size, the industry share of small firms, labour quality, industry openness, interest rate and growth in industrial disputes, representing capital, market size and structure, labour characteristics, international influences and risk factors. Economies of scale (including scale economies and R&D intensity), industry employment, industry profits, labour demand, industry-specific wages, working hours, international labour productivity growth, computer usage and inflation rate were not significant in this model.

Industry-specific real FDI flows had a significantly positive, but small effect on industry-specific labour productivity, indicating that labour productivity growth increased as more FDI entered the Australian economy, substantiating the theory that foreign firms are more productive and help to increase the overall labour productivity. It remains, however, unclear whether labour productivity growth is higher owing to the foreign firms only or whether there are spillover effects on Australian firms.

Looking at the signs of the remaining explanatory variables shows that it could be the capital inflow that increased labour productivity, as an industry's average capital intensity also increased labour productivity. Hence, it could be the increased capital intensity not the increased efficiency that increased labour productivity. The negative sign on interest rates substantiates this theory. Higher interest rates should lead to an increased cost of capital and thus reduced investment, leading to reduced labour productivity growth. The positive link between the industry percentage of small firms and labour productivity growth can be explained by the increased competition through a larger number of small firms, forcing firms to be more productive. This idea was substantiated through the positive sign on openness, indicating that labour productivity growth increased due to increased competition on an international level.

Labour quality reduced labour productivity, which is somewhat surprising, as skilled labour should be more productive than unskilled labour. Then again, it may be easier to substitute unskilled labour with machinery than skilled labour, so that labour productivity growth is due to replacing unskilled workers with labour-saving machinery rather than due to increased skill levels.

The signs on industry size and the growth of industrial disputes are somewhat surprising. Industry size had a negative sign on labour productivity growth, indicating that labour productivity grows less in larger industries. However, this effect could not be explained by lower competition, since market size had no negative correlation with industry concentration. An increasing number in industrial disputes should reflect an increase in market risk and thus reduction in investment and in labour productivity growth. Working days lost due to industrial disputes should have a negative effect on production. Yet, the growth in industrial disputes positively affected labour productivity growth. Overall, an increase in capital (foreign and domestic), competition, openness and the growth in industrial disputes promoted labour productivity growth, while market size, labour quality and interest rate slowed it down.

9.4 ANALYSIS OF THE EFFECTS OF INDUSTRY-SPECIFIC FDI ON MARKET STRUCTURE IN AUSTRALIA

9.4.1 INTRODUCTION AND DATA

In the fourth and final model of the consequences of industry-specific FDI, industry-specific market structure was analysed. Industry-specific market structure was measured by industry concentration, which is the *"extent to which a market is taken up by a limited number of firms. The commonest ways of measuring concentration are the n-firm concentration ratio, for example, the five-firm concentration rate is the proportion of the market in the hands of the five largest firms; and the Herfindahl Index, which sums the squares of the market shares expressed as decimals. Size may be measured by turnover, employment, or capital employed."*[241] Since data on the n-firm concentration ratio or the market share of individual firms were not available for Australia (or not available in enough detail for this panel data analysis), the share of large firms in total industry gross product (*ausconc1i*), total assets (*ausconc2i*), total sales (*ausconc3i*) or total employment (*ausconc4i*) were used as alternatives to describe an industry's market structure over time.

The dataset was determined by the availability of industry concentration and industry-specific FDI data since the main focus of this analysis was the link between FDI and industry concentration. Data were available for seven years between 1995 and 2001 and nine cross-sections, giving a maximum of 63 observations. Figure 9-4 shows industry concentration (*ausconc1* – the aggregate of the variable (*ausconc1i*) that was later chosen for the analysis, since it performed best) and real annual FDI in Australia between 1995 and 2001. No clear link between industry concentration and real annual FDI flows existed.

The analysis of the effects of industry-specific FDI on market structure in Australia was based on Chapter 7.1.7, in which some studies on the effect of FDI on competition and industrial concentration were discussed. According to those studies, additional variables that have effects on competition and industrial concentration were average plant size, average plant age, industry (employment) size and growth (Barrios et al., 2004), scale economies, R&D and advertising expenditure, capital expenditure, regional concentration, industry (sales) size and growth, import and export intensity and net entry rates in an industry (Driffield, 2001). As in the previous models, a broader approach (based on FDI and non-FDI related literature) was chosen to find a set of possible explanatory variables.

---

[241] Source: "concentration" A Dictionary of Economics. John Black. Oxford University Press, 2002. Oxford Reference Online. Oxford University Press. Melbourne University, 3 March 2005. www.oxfordreference.com/views/ENTRY.html?subview=Main&entry=t19.e502

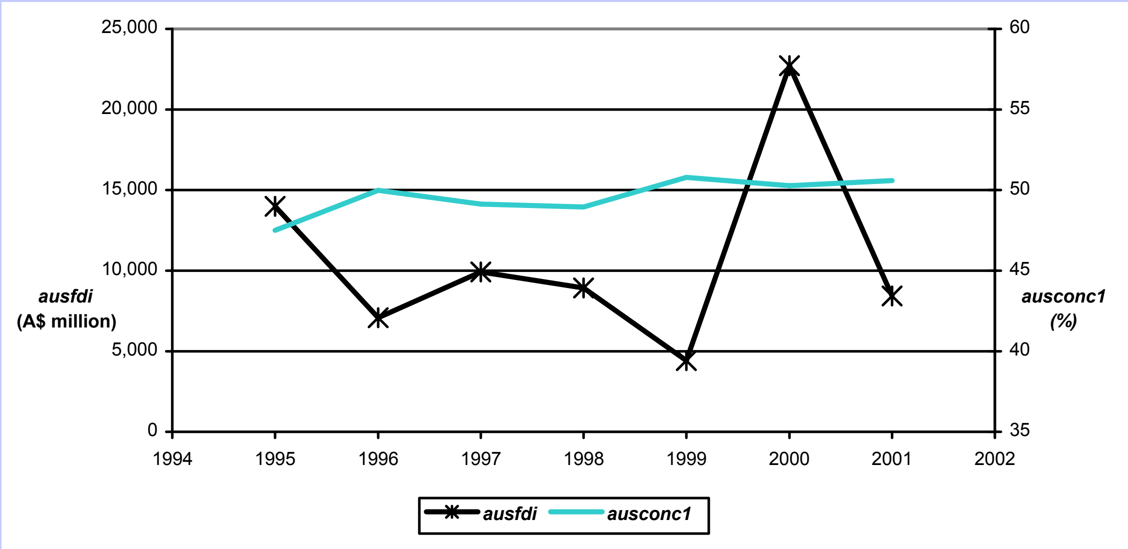


Figure 9-4: Real annual aggregate FDI Inflows and Industry Concentration in Australia, 1994 to 2002

A combination of FDI and other capital, market size, economies of scale, international influence, risk factors and industry dummies was used to explain industry concentration. While the focus is on the link between industry concentration and FDI, other factors were included since FDI could not be seen as the only determinant of industry concentration, but as one of many determinants. The model was stated as:

conc = f(*fdii, capital, market, profits, emp, scale, R&D, trade, inr, inf, indus, sector)*

where the variables are as listed and defined below:

conc	defined as in Section 9.3, i.e. *ausconc1i, ausconc2i*, *ausconc3i* or *ausconc4i*,
fdii	defined as in Section 9.1, i.e. *ausrfdii* or *ausrfdisti*,
capital	defined as in Section 9.1, i.e. *ausrdii* or *auskli,*
market	defined as in Section 9.1, i.e. *ausrgdpi* or *ausrsalesi,*
profits	defined as in Section 9.1, i.e. *ausprofmargi*,
emp	defined as in Section 9.1, i.e. *ausempi,*
scale	defined as in Section 9.3, i.e. *ausscalei,*
R&D	defined as in Section 9.3, i.e. *ausrd1i or ausrd2i,*
trade	defined as in Section 9.3, i.e. *ausexpinti, ausimpinti* or *ausopeni,*
inr	defined as in Section 9.1, i.e. *ausinr,*
inf	defined as in Section 9.1, i.e. *ausinf,*
indus	defined as in Section 9.1, i.e. *ausindusi,*
sector	defined as in Section 9.1, i.e. *prim, man* or *tert.*

In summary, FDI and other capital was represented by *fdii* and *capital*, market size by *market*, *profits* and *emp*, economies of scale by *scale, R&D* and *comp,* international influence by *trade*, risk factors by *inr, inf* and *indus* and other factors by *sector*. For a summary see Table 9-33. Data sources and descriptive statistics of the variables discussed can be found in Appendix A.6 (Table A-15 and A-16). Variables that could be important in explaining industry concentration, but were not used for this analysis owing to availability problems include an industry's technology intensity, advertising intensity or marketing intensity, an industry's acquisition intensity, entry barriers or entry fees (seen as fixed costs) in an industry, input-output linkages with other industries and trade costs (including industry-specific customs duties).[242]

Table 9-33

Determinants of Industry-Specific Market Structure in Australia		
	Dependent Variable	**Alternative Variable**
Market Structure		
Industry Concentration (*conc*)	*ausconc1i*	*ausconc2i, ausconc3i, ausconc4i*
	Explanatory Variable	**Alternative Variable**
FDI and Other Capital		
Industry-specific FDI (*fdii*)	*ausrfdii*	*ausrfdisti*
Industry Capital Intensity (*capital*)	*ausrdii*	*auskli*
Market Size		
Industry Sales or Size (*market*)	*ausrgdpi*	*ausrsalesi*
Industry Profits (*profits*)	*ausprofmargi*	---
Industry Employment (*emp*)	*ausempi*	
Economies of Scale		
Industry Scale Economies (*scale*)	*ausscalei*	
Industry R&D Expenditure (*R&D*)	*ausrd1i*	*ausrd2i*
International Influence		
Industry Trade (*trade*)	*ausexpinti, ausimpinti*	*ausopeni*
Risk Factors		
Australian Interest Rate (*inr*)	*ausinr*	---
Australian Inflation Rate (*inf*)	*ausinf*	---
Australian Industrial Disputes (*indus*)	*ausindusi*	---
Industry Dummies		
Industry Dummies (*sector*)	*prim, man, tert*	*min, man, con, who, ret, rest, tras, rebs, uti*
Data Sources: See Appendix A.6		

Before estimating the model, the explanatory variables in the industry-specific market structure model and their potential substitutes are discussed and reasons are given for their predicted effects. Based on the empirical results discussed in Chapter 7.1.7, the industry concentration effect of FDI is unclear. While FDI may reduce industry concentration through increased competition, FDI could also increase industry concentration, since MNEs tend to be larger than domestic firms, particularly because they are, by definition, firms with market power. Domestic investment or capital intensity could have a positive effect on industry concentration if it represents existing firms growing bigger rather than new firms entering the market.

The direct link between market size (measured by GDP, sales or employment) and industry concentration is unclear. It needs to be tested whether industry concentration is higher in large industries than in small ones. The same is true for profitability. Industries with higher profits can attract either large firms (increasing concentration) or small firms (reducing

242 Empirical studies analysing the determinants of industry concentration include: Bhattacharya (2002), who explained industrial concentration and competition in Malaysian manufacturing using entry barriers (such as capital and advertising intensity), demand conditions (such as market size) and international influences (such as the ratio of exports and imports to total sales); Athreye and Kapur (2003), who explained the impact of economic liberalisation on Indian industry concentration using the industry's marketing intensity, technology intensity and ratio of industry sales to average net fixed assets as further determinants of concentration; and Traistaru and Martincus (2003), who explained industry concentration patterns in Mercosur using labour intensity, human capital intensity, technology, market size, scale economies, input-output linkages and trade costs.

concentration). Scale economies and R&D expenditure were expected to increase industry concentration, as they are characteristics of large firms. If industries have high fixed or sunk costs relative to variable cost, there are scale economies, and firms need to be of a certain size to survive and industry concentration should be higher than in industries with small fixed costs.

International trade and openness may increase competition (as firms have to compete with domestic and international firms) and thus reduce industry concentration. If domestic firms have to compete with larger international firms, they may only be able to do so if they are large themselves. Only large companies may start to export, while small companies focus on the domestic market. Hence, the overall industry concentration effect of trade is unclear. Risk factors that may affect industry concentration include the inflation rate, interest rate and the number of industrial disputes. Generally, higher risk may promote a larger firm size, as firms want to diversify and spread risk. So if the market risk changes over time, so should the market structure. Industry dummies may be of use if some of the variation of industry-specific employment can only be explained by general differences between the industries, i.e. differences not explained by other variables.

If alternative variables could be used, the ones with the best fit were chosen. Current and lagged values were included when significant, while insignificant variables were not included. Explanatory variables were included with lags when this increased the fit of the model. The number of lags included was restricted to a maximum of three. A lagged dependent variable was experimented with, but was not included in the final model.

9.4.2 MODEL SPECIFICATION AND ESTIMATION

For the final model of the effect of industry-specific FDI in Australia between 1992 and 2001, industry concentration was estimated as a function of industry-specific FDI (*ausrfdii*), domestic investment (*aurdii*), industry-specific sales (*ausrsalesi*), industry-specific employment (*ausempi*) and an industry's number of industrial disputes (*ausindusi*) (Table 9-34).

None of the variables describing economies of scale or international influence were significant. In contrast to the previous three models, the first lag of industrial concentration was not included as an explanatory variable, as problems with autocorrelation were solved by estimating the model as a fixed effects model. The model was stated as:

$$ausconc1i_{it} = \alpha + \beta_{11}\, ausrfdii_{it} + \beta_{12}\, ausrfdii_{it-1} + \beta_{13}\, ausrfdii_{it-3} + \beta_{21}\, ausrdii_{it} + \beta_{22}\, ausrdii_{it-1} + \beta_{23}\, ausrdii_{it-2} + \beta_{31}\, ausrsalesi_{it} + \beta_{41}\, ausempi_{it} + \beta_{51}\, ausindusi_{it} + \beta_{52}\, ausindusi_{it-1} + \beta_{53}\, ausindusi_{it-2} + \varepsilon_{it}$$

(with the structure of ε_{it} depending on whether the model should best be estimated using least squares, fixed effects or random effects estimation).

Table 9-34

Industry-Specific Market Structure Equation				
Dependent Variable: *ausconc1i* Sample: Time: 1995 – 2001, t = 7 (t = 3 after adjusting endpoints), N = 9. Missing values = 4. Included observations: 60 Least Squares				
Variable	**Lags**	**Coeff.**	**t-stat**	**Prob**
C	---	31.806**	6.301	0.000
ausrfdii	0	0.002	1.180	0.244
	1	0.000	-0.074	0.941
	2	0.002	0.799	0.428
ausrdii	0	0.003*	1.498	0.141
	1	0.000	0.131	0.897
	2	0.001	0.649	0.520
ausrsalesi	0	0.008**	1.710	0.094
ausempi	0	-0.034**	-3.833	0.000
ausindusi	0	0.001	0.142	0.888
	1	0.000	0.128	0.899
	2	-0.001	-0.245	0.808
** significant at 10% critical value, * significant at 15% critical value				
R-squared				0.727
Adjusted R-squared				0.664
S.E. of regression				14.255
Sum squared resid				9,754.201
Durbin-Watson stat				0.148
F-statistic				11.614
Prob (F-statistic)				0.000

While the model was originally estimated using least squares and no effects, it was more appropriately specified as a fixed effects model. The fixed effects model specification proved to be appropriate and solved the problem of autocorrelation. Including industry dummies made it impossible to include variables that only varied across industries, but not over time (such as *ausrd1i* or *ausrd2i*, *ausexpinti*, *ausimpinti* or *ausopeni*). Although those variables were important in explaining *ausconc1i*, a model including those variables did not perform as well as a model including industry dummies. The specification of the model as a random effects model could not be tested, as the number of cross-sections was smaller than the number of coefficients (Table 9-35).

Table 9-35

Fixed and Random Effects Estimation, Industry-Specific Market Structure Model		
Fixed Effects Model		
F test that all $u_i = 0$	F(8, 40) = 346.300	Prob > F = 0.000
Random Effects Model		
The number of cross-sections is smaller than the number of coefficients, so the Random Effects Model cannot be estimated.		

Once the model was estimated as a fixed effects model (Table 9-37, Model A), it was tested whether the data series should be used in levels form or whether they should be differenced. Of the three variables included with two lags, *ausrfdii* and *ausrdii* had to be differenced once, while *ausindusi* was used in levels form (Table 9-36). The model including Δ*ausrfdii* and Δ*ausrdii* was used for further estimation.

Table 9-36

Test for Differencing, Industry-Specific Market Structure Model			
Variable	χ^2 **(Prob)**	χ^2 **(Prob)**	χ^2 **(Prob)**
ausrfdii	2.524 (0.112)	3.735* (0.053)	10.166* (0.001)

ausrdii	4.646* (0.031)	2.285 (0.131)	8.300* (0.004)
ausrsalesi	---	---	---
ausempi	---	---	---
ausindusi	7.617* (0.006)	7.065* (0.008)	15.452* (0.000)
Result	*ausrfdii* → *Δausrfdii*	*ausrdii* → *Δausrdii*	---
* significant at 10% critical value			

Table 9-37

Industry-Specific Market Structure Equation									
Sample: Time: 1995 – 2001, t = 7 (t = 3 after adjusting endpoints), N = 9. Missing values = 4. Included observations: 60 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance									
Model A: Model with variables in levels form					**Model B: Model after differencing**				
Dependent Variable: *ausconc1i*					**Dependent Variable: *ausconc1i***				
Variable	**Lags**	**Coeff.**	**t-stat**	**Prob**	**Variable**	**Lags**	**Coeff**	**t-stat**	**Prob**
C	---	94.884**	23.164	0.000	**C**	---	88.098**	39.402	0.000
	0	0.000	-0.813	0.421		0	0.000	1.039	0.305
ausrfdii	1	0.000	-0.091	0.928	***Δausrfdii***	1	0.001**	2.853	0.007
	2	-0.001**	-3.009	0.005		---	---	---	---
	0	0.000	-0.471	0.640		0	0.000	1.385	0.174
ausrdii	1	0.000	0.180	0.858	***Δausrdii***	1	0.001**	2.037	0.048
	2	-0.001**	-2.629	0.012		---	---	---	---
ausrsalesi	0	0.011**	2.217	0.032	***ausrsalesi***	0	0.005	1.281	0.207
ausempi	0	0.015**	2.443	0.019	***ausempi***	0	0.013**	1.928	0.061
	0	-0.002**	-3.942	0.000		0	-0.001**	-3.154	0.003
ausindusi	1	-0.001	-1.409	0.167	***ausindusi***	1	-0.001**	-2.081	0.044
	2	0.001**	2.214	0.033		2	0.000	0.915	0.365
min	---	---	---	---	***min***	---	---	---	---
man	---	-68.360**	-8.539	0.000	***man***	---	-54.487**	-8.941	0.000
uti	---	0.344	0.132	0.896	***uti***	---	3.349*	1.622	0.112
con	---	-87.743**	-17.319	0.000	***con***	---	-77.030**	-23.274	0.000
who	---	-92.248**	-8.659	0.000	***who***	---	-73.126**	-13.480	0.000
ret	---	-95.541**	-10.932	0.000	***ret***	---	-77.469**	-12.515	0.000
rest	---	-80.727**	-21.108	0.000	***rest***	---	-73.759**	-24.147	0.000
tras	---	-34.353**	-13.793	0.000	***tras***	---	-33.506**	-13.073	0.000
rebs	---	-81.367**	-16.800	0.000	***rebs***	---	-73.968**	-15.407	0.000
** significant at 10% critical value, * significant at 15% critical value									
R-squared				0.996	**R-squared**				0.996
Adjusted R-squared				0.994	**Adjusted R-squared**				0.994
S.E. of regression				1.863	**S.E. of regression**				1.902
Sum squared resid				138.829	**Sum squared resid**				151.956
Durbin-Watson stat				2.096	**Durbin-Watson stat**				1.872
F-statistic				539.515	**F-statistic**				578.227
Prob (F-statistic)				0.000	**Prob (F-statistic)**				0.000

The industry-specific market structure model for Australia was then estimated as a combination of two variables in levels form without lags (*ausrsalesi* and *ausempi*), one variable in levels form with lags (*ausindusi*) and two variables in first difference with lags (*Δausrfdii* and *Δausrdii*) and eight industry dummies (for manufacturing, utilities, wholesale trade, retail trade, restaurants, transport services and real estate and business services), reflecting the fixed effects. The parameters of the seventeen variables are shown in Table 9-37, Model B. The industry-specific market structure model had a very good fit, explaining 99.6% of the variation of industry concentration. The adjusted R^2 was with 99.4% almost as high. Twelve of the seventeen explanatory variables were significant at a 10% critical value, one variable was significant at a 15% critical value, while four variables were insignificant. The F-test showed that all slope coefficients combined were not equal to zero.

9.4.3 MODEL EVALUATION

In order to evaluate the adequacy of the industry-specific market structure model, a series of diagnostic tests was performed. The test results are presented in Table 9-38. The hypothesis of homoscedasticity was rejected at a 5% critical value, which is why White heteroscedasticity-consistent standard errors and covariances were used when estimating the model. The hypotheses of non-autocorrelation and correct functional form were not rejected at a 5% critical value, so that the model could be viewed as an appropriate representation of the data generating process.

Table 9-38

Diagnostic Tests (5% critical values), Industry-Specific Market Structure Model					
		Test	Test-Statistic	5% Critical value	Probability
Heteroscedasticity	**White LR-test**	$\chi^2(11)$	226.144	19.675	0.000
Autocorrelation	**F-test**	F(1,50)	0.002	4.030	0.961
Misspecification	**RESET(1)**	F(1,41)	1.758	4.080	0.192
	RESET(2)	F(2,40)	1.039	3.230	0.363
* significant at 5% critical value					

In order to test for parameter stability, the model was split into two subsamples, one for 1995 to 1998 and for 1999 to 2001.[243] The results for the estimation of the two subsamples are stated in Table 9-39, Model A and B. The model performed well for each subsample (R^2 of 99.6% for the first subsample compared with an R^2 of 99.9% for the second subsample), though most variables – apart from the industry dummies – were not significant at a 10% or 15% critical value. However, the F-test showed that all slope coefficients combined were significant for both subsamples. The coefficients on *Δausrfdii* and *Δausrfdii(-1)* were positive, but not significant at a 10% or 15% critical value in both subsamples. The hypothesis of parameter stability was rejected at a 5% critical value (Table 9-40), indicating that the two subsamples were significantly different to each other. In contrast, a dummy variable for the period 1999 to 2001 was insignificant, indicating that intercept did not change significantly over time (Table 9-39, Model C).

Table 9-39

Time Effects: Change in Intercept and Slope Coefficients, Industry-Specific Market Structure Model							
Dependent Variable: *ausconc1i* Sample: Cross-Sections: N = 9 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: 1995 – 1998 Sample (t = 4)		Model B: 1999 – 2001 Sample (t = 3)		Model C: Total Sample, 1995 – 2001 (t = 7)	
	Lags	Coefficients	t-stat	Coefficients	t-stat	Coefficients	t-stat
C	----	64.714**	6.031	101.851**	5.231	87.738**	38.766
Δausrfdii	0	0.000	0.058	0.000	-0.846	0.000	0.794
	1	0.001	1.164	0.000	-0.410	0.001**	2.549
Δausrdii	0	0.000	-0.203	0.000	-0.461	0.000	1.057
	1	0.001	0.980	0.000	0.447	0.001**	1.814
ausrsalesi	0	0.008	1.004	-0.008	-0.607	0.007*	1.511

[243] Since there are seven time periods in this model, an even split is obviously not possible, so that one subsample has to include three, the other four time periods. The sample was split between 1998 and 1999, as it was only possible to estimate it that way (the model could not be estimated for 1995 to 1997 subsample, while estimating it for 1995 to 1998 and 1999 to 2001 was fine).

ausempi	0	0.002	0.113	0.002	0.222	0.015**	2.141
ausindusi	0	0.000	0.412	-0.005	-0.618	-0.001**	-3.207
	1	0.001	0.762	0.001	0.079	-0.001**	-2.018
	2	0.002**	1.867	-0.001	-0.397	0.000	0.700
min	---	---	---	---	---	---	---
man	---	-26.569	-1.488	-24.462	-0.907	-60.223**	-7.166
uti	---	29.280**	2.431	-5.430	-0.309	3.562**	1.752
con	---	-51.218**	-4.286	-71.049**	-6.024	-78.702**	-22.135
who	---	-50.570**	-3.087	-53.516**	-2.133	-77.412**	-10.760
ret	---	-46.781**	-2.572	-51.931**	-2.249	-82.472**	-10.720
rest	---	-46.040**	-4.060	-79.958**	-4.514	-74.299**	-24.561
tras	---	-7.017	-0.609	-36.286**	-2.196	-34.472**	-13.023
rebs	---	-44.071**	-2.828	-61.919**	-3.437	-76.281**	-15.166
T(1999 – 2001)	---	---	---	---	---	-0.792	-1.024
** significant at 10% critical value, * significant at 15% critical value							
R-squared			0.996		0.999		0.996
Adjusted R-squared			0.992		0.996		0.994
S.E. of regression			2.070		1.699		1.900
Sum squared resid			64.252		25.968		147.987
Durbin-Watson stat			2.085		2.991		1.999
F-statistic			242.218		359.136		547.460
Prob (F-statistic)			0.000		0.000		0.000

Table 9-40

Test of Equality of Regression Coefficients generated from Time-Specific Subsamples, Industry-Specific Market Structure Model				
	Test	**F-Statistic**	**Critical value**	**Probability**
Parameter Stability (1999– 2001)	F(18,24)	2.681	2.060	0.013

After the hypothesis of parameter stability over time was rejected, parameter stability across industries was tested. The sample was split into two subsamples (for primary/manufacturing and tertiary industries). The estimation results are shown in Table 9-41, Model A and B. Since the industry-specific subsamples included different industry dummies, the results from the two regressions could be compared, but the test of equality of regression coefficients generated from industry-specific subsamples could not be performed. Most parameter coefficients estimated using the subsamples were similar in sign (except for *ausrsalei* and *ausempi* in Model A and the first and second lag of *ausindusi* in Model B), but different in significance (the only variable that was significant at a 10% critical value was the second lag of *ausindusi* for the tertiary subsample). The explanatory power was very good (R^2 of 99.6% for the primary/secondary subsample compared with an R^2 of 99.4% for the tertiary subsample). The F-test showed that all slope coefficients combined were significant for both subsamples. The coefficients on *Δausrdii* and *Δausrfdii (-1)* had the same sign as in the model using the complete sample, but neither of them was significant for any of the two subsamples.

Including sector dummies (for primary and tertiary industries) instead of individual industry dummies was only successful in the sense that they were both significant, but they led to autocorrelation and hence misspecification of the model (Table 9-41, Model C). The industry dummies could be excluded and the coefficients that were generated from industry-subsamples using least squares with no effect could be compared. The F-test showed that all slope coefficients combined were significant for both subsamples. The subsample of tertiary industries was significantly different to the rest of the sample, so there was evidence for parameter variability (Table 9-42). Estimating the model as a random coefficients model (excluding the industry dummies) was not possible, since the number of explanatory variables exceeded the number of time periods per cross-section.

Table 9-41

Industry Effects: Change in Intercept and Slope Coefficients, Industry-Specific Market Structure Model							
Dependent Variable: *ausconc1i* Sample: Time: 1995 – 2001, t = 7 Least Squares, White Heteroscedasticity-Consistent Standard Errors & Covariance							
		Model A: *prim, man* Sample (N = 2)		**Model B: *tert* Sample (N = 7)**		**Model C: Total Sample (N = 9)**	
	Lags	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**	**Coefficients**	**t-stat**
C	----	92.466**	14.820	91.477**	47.277	84.382**	6.428
Δausrfdii	0	0.000	0.990	0.000	0.198	0.001	0.757
	1	0.001	1.772	0.001	1.092	0.001	0.469
Δausrdii	0	0.000	1.170	0.000	0.323	0.003	1.461
	1	0.001	1.295	0.001	1.474	0.003	1.339
ausrsalesi	0	-0.001	-0.115	0.004	0.736	0.002	0.500
ausempi	0	-0.005	-0.190	0.014*	1.546	-0.030**	-2.805
ausindusi	0	-0.001*	-2.003	0.001	0.908	-0.002	-1.040
	1	-0.001	-1.083	0.002	1.214	-0.005	-1.399
	2	0.000	0.500	0.005**	2.840	0.000	-0.221
min	---	---	---	---	---	---	---
man	---	-24.431	-0.738	---	---	---	---
uti	---	---	---	---	---	---	---
con	---	---	---	-83.897**	-19.629	---	---
who	---	---	---	-75.745**	-10.381	---	---
ret	---	---	---	-81.053**	-11.666	---	---
rest	---	---	---	-77.517**	-20.886	---	---
tras	---	---	---	-37.674**	-13.729	---	---
rebs	---	---	---	-77.946**	-12.934	---	---
prim	---	---	---	---	---	32.708**	1.760
tert	---	---	---	---	---	-28.928**	-4.547
** significant at 10% critical value, * significant at 15% critical value							
R-squared		0.996		0.994		0.557	
Adjusted R-squared		0.985		0.991		0.456	
S.E. of regression		1.677		2.035		18.149	
Sum squared resid		8.433		124.242		15,810.290	
Durbin-Watson stat		1.863		2.028		0.183	
F-statistic		83.972		340.859		5.494	
Prob (F-statistic)		0.002		0.000		0.000	

Table 9-42

Test of Equality of Regression Coefficients generated from Industry-Specific Subsamples, Industry-Specific Market Structure Model				
	Test	**F-Statistic**	**5% Critical value**	**Probability**
PRIM Sample	Cannot be estimated			
TERT Sample	F(10, 40)	34.266	2.070	0.000
Random Coefficients Model	Cannot be estimated: near singular matrix			
* significant at 5% critical value				

9.4.4 RESULTS

The change in industry-specific real FDI flows had the expected positive effect on industry concentration.[244] Other variables that increased industry concentration were the change in domestic investment flows and industry-specific employment, while industrial disputes reduced industry concentration (Table 9-43). Industry sales were not significant in the model after differencing, but were significantly positive before differencing. All industry dummies – except

[244] The hypothesis that *Δausrfdii* and *Δausrfdii(-1)* are jointly insignificant (i.e. that both coefficients are equal to zero) was rejected at a 10% critical value: F(2,42) = 5.592, Prob = 0.007.

for the one for utilities – had a negative effect on industry concentration compared with the industry concentration for mining, which is the dummy excluded.

Repeating the analysis, but using the change in real FDI stocks instead of real FDI flows, could not substantiate the result of a significantly positive effect on industry concentration. The model using the change in the real FDI stocks had a slightly lower fit (R^2 of 99.5% and adjusted R^2 of 99.3%), indicating that using real FDI flow data were the more appropriate choice.[245] Models using *ausconc2i, ausconc3i* or *ausconc4i* instead of *ausconc1i* were misspecified. The variables *Δausrfdii* and *Δausrfdii(-1)* were positive, but insignificant in all three models. Even the hypothesis that *Δausrfdii* and *Δausrfdii(-1)* were jointly zero was not rejected. In addition, the models had a problem with autocorrelation and were therefore not appropriate specifications of the market structure model.

Table 9-43

Industry-Specific Market Structure Model, Observed and Predicted Effects					
	Short-run effect (current value)		Long-run effect (after 2 lags)		Expected Sign
Δausrfdii	0.000	n.s.	0.001	+	?
Δausrdii	0.000	n.s.	0.001	+	?
ausrsalesi	0.005	n.s.	0.005	n.s.	?
ausempi	0.013	+	0.013	+	?
ausindusi	-0.001	-	-0.002	-	-

9.4.5 CONCLUSIONS

The final analysis of consequences of industry-specific FDI in Australia focused on the effect of FDI on market structure. A model was estimated with industry concentration for the period 1995 to 2001 and a set of explanatory variables including industry-specific FDI, domestic investment, industry sales, employment and industrial disputes and industry dummies, representing capital, market size, risk factors and industry differences. FDI and domestic investment were used in first differences. Other variables such as profitability, interest rate, inflation rate and factors such as economies of scale (measured by scale economies or R&D expenditure) and international influence (measured by industry trade) were insignificant and were thus not included.

The growth in industry-specific real FDI flows had a significantly positive, but small effect on industry concentration, indicating that industry concentration (measured by industry value added by large firms as a percentage of total industry value added) increased as more FDI entered the Australian economy, substantiating the theory that foreign firms are larger than domestic firms and increase industry concentration. Weakening this theory is the finding that

245 The coefficients on *ΔΔausrfdisti* and *ΔΔausrfdisti(-1)* were 0.000 and -0.0001 respectively instead of 0.000 and 0.001 for *Δausrfdii* and *Δausrfdii(-1),* while the hypothesis that *ΔΔausrfdisti* and *ΔΔausrfdisti(-1)* are jointly insignificant was not rejected at a 10% critical value: F(2,41) = 2.206, Prob = 0.123. Using the *Δausrfdisti, Δausrfdisti(-1)* and *Δausrfdisti(-2)* instead of *ΔΔausrfdisti* and *ΔΔausrfdisti(-1)* did not prove to be successful either. The coefficients were 0.000, -0.0001 and 0.0001, but all three were insignificant. The hypothesis that *Δausrfdisti, Δausrfdisti(-1)* and *Δausrfdisti(-2)* are jointly insignificant could not to be rejected at a 10% critical value: F(3,40) = 1.622, Prob = 0.200.

domestic investment growth also has a positive sign on industry concentration. Capital growth in general led to a higher level of industry concentration, possibly owing to large firms dominating investments. Total industry sales increased industry concentration, but the variable was not significant at a 10% or 15% critical value when included in the model after differencing. However, it had a significantly positive effect before differencing, indicating that market size (measured by total industry sales) increased industry concentration. The significantly positive sign on industry employment, which can be used as an alternative indicator of market size, substantiates this theory.

The number of industrial disputes (per thousand employees per year) had a negative effect on industry concentration, indicating that industrial disputes cannot only reflect market risk (which would promote industry concentration), but can also be a reflection of employees having more power, which may reduce the power of large firms and could thus act as a disincentive for large firms, so that they are more dominant in industries with fewer industrial disputes. A positive correlation[246] between the two variables indicated the opposite, i.e. that industries with more industrial disputes are more concentrated, so that there was no clear explanation for the negative sign on industrial disputes. Taking the industry dummies into account, industry concentration of most industries was higher than that of mining (which was the dummy not included). It was the lowest in retail trade and construction, followed by real estate and business service, restaurants and accommodation services and wholesales trade. Industry concentration was only higher in the utilities sector.

Overall, an increase in capital growth (foreign and domestic) and market size (measured by industry sales and employment) increased industry concentration, while a higher number of industrial disputes reduced industry concentration.

[246] The number of industrial disputes and industry concentration appeared to be positively correlated with a correlation coefficient of 0.38.

9.5 CONCLUSIONS

For the second analysis of the consequences of Australian FDI inflows, models with industry-specific annual FDI flow data for the period between 1992 and 2001 were used to analyse the effects of FDI on employment, wages, productivity and market structure. For each model, a set of variables including a combination of capital, market size and structure, labour market conditions and labour characteristics, international influences, risk factors and industry dummies was used to analyse the effects. Panel data analysis was used to estimate the models.

In summary, FDI had a significant and negative effect on employment growth and a significant, positive effect on labour productivity growth, while FDI growth had a significant, negative effect on real wage growth and a significant, positive effect on industry concentration.[247] However, since the estimation equations did not take account of spillover effects due to data limitations, it is unclear how much of these changes is due to direct effects from foreign affiliates and how much is due to indirect effects from local firms or whether opposing effects were at work. For a summary of the four models and the effects that FDI and other variables had on employment growth, wage growth, labour productivity growth and industry concentration see Table 9-44.

The negative effect on employment and wage growth could be explained by foreign firms being more capital-intensive than domestic firms and substituting some labour with capital. Hence, FDI does not increase employment as much as domestic investment – a reason that could explain the slower employment growth. Slower labour demand growth, in turn, has a negative effect on wage growth. In contrast to prediction, FDI did not increase the demand for skilled labour and wages. The effect of FDI on employment growth has not previously been analysed for FDI in Australia, so that the unexpected negative sign on FDI inflows cannot be further explained by previous results. There was also no support for the negative effect of FDI on wage growth. Brash (1966), the ABS (1998) and Bora (1998) found foreign firms to have higher wages than domestic firms – a finding that could not be tested for the type of data used for this analysis, while Fisher et al. (1998) claimed that a reduction of FDI would lead to a reduction of wages in general. The negative effect of FDI on employment growth and wage growth could not be supported by international studies. Studies analysed the effects of FDI on employment and wages, not employment growth and wage growth, and only positive effects were observed. The Department of Trade and Industry (1995) found FDI to create direct and indirect jobs, while Aitken et al. (1995) and Figlio and Blonigen (2000) found FDI to have a positive effect on industry-specific average wages. Lipsey (1994), Feliciano and Lipsey (1999), Griffith and Simpson (2001), Lipsey and Sjöholm (2003), Conyon et al. (2003) and Driffield and Girma (2003) found foreign firms to have higher wages than domestic firms.

---

[247] Before differencing, FDI (instead of FDI growth) was found to have a significantly positive effect (0.442) on real wages (instead of real wage growth) and a significantly positive effect (0.080) on industry concentration.

Table 9-44

Analysis of Consequences of Industry-Specific FDI in Australia – Summary of the Effects of FDI and other Variables on Employment Growth, Wage Growth, Labour Productivity Growth and Industry Concentration				
FDI	***Δausempi***	***Δausrwages11i***	***Δauslp1i***	***ausconc1i***
ausrfdii	negative (-0.006)	---	positive (1.068)	---
Δausrfdii	---	negative (-0.160)	---	positive (0.001)
Other Capital				
Δausrdii	---	---	---	positive (0.001)
ΔΔausrdii	negative (-0.001)	---	---	---
auskli	---	---	positive (5.279)	
Market Size and Structure				
ausrgdpi	---	---	negative (-0.063)	---
Δausrgdpi	positive (0.003)	positive (0.443)	---	---
ausrsalesi	---	---	---	not significant (0.005)
ausempi	---	---	---	positive (0.013)
Δausempi	---	negative (-44.080)	---	---
Δausprofmargi	positive (2.831)	---	---	---
aussfirmsi	---	---	positive (105.099)	---
Labour Market Conditions and Labour Characteristics				
Δausrwages11i	negative (-0.002)	---	---	---
Δauslp1i	negative (-0.001)	---	---	---
Δauslp2i	---	positive (281.640)	---	---
auslq1i	---	---	negative (-96.551)	---
ausfemi	---	positive (3169.870)	---	---
International Influences				
ausopeni	---	---	positive (11.158)	---
Risk Factors				
ausinr	positive (3.946)	---	negative (-311.035)	---
ausinf	positive (4.194)	negative (-185.388)	---	---
ausindusi	---	positive (0.422)	---	negative (-0.002)
Δausindusi	---	---	positive (2.933)	---
Other Factors				
Industry Dummies	agr: negative, rebs: positive (other industries: basis)	---	---	man, con, who, ret, rest, tras, rebs: negative uti: positive (min: basis)

Furthermore, owing to the capital intensity of production in foreign affiliates, FDI increased labour productivity growth. It could also be that foreign affiliates use more up-to-date technology or efficient management practices. So FDI and foreign firms tend to increase the performance in the economy as a whole – this argument works well with the observation of the positive effect of quarterly on GDP growth found in Chapter 8. It remains unclear, however, whether labour productivity growth is higher owing to the foreign firms only or whether there are spillover effects on Australian firms. While the effect of FDI on labour productivity growth has not previously been analysed for Australia, there have been several studies looking at the effect of FDI on labour productivity. Brash (1966) and Bora (1998) found foreign firms to be more productive than domestic firms, while Fisher et al. (1998) argued that a reduction of FDI would lead to a reduction of labour productivity. Caves (1974) found evidence for positive technology spillovers through FDI. Hence, the finding of a positive effect of FDI on labour productivity growth appears to be a reasonable result and in line with previous findings. Looking at econometric studies analysing the consequences of FDI internationally, the finding of a positive effect of FDI on industry concentration finds support. Blomström (1986) and Blomström and Wolff (1993) found FDI to have a positive effect on labour productivity growth, while Globerman (1979), Kokko (1994) and Conyon et al. (1999) found evidence for higher productivity in foreign affiliates.

The positive effect of FDI on industry concentration indicates that foreign firms tend to be larger than domestic firms and thus increase industry concentration. Weakening this theory is the finding that domestic investment growth also has a positive sign on industry concentration. Hence, capital growth in general led to a higher level of industry concentration, possibly due to large firms dominating investments. The effect of FDI on industry concentration has not previously been analysed for Australia, so that the result of a positive effect cannot be further supported by previous results. In international econometric studies, the positive effect of FDI on industry concentration was in line with results by Rosenbluth (1970) and Wilmore (1976), but in contrast to the negative link found by Evans (1977) and Driffield (2001).

Comparing these results with previous econometric studies analysing the consequences of FDI in Australia shows that FDI has a wider range of consequences than previously assumed. It has been shown in this study that employment growth, wage growth, labour productivity growth and industry concentration were affected by Australian FDI. None of the previous studies has analysed all the consequences investigated in this study, so in this study an important contribution has been made by providing a more complete picture of FDI in Australia. Moreover, the study is based on more recent and previously unexplored datasets. Overall, the results on labour productivity growth and industry concentration were more in line with international studies than with other Australian results, while the effects on employment growth and wage growth could not be supported by previous Australian or international studies.

CHAPTER 10

CONCLUSIONS

In this thesis, answers to two broad set of questions have been sought: First, what are the determinants of FDI in Australia; how can Australia attract FDI; which factors discourage it; and how do the determinants of Australian FDI compare with those of other countries? Second, what are the effects of FDI in Australia; are benefits and opportunities likely to outweigh risks and dangers; and how do the consequences of Australian FDI compare with those of other countries?

The study has made use of previously unexplored datasets and has provided novel and somewhat surprising answers to those questions. Section 10.1 gives a short summary of the motivation and aim of the thesis. The main findings and conclusions concerning the determinants of FDI in Australia (Part I) and the consequences of FDI in Australia (Part II) will be discussed in Section 10.2. Section 10.3 discusses policy implications, while Section 10.4 makes suggestions for further research.

10.1 THE MOTIVATION AND THE AIM OF THE THESIS

Increased globalisation over the last two decades has led to strong growth of international business activity and FDI. This has led to extensive research on the determinants and consequences of FDI. Despite the considerable amount of research that has been undertaken, Australia – the second largest net importer of FDI in the developed world – represents a country with a substantial share of foreign ownership whose FDI experience has been largely overlooked in terms of a comprehensive economic analysis. Although Australia's FDI stock was worth US$ 111.1 billion in 2001, the twelfth largest in the world, and Australia ranked tenth in the world in terms of most attractive investment destination, empirical work on FDI and its determinants and consequences is still limited.

The purpose of this analysis was to determine what has caused Australia's volatile FDI experience, which factors have determined FDI inflows into Australia, and what have been the welfare implications of FDI inflows on the Australian economy. To analyse those questions, new and previously unused data on quarterly, country-specific, industry-specific and form-specific FDI in Australia have been explored. A further contribution of the thesis is the search for new FDI data by bringing together and analysing datasets provided by the ABS and those provided by other statistical agencies (from the US, the UK, Japan and Germany). A detailed description of the data on FDI in Australia was given in Chapter 2 since no such comprehensive summary has been available for Australia. It may therefore contribute to the better understanding of the Australian FDI experience.

10.2 MAIN FINDINGS AND CONCLUSIONS

10.2.1 PART I

The first part of the analysis of FDI in Australia focused on the determinants of FDI, for which five kinds of datasets were analysed (aggregate quarterly data, country-specific annual data, industry-specific annual data, country- and industry-specific data and US form-specific data). Although a wide range of datasets were used, results were limited by the fact that most of the series started at 1985 or later (due to changes in the FDI definition in 1985), which made the analysis of the effect of reforms in the 1980s impossible. Nevertheless, a number of important issues emerged from this analysis of the determinants of FDI in Australia.

First, FDI cannot be explained by one single FDI theory, but by a variety of theoretical models. The different approaches do not necessarily replace each other, but explain different aspects of the same phenomenon. As expected from the discussion of the theoretical models, FDI in Australia could be explained by factors based on a combination of different theories, including ownership advantages, market size and characteristics, factor costs, transport costs and protection, risk factors and policy variables. Estimation results did not show clear support for any of the eight theoretical models discussed.[248]

Second, FDI decisions – unlike portfolio investment decisions – are predominantly driven by longer-term considerations. Most explanatory variables in the quarterly FDI model were insignificant in the time period when the investment was made, but were significant for up to five quarterly lags. Annual data were significant for up to three annual lags, though most variables were also significant in the time period when the investment was made, suggesting that most

[248] The eight theoretical models included: (1) the Neoclassical Trade Theory and the Heckscher-Ohlin model, (2) ownership advantages as determinants of FDI, (3) Dunning's OLI framework, (4) the horizontal FDI model, (5) the vertical FDI model, (6) Knowledge-Capital Model, (7) Diversified FDI and the risk diversification model and (8) policy variables as determinants of FDI.

investment decisions take into account the economic environment in the year of the investment, but not in the quarter of the investment – though longer-term factors also mattered.

Third, investment decisions depend on factors such as investment origin, the industry in which the investment takes place and the form of the investment, making aggregation often inappropriate, as important determinants get blurred through aggregation. However, when data are disaggregated in ever smaller sets, the overall picture of FDI gets lost. After all, every single investment project may be affected by a unique set of determinants. The use of quarterly aggregate data worked surprisingly well in explaining FDI, while disaggregating the data revealed the complexity of the issue and models had a somewhat lower explanatory power. The problem of aggregation also shows that the analysis of FDI in an individual country is important, as analysing FDI in a panel of multiple countries adds another level of disturbance. Results may differ substantially from country to country, a result that cross-country studies may hide, as they force results into one single structure.

Comparing the results from Chapter 5 with the ones from Chapter 4, some variables seemed to contribute significantly to the variation of all forms of FDI (for an overview see Table 5-60), while others were only significant in some of the models. Overall, Australian FDI was driven by economic growth and market size, wages and labour supply (though the signs varied across models), trade and openness (though customs duties encouraged Japanese industry-specific FDI), interest rates, exchange rate appreciation, inflation rate (which had a unexpected positive effect) and the investing country's overall FDI outflows. Corporate tax rates were only significant in the quarterly FDI model, but they had an unpredicted positive sign (Table 10-1).

Table 10-1

Determinants of FDI in Australia – Results from the Quarterly FDI Equation, the Country-Specific FDI Equation and the Industry-Specific FDI Equation

	Quarterly FDI *(ausrfdi)*	**Country-Specific FDI *(ausrfdic)***	**Industry-Specific FDI**				
			From All Countries *(ausrfdii)*	**From the US *(rfdiius)***	**From the UK *(rfdiiuk)***	**From Japan *(rfdiijp)***	**From Germany *(rfdiide)***
Market Size	*Δausrgdp: +*	*ausrgdp: -*	*ausempi: +*	*ΔΔausrgdpi :+*	n.s.	*ausempi:-*	*ausrgdpi: +* *ausempi: +*
Factor costs	*Δausrwages22:-* *ausjobvac: -*	*ausrwages11:-*	*ausrwages1l: +*	*ausrwages1i:+*	*ausuer: +*	*ausrwages1i:-* *ausjobvac:+*	*ausrwages11 : -*
Transport Costs & Protection	*ausopen: +*	*rimpoc:+* *Δrexpoc: -*	*ausopen: +*	*rimpous: +*	n.s.	*auscdut: +*	*ausrimpo:-*
Risk Factors	*ausbb30: +* *Δexrus: +* *ausinf: +*	*ΔΔinrdifc:-* *austwi:+* *ausinf:+*	*exrus: +* *Δausinf: +*	n.s.	*inrdifuk:-* *relinfuk: -* *ausindusi: +*	*Δexrvoljp: -*	*Δexrde:+* *relinfde: -*
Policy Variables	*austax: +*	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Other Factors	---	*Δoutrfdi +* *eng +*	n.s.	*outrfdius:-*	*outrfdiuk: +*	n.s.	n.s.

n.s.: not significant and therefore not included in the model

Hence models including a combination of market size, factor costs, transport costs and protection, risk factors, policy variables and other factors were appropriate representations of the data generating process of Australian FDI inflows. In contrast, separate models with FDI determinants from alternative theories are not sufficient in explaining industry-specific FDI and lead to misspecification due to missing variables. Aggregate variables, risk variables, policy variables, the horizontal FDI, vertical FDI or Knowledge-Capital Model analysed individually did not perform well in explaining the variation in country-specific or industry-specific FDI (Chapters 4.2.5 and 5.4).

Industry-specific GDP, employment and real wages, Australian customs duties and US FDI outflows are potentially important variables affecting different forms of US FDI flows (including total, horizontal, vertical and export platform FDI and vertical integration) in Australia, while industry-specific GDP and employment, plant- and firm-level scale economies and the share of service sales relative to other sales are potentially important variables in terms of having an effect on the intensity of vertical MNEs. However, both models proved to be of only limited adequacy owing to problems with autocorrelation and misspecification. It seemed as though FDI was determined by different factors and is not a homogeneous variable (i.e. it is only an aggregation of all the individual investment decisions made by numerous MNEs, which may differ significantly).

Factors that were not significant in any of the models were Asia-Pacific market size, market size differential or relative markets size (of Home and Host) and combined markets size (Home and Host), Australian labour productivity, Australian skill endowment or relative skill endowment (of Home and Host), OECD GDP and FDI inflows in the Asia-Pacific region. Variables that had unexpected effects were corporate tax rate (with a positive effect in the quarterly FDI model), inflation rate (with a positive effect in the quarterly and country-specific FDI model), real wages (with a positive effect in some of the industry-specific FDI models), exchange rate and exchange rate appreciation (with a positive effect in the quarterly, country-specific and some of the industry-specific FDI models), industrial disputes (with a positive effect in one of the industry-specific FDI model) and Home FDI outflows (with a negative effect in one of the industry-specific FDI models). While some of those effects were supported by other empirical studies, the signs on inflation rate and outward FDI are unique results.

Comparing these results with previous econometric studies analysing the determinants of FDI in Australia (Chapter 3.2) shows that FDI should be explained by a wider set of determinants than previously assumed. In this study it has been shown that a combination of market size, factor costs, transport costs and protection, risk factors, policy variables and other factors performs well in explaining Australian FDI inflows. None of the previous studies has analysed the full set of these determinants, so this study makes a contribution by providing a more complete picture of FDI in Australia. Some of the limitations of previous studies have been overcome in this study using more recent and previously unexplored datasets. In terms of the signs and significance of the determinants analysed, many results from previous studies have been supported by this study (such the effects of openness, customs duties, interest rates, exchange rate appreciation and volatility and industrial disputes on FDI), while in this study significance has been given to some determinants that were previously insignificant or of an unexpected sign (such as market size and growth, wages and wage growth, inflation and corporate tax rates).

When comparing the results from this study with previous econometric studies analysing the determinants of FDI internationally (Chapter 3.1), it seems that the variables with expected signs are generally in line with those in previous research. In terms of the effects of economic growth, market size, wages, labour supply, openness, customs duties and interest rates, Australia is in line with international results. Of the unexpected effects, the positive effect of the corporate tax rate, the negative effect of wages, the positive effect of exchange rate (appreciation) and the positive effect of industrial disputes found support in previous empirical studies (though not in the majority of studies), while the signs on inflation rate and outward FDI could neither be supported by Australian nor by international studies. Overall, the unexpected results were more in line with previous Australian studies than with international results.

10.2.1 PART II

The second part of the analysis of FDI in Australia focused on consequences of FDI, for which two kinds of datasets were used (aggregate quarterly data and industry-specific annual data). A number of important issues emerged from the analysis of consequences of FDI in Australia.

Looking at quarterly FDI inflows in Australia (Chapter 8), the long-term effects of an increase in FDI were an increase in domestic investment growth, GDP growth and FDI itself, but also a reduction in export growth (Table 10-2). Through its effect on GDP growth, FDI also led to an increase in import growth. Taking indirect effects into account, FDI led to GDP growth, leading to increased domestic investment growth, GDP growth, import growth and FDI, but to reduced export growth.

Table 10-2

Consequences of FDI in Australia – Results from the Quarterly FDI Equation and the Industry-Specific FDI Equation

FDI	(Direct Long-Run) Effect on							
	GDP	Imports	Exports	Domestic Investment	Employment	Wages	Labour Productivity	Market Structure
ausrfdi	*Δausrgdp:* +	n.s.	*Δausrexpo:* -	*Δausrdi:* +	---	---	---	---
ausrfdii	---	---	---	---	*Δausempi:* -	---	*Δauslp1i:* +	---
Δausrfdii	---	---	---	---	---	*Δausrwages11i:* -	---	*ausconc1i:* +

n.s.: not significant, ---: not included in the model

The findings of positive effects on economic growth and, to some degree, domestic investment support the Australian government's view that FDI is a favourable source of capital for the Australian economy. However, the claim that FDI is favourable for Australia's balance-of-payments position could not be supported by this econometric analysis. FDI did not have a positive effect on Australian exports and did not reduce imports. The contrary was observed, a claim that went well with the results from the ABS (2004b) report, in which foreign-owned firms were found to increase the Australian trade deficit. Hence, such an important issue should be analysed in more detail and not judged by case studies alone.

Looking at industry-specific FDI inflows in Australia (Chapter 9), FDI had significant effects on employment growth (negative) and labour productivity growth (positive), while FDI growth had significant effects on real wage growth (negative) and industry concentration (positive) (Table 10-2).[249] The negative effect on employment and wage growth indicates that foreign firms are more capital-intensive than domestic firms and substitute some labour with capital. Owing to the capital intensity of production in foreign affiliates, FDI has a positive effect on labour productivity growth, so that FDI and foreign firms seem to increase the economy's performance. The positive effect of FDI on industry concentration indicates that foreign firms tend to be larger than domestic firms and thus increase industry concentration or reduce competition.

Comparing these results with previous econometric studies analysing the determinants of FDI in Australia (Chapter 7.2) shows that positive effects of FDI on GDP growth and labour productivity growth were in line with previous Australian studies, while the effects on import growth, domestic investment growth and industrial concentration are effects that have not previously been analysed for the case of Australia. The negative effects of FDI on export growth, employment growth and wage growth were not in contrast to previous studies.

When comparing the results from this study with previous econometric studies analysing the consequences of FDI internationally (Chapter 7.1), it seems that the effects in this study of FDI on GDP growth (positive), import growth (insignificant), domestic investment growth (positive), labour productivity growth (positive) and industrial concentration (positive) are in line with the results of international studies, while the negative effects of FDI on export growth, employment growth and wage growth were in contrast to previous studies.

10.3 Policy Implications

While FDI can have many positive effects, the actual consequences vary according to the motives for, and the form of, FDI undertaken, the economic environment and the strategies and policies pursued by the Host government.[250] While some case studies indicate that FDI has led to welfare benefits ranging from employment and export creation to the provision of cheaper, better goods and services, this may not be true for Australian FDI and the economy overall. Hence, policy makers should be cautious about making easy generalisations about the economic and social consequences of FDI.

If Australia wants to attract FDI without losing sight of the ultimate objective that FDI is meant to serve, i.e. increasing the country's welfare, it is important that the government or IPAs not only attract FDI, but that they also pay more attention to enhancing the positive effects from such investment. Considering the results from Chapter 8 (i.e. that FDI has led to a reduction in export growth and (through its effect on GDP growth) and increase in import growth) and

[249] Before differencing, FDI (instead of FDI growth) was found to have a significantly positive effect (0.442) on real wages (instead of real wage growth) and a significantly positive effect (0.080) on industry concentration.
[250] Dunning (2005)

Australia's balance of payments deficit, this could mean, for instance, that IPAs should focus on attracting export-oriented or import-substituting FDI, rather than FDI in general, as most of Australia's current inward FDI is mainly market-oriented with little focus on exports (despite some individual projects indicating the opposite). However, this issue deserves further analysis. In addition, the government should perhaps not only get involved in how to attract firms (investment attraction), in how to make firms stay and in how to make them expand (aftercare), but also in how to get the best possible outcome from established and future foreign affiliates (observation, direction and improved targeting of future FDI), i.e. IPAs may need to pay more attention to enhancing the positive effect of such investment. Yet, the issue of whether governments should get more involved in FDI projects is another matter and should be explored in more detail.[251] In order to maximise the positive welfare effects from FDI, FDI needs to be better understood and better data are a necessity in improving this understanding, since any detailed analysis is limited by data availability.

Australia should also have a clearer long-term strategy in relation to FDI. The long-term goal is currently unclear – apart from the fact that Australia tries to attract investors through investment promotion and increased openness of the economy. Free trade agreements are signed without stating in detail what are likely to be the expected welfare effects through increased FDI from particular countries. Concluding that increased investment is generally good is dangerous and lacks economic foundation. Not the quantity of FDI matters, but the quality and the latter needs to be better understood. However, Australia is not alone in assuming that more FDI is better. Many countries place too much store on FDI and forget that it is only a complement to domestic investment or perhaps a catalyst, but no magic cure. Countries with expectations that are too high are only certain to be disappointed and disillusioned.[252] It should not only matter how much investment enters the economy, how many jobs and how much output is created, but also how FDI affects the economy in general, including general welfare, taxes, GDP, direct investment, trade, overall employment, wages, technology and productivity and market structure. Effects on the environment and on society may be considered as well. Whether FDI is beneficial also depends on how local networks interact with international networks in the process of economic growth and development, i.e. whether firms cooperate or compete.[253]

In terms of future investment, according to Andersson (2005), smaller countries (such as Australia) may have an opportunity to attract technology-intensive operations, since limited market size is less important than greater openness and readiness to accept entry by newcomers, low trade and investment barriers, structural reforms, and a strong existing scientific and industrial base. Countries are only able win the fierce competition for FDI by being a step ahead – through faster implementation of relevant and effective policies in regard to evolving market needs.[254] Sauvant (2005) suggests that developed countries need to focus on

---

[251] Sauvant (2005)
[252] Sauvant (2005)
[253] Cantwell (2005)
[254] Andersson (2005)

new investment sources, smaller- to medium-sized enterprises and niche FDI for new FDI opportunities.

10.4 Implications for Further Research

In this section some suggestions are offered for future research concerning FDI in Australia. Three main areas for further research emerge: analysis that is based on better data, future analysis that takes the changing conditions into account and analysis that focuses on particular forms of FDI.

First, better data and longer time periods are needed. While this study makes a major contribution in terms of understanding determinants and consequences of FDI, the analysis is only as good as the data on which it is based. While the need for better data is obvious for most areas of economic research, the issue here is that it needs to be possible to analyse Australian FDI using data of internationally comparable quality. There should not be any reason why data on manufacturing industries are not available in a disaggregated form or why data on FDI in different states or regions are not available. Those data are essential to better analyse the determinants (including the links to the state-specific investment attraction programs) and consequences of FDI. The need for longer time periods arises because the Australian definition of FDI changed in 1985, and no data from before that time period can be used for comparison. Other (country- and industry-specific) datasets are only available from 1992 onwards, which makes testing for changes in the determinants and consequences of FDI over time or the long-term effects, impossible. Better data and more information on foreign affiliates in Australia are also needed. Details that could be important are related to where foreign affiliates locate, whether they dominate certain industries, how much they invest over time, how employment and output/sales are affected, how profitable foreign affiliates are and how much foreign affiliates import, export and invest in R&D. Getting a better understanding of foreign affiliates from different countries in Australia also helps to target future investors. The surveys conducted by the ABS are first steps in the correct direction.

Second, conditions affecting FDI are expected to change significantly in the future. Relevant issues are the changing composition of FDI and the move towards more FDI in services (in Australia and globally), the increased competition for FDI from developing countries in general and economies in the Asia-Pacific region in particular, the emergence of new investment sources and Australia's recent move towards signing free trade agreements with various countries including the US and China (an analysis on the effects of a free trade agreement with the US, for instance, seems promising given the detailed data that are collected by the US). Hence, the analysis needs to be repeated in the future taking those changing conditions into account.

For international and Australian FDI, the size and stability of FDI inflows and their sectoral and geographical composition are expected to change. FDI in services is expected to increase in importance. While the fragmentation of the production of goods was until now seen as a typical type of FDI, the fragmentation in the production of services is expected to become more important than that of goods.[255] There is also a trend towards more global strategic alliances, the use of venture capital and private equity fund investments as a new form of quasi-FDI.[256] Globalisation is no longer limited to mature, large corporations, but younger and small- to medium-sized enterprises are becoming more engaged. Small- and medium-sized enterprises tend to be more tied than large firms to local resources and capabilities, are affected by globalisation in other ways, and encounter special risks. However, industrial performance is now less based on plant-level scale economies, but increasingly fuelled by networking capacity and flexibility.[257] Currently, consequences of FDI in service industries and FDI by small and medium-sized enterprises are still unclear and better data are needed to gain a better understanding of the determinants.[258]

In recent years, there has been a strong increase in FDI inflows to developing countries (in particular China, India and other East Asian economies) and Central and Eastern Europe, while developed countries have experienced a reduction in FDI inflows.[259] Hence, Australia is set to experience stronger competition from the Asia-Pacific region when trying to attract FDI. Developing countries have also started to become more important as sources of FDI. Firms in Brazil, Russia, India and China in particular, are expected to join countries such as Chile, Mexico, Malaysia and Singapore to become significant players in the world FDI market.[260] Australia has become increasingly active on free trade agreements and has embarked on a range of free trade agreement negotiations with key trading partners. It entered free trade agreements with New Zealand (in 1966), Singapore (in 2003), the US (in 2004) and Thailand (in 2004) and currently is negotiating free trade agreements or is establishing framework agreements with ASEAN, China, Malaysia, Japan and the United Arab Emirates.[261] Based on those trends, the Australian FDI experience is expected to change. Future research will need to analyse this change and explore how it affects the outcomes identified in this study.

Third, as indicated in Chapter 6, the determinants (and potentially consequences) of FDI are dependent on the form of FDI. In order to explore which combination of variables should be used to best explain the different FDI forms (vertical FDI, horizontal FDI, export-platform FDI, total FDI and vertical integration), distribution- versus market-oriented FDI or vertical MNE intensity, a more detailed analysis should be carried out, going through each case individually. An interesting application is again the recently signed free trade agreement between Australia and the US: while the free trade agreement is expected to be beneficial for US FDI flows into

[255] Sauvant (2005)
[256] Stopford (2005)
[257] Andersson (2005)
[258] Andersson (2005)
[259] UNCTAD (2005)
[260] Stopford (2005), Von Zedtwitz (2005) and Sauvant (2005)
[261] www.dfat.gov.au/trade/ (as of 30.09.2005)

Australia, a better analysis should look at whether it is beneficial for all kinds of industry-specific FDI or for all FDI forms or whether it affects the FDI composition, being more beneficial for some FDI forms or FDI in some industries than for others. This in turn should be contrasted with which industries or forms of FDI are preferable, so that appropriate investment attraction strategies can be introduced. Furthermore, determinants and consequences may differ depending on whether FDI is greenfield investment, expansion or re-investment or investment as part of a merger or acquisition. While this could not be explored due to the current lack of data, this research question should be analysed in the future.

Even with some of the limitations of this study, a better understanding of FDI in Australia has been provided and the determinants and consequences of different types of FDI flows in Australia based on a combination of different theoretical models have been explained. Overall, the approach has proved to be useful and it offers further potential.

REFERENCES

A.T. Kearney and Global Business Policy Council. 2002. *FDI Confidence Index*, vol. 5, September, Alexandria, VA: A.T. Kearney.

Agarwal, J.P. 1980. Determinants of Foreign Direct Investment: A Survey. *Weltwirtschaftliches Archiv*, vol.106, pp.739-773.

Agosín, M. and R. Mayer. 2000. Foreign Investment in Developing Countries: Does it Crowd In Domestic Investment? *UNCTAD Discussion Paper 146*. Geneva: United Nations Publication.

Aharoni, Y. 1966. *The Foreign Investment Decision Process.* Boston: Harvard University Press.

Aitken, B. and A. Harrison. 1999. Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela. *American Economic Review*, vol.89, pp.605-618.

Aitken, B., A. Harrison and R.E. Lipsey. 1995. Wages and Foreign Ownership: A Comparative Study of Mexico, Venezuela, and the United States. *NBER Working Paper 5102*. Cambridge, MA: National Bureau of Economic Research.

Aitken, B., G.H. Hanson and A.E. Harrison. 1997. Spillovers, Foreign Investment and Export Behaviour. *Journal of International Economics*, vol.43, pp.103-132.

Alfaro, L., A. Chanda, S. Kalemil-Ozcan and S. Sayek. 2001. FDI and Economic Growth: The Role of Local Financial Markets. *University of Houston Working Papers*.

Aliber, R.Z. 1970. A Theory of Direct Foreign Investment. In C. Kindleberger (ed.) *The International Corporation*. Cambridge, MA: MIT Press.

Andersson, T. 2005. Coping Skills. In: Passow, S. and M. Runnbeck (eds.). 2005. *What's Next? Strategic Views on Foreign Direct Investment.* ISA in cooperation with UNCTAD and WAIPA, p.24-31. www.isa.se/upload/english/Publications/What's%20Next%20ENG.pdf

Andrews, M. 1972. *A Survey of American Investment in Irish Industry.* Seniro honors thesis, Harvard College.

Athreye, S. and S. Kapur. 2003. Industrial Concentration in a Liberalising Economy: A Study of Indian Manufacturing. *Birkbeck University of London, Working Papers in Economics & Finance No. 05/03.* London: Birkbeck University, School of Economics, Mathematics & Statistics. www.econ.bbk.ac.uk/wp/ewp/concentration_dec03.pdf

Australian Bureau of Statistics (ABS). 1998. *Small and Medium Enterprises: Business Growth and Performance*. ABS Cat. No 8141.0, 1996-1997. Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics (ABS). 2000. *Balance of Payments & International Investment Position, Australia*. ABS Cat. No 5302.0, Dec. 2000. Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics (ABS). 2004a. *Economic Activity of Foreign Owned Businesses in Australia*. ABS Cat. No 5494.0 2000-2001. Canberra: Australian Bureau of Statistics.

Australian Bureau of Statistics (ABS). 2004b. *Foreign Ownership of Australian Exporters and Importers*. ABS Cat. No 5496.0.55.001, 2002-2003. Canberra: Australian Bureau of Statistics.

Bajo-Rubio, O. and S. Sosvilla-Rivero. 1994. An Econometric Analysis of Foreign Direct Investment in Spain, 1964-89. *Southern Economic Journal*, vol.61, pp.104-120.

Balasubramanayam, V.N., M. Salisu and D. Sapsford. 1996. Foreign Direct Investment and Growth in EP and IS Countries. *The Economic Journal,* vol.106, pp.92-105.

Banerjee, A., J.J. Dolado, J.W. Galbraith and D.F. Hendry. 1986. Exploring Equilibrium Relationships in Econometrics through Static Models: Some Monte Carlo Evidence. *Oxford Bulletin of Economics and Statistics*, vol.48, pp.253-277.

Banerjee, A., J.J. Dolado, J.W. Galbraith and D.F. Hendry. 1993. *Cointegration, Error Correction and the Econometric Analysis of Nonstationary Data.* Oxford: Oxford University Press.

Barrell, R. and N. Pain. 1996. An Econometric Analysis of US Foreign Direct Investment. *Review of Economics and Statistics*, vol. 78, pp.200-207.

Barrios, S., H. Görg and E. Strobl. 2004. Foreign Direct Investment, Competition and Industiral Development in the Host Country. *GEP Research Paper 2004/06.* University of Nottingham, Leverhulme Centre for Research on Globalisation and Economic Policy.

Barro, R.J. [5]2000. *Macroeconomics.* Cambridge, Massachusetts: The MIT Press.

Barros, P.P. and L.M.B. Cabral. 2001. Government Subsidies to Foreign Direct Investment. *CEPR Working Paper*, February.

Barry, F. and J. Bradley. 1997. FDI and Trade: the Irish Host-Country Experience. *Economic Journal*, vol.107, pp.1798-1811.

Bartelsman, D.J. and H.L.F. de Groot. 2004. *Integrating Evidence on the Determinants of Productivity.* www.pc.gov.au/commission/work/productivity/conferences/pp2004/presentations/bartelsman1/bartelsman12.pdf

Basi, R.S. 1966. *Determinants of US Direct Investment in Foreign Countries.* Kent University Press.

Baumann, H.G. 1975. Merger Theory, Property Rights, and the Pattern of U.S. Direct Investment in Canada. *Weltwirtschafltiches Archiv*, vol.111, pp.676-698.

Behrman, J. 1962. Foreign Associates and their Financing. In: R. Mikesell (ed.). *US Private and Government Investment Abroad.* Oregon University Press.

Bénassy-Quéré, A., L. Fontagné and A. Lahrèche-Révil. 2001a. Foreign Direct Investment and Company Taxation in Europe. *Economics Working Papers No. 004.* Brussels: European Network of Economic Polity Research Institutes.

Bénassy-Quéré, A., L. Fontagné and A. Lahrèche-Révil. 2001b. Tax Competition and Foreign Direct Investment. *CEPII Working Paper*, Paris: CEPII research center. http://team.univ-paris1.fr/trombi/fontagne/papers/Taxcompet.pdf

Bhagwati, J.N. 1994. Free Trade: Old and New Challenges. *Economic Journal,* vol.104, pp.231-246.

Bhattacharya, M. 2002. Industrial Concentration and Competition in Malaysian Manufacturing. *Applied Economics,* vol.34, pp.2127-2134.

Bhaumik, S.K., S. Estrin and K. Meyer. 2004. Growth at MNEs: Evidence from Egypt, India, South Africa and Vietnam. *IZA Discussion Paper No. 1272.* Bonn: Forschungsinstitut zur Zukunft der Arbeit – Institute for the Study of Labour (IZA).

Biswas, R. 2002. Determinants of Foreign Direct Investment. *Review of Development Economics*, vol.6, pp.492-504.

Black, D.A. and W.H. Hoyt. 1989. Bidding for Firms. *American Economic Review*, vol.79, pp.1249-1256.

Blomström, M. 1986. Foreign Investment and Productive Efficiency: The Case of Mexico. *Journal of Industrial Economics*, vol. 15, pp.97-110.

Blomström, M. and E.N. Wolff. 1993. Growth in a Dual Economy. *NBER Working Paper 4433*. Cambridge, MA: National Bureau of Economic Research.

Blomström, M. and H. Persson. 1983. Foreign Investment and Spillover Efficiency in an Underdeveloped Economy: Evidence from the Mexican Manufacturing Industry. *World Development*, vol.11, pp.493-501.

Blomström, M. and R.E. Lipsey. 1986. Firm Size and Foreign Direct Investment. *NBER Working Paper 2092*. Cambridge, MA: National Bureau of Economic Research.

Blomström, M., R. Lipsey and M. Zejan. 1994. What Explains Developing Country Growth? *NBER Working Paper 4132*. Cambridge, MA: National Bureau of Economic Research.

Blonigen, B.A. 1997. Firm-Specific Assets and the Link between Exchange Rates and Foreign Direct Investment. *American Economic Review*, vol.87, pp.467-465.

Blonigen, B.A. and M.J. Slaughter. 2001. Foreign-Affiliate Activity and US Skill Upgrading. *Review of Econmics and Statistics,* vol.83, pp.362-376.

Blonigen, B.A., R.B. Davies and K. Head. 2002. Estimating the Knowledge-Capital Model of the Multinational Enterprise: Comment. *NBER Working Paper 8929.* Cambridge, MA: National Bureau of Economic Research.

Bond, E. and L. Samuelson. 1986. Tax Holidays as Signals. *American Economic Review*, vol.76, pp.820-826.

Bora, B. 1998. *Characteristics and Behaviour of Multinationals in Australia.* Flinders University, Adelaide.

Bora, B. 2002. FDI and the Environment – The Link between FDI and the Environment. In: B. Bora (ed.). *Foreign Direct Investment – Research Issues.* London and New York: Routledge, ch.13, pp.211-229.

Borensztein, E., J. de Gregorio and L.-W. Lee. 1998. How does Foreign Investment affect Economic Growth? *Journal of International Economics*, vol. 45, pp. 115-135.

Bosworth, P., S.M. Collins and C.M. Reinhart. 1999. Capital Flows to Developing Economies: Implications for Saving and Investment. *Brookings Papers on Economic Activit*y, vol.1999, pp.143-169.

Braconier, H., P-J. Norbaek and D. Urban. 2002. Vertical FDI Revisited. *IUI Working Paper 579.* Stockholm: The Research Institute for Industrial Economics.

Brainard, S.L. 1993a. A Simple Theory of Multinational Corporations and Trade with a Trade-off between Proximity and Concentration. *NBER Working Paper 4269*. Cambridge, MA: National Bureau of Economic Research.

Brainard, S.L. 1993b. An Empirical Assessment of the Factor Proportions Explanation of Multinationals Sales. *NBER Working Paper 4580*. Cambridge, MA: National Bureau of Economic Research.

Brainard, S.L. 1993c. An Empirical Assessment of the Proximity-Concentration Tradeoff between Multinational Sales and Trade. *NBER Working Paper 4583*. Cambridge, MA: National Bureau of Economic Research.

Brainard, S.L. 1997. An Empirical Assessment of the Proximity-Concentration Trade-off between Multinational Sales and Trade. *American Economic Review*, vol.87, pp.520-544.

Brander, J. and B. Spencer. 1987. Foreign Direct Investment with Unemployment and Endogenous Taxes and Tariffs. *Journal of International Economics*, vol.22, pp.257-279.

Branstetter, L. 2000. Is Foreign Direct Investment a Channel of Knowledge Spillovers? Evidence from Japan's FDI in the United States. *NBER Working Paper 8015.* Cambridge, MA: National Bureau of Economic Research.

Brash, D.T. 1966. *American Investment in Australian Industry*. Canberra: Australian University Press.

Buckley, P.J. 1985. New Forms of International Industrial Co-operation. In: P.J. Buckley and M. Casson (eds.). *The Economic Theory of the Multinational Enterprise.* London: Macmillan, pp.39-59.

Buckley, P.J. and A.M. Mathew. 1979. The Motivation for Recent First Time Direct Investments in Australia by UK Firms. *Management International Review*, vol.19, p.57.

Buckley, P.J. and M. Casson. 1976. *The Future of the Multinational Enterprise.* London: Macmillan.

Buckley, P.J. and M. Casson. 1981. The Optimal Timing of Foreign Investment*. Economic Journal*, vol.91, pp.75-87.

Business Monitor International. 2005. *The Australia Business Forecast Report Q2/2005.* London: Business Monitor International Ltd.

Campos, N.F. and Y. Kinoshita. 2002. Foreign Direct Investment as Technology Transferred: Some Panel Evidence from the Transition Economies. *William Davidson Working Paper 438*. University of Michigan: William Davidson Institute.

Cantwell, J.A. 2005. Too Little or Too Much? In: Passow, S. and M. Runnbeck (eds.). 2005. *What's Next? Strategic Views on Foreign Direct Investment.* ISA in cooperation with UNCTAD and WAIPA, p.32-37. www.isa.se/upload/english/Publications/What's%20Next%20ENG.pdf

Carkovic, M. and R. Levine. 2000. Does Foreign Direct Investment Accelerate Economic Growth. *University of Minnesota Working Paper*.

Carr, D.L, J.R. Markusen and K.E. Maskus. 1998. Estimating the Knowledge-Capital Model of the Multinational Enterprise. *NBER Working Paper 6773.* Cambridge, MA: National Bureau of Economic Research.

Casson, M.C. 1979. The Rationale of the Multinational Enterprise. In: M. Casson. *Alternatives to the Multinational Enterprise.* London: Macmillan Press, pp.45-62.

Casson, M.C. 1983. *The Growth of International Business.* London: Allen and Unwin.

Casson, M.C. 1987. *The Firm and the Market: Studies in Multinational Enterprise and the Scope of the Firm.* Oxford: Blackwell and Cambridge, MA: MIT Press.

Caves, R. 1989. Exchange Rate Movement and Foreign Direct Investment in the United States. In: D.B. Audretsch and M.P. Claudon (eds.). *The Internationalisation of US Markets.* New York: New York University Press, pp.199-238.

Caves, R.E. 1971. International Corporations: the Industrial Economics of Foreign Investment. *Economica*, vol.38, pp.1-27.

Caves, R.E. 1974a. Causes of Direct Investment: Foreign Firms' Shares in Canadian and United Kingdom Manufacturing Industries. *Review of Economics and Statistics*, vol.56, pp.279-293.

Caves, R.E. 1974b. Multinational Firms, Competition, and Productivity in Host-Country Markets. *Economica*, vol.41, pp.176-193.

Caves, R.E. 1982. *Multinational Enterprise and Economic Analysis.* Cambridge: Cambridge University Press.

Caves, R.E. 1996. *Multinational Enterprise and Economic Analysis.* Cambridge: Cambridge University Press.

Chakraborty, C. and P. Basu. 2002. Foreign Direct Investment and Growth in India: a Cointegration Approach. *Applied Economics*, vol.34, pp.1061-1073.

Chalmin, P. 1986. The Strategy of a Multinational in the World Sugar Economy: The Case of Tate and Lyle, 1870-1980. In: Teichova, A., M. Levy-Leboyer and H. Nussbaum (ed.). *Multinational enterprise in historical perspective.* Cambridge: Cambridge University Press.

Charemza, W.W. and D.F. Deadman. 1997. *New Directions in Econometric Practice – General to Specific Modelling, Cointegration and Vector Autoregression*. Cheltenham, UK: Edward Elgar, Ch.3.

Chen, E.K.Y. 1983a. *Multinational Corporations, Employment and Technology*. London: Macmillan.

Chen, E.K.Y. 1983b. Multinational Corporations and Technology Diffusion in Hong Kong Manufacturing. *Applied Economics*, vol.15, pp.309-321.

Chlestos, M. 2004. *The socio-economic determinants of labour demand in Greece: an empirical investigation.* Prepared for Presentation at the VXXXVIII International Conference – Applied Econometrics Association in Mons (Belgium) 2004, Econometrics of Labour Demand. www.aea.fed-eco.org/2004Mons

Clayton Utz. 2004. *Doing Business in Australia.* Australia: Clayton Utz.

Coase, R.H. 1937. The nature of the firm. *Economica*, vol.4, pp.386-405.

Commonwealth Treasury. 1972. Overseas Investment in Australia. *Treasury Economic Paper No.1.* Canberra: Australian Government Publishing Service.

Connolly, G., A. Herd, K. Chowdhury and S. Kompo-Harms. 2004. *Enterprise Agreements and Other Determinants of Labour Productivity.* Prepared for Presentation at the Australian Labour Market Research Workshop 2004, University of Western Australia, Perth, 6-7 December 2004. www.clmr.ecel.uwa.edu.au/ASLE/workshop%20papers/Connollyetaldewr.pdf

Connolly, G., A. Herd, K. Chowdhury and S. Kompo-Harms. 2004. Enterprise Agreements and Other Determinants of Labour Productivity. A Paper prepared for Presentation at the

Australian Labour Market Research Workshop 2004, University of Western Australia, Perth, 6-7 December 2004. www.clmr.ecel.uwa.edu.au/ASLE/workshop%20papers/Connollyetaldewr.pdf

Conyon, M., S. Girma, S. Thompson and P.Wright. 1999. The Impact of Foreign Acquisition on Wages and Productivity in the UK. *GLM Research Paper 99/8.* University of Nottingham, UK: Centre for Research on Globalisation and Labour Markets.

Copeland, B.R. and M.S. Taylor. 1997. A Simple Model of Trade, Capital Mobility and the Environment. *NBER Working Paper 5898*. Cambridge, MA: National Bureau of Economic Research.

Copeland, B.R. and M.S. Taylor. 2003. Trade, Growth and the Environment. *NBER Working Paper 9823*. Cambridge, MA: National Bureau of Economic Research.

Corrs Chambers Westgarth. 2004. *Doing Business in Australia.* Australia: Corrs Chambers Westgarth.

Culem, D.G. 1988. The Locational Determinant of Direct Foreign Investment Among Industrialised Countries. *European Economic Review*, vol. 32, pp. 885-904.

Cullison, W.E. 1979. The Determinants of Labour Force Participation: An Empirical Analysis. *FRB Working Paper 79-3.* Richmond, VA: Federal Reserve Bank of Richmond.

Cushman, D.O. 1988. Exchange-Rate Uncertainty and Foreign Direct Investment in the United States. *Weltwirtschaftliches Archiv*, vol. 124, pp.322-336.

Das, S. 1987. Externalities and Technology Transfer through Multinational Corporations – A Theoretical Analysis. *Journal of International Economics*, vol.22, pp.171-182.

Daveri, F. and A. Filippin. 2002. *Are Real Wages and TFP important Correlates of Sector Employment? Evidence from Ten OECD Countries.* www.antoniofilippin.net/dafi_151002.pdf

Davidson, J.E.H., D.F. Hendry, F. Srba and S. Yeo. 1978. Econometric Modelling of the Aggregate Time-Series Relationship between Consumers' Expenditure and Income in the United Kingdom. *Economic Journal,* vol.88, pp.661-692.

Davidson, W.H. 1980. The Location of Foreign Direct Investment Activity: Country Characteristics and Experience Effects. *Journal of International Business Studies*, vol.11, pp.9-22.

De Mello, L.R. 1999. Foreign Direct Investment-led Growth: Evidence from Time Series and Panel Data. *Oxford Economic Papers*, vol.51, pp.133-151.

De Mooij, R.A. and S. Ederveen. 2001. Taxation and Foreign Direct Investment: A Synthesis of Empirical Research. *CPB Discussion Paper No.3.* The Hague: CPB Netherlands Bureau for Economic Policy Analysis.

Deane, R.S. 1970. *Foreign Investment in New Zealand Manufacturing.* Wellington, N.Z.: Sweet and Maxwell.

Deardorff, A.V., 2001. Fragmentation in Simple Trade Models. *North American Journal of Economics and Finance*, vol.12, pp.121-137.

Department of Foreign Affairs and Trade (DFAT). 1999. *Foreign Direct Investment: The Benefits for Australia.* Canberra: Commonwealth of Australia.

Department of Trade and Industry (DTI). 1995. *Assessment of the Wider Effects of Foreign Direct Investment in the UK.* Cambridge: PA Cambridge Economic Consultants Ltd.

Devereux, M. and R. Griffith. 1998. Taxes and the Location of Production: Evidence from a Panel of U.S. Multinationals. *Journal of Public Economics*, vol. 68, pp. 335-367.

Dewenter, K.L. 1995. Do Exchange Rates Changes Drive Foreign Direct Investment? *Journal of Business*, vol.68, pp.405-433.

Dixit, A.K. and G.M. Grossman. 1982. Trade and Protection with Multistage Production. *Review of Economic Studies*, vol.49, pp.583-594.

Donovan, D. and Y. Mai. 1996. APEC Trade Liberalisation: the Effects of Increased Capital Mobility. *Australian Commodities Forecasts and Issues*, vol.3, pp.520-526.

Drake, T.A. and R.E. Caves. *1992. Changing Determinants of Japanese Direct Investment in the United States.* Journal of Japanese and International Economics*, vol.6, pp.228-246.*

Driffield, N. and M. Munday. 1994. The Impact of Foreign Direct Investment on UK Manufacturing: Is there a Profit Squeeze in Domestic Firms? *Applied Economics*, vol.30, pp.705-709.

Driffield, N. and S. Girma. 2003. Regional Foreign Direct Investment and Wage Spillovers: Plant Level Evidence from the UK Electronics Industry. *Oxford Bulletin of Economics and Statistics*, vol.65, pp.453-474.

Driffield, N. Inward Investment and Host Country Market Structure: The Case of the UK. *Review of Industrial Organization*, vol.18, pp.363-378.

Dunning, J. 1958. *American Investment in British Manufacturing.* London: George Allen & Unwin.

Dunning, J.H. 1973. *The Determinants of International Production*. Oxford Economic Papers*, vol.25, pp.289-336.*

Dunning, J.H. 1977. *Trade, Location of Economic Activity and the MNE: A Search for an Eclectic Appraoch. In: B. Ohlin et al. (eds.).* The International Allocation of Economic Activity. *London: Holmes and Meier, pp.395-418.*

Dunning, J.H. 1979. Explaining changing pattern of international production: in defence of eclectic theory. *Oxford Bulletin of Economics and Statistics*, vol.41, pp.269-296.

Dunning, J.H. 1980. Toward and Eclectic Theory of International Production: Some Empirical Tests. *Journal of International Business Studies,* vol.11, pp.9-31.

Dunning, J.H. 1981. *International Production and the Multinational Enterprise.* London: Allen and Unwin.

Dunning, J.H. 1988a. The Eclectic Paradigm of International Production: A Restatement and Some Possible Extensions. *Journal of International Business Studies,* vol.19, pp.1-31.

Dunning, J.H. 1988b. *Explaining International Production.* London: Allen and Unwin.

Dunning, J.H. 1992. *Multinational Enterprises and the Global Economy.* Wokingham, UK and Reading, MA: Addison-Wesley

Dunning, J.H. 1993. MNEs, the Balance of Payments and the Structure of Trade. In: Dunning, J.H. (ed.). *Multinational enterprises and the global economy*. Wokingham, UK and Reading, MA: Addison-Wesley

Dunning, J.H. 1996. Re-evaluating the Benefits of FDI. In: International Thomson Press on behalf of UNCTAD, Division on Transnational Corporations and Investment (ed.). *Companies Without Borders – Transnational Corporations in the 1990s.* London: International Thomson Business Press.

Dunning, J.H. 2005. The Evolving World Scenario. In: Passow, S. and M. Runnbeck (eds.). 2005. *What's Next? Strategic Views on Foreign Direct Investment.* ISA in cooperation with UNCTAD and WAIPA, p.12-17. www.isa.se/upload/english/Publications/What's%20Next%20ENG.pdf

Dunning, J.H. and P.J. Buckley. 1977. International Production and Alternative Models of Trade. *Manchester School of Economic and Social Studies*, vol.45, pp.393-403.

Dyster, B. and D. Meredith. 1990. *Australia in the International Economy in the Twentieth Century.* Cambridge: Cambridge University Press.

Eaton, J. and A. Tamura. 1994. Bilateralism and regionalism in Japanese and US trade and foreign direct investment relationships. *Journal of Japanese and International Economics*, vol.8, pp.478–510.

Economist Intelligence Unit (EIU). 2003. *World Economic Prospects – The future of FDI: Globalisation or Regionalisation?* www.eiu.com

Edgington, D.W. 1990. *Japanese Business Down Under – Patterns of Japanese Investment in Australia.* London and New York: Routledge.

Ekholm, K. 1998. Proximity Advantages, Scale Economies, and the Location of Production. In: P. Braunerhjelm and K. Ekholm (eds.). *The Geography of Multinationals.* Kluwer Academic Publishers, Dordrecht.

Ekholm, K., R. Forslid and J.R. Markusen. 2003. Export-Platform Foreign Direct Investment. *NBER Working Paper 9517*. Cambridge, MA: National Bureau of Economic Research.

Enders, W. and T. Sandler. 1996. Terrorism and Foreign Direct Investment in Spain and Greece. *Kyklos*, vol.49, pp.331-352.

Ethier, W. 1986. The Multinational Firm. *Quarterly Journal of Economics*, vol.101, pp.805-833.

Ethier, W. and J.R. Markusen. 1996. Multinational Firms, Technology Diffusion and Trade. *Journal of International Economics*, vol.41, pp.1-28.

Evans, P.B. 1977. Direct Investment and Industrial Concentration. *Journal of Development Studies*, vol.13, pp.373-385.

Eviews. 2001. *EViews 4.0 User Guide.* Irvine, CA: Quantitative Micro Software, LLC.

Fairchild, L. and K. Sosin. 1986. Evaluating Differences in Technological Activity between Transnational and Domestic Firms in Latin America. *Journal of Development Studies*, vol.22, pp.697-708.

Feenstra, R.C. 1998. Facts and Fallacies about Foreign Direct Investment. *Department of Economics Working Paper 98-04.* Department of Economics University of California, Davis. www.econ.ucdavis.edu/workingpapers/workingPaperPDF/98-04.pdf

Feenstra, R.C. and G.H. Hanson. 1996. Foreign Investment, Outsourcing, and Relative Wages. In: R.C. Feenstra, G.M. Grossman and D.A. Irwin (eds.) *Political Economy of Trade Policy: Essays in Honour of Jagdish Bhagwati.* Cambridge, MA: MIT Press, pp.89-127.

Feenstra, R.C. and G.H. Hanson. 1997. Foreign Direct Investment and Relative Wages: Evidence from Maquiladoras. *Journal of International Economics*, vol.42, pp.371-393.

Feliciano, Z. and R.E. Lipsey. 1999. Foreign Ownership and Wages in the United States, 1987 – 1992. *NBER Working Paper 6923*. Cambridge, MA: National Bureau of Economic Research.

Figlio, D.N. and B.A. Blonigen. 2000. The Effects of Foreign Direct Investment on Local Communities. *Journal of Urban Economics*, vol.48, pp.338-363.

Findlay, R. 1978. Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology: A Simple Dynamic Model. *Quarterly Journal of Economics*, vol.92, pp.1-16.

Fisher, S., A. Stoeckel and B. Borrell. 1998. *Trojan Horse or more Horsepower? Foreign Investment and the Australian Rural Economy.* Canberra: Centre of International Research Economics.

Foreign Investment Review Board (FIRB). 2004. *Annual Report 2002-2003.* Canberra: Commonwealth of Australia, Department of Communications, Information Technology and the Arts.

Forsyth, D.C.J. 1972. *US Investment in Scotland.* Praeger Special Studies in International Ecnomics and Development.

Froot, K.A. and J. Stein. 1991. Exchange Rate and Foreign Direct Investment: An Imperfect Capital Markets Approach. *The Quarterly Journal of Economics*, vol.106, pp.1191-1217.

Gentry, B. and L. Fernandez. 1997. *Valuing the Environment: How Fortune 500 CFOs and Analysts Measure Corporate Performance.* New York: United Nations Development Programme, Bureau of Development Policy, Office of Development Studies.

Gerschenberg, I. 1987. The Training and Spread of Managerial Know-How: A Comparative Analysis of Multinational and other Firms in Kenya. *World Development*, vol.15, pp.931-939.

Girma, S., H. Görg and M. Pisu. 2004. The Role of Exports and Foreign Linkages for FDI Productivity Spillovers. *GEP Research Paper.* University of Nottingham, Leverhulme Centre for Research on Globalisation and Economic Policy. www.nottingham.ac.uk/economics/leverhulme/seminars/pdf/mauro_pisu.pdf

Globerman, S. 1979. Foreign Direct Investment and 'Spillover' Efficiency Benefits in Canadian Manufacturing Industries. *The Canadian Journal of Economics*, vol.12, pp.42-56.

Globerman, S., J.C. Ries and I. Vertinsky. 1994. The Economic Performance of Foreign Affiliates in Canada. *The Canadian Journal of Economics*, vol.27, pp.143-156.

Goldberg, M.A. 1972. The Determinants of US Direct Foreign Investment in the EEC: Comment. *American Economic Review*, vol. 62, pp. 692-699.

Gopinath, M., D. Pick and U. Vasavada. 1999. The Economics of Foreign Direct Investment and Trade with an Application to the US Food Processing Industry. *American Journal of Agricultural Economics*, vol.81, pp.442–452.

Görg, H. and E. Strobl. 2000. Multinational Companies, Technology Spillovers and Plant Survival: Evidence for Irish Manufacturing. *EEG Working Paper No.8/2001.* Madrid: European Economy Group. www.ucm.es/info/econeuro/documentos/documentos/dt082001.pdf

Graham, E.M. 1978. Transatlantic Investment by Multinational Firms: A Rivalistic Phenomenon? *Journal of Post Keynesian Economics*, vol.1, pp.82-99.

Graham, E.M. and P.R. Krugman. 1993. *Foreign Direct Investment in the United States.* Washington, DC: Institute for International Economics.

Greene, W.H. [4]2000. *Econometric Analysis.* New York: Prentice-Hall.

Griffith, R. and H. Simpson. 2001. Characteristics of Foreign-Owned Firms in British Manufacturing. *IFS Working Paper No.WP01/10.* London: Institute for Fiscal Studies.

Gropp, R. and K. Kostial. 2000. The Disappearing Tax Base: Is Foreign Direct Investment Eroding Corporate Income Taxes? *ECB Working Paper No.31.* Frankfurt: European Central Bank.

Grossman, G.M. 1984. International Trade, Foreign Investment, and the Formation of the Entrepreneurial Class. *American Economic Review*, vol.74, pp.605-614.

Grossman, G.M. and A.B. Krueger. 1995. Economic Growth and the Environment. *Quarterly Journal of Economics*, vol.110, pp.353-377.

Grossman, G.M. and E. Helpman. 2002a. Outsourcing versus FDI in Industry Equilibrium. *NBER Working Paper 9300*. Cambridge, MA: National Bureau of Economic Research.

Grossman, G.M. and E. Helpman. 2002b. Integration versus Outsourcing in Industry Equilibrium. *Quarterly Journal of Economics*, vol.117, pp.85-120.

Grubert, H. and J. Mutti. 1991. Taxes, Tariffs and Transfer Pricing in Multinational Corporate Decision Making. *Review of Economics and Statistics*, vol.68, pp.285-293.

Haaland, J.I. and I. Wooton. 1999. International Competition for Multinational Investment. *Scandinavian Journal of Economics*, vol.101, pp.631-649.

Haaland, J.I. and I. Wooton. 2001a. Multinational Firms: Easy Come, Easy Go? *CEPR Discussion Paper,* No 2600.

Haaland, J.I. and I. Wooton. 2001b. Multinational Investment, Industry Risk, and Policy Competition. Discussion Paper No. 35/2001, Department of Economics, Norwegian School of Economics and Business Administration.

Haaparanta, P. 1996. Competition for Foreign Direct Investment. *Journal of Public Economics*, vol.63, pp.141-153.

Haddad, M. and A. Harrison. 1993. Are there Positive Spillovers from Direct Foreign Investment? Evidence from Panel Data for Morocco. *Journal of Development Economics*, vol. 42, pp.51-74.

Hanson, G. H., Mataloni, R. J., Slaughter, M. J. 2001. Expansion Strategies of U.S. Multinational Firms. *NBER Working Paper 8433*. Cambridge, MA: National Bureau of Economic Research.

Harris, R. and C. Robinson. 2002. The Effect of Foreign Acquisition on Total Factor Productivity: Plant-Level Evidence from UK Manufacturing, 1987-1992. *Review of Economics and Statistics*, vol.84, pp.562-568.

Haufler, A. and I. Wooton. 1999. Country Size and Tax Competition for Foreign Direct Investment. *Journal of Public Economics*, vol.71, pp.121-139.

Hejazi, W. 2002. Foreign Direct Investment and Domestic Capital Formation. *Industry Canada Working Paper No.36.* Ottawa: Industry Canada.

Helleiner, G.K. 1989. Transnational Corporations and Direct Foreign Investment. In: Chenery, H. and T.N. Srinivasan (eds.). *Handbook of Development Economics*, vol.III, ch.27.

Helpman, E. 1984. A Simple Theory of Trade with Multinational Corporations. *Journal of Political Economy*, vol.92, pp.451-471.

Helpman, E. 1985. Multinational Corporations and Trade Structure. *Review of Economic Studies*, vol.52, pp.443-458.

Helpman, E. and P.R. Krugman. 1985. *Market Structure and Foreign Trade.* Cambridge, MA: MIT Press.

Hennart, J.F. 1982. *A Theory of Multinational Enterprise.* Ann Arbor: University of Michigan Press.

Hennart, J.F. 1991. The Transaction Cost Theory of the Multinational Enterprise. In: C.N. Pitelis and R. Sugden (eds.). *The Nature of the Transnational Frims.* London: Routledge, pp.81-116.

Hines, J.R. 1996. Tax Policy and the Activities of Multinational Corporations. *NBER Working Paper 5589*. Cambridge, MA: National Bureau of Economic Research.

Hines, J.R. 1999. Lessons from Behavioural Response to International Taxation. *National Tax Journal*, vol.52, pp.305-323.

Hines, J.R. and E.M. Rice. 1996. Fiscal Paradise: Foreign Tax Havens and American Business. *Quarterly Journal of Economics*, vol. 109, pp.149-182.

Hobson, C.K. 1914. *The Export of Capital.* London: Constable.

Horst, T. 1971. The Theory of the Multinational Firm: Optimal Behaviour under Different Tariff and Tax Rules. *Journal of Political Economy*, vol.79, pp.1059-1072.

Horst, T. 1972. Firms and Industry Determinants of the Decision to Invest Abroad: An Empirical Study. *Review of Economics and Statistics*, vol.54, pp.258-266.

Horstmann, I.J. and J.R. Markusen. 1987a. Strategic Investment and the Development of Multinationals. *International Economic Review*, vol.28, pp.109-121.

Horstmann, I.J. and J.R. Markusen. 1987b. Licensing Versus Direct Investment: A Model of Internalisation by the Multinational Enterprise. *Canadian Journal of Economics*, vol.20, pp.464-481.

Horstmann, I.J. and J.R. Markusen. 1992. Endogenous Market Structures in International Trade (natura facit saltum). *Journal of International Economics*, vol.32, pp.109–129.

Hubert, F. and N. Pain. 2002. Fiscal Incentives, European Integration and the Location of Foreign Direct Investment *NIESR Discussion Paper No.195*, London: National Institute of Economic and Social Research

Hughes, J.S., D.E. Logue and R.J. Sweeney. 1975. Corporate International Diversification and Market Assigned Measures of Risk and Diversification. *Journal of Financial and Quantitative Analysis*, vol.10, pp.627-637.

Hughes, K. and C. Oughton. 1992. Foreign and Domestic Multinational Presence in the UK. *Applied Economics*, vol.24, pp.745-749.

Hutchinson, D. and S. Nicholas. 1994. *Japanese Multinationals in Australian Manufacturing: Facts and Perceptions of Foreign Direct Investment and Technology Transfer.* Parkville, VIC: Department of Economic History, University of Melbourne.

Hymer, S.H. 1976. *The International Operations of National Firms: A Study of Direct Investment*. Cambridge, MA: MIT Press.

IDA Ireland. 2005. *Annual Report 2004.* Dublin: IDA Ireland. www.idaireland.com/uploads/documents/IDA_Publications/IDA_Annual_Report_2004.pdf

International Monetary Fund (IMF). [5]1993. Balance of Payments Manual. Washington, DC: International Monetary Fund. www.imf.org/external/np/sta/bop/BOPman.pdf

Invest Australia. 2003a. *Australia: A Wealth of Opportunity*. Canberra: Commonwealth of Australia.

Invest Australia. 2003b. *Australia: A Wealth of Opportunity – Ten Good Reasons to Invest in Australia.* Canberra: Commonwealth of Australia.

Jasay, A.E. 1960. The Social Choice between Home and Overseas Investment. *Economic Journal*, vol. 70, pp. 105-113.

Johansen, S. 1991. Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models. *Econometrica*, vol.59, pp.1551-1580.

Johansen, S. 1995. *Likelihood-based Inference in Cointegrated Vector Autoregressive Models.* Oxford University Press.

Johns, B.L. 1974. The International Corporation and its Impact upon the Host Country – Australia. In: Lindgren, K.E., H.H. Mason and B.L.J. Gordon (ed.). 1974. *The Corporation and Australian Society.* Sydney: The Law Book Company, p.291-305.

Johnston, J. and J. DiNardo. [4]1997. *Econometric Methods.* Singapore: McGraw-Hill.

Jones, R.W. and H. Kierzkowski. 1990. The Role of Services in Production and International Trade: A Theoretical Framework. In: Jones, R.W. and A.O. Krueger (eds). *The Political Economy of International Trade.* Oxford: Basil Blackwell. Ch.3.

Jones, R.W. and H. Kierzkowski. 2001. A Framework for Fragmentation. In: Arndt, S.W. and H. Kierzkowski (eds). *Fragmentation – New Production Patterns in the World Economy*. Ch.4.

Jones, R.W. and H. Kierzkowski. 2004. International Fragmentation and the New Economic Geography. Forthcoming in *North American Journal of Economics and Finance.*

Karunaratne, N.D. and C. Tisdell. 1998. Globalisation and Multinational Foreign Direct Investment – Australian Insights. *Economia Internazionale*, vol.51, pp.531-553.

Keller, W. and A. Levinson. 1999. Environmental Compliance Costs and Foreign Direct Investment Inflows to U.S. States. NBER Working Paper 7369.

Keller, W. and S.R. Yeaple. 2003. Multinational Enterprises, International Trade and Productivity Growth: Firm Level Evidence from the United States. *NBER Working Paper 9504.* Cambridge, MA: National Bureau of Economic Research.

Kemp, M.C. 1962. The Benefits and Costs of Private Investment from Abroad: Comment. Economic Record, vol.38, pp.108-110. Reprinted in: J.H. Dunning (ed.). 1972. *International Investment*. Harmondsworth: Penguin Books, Ch. 6, pp.159-162.

Kemp, M.C. 1964. *The Pure Theory of International Trade.* Englewood Cliffs: Prentice Hall.

Kim, D.D.-K. and J.-S. Seo. 2003. Does FDI Inflow Crowd out Domestic Investment in Korea? *Journal of Economic Studies*, vol.30, pp.605-622.

Kim, W.C., P. Hwang and W.P. Burghers. 1993. Multinationals' Diversification and the Risk-Return Trade-Off. *Strategic Management Journal*, vol.14, pp.275-286.

Kindleberger, C.P. 1969. *American Business Abroad: Six Lectures on Foreign Direct Investment*. New Haven: Yale University Press.

Klein, M.W. and E. Rosengren. 1994. The Real Exchange Rate and Foreign Direct Investment in the United States: Relative Wealth vs. Real Wage Effects. *Journal of International Economics,* vol.36, pp.373-389.

Knickerbocker, F.T. 1973. *Oligopolistic Reaction and Multinational Enterprise,* Boston: Harvard University Press.

Kogut, B. and S.J. Chang. 1991. Technological Capabilities and Japanese Foreign Direct Investment in the United States. *Review of Economics and Statistics*, vol.73, pp.401-413.

Koizumi, T. and K.J. Kopecky. 1977. Economic Growth, Capital Movements and the International Transfer of Technical Knowledge. *Journal of International Economics*, vol.7, pp.45-65.

Kokko, A. 1994. Technology, Market Characteristics, and Spillovers. *Journal of Development Economics*, vol.43, pp.279-293.

Kolde, E. 1968. *International Business Enterprise.* Prentice Hall.

Kolstad, C.D. and Y. Xing. 1998. Do Lax Environmental Regulations Attract Foreign Investment? *Departmental Working Paper No. 28-98.* Santa Barbara: University of California: Department of Economics.

Kopits, G.F. 1976. Intra-firm Royalties Crossing Frontiers and Transfer-Pricing Behaviour. *Economic Journal*, vol.86, pp.781-805.

Kopits, G.F. 1979. Multinational Conglomerate Diversification. *Economia Internazionale*, vol.32, pp.99-111.

Krugman, P.R. 1983. The "New Theories" of International Trade and the Multinational Enterprise. In: C.P. Kindleberger and D.B. Audretsch (eds.). *The multinational corporation in the 1980s*. Cambridge, MA: MIT Press, ch.3.

Lall, S. 1973. Transfer Pricing by Multinational Manufacturing Firms. *Oxford Bulletin of Economics and Statistics*, vol.35, pp.173-195.

Lall, S. 1980. Monopolistic Advantages and Foreign Involvement by U.S. Manufacturing Industry. Oxford *Economic Papers*, vol.32, pp.102-122.

Lall, S. and N.S. Siddharthan. 1982. The Monopolistic Advantage of Multinationals: Lessons from Foreign Investment in the US*. Economic Journal*, vol.92, pp.668-683.

Lall, S. and P. Streeten. 1977. *Foreign Investment, Transnational and Developing Countries.* London: Macmillan.

Layton, A.P. and T. Makin. 1993. Estimates of the Macroeconomic Impact of Foreign Investment in Australia. *International Economic Journal*, vol.7, pp.35-42.

Lenin, V.I. 1999. *Imperialism: The Highest Stage of Capitalism.* Sydney: Resistance Books. Original publication in 1939.

Lipsey, R.E. 1994. Foreign-Owned Firms and U.S. Wages. *NBER Working Paper 4927*. Cambridge, MA: National Bureau of Economic Research.

Lipsey, R.E. 2000. Interpreting Developed Countries' Foreign Direct Investment. *NBER Working Paper 7810. Cambridge*, MA: National Bureau of Economic Research.

Lipsey, R.E. 2002. Home and Host Country Effects of FDI. *NBER Working Paper 9293.* Cambridge, MA: National Bureau of Economic Research.

Lipsey, R.E. and F. Sjöholm. 2003. Foreign Direct Investment, Education and Wages in Indonesian Manufacturing. *Journal of Development Economics*, vol.73, pp.415-422.

Liu, X., C. Wang and Y. Wei. 2001. Causal Links between Foreign Direct Investment and Trade in China*. China Economic Review*, vol.12, pp.190-202.

Loree, D.W. and S.E. Guisinger. 1995. Policy and Non-policy Determinants of U.S. Equity Foreign Direct Investment. *Journal of International Business Studies*, vol.26, pp. 281-299.

Love, J.H. and F. Lage-Hidalgo. 2000. Analysing the determinants of US direct investment in Mexico. *Applied Economics*, vol.32, pp.1259-1267.

Lucas, R.B. 1993. On the Determinants of Foreign Direct Investment: Evidence from East and Southeast Asia. *World Development*, vol.21, pp.391-406.

Lunn, J. 1980. Determinants of US Direct Investment in the EEC: Further Evidence. *European Economic Review*, vol.13, pp.93-101.

Lütkepohl, H. 2004. Vector Autoregressive and Vector Error Correction Models. In: Lütkepohl, H. and M. Krätzig (eds). *Applied Time Series Econometrics.* Cambridge University Press, pp.86-158.

Mabey, N. and R. McNally. 1999. *Foreign Direct Investment and the Environment – From Pollution Havens to Sustainable Development.* Godalming, UK: WWF-UK.

MacDougall, G.D.A. 1960. The Benefits and Costs of Private Investment from Abroad: A Theoretical Approach. *Economic Record*, vol.36, pp.13-35.

Magee, S.P. 1977. Information and Multinational Corporations: An Appropriability Theory of Direct Foreign Investment. In: J. Bhagwati (ed). *The new international economic order.* Cambridge, MA: MIT Press, pp.317-340.

Makin, T. 1998. The National Income Gains from Foreign Investment. In: P.S. Paul (ed.). *Trade and Growth: New Theory and the Australian Experience.* St Leonards, NSW: Allen and Unwin.

Mansfield, E. and A. Romeo. 1980. Technology Transfer to Overseas Subsidiary by U.S.-Based Firms. *The Quarterly Journal of Economics*, vol.95, pp.737-750.

Markusen, J.R. 1984. Multinationals, Multi-Plant Economies, and the Gains from Trade. *Journal of International Economics*, vol.16, pp.205-266.

Markusen, J.R. 1997. Trade versus Investment Liberalisation. *NBER Working Paper 6231*. Cambridge, MA: National Bureau of Economic Research.

Markusen, J.R. 2001. Contracts, Intellectual Property Rights, and Multinational Investment in Developing Countries. *Journal of International Economics*, vol. 53, pp.189-204.

Markusen, J.R. 2002. *Multinational Firms and the Theory of International Trade.* Cambridge, MA: MIT Press.

Markusen, J.R. and A.J. Venables. 1998. Multinational Firms and the New Trade Theory. *Journal of International Economics,* vol.46, pp.183–203.

Markusen, J.R. and A.J. Venables. 2000. The Theory of Endowment, Intra-Industry, and Multinational Trade, *Journal of International Economics*, vol.52, pp.209–234.

Markusen, J.R. and K.E. Maskus. 2002. Discriminating among Alternative Theories of the Multinational Enterprise. *Review of International Economics*, vol.10, pp.694-707.

Markusen, J.R., A.J. Venables, D.E. Konan and K.H. Zhang. 1996. A Unified Treatment of Horizontal Direct Investment, Vertical Direct Investment, and the Pattern of Trade in Goods and Services. *NBER Working Paper 5696*. Cambridge, MA: National Bureau of Economic Research.

Markusen, J.R., J.R. Melvin, W.H. Kaempfer and K.E. Maskus. 1995. *International Trade – Theory and Evidence*. Boston: McGraw-Hill.

Mátyás, L. and P. Sevestre. 1996. *The Econometrics of Panel Data: A Handbook of the Theory with Applications.* Dordrecht, The Netherlands: Kluwer Academic Publishing.

McKern, R.B. 1976. *Multinational Enterprise and Natural Resources.* Sydney: McGraw-Hill.

McManus, J.C. 1972. The Theory of the International Firms. In: G. Pacquet (ed.). *The Multinational Firm and the Nation State.* Toronto: Collier-Macmillan.

Michel, A. and I. Shaked. 1986. Multinational Corporations vs. Domestic Corporations: Financial Performance and Characteristics. *Journal of International Business Studies*, vol.17, pp.89-100.

Miller, J.C. and B. Pras. 1980. The Effects of Multinational and Export Diversification on the Profit Stability of US Corporations. *Southern Economic Journal*, vol.46, pp.792-805.

Milner, C. and E. Pentecost. 1996. Locational Advantage and US Foreign Direct Investment in the UK. *Applied Economics*, vol.28, pp.605-615.

Moore, M.O. 1993. Determinants of German Manufacturing Direct Investment: 1980-1988. *Weltwirtschaftliches Archiv*, vol.129, pp.120-137.

Moshirian, F. 1998. International Financial Services: Multinational Financial Companies in Australia. *Journal of Multinational Financial Management*, vol.8, pp.211-231.

Mudambi, R. 1999. Multinational Investment Attraction: Principle-Agent Considerations. *International Journal of Economics of Business*, vol.6, pp.65-79.

Mudambi, R. 2001. The Location of the Multinational Firm: A Survey. University of Reading Discussion Papers in International Investment and Management No. 291.

Mundell, R.A. 1957. International Trade and Factor Mobility. *American Economic Review*, vol.47, pp.321-335.

Nicholas, S. and W. Purcell. 2001. Japanese Subsidiaries in Australia: Work Practices and Subcontracting Relations as Learning Mechanism. *The Singapore Economic Review*, vol.46, pp.119-139.

Nicholas, S., A. Sammartino and E. Maitland. 2003. *Do Multinational Enterprises Benefit Australia?* Australia: Committee for the Economic Development of Australia (CEDA).

Nicholas, S., D. Merrett, G. Whitwell, W. Purcell and S. Kimberley. 1996. *Japanese FDI in Australia in 1990s: Manufacturing, Financial services and Tourism.* Canberra, ACT: Australia-Japan Research Centre, The Australian National University.

Nurkse, R. 1933. Causes and Effects of Capital Movements (first published as: Ursachen und Wirkungen der Kapitalbewegungen). Zeitschrift fuer Nationaloekonomie, vol.5, pp.78-96. Reprinted in: J.H. Dunning (ed.). 1972. *International Investment*. Harmondsworth: Penguin Books, Ch.3, pp.97-116.

O'Sullivan, P.J. 1993. An Assessment of Ireland's Export-led Growth Strategy via Foreign Direct Investment: 1960-1980. *Weltwirtschaftliches Archiv*, vol.129, pp.139-158.

Office of Legislative Drafting, Attorney-General's Department. 2004. *Foreign Acquisitions and Takeovers Act 1975 (Act No. 92 of 1975 as amended, prepared 23.08.2004).* Canberra: Scaleplus Law Resource: http://scaleplus.law.gov.au/cgi-bin/download.pl? /scale/data/ pasteact/ 1/536

Organization of Economic Cooperation and Development (OECD). 1997. *Economic Globalisation and The Environment.* Paris: OECD.

Organization of Economic Cooperation and Development (OECD). 1998. *Foreign Direct Investment and Economic Development – Lessons of Six Emerging Economies.* Paris: OECD.

Oulton, N. 1998. Labour Productivity and Foreign Ownership in the UK. *NIESR Discussion Paper No. 143.* London: National Institute of Economic and Social Research.

Owen, R.F. 1982. Interindustry Determinants of Foreign Direct Investments: A Canadian Perspective. In: A.M. Rugman (ed.). *New Theories of the Multinational Enterprise.* London: Croom Helm.

Ozawa, T. and S. Castello. 2003. FDI and Endogenous Growth: IB Perspectives. In: J. Cantwell and R. Narula (eds.). *International Business and the Eclectic Paradigm – Developing the OLI framework.* Routledge: New York, Ch. 4, pp.74-95.

Pain, N. 1993. An Econometric Analysis of Foreign Direct Investment in the United Kingdom. *Scottish Journal of Political Economy*, vol.40, pp.1-23.

Pain, N. and K. Wakelin. 1998. Export Performance and the Role of Foreign Direct Investment. *Manchester School of Economic and Social Studies*, vol.66, pp. 62–88.

Parry, T.G. 1978. Structure and Performance in Australian Manufacturing. With Special Reference to Foreign-Owned Enterprises. In: W. Kasper and T.G. Parry (eds.). *Growth, Trade and Structural Change in an Open Australian Economy*, pp.173-199. Kensington, Australia: Centre for Applied Economic Research, University of New South Wales.

Passow, S. and M. Runnbeck (eds.). 2005. *What's Next? Strategic Views on Foreign Direct Investment.* ISA in cooperation with UNCTAD and WAIPA. www.isa.se/upload/english/ Publications/What's%20Next%20ENG.pdf

Pearce, I.F. and D.C. Rowan. 1966. A Framework for Research into Real Effects of International Capital Movements. In: T.Bagiotti (ed.) Essays in Honour of Marco Fanno. Cedam: Padova, pp.505-535. Reprinted in: J.H. Dunning (ed.). 1972. *International Investment.* Harmondsworth: Penguin Books, Ch.7, pp.163-197.

Pearce, R.D. 1993. *The Growth and Evolution Multinational Enterprise: Patterns of Geographical and Industrial Diversification.* Cheltenham: Edward Elgar.

Perlitz, M. 1997. *Internationales Management.* Stuttgart: Lucius & Lucius.

Pfaffermayr, M. 1994. Foreign Direct Investment and Exports: a Time Series Approach. *Applied Economics*, vol.26, pp.337-351.

Piana. V. 2001. Economics Web Institute, Key Concepts' Glossary: Employment. www.economicswebinstitute.org:8080/glossary/employ.htm

Piana. V. 2001. Economics Web Institute, Key Concepts' Glossary: Productivity. www.economicswebinstitute.org:8080/glossary/prdctvt.htm

Piana. V. 2001. Economics Web Institute, Key Concepts' Glossary: Wages. www.economicswebinstitute.org/glossary/wages.htm

Raff, H. and K. Srinivasan. 1998. Tax Incentives for Import-Substituting Foreign Investment: Does Signaling Play a Role? *Journal of Public Economics*, vol.67, pp.167–193.

Ratnayake, R. 1993. Factors Affecting Inter-Industry Variation of Foreign Ownership of Manufacturing Industry. *Applied Economics*, vol.24, pp.653-659.

Ray, E.J. 1977. Foreign Direct Investment in Manufacturing. *Journal of Political Economy*, vol. 85, pp. 283-297.

Ray, E.J. 1989. The Determinants of Foreign Direct Investment in the United States: 1979-85. In R. Feenstra (ed.). *Trade Policies for International Competitiveness.* Chicago: University of Chicago Press.

Razin, A. 2002. FDI Contribution to Capital Flows and Investment in Capacity. *NBER Working Paper 9204.* Cambridge, MA: National Bureau of Economic Research.

Read, R. 1983. The Growth and Structure of Multinationals in Banana Export Trade. In: M. Casson (ed.). *The Growth of International Business.* London: Allen & Unwin.

Robinson,H.J. 1961. *The Motivation and flow of Private Foreign Investment.* Stanford Research Institute, California.

Rolfe, R.J., D.A. Ricks, M.M. Pinter, M. McCarthy. 1993. Determinants of FDI Incentive Preferences of MNEs. *Journal of International Business Studies*, vol. 24, 2, pp. 335 -355.

Romer, D. [2]2001. *Advanced Macroeconomics.* Singapore: McGraw-Hill.

Root, F.R. and A.A. Ahmed. 1978. The Influence of Policy Instruments on Manufacturing Direct Foreign Investment in Developing Countries. *Journal of International Business Studies,* vol.9, pp.81-93.

Rosenbluth, G. 1970. The Relation between Foreign Control and Concentration in Canadian Industry. *Canadian Journal of Economics*, vol.3, pp.14-38.

Ruffin, R.J. 1984. International Factor Movements. R.W. Jones and P.B. Kenen. *Handbook of International Economics*, vol.I, Ch.5, pp.237-288.

Rugman, A.M. 1975. Motives for Foreign Investment: The Market Imperfections and Risk Diversification Hypothesis. *Journal of World Trade Law*, vol.9, pp.567-573.

Rugman, A.M. 1977. Risk, Direct Investment and International Diversification. *Weltwirtschaftliches Archiv*, vol.113, pp.487-500.

Rugman, A.M. 1986. New Theories of the Multinational Enterprise: an Assessment of Internalization Theory. *Bulletin of Economic Research*, vol.35, pp.101-18.

Santiago, C.E. 1987. The Impact of Foreign Direct Investment on Export Structure and Employment Generation. *World Development*, vol.15, pp.317-328.

Sanyal, K.K. and Jones, R.W. 1982. The Theory of Trade in Middle Products. *American Economic Review*, vol.72, pp.16-31.

Saunders, R.S. 1982. The Determinants of Interindustry Variation of Foreign Ownership in Canadian Manufacturing Industries. *Canadian Journal of Economics*, vol.15, pp.77-84.

Sauvant, K.P. 2005. Reservoirs of the Future. In: Passow, S. and M. Runnbeck (eds.). 2005. *What's Next? Strategic Views on Foreign Direct Investment.* ISA in cooperation with UNCTAD and WAIPA, p.90-97. www.isa.se/upload/english/Publications/What's%20Next%20ENG.pdf

Scaperlanda, A.E. and L.J. Mauer. 1969. The Determinants of US Direct Investment in the EEC. *American Economic Review*, vol.59, pp.558-568.

Scaperlanda, A.E. and L.J. Mauer. 1972. Reply. *American Economic Review*, vol.62, pp.700-704.

Schneider, F. and B.S. Frey. 1985. Economic and Political Determinants of Foreign Direct Investment. *World Development*, vol.13, pp.161-175.

Shan, J. 2002. A VAR Approach to the Economics of FDI in China. *Applied Economics*, vol.34, pp.885-893.

Smarzynska, B.K. and S.-J. Wei. 2001. Pollution Havens and Foreign Direct Investment: Dirty Secret or Popular Myth? NBER Working Paper 8465.

Soto, M. 2000. Capital Flows and Growth in Developing Countries: Recent Empirical Evidence. *OECD Development Centre Technical Paper No.160*. OECD, Paris.

Sousa, N., D. Greenaway and K. Wakelin. 2000. Multinationals and Export Spillovers. *GLM Research Paper 2000/14.* University of Nottingham, UK: Centre for Research on Globalisation and Labour Markets.

StataCorp. 2003. *Cross-Sectional Time-Series. Reference Manual, Release 8.* College Station, Texas: Stata Corp.

Stopford, J.M. 2005. New Actors Take the Stage. In: Passow, S. and M. Runnbeck (eds.). 2005. What's *Next? Strategic Views on Foreign Direct Investment.* ISA in cooperation with UNCTAD and WAIPA, p.40-45. www.isa.se/upload/english/Publications/What's%20Next%20ENG.pdf

Streeten, P. 1969. New Approaches to Private Investment in Less Developed Countries (first published as: Nouvelles manieres d'aborder le probleme de l'investissement prive dans les pays en boie de developpement). Revue de la Societe d'Etudes et d'Expansion, vol.238, pp.909-924. Reprinted in: J.H. Dunning (ed.). 1972. *International Investment.* Harmondsworth: Penguin Books, Ch.17, pp.436-452.

Swedenborg, B. 1979. *The Multinational Operations of Swedish Firms: An Analysis of Determinants and Effects.* Stockholm: Industrial Institute for Economic and Social Research.

Tang, L. 2002. Measuring the Intensity of Vertically Integrated Multinational Enterprises. *Review of Development Economics*, vol.6, pp.478-491.

Tcha, M. 1998. Labour Disputes and Direct Foreign Investment – The Experience of Korea in Transition. *Economic Development and Cultural Change*, vol.46, pp.305-328.

Tcha, M. 1999. A Note on Australia's Inward and Outward Direct Foreign Investment. *Papers in Regional Science*, vol.78, pp.89-100.

Teece, D.J. 1981. The Multinational Enterprise: Market Failure and Market Power Consideration. *Sloan Management Review*, vol.22, pp.3-17.

Teece, D.J. 1985. Multinational Enterprise, Internal Governance, and Industrial Organisation. *American Economic Review*, vol. 75, pp.233-238.

Thompson, R.S. 1985. Risk Reduction and International Diversification: An Analysis of Large UK Multinational Companies. *Applied Economics*, vol.16, pp.529-541.

Toda, H.Y. and P.C.B. Phillips. 1993. Vector Autoregressions and Causality. *Econometrica*, vol.61, pp.1367-1393.

Toda, H.Y. and P.C.B. Phillips. 1994. Vector Autoregression and Causality: A Theoretical Overview and Simulation Study. *Econometric Reviews*, vol.13, pp.259-285.

Traistaru, I. and C.V. Martincus. 2003. *Determinants of Manufacturing Concentration Patterns in Mercosur.* Prepared for Presentation at the European Regional Science Assiociation (ERSA) 2003 Congress, Paper No.191. www.ersa.org/ersaconfs/ersa03/cdrom/papers/191.pdf

United Nations Centre on Transnational Corporations (UNCTC). 1991. *Transnational Corporations: A Selective Bibliography, 1988-1990.* New York: United Nations.

United Nations Conference on Trade and Development (UNCTAD). 1994. *World Investment Report 1994: TNCs, Employment and the Workplace.* New York and Geneva: United Nations.

United Nations Conference on Trade and Development (UNCTAD). 1996. *Incentives and Foreign Direct Investment.* New York: United Nations.

United Nations Conference on Trade and Development (UNCTAD). 2000. *World Investment Report 2000: Cross-border Mergers and Acquisitions and Development.* New York and Geneva: United Nations.

United Nations Conference on Trade and Development (UNCTAD). 2002. *World Investment Report 2002: Transnational Corporations and Export Competitiveness*. New York and Geneva: United Nations.

United Nations Conference on Trade and Development (UNCTAD). 2003. *World Investment Directory Country Profile: Australia.* New York and Geneva: United Nations. www.unctad.org/sections/dite_fdistat/docs/wid_cp_au_en.pdf

United Nations Conference on Trade and Development (UNCTAD). 2005. *World Investment Report 2005: Transnational Corporations and the Internationalisation of R&D.* New York and Geneva: United Nations.

Van Loo, F. 1977. The Effect of Foreign Direct Investment on Investment in Canada. *Review of Economics and Statistics*, vol.59, pp. 474-481.

Vernon, R. 1966. International Investment and International Trade in the Product Cycle. *Quarterly Journal of Economics*, vol. 80, p. 190-207.

Von Zedtwitz, M. 2005. China Goes Abroad. In: Passow, S. and M. Runnbeck (eds.). 2005. *What's Next? Strategic Views on Foreign Direct Investment.* ISA in cooperation with UNCTAD and WAIPA, p.62-69. www.isa.se/upload/english/Publications/What's%20Next%20ENG.pdf

Wang, J.-Y. and M. Blomström. 1992. Foreign Investment and Technology Transfer – A Simple Model. *European Economic Review*, vol.36, pp.137-155.

Wheeler, D. and A. Mody. 1992. International Investment Location Decisions: The Case of US Firms. *Journal of International Economics*, vol.33, pp.57-76.

Wilkins, M. 1970. *Emergence of Multinational Enterprise: American Business Abroad from the Colonial Era to 1914.* Cambridge, MA: Harvard University Press.

Williamson, O.E. 1975. *Markets and Hierarchies: Analysis and Antitrust Implications: A Study in the Economics of Internal Organisations.* New York: Free Press, Macmillan.

Wilmore, L. 1976. Direct Foreign Investment in Central American Manufacturing. *World Development*, vol.4, pp.499-518.

Wolf, B.N. 1977. Industrial Diversification and Internalisation: Some Empirical Evidence. *Journal of Industrial Economics*, vol.26, pp.177-191.

Wong, K.-Y. 1988. International Factor Mobility and the Volume of Trade: An Empirical Study. In: R.C. Feenstra (ed.). *Empirical Methods for International Trade*, pp.231-250. Cambridge, MA: MIT Press, pp.231-250.

Wooldridge, J.M. 2002. *Econometric Analysis of Cross Section and Panel Data.* Boston: Massachusetts Institute of Technology.

World Trade Organisation. 1996. *Annual Report 1996, Volume 1 – Special Topic: Trade and Foreign Direct Investment.* Geneva: World Trade Organisation.

Yang, J.Y.Y., N. Groenewold and M. Tcha. 2000. The Determinants of Foreign Direct Investment in Australia. *Economic Record*, vol.76, pp.45-54.

Zejan, M.C. 1989. Intra-firm Trade and Swedish Multinationals. *Weltwirtschaftliches Archiv*, vol.29, pp.814-833.

Zhang, K.H. 2001. Does Foreign Direct Investment Promote Economic Growth? Evidence from East Asia and Latin America. *Contemporary Economic Policy*, vol.19, pp.175-185.

Zhang, K.H. and J.R. Markusen. 1999. Vertical Multinational and Host Country Characteristics. *Journal of Development Economics*, vol.59, pp.233-262.

APPENDIX

A. 1 QUARTERLY FDI MODEL (ANALYSED IN CHAPTER 4.1)

Table A-1

Data Sources, Quarterly FDI Model		
Variable	**Source and Name of Series**	**Unit of Measurement**
FDI		
ausnfdi **(Nominal Quarterly Aggregate FDI Inflows into Australia)**	ABS 5302.0 Balance of Payments and International Investment Position, Table 1: Balance of Payments, summary: original, Direct Investment in Australia. Q3/1985 – Q2/2003.	A$ million
ausinvdef **(Australian Investment Deflator)**	dxEcondata, ABS Treasury Model Database, NIF – Current Series, Table N12: NIF.P – Price Indexes, Price indexes: Private gross fixed capital expenditure: Plant & equipment investment. Q3/1985-Q1/2003.	Index, 2000/01 = 1
ausrfdi **(Real Quarterly Aggregate FDI Inflows into Australia)**	Constructed as *ausrfdi = ausnfdi/ausinvdef*. Q3/1985 – Q1/2003.	A$ million, 2000/01 prices
Market Size		
ausrgdp **(Real Quarterly Australian GDP)**	dxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-05: Expenditure on GDP: Chain Volume Measures: seasonally adjusted, CVM: Gross domestic product. Q3/1985 – Q1/2003.	A$ million, 2000/01 prices
Factor Costs		
ausjobvac **(Number of Australian Job Vacancies)**	dxEcondata. ABS Time Series Statistics Plus, L. Labour, ABS 6354.0 – Job Vacancies, Table 6354-01: Total Job Vacancies: Private & Public: States, Total job vacancies: Private sector: Australia, seasonally adjusted. Q3/1985 – Q2/2003.	'000 vacancies
ausuer **(Australian Unemployment Rate)**	dxEcondata. ABS Labour Force Statistics, Unemployment Rate: Australia, Table LMUR-909: Aus: Unemployment Rate: Persons: Total, Seasonally adjusted. Q3/1985–Q2/2003.	%
auscpi **(Australian Consumer Price Index)**	Derived from Inflation Series, knowing that $ausinf_t = ((auscpi_t - auscpi_{t-1})/auscpi_t)*100$. Q3/1985 – Q2/2003.	Index, 2000/01 = 1
ausawe **(Australian Average Weekly Earnings)**	dxEcondata, ABS Time Series Statistics Plus, L. Labour, ABS 6302.0 – Average Weekly Earnings, Table 6302-02: Average Weekly Earnings: Australia: seasonally adjusted. AWE: Persons, Total earnings: All employees, s.a. Q3/1985 – Q1/2003.	A$ per week
ausrwages1 **(Australian Real Wages 1)**	Constructed as *ausrwages1 = ausawe/auscpi*. Q3/1985 – Q1/2003.	A$ per week, 2000/01 prices
auswss **(Australian Wages, salaries & supplements)**	dxEcondata, ABS Treasury Model Database, NIF – Current Series, Table N20: NIF.Y – Incomes, Incomes: Wages, salaries & supplements: Farm & Non-farm, seasonally adjusted. Q3/1985-Q1/2003.	A$ million per quarter
ausemp **(Number of Employed Persons in Australia)**	dxEcondata, ABS Treasury Model Database, NIF – Current Series, Table N11: NIF.N – Labour Market, Labour market: Farm & Non-farm employment: Total, seasonally adjusted. Q3/1985-Q1/2003.	'000 employees
auswsspe **(Australian Wages, Salaries & Supplements per Employee)**	Constructed as *auswsspe = auswss/(ausemp*13)*. Q3/1985-Q1/2003.	A$ per week
ausipd **(Australian GDP Implicit Deflator)**	DxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-09: Expenditure on GDP: Implicit Price Deflators: Seasonally adjusted: IPD: Gross domestic product. Q3/1985 – Q2/2003.	Index, 2000/01 = 1
ausrwages2 **(Australian Real Wages 2)**	Constructed as *ausrwages2 = auswsspe/ausipd*. Q3/1985-Q1/2003.	A$ per week, 2000/01 prices
ausprod **(Australian Labour Productivity)**	dxEcondata, ABS National Accounts (2001/02), Summary Tables and Productivity Estimates, Table 5204-21: Productivity & Related Measures: Market Sector, Productivity: Labour (GDP per unit of labour input). Q3/1985 – Q2/2002.	Index, 2000/01 = 1
ausrwages11 **(Australian Real Wages 11)**	Constructed as *ausrwages11 = ausrwages1/ausprod*. Q3/1985 – Q2/2002.	A$ per week, 2000/01 prices
ausrwages22 **(Australian Real Wages 22)**	Constructed as *ausrwages22 = ausrwages2/ausprod*. Q3/1985 – Q2/2002.	A$ per week, 2000/01 prices

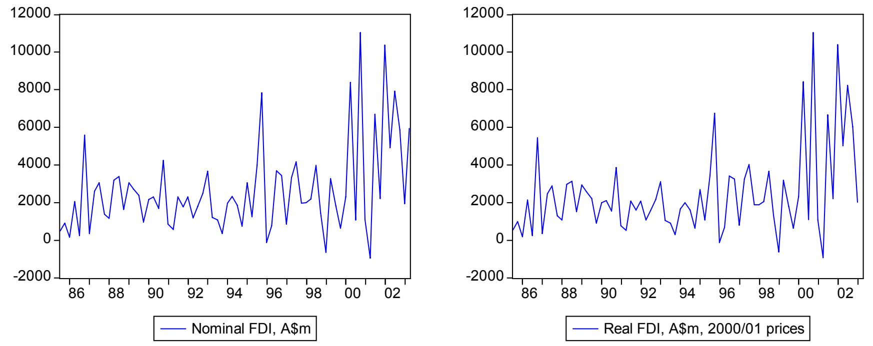
(Table A-1 continued)

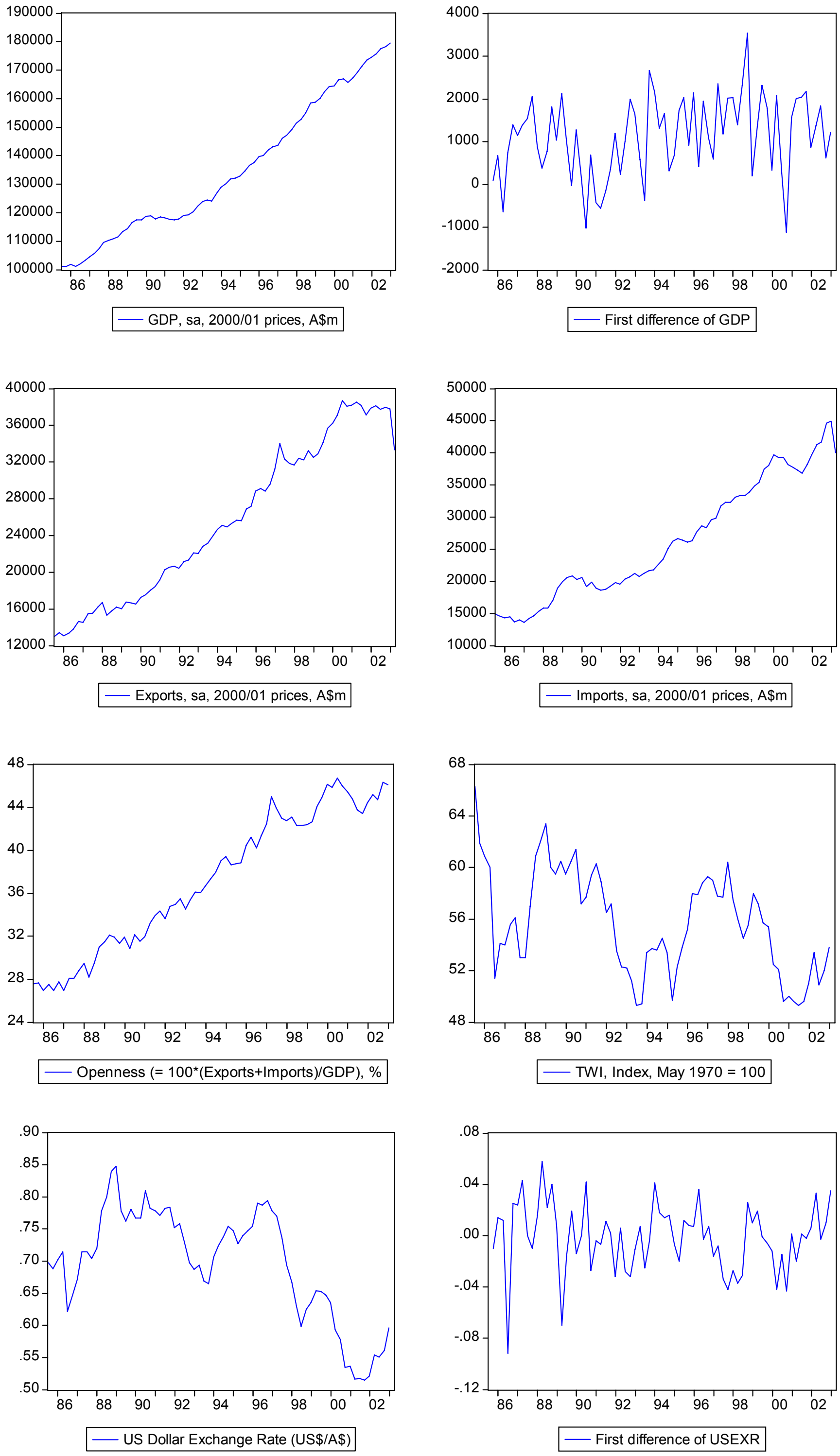
Transport Costs and Protection		
ausrexpo **(Real Quarterly Australian Exports)**	dxEcondata, ABS Time Series Statistics Plus, B. Balance of Payments, ABS 5302.0 Balance of Payments and International Investment Position, Table 5302-06: Goods & Services: Chain Volume Measures & Price Indexes, seasonally adjusted: CVM: Goods & services: Credits: Total. Q3/1985 – Q2/2003.	A$ million, 2000/01 prices
ausrimpo **(Real Quarterly Australian Imports)**	dxEcondata, ABS Time Series Statistics Plus, B. Balance of Payments, ABS 5302.0 Balance of Payments and International Investment Position, Table 5302-06: Goods & Services: Chain Volume Measures & Price Indexes, seasonally adjusted: CVM: Goods & services: Debits: Total. Q3/1985 – Q2/2003.	A$ million, 2000/01 prices
ausopen **(Openness of the Australian Economy)**	Constructed as *ausopen = 100*(ausrexpo+ausrimpo)/ausrgdp*. Q3/1985 – Q2/2003.	%
auscdut **(Australian Customs Duty)**	ABS 1364.0.15.003 Modellers' Database, Table 31. TRYM Rates, Customs Duty. Q3/1985-Q1/2003.	%
Risk Factors		
ausbb30 **(Nominal Australian Interest Rate)**	dx EconData, RBA Bulletin Database, F. Financial Markets, Interest Rates and Exchange Rates, Table F.01: 1: Interest Rates and Yields: Money Market: Monthly, Interest rates: Money market: Bank accepted bills: 30 days. Q3/1985 – Q2/2003.	% per annum
auscpi **(Australian Annual Consumer Price Inflation)**	dxEcondata, RBA Bulletin Database, G. Prices and Output, Table G.01: Measures of Consumer Price Inflation, Annual percentage change: CPI: All groups. Q3/1985 – Q1/2003.	% per annum
ausrir **(Real Australian Interest Rate)**	Constructed as *ausrir = ausbb30-auscpi*. Q3/1985-Q1/2003.	% per annum
austwi **(Australian Exchange Rate, Trade Weighted Index)**	dxEcondata, ABS Time Series Statistics Plus, B. Balance of Payments, ABS 5302.0 Balance of Payments and International Investment Position, Table 5302-38: Exchange Rates, Exchange rates: Period average: Trade weighted index. Q3/1985 – Q1/2003.	Index, May 1970 = 100
ausinf **(Australian Quarterly Inflation Rate)**	dxEcondata, RBA Bulletin Database, G. Prices and Output, Table G.01: Measures of Consumer Price Inflation, Quarterly percentage change: CPI: All groups. Q3/1985 – Q1/2003.	% per quarter
exrus **(US Dollar-Australian Dollar Exchange Rate)**	dxEcondata, ABS Time Series Statistics Plus, B. Balance of Payments, ABS 5302.0 Balance of Payments and International Investment Position, Table 5302-38: Exchange Rates, Exchange rates: Period average: United States dollar. Q3/1985 – Q1/2003.	US$/A$
ausindus **(Working Days Lost due to Industrial Disputes in Australia)**	dxEcondata, ABS Time Series Statistics Plus, L. Labour, ABS 6321.0 – Industrial Disputes, Table 6321-2A: Working Days Lost: Industry*, Days Lost: All Industries, *seasonally adjusted using Eviews "Seasonal Adjustment, Census X11 – Multiplicative"*. Q3/1985 – Q4/2002.	'000 days per quarter
Policy Variables		
austax **(Australian Corporate Tax Rate)**	dxEcondata. ABS Treasury Model Database, NIF – Current Series, Table N14: NIF.R – Tax Rates, Tax rates: Corporate trading enterprises. Q3/1985-Q1/2003.	%
Other Factors		
oecdrgdp **(Real Quarterly OECD GDP)**	dxEcondata. OECD Quarterly National Accounts, 1. Zones in US dollars, OECD-Total, Table A1-1d: OECD-Total (25 countries): GDP by Expenditure: 2000 Prices & 2000 PPPs (seasonally adjusted). Q3/1985 – Q1/2003.	US$ billion, 2000 prices
gdpgrdifq **(Difference in Quarterly GDP Growth between Australia and OECD)**	Constructed as Difference between Australian and OECD (25 countries) Quarterly GDP Growth Rates (based on *oecdrgdp* and *ausrgdp*)	%
gdpgrdifa **(Difference in Annual GDP Growth between Australia and OECD)**	Constructed as Difference between Australian and OECD (25 countries) Annual GDP Growth Rates (based on *oecdrgdp* and *ausrgdp*)	%
Other Variables		
auscons **(Real Quarterly Australian Consumption Expenditure)**	dxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-05: Expenditure on GDP: Chain Volume Measures: seasonally adjusted, CVM: Final Consumption Expenditure. Q3/1985 – Q1/2003.	A$ million, 2000/01 prices

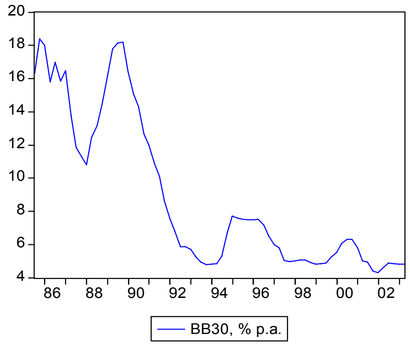
Table A-2

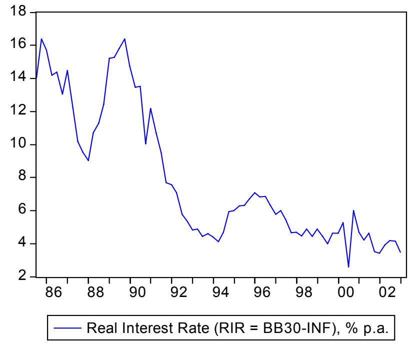
Summary Statistics, Quarterly FDI Model					
Variable	**Observations**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
FDI					
ausnfdi	72	2,636.431	2,361.683	- 960.000	11,028.000
ausrfdi	71	2,647.507	2,327.317	-941.177	11,050.100
Market Size					
ausrgdp	71	135,011.500	23,861.58	101,121.000	179,453.000
Factor Costs					
ausjobvac	72	62,473	22.528	20.320	101.050
ausuer	72	7.860	1.395	10.800	5.600
ausrwages1	71	635.768	17.615	607.760	667.040
ausrwages2	71	606.517	52.976	529.976	691.836
ausrwages11	68	746.023	74.839	632.781	887.680
ausrwages22	68	703.709	28.537	652.800	774.418
Transport Costs and Protection					
ausrexpo	72	25,597.760	8,530.785	13,029.000	38,683.000
ausrimpo	72	26,362.220	9,190.078	13,584.000	44,912.000
ausopen	72	37.188	6.429	26.916	46.743
auscdut	72	4.340	1.472	2.530	7.130
Risk Factors					
ausbb30	72	8.857	4.640	4.307	18.400
ausrir	71	7.906	4.116	2.600	16.400
austwi	71	55.749	3.976	49.300	66.300
exrus	71	0.695	0.086	0.515	0.848
ausinf	71	1.008	0.850	- 0.400	3.700
ausindus	70	220.625	130.243	51.437	555.435
Policy Variables					
austax	71	37.662	5.071	30.000	49.000
Other Factors					
oecdrgdp	71	21,770.011	2,939.934	16,891.212	26,636.215
gdpgrdifq	71	0.197	0.804	-1.760	2.010
gdpgrdifa	71	0.768	1.531	-2.460	4.000
Other Variables					
auscons	71	106,695.056	17,643.472	81,411.000	141,064.000

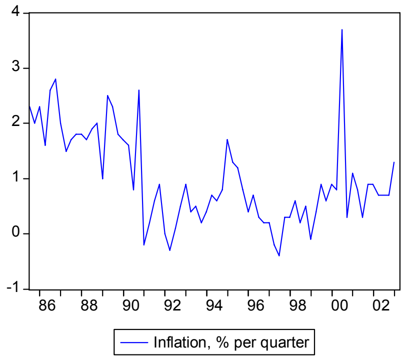
Figure A-1: Time Series Plots, Quarterly FDI Model

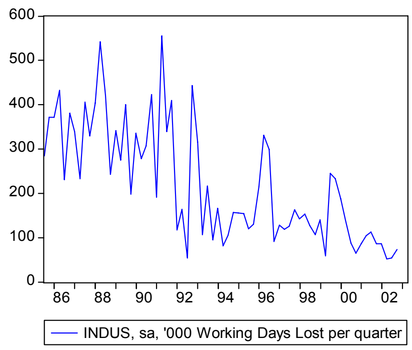


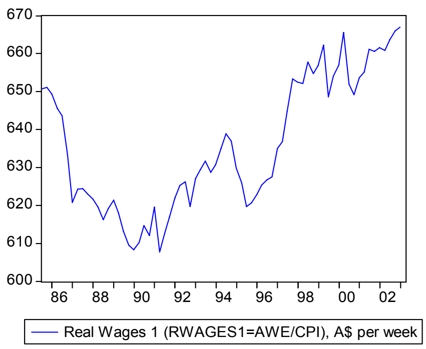

GDP, sa, 2000/01 prices, A$m
First difference of GDP
Exports, sa, 2000/01 prices, A$m
Imports, sa, 2000/01 prices, A$m
Openness (= 100*(Exports+Imports)/GDP), %
TWI, Index, May 1970 = 100
US Dollar Exchange Rate (US$/A$)
First difference of USEXR

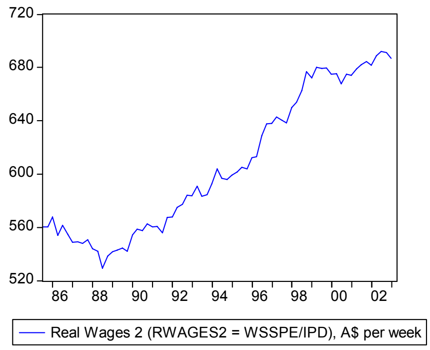

BB30, % p.a.

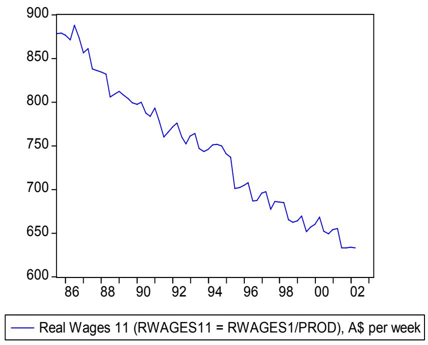

Real Interest Rate (RIR = BB30-INF), % p.a.

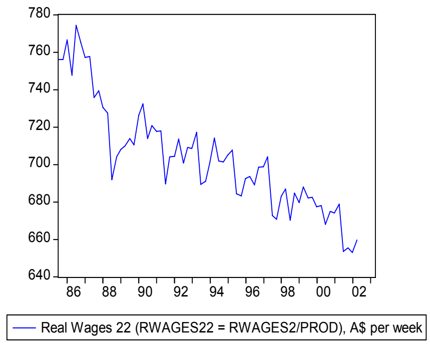

Inflation, % per quarter

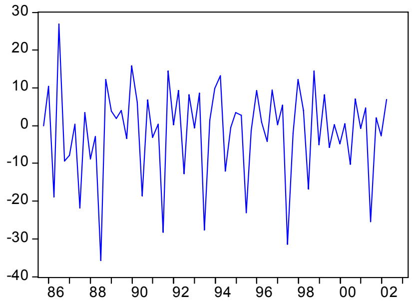

INDUS, sa, '000 Working Days Lost per quarter


Real Wages 1 (RWAGES1=AWE/CPI), A$ per week

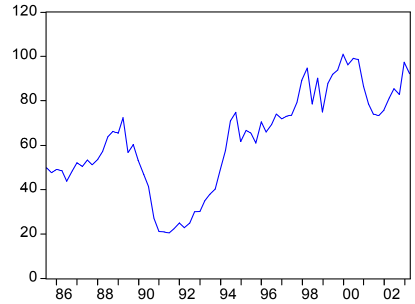

Real Wages 2 (RWAGES2 = WSSPE/IPD), A$ per week


Real Wages 11 (RWAGES11 = RWAGES1/PROD), A$ per week

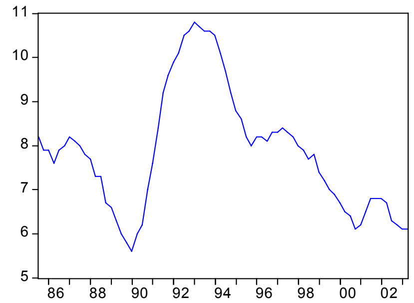

Real Wages 22 (RWAGES22 = RWAGES2/PROD), A$ per week



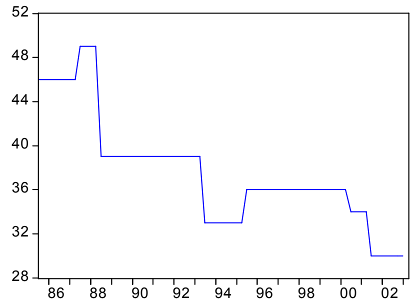
First difference of RWAGES22



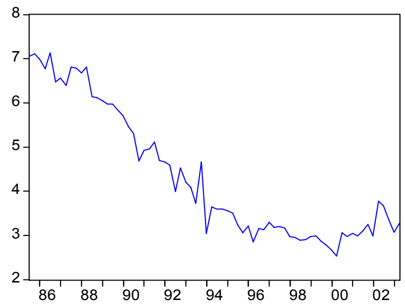
Job vacancies, sa, '000



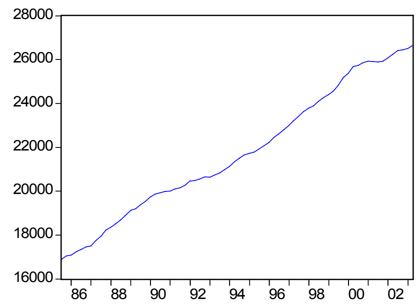
Unemployment Rate (UER), sa, %



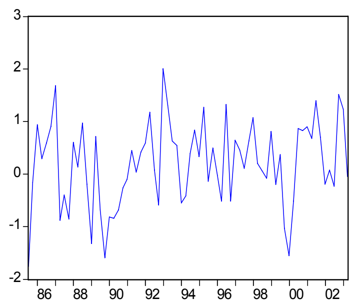
Tax Rate: Corporate Trading Enterprise, %



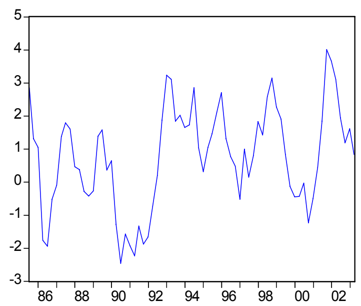
Customs Duty, %



OECD GDP, sa, 2000 prices, US$b



Difference in Quarterly GDP Growth between Australia and OECD



Difference in Annual GDP Growth between Australia and OECD

A. 2 COUNTRY-SPECIFIC FDI MODEL (ANALYSED IN CHAPTER 4.2)

Table A-3

Data Sources, Country-Specific FDI Model		
Variable	**Source and Name of Series**	**Unit of measurement**
FDI		
ausnfdic **(Nominal Annual Country-Specific FDI Inflows into Australia)**	Australian Bureau of Statistics, International Investment Section, unpublished data, cited in UNCTAD (2003), p.9, Table 6a. 1992 – 2001.	A$ million
ausinvdef **(Investment Deflator)**	See Quarterly Data, annual average. 1992 – 2001.	Index, 2000/01 = 1
ausrfdic **(Real Annual Country-Specific FDI Inflows into Australia)**	Constructed as *ausrfdic = ausnfdic/ausinvdef*. 1992 – 2001.	A$ million, 2000/01 prices
Market Size		
ausrgdp **(Real Annual Australian GDP)**	The World Bank. 2003. World Development Indicators (CD-Rom). Washington, D.C: Development Data Group, The World Bank. GDP. 1992 – 2001.	A$ million, constant prices
rgdpc, ausrgdp1 **(Real Annual GDP, Home & Australia)**	The World Bank. 2003. World Development Indicators (CD-Rom). Washington, D.C: Development Data Group, The World Bank. GDP. 1992 – 2001.	US$ million, 1995 prices
aprgdp **(Real Annual Asia-Pacific GDP)**	dxEcondata. World Bank World Tables. Topical Pages. GDP and Growth. Table T.08: GDP: 1995 US$: East Asia and the Pacific, South Asia and other High-Income OECD and non-OECD countries in Asia-Pacific (incl. Japan, Korea, New Zealand, Hong Kong and Singapore), excl. Australia. 1992 – 2001.	US$ million, 1995 prices
rgdpdifc **(Market Size Differential, Home minus Australia)**	Constructed as *rgdpdifc = rgdpc – ausrgdp1*. 1992 – 2001.	US$ million, 1995 prices
relgdpc **(Relative Market Size, Home/Australia)**	Constructed as *relgdpc = rgdpc/ausrgdp1*. 1992 – 2001.	---
rgdpsumc **(Combined Market Size, Home & Australia)**	Constructed as *rgdpsumc = rgdpc + ausrgdp1*. 1992 – 2001.	US$ million, 1995 prices
Factor Costs		
ausjobvac **(Number of Australian Job Vacancies)**	See Quarterly Data, annual average. 1992 – 2001.	'000 vacancies
ausuer **(Australian Unemployment Rate)**	See Quarterly Data, annual average. 1992 – 2001.	%
ausrwages1 **(Australian Real Wages 1)**	See Quarterly Data, annual average. 1992 – 2001.	A$ per week, 2000/01 prices
ausrwages2 **(Australian Real Wages 2)**	See Quarterly Data, annual average. 1992 – 2001.	A$ per week, 2000/01 prices
ausrwages11 **(Australian Real Wages 11)**	See Quarterly Data, annual average. 1992 – 2001.	A$ per week, 2000/01 prices
ausrwages22 **(Australian Real Wages 22)**	See Quarterly Data, annual average. 1992 – 2001.	A$ per week, 2000/01 prices
ausprod **(Australian Labour Productivity)**	See Quarterly Data, annual average. 1992 – 2001.	Index, 2000/01 = 1
tertc, austert **(Tertiary Education in Home & Australia)**	The World Bank. 2003. World Development Indicators (CD-Rom). Washington, D.C: Development Data Group, The World Bank. School enrolment, tertiary. 1992 – 2001.	% gross
reltertc **(Relative Skill Endowment, Home/ Australia)**	Constructed as *reltertc = tertc/austert*. 1992 – 2001.	---

(Table A-3 continued)

Transport Costs and Protection		
expoc **(Nominal Annual Country-Specific Australian Exports)**	ABS 5368.0 International Trade in Goods and Services, Australia, Table 9a: Merchandise Exports, Country and Country groups, Australia, fob value. 1992 – 2001.	A$ million
impoc **(Nominal Annual Country-Specific Australian Imports)**	ABS 5368.0 International Trade in Goods and Services, Australia, Table 9b: Merchandise Imports, Country and Country groups, Australia, customs value. 1992 – 2001.	A$ million
ausipd **(Australian GDP Implicit Deflator)**	See Quarterly Data, annual average. 1992 – 2001.	Index, 2000/01 = 1
rexpoc **(Real Annual Country-Specific Australian Exports)**	Constructed as *rexpoc = expoc/ipd*. 1992 – 2001.	A$ million, 2000/01 prices
rimpoc **(Real Annual Country-Specific Australian Imports)**	Constructed as *rimpoc = impoc/ipd*. 1992 – 2001.	A$ million, 2000/01 prices
rtradec **(Real Annual Country-Specific Australian Trade)**	Constructed as *rtradec = rexpoc + rimpoc*. 1992 – 2001.	A$ million, 2000/01 prices
ausopen (Openness of the Australian Economy)	See Quarterly Data, annual average. 1992 – 2001.	%
geodistc **(Country-Specific Geographical Distance)**	Time & Distance Calculator: Geographical distance from Home capital to Host capital (Canberra). www.ar-group.com/calc.htm 1992 – 2001.	Km
timedistc **(Country-Specific Time Difference)**	Time Zone Converter: Time Difference between Home capital and Host capital (Canberra). www.timezoneconverter.com. 1992 – 2001.	Hours
auscdut **(Australian Customs Duty)**	The World Bank. 2003. World Development Indicators, Washington, D.C: Development Data Group, The World Bank, various issues. 1992 – 2001.	%
cdutc **(Home Customs Duty)**	The World Bank. 2003. World Development Indicators, Washington, D.C: Development Data Group, The World Bank, various issues. 1992 – 2001.	%
cdutsumc **(Combined Customs Duty, Home & Australia)**	Constructed as *cdutsumc = cdutc + auscdut*. 1992 – 2001.	%
Risk Factors		
ausbb30 **(Nominal Australian Interest Rate)**	See Quarterly Data, annual average. 1992 – 2001.	% per annum
inrc, ausinr **(Nominal Interest Rate, Home & Australia)**	The World Bank. 2003. World Development Indicators (CD-Rom). Washington, D.C: Development Data Group, The World Bank. Lending interest rate. 1992 – 2001.	% per annum
relinrc **(Relative Interest Rate, Home/Australia)**	Constructed as *relinrc = inrc/ausinr*. 1992 – 2001.	---
inrdifc **(Interest Rate Difference, Home minus Australia)**	Constructed as *inrdifc = inrc - ausinr*. 1992 – 2001.	% per annum
exrc **(Country-Specific Exchange Rate)**	The World Bank. 2003. World Development Indicators (CD-Rom). Washington, D.C: Development Data Group, The World Bank. Official exchange rate (LCU per US$, period average). 1992 – 2001. Converted into LCU/A$.	LCU/A$
exrvolc **(Country-Specific Exchange Rate Volatility)**	Exchange Rate Volatility (LCU/A$). Constructed as percentage change of *exrc*. 1992 – 2001.	%
austwi **(Australian Exchange Rate, Trade Weighted Index)**	See Quarterly Data, annual average. 1992 – 2001.	Index, May 1970 = 100
infc, ausinf **(Inflation Rate, Home & Australia)**	The World Bank. 2003. World Development Indicators (CD-Rom). Washington, D.C: Development Data Group, The World Bank. Inflation, consumer prices. 1992 – 2001.	% per annum
relinfc **(Relative Inflation Rate, Home/Australia)**	Constructed as *relinfc = infc/ausinf*. 1992 – 2001.	---

(Table A-3 continued)

(Risk Factors continued)		
inrdifc **(Inflation Rate Difference, Home minus Australia)**	Constructed as *infdifc = infc - ausinf*. 1992 – 2001.	% per annum
ausindus **(Working Days Lost due to Industrial Disputes in Australia)**	See Quarterly Data, annual total. 1992 – 2001.	'000 days per annum
Policy Variables		
taxc, austax **(Corporate Tax Rate, Home & Australia)**	dxEcondata, ABS Treasury Model Database, NIF – Current Series, Table N14: NIF.R – Tax Rates, Tax rates: Corporate trading enterprises and KPMG. Corporate Tax Survey, various issues. 1992 – 2001.	%
taxdifc **(Corporate Tax Rate Differential, Home minus Australia)**	Constructed as *taxdifc = taxc - austax*. 1992 – 2001.	%
Other Factors		
outfdic **(Nominal Annual Home FDI Outflows)**	UNCTAD Handbook of Statistics On-line: FDI Database. FDI Outflows (US$, converted into A$) www.unctad.org/statistics/handbook. 1992 - 2001.	A$ million
outrfdic **(Real Annual Home FDI Outflows)**	Constructed as *routfdic = outfdic/ausinvdef*. 1992 – 2001.	A$ million, 2000/01 prices
apfdi **(Nominal Annual Asia-Pacific FDI Inflows)**	UNCTAD Handbook of Statistics On-line: FDI Database. FDI Inflows: Asia-Pacific, excluding Australia (US$, converted into A$). 1992 – 2001. www.unctad.org/statistics/handbook	A$ million,
aprfdi **(Real Annual Asia-Pacific FDI Inflows)**	Constructed as *aprfdi = apfdi/ausinvdef*. 1992 – 2001.	A$ million, 2000/01 prices
oecdrgdp **(Real Annual OECD GDP)**	See Quarterly Data, annual total. 1992 – 2001.	US$ billion, 2000 prices
gdpgrdifa **(Difference in Annual GDP Growth between Australia and OECD)**	Constructed as Difference between Australian and OECD (25 countries) Annual GDP Growth Rates (based on *oecdrgdp* and *ausrgdp*)	%
eng **(Dummy for Home Countries with English as an Official Language)**	English is Official Language in Canada, Hong Kong, Ireland, New Zealand, Philippines, Singapore, South Africa, United Kingdom and United States. CIA: The World Fact Book. www.cia.gov/cia/publications/factbook/ 1992 – 2001.	---
eu, ap, na **(Dummy for Home region)**	EU (Europe) includes Belgium/Luxembourg, France, Germany, Ireland, Italy, Netherlands, Sweden, Switzerland and United Kingdom. AP (Asia-Pacific) includes China, Hong Kong, Indonesia, Japan, Korea, Malaysia, New Zealand, Philippines, Singapore and Thailand. NA (North America) includes: Canada and United States. Note: South Africa is not included in EU, AP or NA. 1992 – 2001.	---

Table A-4

Summary Statistics, Country-Specific FDI Model							
Variable	**Observations**			**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
	n	**T**	**N**				
FDI							
ausnfdic	22	9.82	216	369.685	1,789.281	-12,057.000	13,988.000
ausrfdic	22	9.82	216	346.208	1,755.132	-11,946.500	14,147.160
Market Size							
ausrgdp	22	10	220	537,326.300	61,480.640	445,833.000	632,990.000
aprgdp	22	10	220	8,164,319.000	642,515.600	7,138,142.000	9,086,559.000
rgdpdifc	22	10	220	694,229.600	1,898,617.000	-398,299.000	8,544,644.000
relgdpc	22	10	220	2.754	4.774	0.151	20.234
rgdpsumc	22	10	220	1,490,839.000	1,902,776.000	382,591.000	9,483,078.000
Factor Costs							
ausjobvac	22	10	220	42.194	14.007	25.723	66.318
ausuer	22	10	220	8.400	1.423	6.400	10.800
ausrwages1	22	10	220	640.339	13.785	623.260	657.650
ausrwages2	22	10	220	631.614	38.064	576.130	679.850
ausrwages11	22	10	220	700.938	41.637	643.720	764.840
ausrwages22	22	10	220	704.107	3.361	698.734	708.793

(Table A-4 continued)

Variable	Observations			Mean	Std. Dev.	Minimum	Maximum
	n	T	N				
ausprod	22	10	220	1.048	0.061	0.953	1.136
austert	22	10	220	41.489	20.495	3.000	89.000
reltertc	22	10	220	0.638	0.333	0.058	2.146
Transport Costs and Protection							
rimpoc	22	10	220	3,584.908	4,588.498	168.116	23,604.900
rexpoc	22	10	220	3,046.572	4,012.442	12.600	23,258.200
rtradec	22	10	220	6,631.479	7,951.795	288.696	38,313.190
ausopen	22	10	220	40.808	3.717	34.731	46.207
geodistc	22	10	220	11,759.860	4,938.183	2,321.000	17,227.000
timedistc	22	10	220	-6.227	4.642	-15.000	2.000
auscdut	22	10	220	3.346	0.521	2.808	4.443
cdutc	22	10	220	8.411	7.305	0.000	45.600
cdutsumc	22	10	220	11.756	7.457	2.808	49.770
Risk Factors							
ausbb30	22	10	220	6.901	1.764	4.952	10.390
relinrc	22	9.82	216	0.998	0.519	0.235	4.001
inrdifc	22	9.82	216	-0.086	4.632	-8.338	24.117
austwi	22	10	220	54.177	2.816	49.625	58.450
exrc	22	10	220	1.284	16.017	-19.436	191.330
ausinf	22	10	220	2.337	1.544	0.250	4.638
relinfc	22	10	220	3.251	6.452	-2.703	67.545
infdifc	22	10	220	0.914	7.202	-5.312	66.692
ausindus	22	10	220	612.790	176.087	393.100	941.200
Policy Variables							
austax	22	10	220	35.200	1.837	33.000	39.000
taxdifc	22	8.35	167	0.397	9.783	-36.000	26.670
Other Factors							
outrfdic	22	9.82	216	32,329.110	58,428.180	-5,770.572	377,409.000
aprfdi	22	9.82	216	139,169.900	68,272.240	43,719.410	270,821.700
oecdrgdp	22	10	220	92,299.800	7,459.318	82,141.990	103,636.900
gdpgrdifa	22	10	220	1.157	0.936	-0.540	2.550
eng	22	10	220	0.405	0.492	0.000	1.000
na	22	10	220	0.091	0.288	0.000	1.000
eu	22	10	220	0.409	0.493	0.000	1.000
ap	22	10	220	0.455	0.499	0.000	1.000

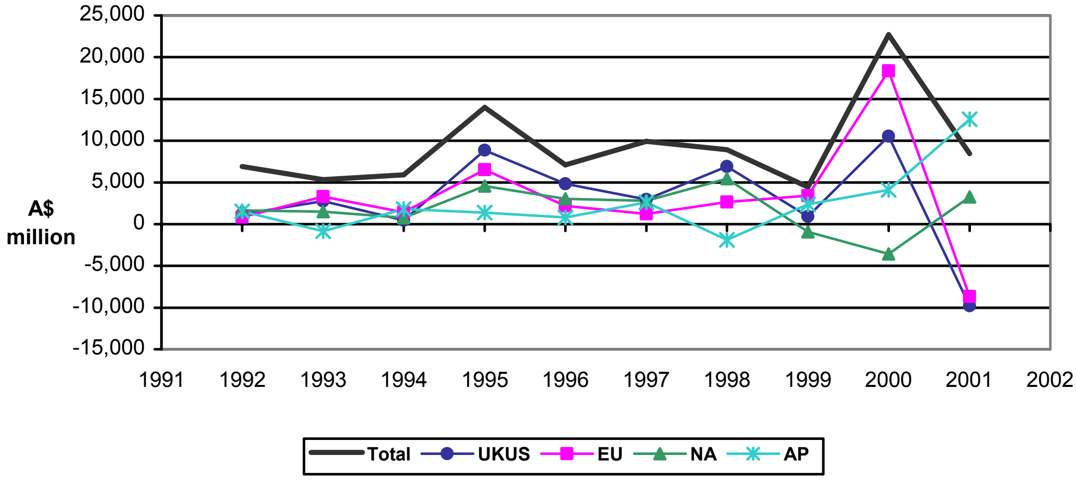


Figure A-2: Real Annual Australian FDI Inflows (by Country and Total), 1991 to 2002

A. 3 INDUSTRY-SPECIFIC FDI MODEL (ANALYSED IN CHAPTERS 5 & 6.1)

Table A-5

Industry Classifications, Industry-Specific FDI Model					
	Australia	**US**	**UK**	**Japan**	**Germany**
Primary Industries					
Agriculture (*agr*)	1992 – 2001	*(oi)*	1981 – 2001	1989 – 2001	1990 – 2001
Mining (*min*)	1992 – 2001	1982 – 2001	1981 – 2001	1989 – 2001	*(oi)*
Secondary Industries					
Manufacturing Total (*man*)	1992 – 2001	---	---	---	---
Food, Beverages, Tobacco (*food*)	---	1982 – 2001	1981 – 2001	1989 – 2001	*(om)*
Textile/Clothing, Wood, Printing (*texw*)	---	*(om)*	1981 – 2001	1989 – 2001	*(om)*
Chemicals (*chem*)	---	1982 – 2001	1981 – 2001	1989 – 2001	1989 – 2001
Machinery (*mach*)	---	1982 – 2001	1981 – 2001	1989 – 2001	1989 – 2001
Metals (*met*)	---	1982 – 2001	*(mach)*	1989 – 2001	*(om)*
Electronics (*elec*)	---	1982 – 2001	*(mach)*	1989 – 2001	1989 – 2001
Transport Equipment (*tran*)	---	1982 – 2001	1981 – 2001	1989 – 2001	1989 – 2001
*Other Manufacturing (om)**	---	*1982 – 2001*	*1981 – 2001*	*1989 – 2001*	*1989 – 2001*
Tertiary Industries					
Construction (*con*)	1992 – 2001	*(os)*	1981 – 2001	1989 – 2001	*(os)*
Retail & Wholesale Trade (*trd*)	1992 – 2001	1982 – 2001	1981 – 2001	1989 – 2001	1989 – 2001
Hospitality (Restaurants, Hotels) (*rest*)	1992 – 2001	*(os)*	1981 – 2001	*(os)*	*(os)*
Communication Services (*com*)	---	*(os)*	1981 – 2001	*(os)*	*(os)*
Finance, Insurance (*fins*)	1992 – 2001	1982 – 2001	1981 – 2001	1989 – 2001	1989 – 2001
Business Services (*rebs*)	1992 – 2001	*(os)*	1981 – 2001	1989 – 2001	*(os)*
Transport Services (*tras*)	1992 – 2001	*(os)*	*(os)*	1989 – 2001	*(os)*
Utilities (Electricity, Gas, Water) (*uti*)	1992 – 2001	*(os)*	*(os)*	*(os)*	*(os)*
*Other Services (os)**	*1992 – 2001*	*1982 – 2001*	*1981 – 2001*	*1989 – 2001*	*1989 – 2001*
*Other Industries (oi)**	*1992 – 2001*	*1982 – 2001*	*1981 – 2001*	*1989 – 2001*	*1989 – 2001*
Total*	**1992 – 2001**	**1982 – 2001**	**1981 – 2001**	**1989 – 2001**	**1989 – 2001**

* *om, os, oi* and Total were not included in the estimation.

Table A-6

Data Sources, Industry-Specific FDI Model		
Variable	**Source and Name of Series**	**Unit of measurement**
FDI		
ausnfdii **(Nominal Annual Industry-Specific FDI Inflows into Australia)**	Australian Bureau of Statistics, International Investment Section, unpublished data, cited in: UNCTAD (2003), p.9, Table 6a. 1992 – 2001.	A$ million
nfdiius **(Nominal Annual Industry-Specific US FDI Outflows into Australia)**	US Department of Commerce, Bureau of Economic Analysis. (US$, converted into A$). 1982 – 2001.	A$ million
nfdiiuk **(Nominal Annual Industry-Specific UK FDI Outflows into Australia)**	UK National Statistics. (GBP, converted into A$). 1981 – 2001.	A$ million
nfdiijp **(Nominal Annual Industry-Specific Japanese FDI Outflows into Australia)**	Japanese Ministry of Economy, Trade and Industry. (JPY, converted into A$). 1989 – 2001.	A$ million

(Table A-6 continued)

(FDI continued)		
nfdiide **(Nominal Annual Industry-Specific German FDI Outflows into Australia)**	Deutsche Bundesbank, Kapitalverflechtung mit dem Ausland, Statistische Sonderveroeffentlichung 10, various issues. (DEM, converted into A$). 1989 – 2001.	A$ million
ausinvdef **(Australian Investment Deflator)**	dxEcondata, ABS Treasury Model Database, NIF – Current Series, Table N12: NIF.P – Price Indexes, Price indexes: Private gross fixed capital expenditure: Plant & equipment investment. 1981 – 2001.	Index, 2001/02 = 1
ausrfdii **(Real Annual Industry-Specific FDI Inflows into Australia)**	Constructed as *ausrfdii = ausnfdiic/ausinvdef*. 1981 – 2001.	A$ million, 2001/02 prices
rfdiic (rfdiius, rfdiiuk, rfdiijp, rfdiide) **(Real Annual Industry- & Country-Specific FDI Inflows into Australia)**	Constructed as *rfdiic = nfdiic/ausinvdef*. 1981 – 2001.	A$ million, 2001/02 prices
ussales **(Nominal Exports from US Affiliates in Australia to the US)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Sales by Affiliates to the United States, Country of Affiliate (Australia) by Industry of Affiliate. 1988 – 1998.	US$ million
localsales **(Local Australian Sales by US Affiliates)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Local Sales by Affiliates, Country of Affiliate (Australia) by Industry of Affiliate. 1988 – 1998.	US$ million
thirdsales **(Exports by US Affiliates in Australia to third Countries)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Sales by Affiliates to Foreign Countries Other Than the Host Country, Country of Affiliate (Australia) by Industry of Affiliate. 1988 – 1998.	US$ million
totalsales **(Total Australian Sales by US Affiliates)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Sales by Affiliates, Country (Australia) by Industry. 1988 – 1998. Equivalent to: *totalsales = ussales + localsales + thirdsales.*	US$ million
affimports **(Imports by US Affiliates in Australia from US Parents)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey, (various issues), US Exports of Goods Shipped to Affiliates by US Parents, Country of Affiliate (Australia) by Industry of Affiliate. 1988 – 1998.	US$ million
russales, rlocalsales, rthirdsales, rtotalsales, raffimports **(Real Different Forms of FDI Flows)**	US$, converted into A$ using *exrus*, then constructed as *russales = ussales/ausipd, rlocalsales = localsales/ausipd, rthirdsales = thirdsales/ausipd, rtotalsales = totalsales/ausipd, raffimports = affimports/ausipd*. 1988 - 1998.	A$ million, 2001/02 prices
Market Size		
ausrgdpi **(Real Annual Industry-Specific Australian GDP)**	dxEcondata, ABS National Accounts 2002/03, Summary Tables and Productivity Estimates, Table 5205-10: Industry Gross Value Added: Chain Volume Measures. 1981 – 2001.	A$ million, 2001/02 prices
ausrgdp **(Real Annual Australian GDP)**	See Country-specific Data. 1981 – 2001.	A$ million, constant prices
rgdpc, ausrgdp1 **(Real Annual GDP, Home & Australia)**	See Country-specific Data. 1981 – 2001.	US$ million, 1995 prices
rgdpdifc (rgdpdifus, rgdpdifuk, rgdpdifjp, rgdpdifde **(Market Size Differential, Home minus Australia)**	Constructed as *rgdpdifc = rgdpc – ausrgdp1*. 1981 – 2001.	US$ million, 1995 prices
relgdpc (relgdpus, relgdpuk, relgdpjp, relgdpde) **(Relative Market Size, Home/Australia)**	Constructed as *relgdpc = rgdpc/ausrgdp1*. 1981 – 2001.	---
rgdpsumc (rgdpsumus, rgdpsumuk, rgdpsumjp, rgdpsumde) **(Combined Market Size, Home & Australia)**	Constructed as *rgdpsumc = rgdpc + ausrgdp1*. 1981 – 2001.	US$ million, 1995 prices
aprgdp **(Real Annual Asia-Pacific GDP)**	See Country-specific Data. 1981 – 2001.	US$ million, 1995 prices

(Table A-6 continued)

(Market Size continued)		
ausemp **(Number of Employed Persons in Australia)**	See Country-specific data. 1981 – 2001.	'000 employees
ausempi **(Number of Employed Person in Australia, by Industry)**	dxEcondata, ABS Labour Force Statistics. Industry: Employed: Australia. Table LQEI-909: Australia: Employed: By ANZSIC industry: Persons: Total. Annual Average. 1985 – 2001.	'000 employees
Factor Costs		
ausjobvac **(Number of Australian Job Vacancies)**	See Country-specific data. 1980 – 2001.	'000 vacancies
ausjobvaci **(Number of Industry-Specific Australian Job Vacancies)**	DxEcondata, ABS Time Series Statistics Plus, L. Labour, ABS 6354.0 – Job Vacancies, Table 6354-02: Total Job Vacancies: Industry: Australia, Total Job Vacancies by industry. 1994 – 2001.	'000 vacancies
ausuer **(Australian Unemployment Rate)**	See Country-specific data. 1982 – 2001.	%
auscpi **(Australian Consumer Price Index)**	Derived from Inflation Series, knowing that $ausinf_t = ((auscpi_t - auscpi_{t-1})/auscpi_t)*100$. 1982 – 2001.	Index, 2001/02 = 1
ausipd **(Australian GDP Implicit Deflator)**	DxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-12: Expenditure on GDP: Implicit Price Deflators: Seasonally adjusted: IPD: Gross domestic product. 1981 – 2001.	Index, 2001/02 prices
ausprod **(Australian Labour Productivity)**	dxEcondata, ABS National Accounts (2002/03), Summary Tables and Productivity Estimates, Table 5204-22: Productivity in the Market Sector: Labour (Hours Worked Basis). 1981 – 2001.	Index, 2001/02 = 1
ausrwages1 **(Australian Real Wages 1)**	See Quarterly Data *"ausrwages1'* (but using *auscpi* 2001/02), annual average. 1981 – 2001.	A$ per week, 2001/02 prices
ausrwages11 **(Australian Real Wages 11)**	See Quarterly Data *"ausrwages11'* (but using *auscpi* 2001/02 and *ausprod* 2001/02), annual average. 1982 – 2001.	A$ per week, 2001/02 prices
ausrwages2 **(Australian Real Wages 2)**	See Quarterly Data *"ausrwages2'* (but using *ausipd* 2001/02), annual average. 1982 – 2001.	A$ per week, 2001/02 prices
ausrwages22 **(Australian Real Wages 22)**	See Quarterly Data *'ausrwages22'* (but using *ausipd* 2001/02 and PROD 2001/02), annual average. 1981 – 2001.	A$ per week, 2001/02 prices
ausawei **(Australian Industry Average Weekly Earnings)**	DxEcondata, ABS Time Series Statistics Plus, L. Labour, ABS 6302.0 – Average Weekly Earnings, Table 6302-10: Average Weekly Earnings: Industry, AWE: Persons: Total Earnings: All employees, by industry (excl. agriculture)). 1984 – 2001.	A$ per week, 2001/02 prices
ausrwages1i **(Australian Industry-Specific Real Wages 1)**	See Quarterly Data *"ausrwages1'* (but using *auscpi* 2001/02 and *ausawei*), annual average. 1984 – 2001.	A$ per week, 2001/02 prices
ausrwages11i **(Australian Industry-Specific Real Wages 11)**	See Quarterly Data *"ausrwages11'* (but using *ausawei, auscpi* 2001/02 and *ausprod* 2001/02), annual average. 1992 – 2001.	A$ per week, 2001/02 prices
tertc, austert **(Tertiary Education in Home & Australia)**	See Country-specific data. 1981 – 2001.	% gross
reltertc (reltertus, reltertuk, reltertjp, reltertde) **(Relative Skill Endowment, Home/ Australia)**	Constructed as *reltertc = tertc/austert.* 1981 – 2001.	---
Transport Costs and Protection		
ausrexpo **(Real Annual Australian Exports)**	dxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-06: Expenditure on GDP: Chain Volume Measures: Seasonally adjusted. Exports of Goods & services. 1981 – 2001	A$ million, 2001/02 prices
ausrimpo **(Real Annual Australian Imports)**	dxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-06: Expenditure on GDP: Chain Volume Measures: Seasonally adjusted. Imports of Goods & services. 1981 – 2001	A$ million, 2001/02 prices
ausopen **(Openness of the Australian Economy)**	Constructed as *ausopen = (ausrexpo+ausrimpo)/ausgdp.* 1981 – 2001	%

(Table A-6 continued)

(Transport Costs and Protection continued)		
expoc (expous, expouk, expojp, expode) **(Nominal Annual Country-Specific Australian Exports)**	See Country-specific data. 1988 – 2001	A$ million
impoc (impous, impouk, impojp, impode) **(Nominal Annual Country-Specific Australian Imports)**	See Country-specific data. 1988 – 2001	A$ million
rexpoc (rexpous, rexpouk, rexpojp, rexpode) **(Real Annual Country-Specific Australian Exports)**	Constructed as *rexpoc = expoc/ausipd*. 1988 – 2001	A$ million, 2001/02 prices
rimpoc (rimpous, rimpouk, rimpojp, rimpode) **(Real Annual Country-Specific Australian Imports)**	Constructed as *rimpoc = impoc/ausipd*. 1988 – 2001	A$ million, 2001/02 prices
ausexportsi **(Industry-Specific Australian Exports)**	ABS 5496.0.55.001 Foreign Ownership of Australian Exporters and Importers, 2002-03. Table 5 "Exporters exporting goods valued at $1m or more, by Industry of exporter, 2002-03". Total Value of Goods exported. 1992 – 2001 average.	A$ million
ausexpinti **(Industry-Specific Australian Export Intensity)**	Constructed as *ausexpinti = ausexportsi/ausgdpi.* 1992 – 2001 average.	%
ausimportsi **(Industry-Specific Australian Imports)**	ABS 5496.0.55.001 Foreign Ownership of Australian Exporters and Importers, 2002-03. Table 12 "Importers importing goods valued at $1m or more, by Industry of importer, 2002-03". Total Value of Goods imported. 1992 – 2001 average.	A$ million
ausimpinti **(Industry-Specific Australian Import Intensity)**	Constructed as *ausimpinti = ausimportsi/ausgdpi.* 1992 – 2001 average.	%
ausopeni **(Australian Industry-Specific Openness)**	Constructed as *ausopeni = (ausexportsi + ausimportsi)/ausgdpi*100.* 1992 – 2001 average.	%
auscdut **(Australian Customs Duty)**	See Country-specific data. 1981 – 2001.	%
cudtc (cdutus, cdutuk, cdutjp, cdutde) **(Home Customs Duty)**	See Country-specific data. 1988 – 2001.	%
Risk Factors		
ausbb30 **(Nominal Australian Interest Rate)**	See Country-specific data. 1981 – 2001.	% per annum
inrc (inrus, inruk, inrjp, inrde), ausinr **(Nominal Interest Rate, Home & Australia)**	See Country-specific data. 1981 – 2001	% per annum
relinrc (relinrus, relinruk, relinrjp, relinrde) **(Relative Interest Rate, Home/Australia)**	Constructed as *relinrc = inrc/ausinr*. 1981 – 2001.	---
inrdifc (inrdifus, inrdifuk, inrdifjp, inrdifde) **(Interest Rate Difference, Home minus Australia)**	Constructed as *inrdifc = inrc – ausinr*. 1981 – 2001.	% per annum
exrc (exrus, exruk, exrjp, exrde) **(Country-Specific Exchange Rate)**	See Country-specific data. 1981 – 2001.	LCU/A$
exrvolc (exrvolus, exrvoluk, exrvoljp, exrvolde) **(Country-Specific Exchange Rate Volatility)**	See Country-specific data. 1981 – 2001.	%

(Table A-6 continued)

(Risk Factors continued)		
austwi **(Australian Exchange Rate, Trade Weighted Index)**	See Country-specific data. 1981 – 2001.	Index, May 1970 = 100
infc (infus, infuk, infjp, infde), ausinf **(Inflation Rate, Home & Australia)**	See Country-specific data. 1981 – 2001.	% per annum
relinfc (relinfus, relinfuk, relinfjp, relinfde) **(Relative Inflation Rate, Home/Australia)**	Constructed as *relinfc = infc/ausinf*. 1981 – 2001.	---
infdifc(infdifus, infdifuk, infdifjp, infdifde) **(Inflation Rate Difference, Home minus Australia)**	Constructed as *infdifc = infc – ausinf*. 1981 – 2001.	% per annum
ausindus **(Working Days Lost due to Industrial Disputes in Australia)**	See Country-specific. 1981 – 2001.	'000 days per annum
ausindusi **(Working Days Lost due to Industrial Disputes in Australia, by Industry)**	dxEcondata, ABS Time Series Statistics Plus, L. Labour, ABS 6321.0 Industrial Disputes, Table 6321-04: Working days lost per thousand employees: Industry, 12 Months ended December, by industry. 1981 – 2001.	Days per annum per 1000 employees
Policy Variables		
taxc (taxus, taxuk, taxjp, taxed), austax **(Corporate Tax Rate, Home & Australia)**	See Country-specific data. 1992 – 2001.	%
taxdifc (taxdifus, taxdifuk, taxdifjp, taxdifde) **(Corporate Tax Rate Differential, Home minus Australia)**	See Country-specific data. 1992 – 2001.	%
Other Factors		
outfdic (outfdius, outfdiuk, outfdijp, outfdide) **(Nominal Annual Home FDI Outflows)**	See Country-specific data. 1981 – 2001.	A$ million
outrfdic (outrfdius, outrfdiuk, outrfdijp, outrfdide) **(Real Annual Home FDI Outflows)**	Constructed as *outrfdic = outfdic/ausinvdef*. 1981 – 2001.	A$ million, 2001/02 prices
apfdi **(Nominal Annual Asia-Pacific FDI Inflows)**	See Country-specific data. 1981 – 2001.	A$ million
aprfdi **(Real Annual Asia-Pacific FDI Inflows)**	Constructed as *aprfdi = apfdi/ausinvdef*. 1981 – 2001.	A$ million, 2001/02 prices
oecdrgdp **(Real Annual OECD GDP)**	See Country-specific. 1981 – 2001.	US$ billion, 1995 prices
gdpgrdifa **(Difference in Annual GDP Growth between Australia and OECD)**	Constructed as Difference between Australian and OECD (25 countries) Annual GDP Growth Rates (based on *oecdrgdp* and *ausrgdp*)	%
prim, man, tert **(Industry Dummy)**	*prim* includes all industries in the Primary Sector, i.e. Agriculture and Mining, *man* includes all industries in the Manufacturing Sector, i.e. Food, Textiles, Chemicals, Machinery, Metals, Electronics and Transport Equipment, and *tert* includes all industries in the Tertiary Sector, i.e. Construction, Trade, Hospitality, Communications, Finance, Business Services, Transport and Utilities. 1992 – 2001.	---

Table A-7

Summary Statistics, Industry-Specific FDI Model							
Variable	Observations			Mean	Std. Dev.	Minimum	Maximum
	n	T	N				
FDI							
ausnfdii	10	10	95	812.126	1,861.417	-7,039.000	12,082.000
nfdiius	11	20	168	170.807	490.360	-599.096	4,819.971
nfdiiuk	12	21	204	132.543	609.530	-5,563.681	2,846.297
nfdiijp	16	12	147	1.956	3.591	0.006	19.888
nfdiide	8	12	83	459.830	505.960	16.886	2,660.853
ausrfdii	10	10	95	751.283	1,799.641	-6,921.337	12,094.090
rfdiius	11	20	168	158.998	453.946	-509.436	4,454.686
rfdiiuk	12	21	204	124.366	582.343	-5,470.679	2,826.474
rfdiijp	16	12	147	1.690	3.176	0.002	18.587
rfdiide	8	12	83	423.192	481.170	16.347	2,616.375
ussales	12	21	103	123.524	175.133	1.139	755.462
localsales	12	21	122	4,400.739	4,027.088	492.840	24,449.150
thirdsales	12	21	102	470.423	560.930	2.562	3,492.736
totalsales	12	21	148	5,068.662	4,350.722	495.682	28,079.977
affimports	12	21	156	446.844	787.931	0.000	4,299.445
russales	12	21	103	145.638	205.236	1.434	792.720
rlocalsales	12	21	122	5,157.658	4,472.997	583.602	24,696.111
rthirdsales	12	21	102	583.915	629.395	3.105	3,528.016
rtotalsales	12	21	148	6,076.684	4,829.482	719.892	28,363.613
raffimports	12	21	156	540.254	900.950	0.000	4,342.874
Market Size							
ausrgdpi	17	21	357	22,898.126	16,990.161	4,062.000	75,119.000
ausrgdp	17	21	357	455,064.286	93,919.302	319,400.00	632,990.00
rgdpdifus	17	21	357	6,395,783.810	1,215,926.630	4,551,130.000	8,544,680.000
rgdpdifuk	17	21	357	709,660.476	93,101.722	544,460.000	865,380.000
rgdpdifjp	17	21	357	4,409,136.190	711,064.024	3,155,470.000	5,229,000.000
rgdpdifde	17	21	357	1,928,540.952	213,006.322	1,590,630.000	2,234,900.000
relgdpus	17	21	357	20.020	0.358	19.210	20.549
relgdpuk	17	21	357	3.136	0.164	2.844	3.392
relgdpjp	17	21	357	14.201	0.979	12.036	15.965
relgdpde	17	21	357	6.831	0.573	5.758	7.718
rgdpsumus	17	21	357	7,070,435.238	1,354,993.837	5,024,670.000	9,483,120.000
rgdpsumuk	17	21	357	1,384,311.905	231,130.452	1,030,720.000	1,803,820.000
rgdpsumjp	17	21	357	5,083,787.619	840,387.969	3,641,730.000	6,132,200.000
rgdpsumde	17	21	357	2,603,192.381	347,977.280	2,064,170.000	3,170,820.000
aprgdp	17	21	357	6,762,663.643	1,539,221.997	4,349,489.960	9,086,558.590
ausemp	17	21	357	7,748.948	857.323	6,410.700	9,213.300
ausempi	17	18	289	764.517	466.515	64.400	1,845.000
Factor Costs							
ausjobvac	17	21	357	66.659	24.618	31.290	115.830
ausjobvaci	17	8	136	9.106	6.340	0.000	26.270
ausuer	17	21	357	8.005	1.383	5.800	10.600
ausrwages1	17	21	357	606.107	48.876	552.822	696.158
ausrwages11	17	20	340	654.150	17.133	628.659	683.713
ausrwages2	17	21	357	774.354	45.626	711.090	877.549
ausrwages22	17	20	340	834.721	96.751	692.460	1,006.555
ausrwages1i	16	18	287	726.633	176.665	345.190	1,428.920
ausrwages11i	16	18	287	920.618	269.852	405.716	2,066.477
austert	17	21	357	47.825	19.787	25.865	79.821
reltertus	17	21	357	1.697	0.510	1.002	2.182
reltertuk	17	21	357	0.799	0.091	0.634	0.943
reltertjp	17	21	357	0.815	0.191	0.563	1.158
reltertde	17	12	204	0.727	0.127	0.601	0.955
Transport Costs and Protection							
ausrimpo	17	21	357	88,278.286	34,679.427	45,546.000	155,279.000
ausrexpo	17	21	357	87,138.762	36,603.972	39,402.000	153,838.000
ausopen	17	21	357	33.281	6.873	23.594	44.940

(Table A-7 continued)

Variable	Observations			Mean	Std. Dev.	Minimum	Maximum
	n	T	N				
(Transport Costs and Protection continued)							
rimpous	17	14	238	18,299.670	3,783.612	12,617.200	24,261.280
rimpouk	17	14	238	5,177.173	1,047.100	3,726.723	7,300.105
rimpojp	17	14	238	13,305.241	1,615.323	10,553.810	16,072.400
rimpode	17	14	238	4,969.176	1,177.605	2,760.055	6,730.303
rexpous	17	14	238	7,424.802	2,136.532	5,307.339	12,034.340
rexpouk	17	14	238	3,228.168	998.159	2,076.179	5,250.505
rexpojp	17	14	238	18,589.775	2,212.266	15,933.430	23,962.630
rexpode	17	14	238	1,353.284	138.117	1,120.000	1,543.226
auscdut	17	21	357	4.995	1.704	2.808	7.215
cdutus	17	13	221	5.777	0.819	4.000	6.600
cdutuk	17	13	204	6.783	1.507	3.900	8.700
cdutjp	17	13	221	6.000	0.627	5.100	7.100
cdutde	17	12	204	6.783	1.507	3.900	8.700
Risk Factors							
ausbb30	17	21	357	10.241	4.545	4.940	17.580
relinrus	17	21	357	1.081	1.124	0.378	5.628
relinruk	17	21	357	0.608	0.245	0.282	1.253
relinrjp	17	21	357	0.643	0.462	0.240	2.180
relinrde	17	21	357	1.402	1.339	0.556	6.857
inrdifus	17	21	357	-1.808	3.829	-8.362	7.172
inrdifuk	17	21	357	-3.613	2.359	-7.534	0.826
inrdifjp	17	21	357	-3.945	3.207	-10.112	2.166
inrdifde	17	21	357	0.208	3.731	-6.326	9.075
austwi	17	21	357	61.543	11.850	48.600	91.500
exrus	17	21	357	0.758	0.138	0.517	1.149
exruk	17	21	357	0.473	0.076	0.359	0.660
exrjp	17	21	357	119.298	59.835	62.483	253.433
exrde	17	21	357	1.508	0.509	1.062	2.597
exrvolus	17	21	357	-3.363	7.860	-20.420	11.587
exrvoluk	17	21	357	-1.027	9.259	-17.516	16.717
exrvoljp	17	21	357	-5.815	11.324	-32.381	22.084
exrvolde	17	21	357	-2.030	12.465	-29.396	25.480
ausinf	17	21	357	4.914	3.403	-0.100	10.900
relinfus	17	21	357	1.395	1.888	0.205	9.334
relinfuk	17	21	357	1.742	2.588	0.377	12.506
relinfjp	17	21	357	0.653	1.471	-0.231	6.915
relinfde	17	21	357	1.136	1.815	-0.014	7.579
infdidus	17	21	357	-1.411	2.737	-7.226	2.087
infdifuk	17	21	357	-0.461	2.586	-5.657	2.882
infdifjp	17	21	357	-3.794	3.118	-8.465	1.481
infdifde	17	21	357	-2.696	3.423	-9.210	4.080
ausindus	17	21	357	1,192.195	816.260	393.100	4,189.200
ausindusi	17	21	357	527.196	1,572.546	7.000	15,548.000
Policy Variables							
austax	17	21	357	39.905	5.079	32.000	47.500
taxdifus	17	9	153	5.056	1.428	4.000	8.000
taxdifuk	17	9	153	-3.278	1.756	-5.000	0.000
taxdifjp	17	9	153	14.318	3.678	7.000	19.400
taxdifde	17	9	153	19.566	5.121	7.360	24.450
Other Factors							
outrfdius	17	21	357	57,153.974	50,335.632	1,435.419	202,701.839
outrfdiuk	17	21	357	48,312.598	62,863.478	4,936.085	250,033.033
outrfdijp	17	21	357	20,461.571	11,452.214	4,459.000	43,539.000
outrfdide	17	21	357	26,975.704	26,550.520	4,019.973	106,145.208
aprfdi	17	21	357	78,361.750	75,127.556	10,554.108	282,658.273
oecdrgdp	17	21	357	73,535.856	12,183.036	55,323.259	94,415.656
oecdgrdifa	17	21	357	0.590	1.415	-2.970	2.550
prim	17	21	357	0.118	0.323	0.000	1.000
man	17	21	357	0.412	0.493	0.000	1.000
tert	17	21	357	0.471	0.500	0.000	1.000

A. 4 FDI FORMS (ANALYSED IN CHAPTER 6.2)

Table A-8

The Share of Vertical MNEs in Australian Sales, Employment and Assets by US MNEs – By Industry of Affiliate												
Lower Bound of Share of VMNEs (θ) if $a_i < b_i$	**Sales**				**Employment**				**Assets**			
	1989	**1991**	**1996**	**1998**	**1989**	**1991**	**1996**	**1998**	**1989**	**1991**	**1996**	**1998**
Petroleum	0.094	---	0.154	0.105	0.183	0.179	0.288	0.238	0.186	0.291	0.349	0.241
- Oil and gas extraction	---	---	---	---	---	---	---	---	---	---	---	---
- Crude petroleum extraction (no refining) and natural gas	---	0.987	---	---	---	---	---	---	---	---	---	---
- Oil and gas field services	---	---	---	---	---	---	---	---	---	---	---	---
- Petroleum and coal products	---	---	---	0.975	0.926	---	0.898	0.873	---	---	---	0.971
- Integrated petroleum refining and extraction	1.000	---	---	0.997	1.000	1.000	0.966	1.000	---	1.000	---	---
- Petroleum refining without extraction	---	---	---	---	---	---	---	---	---	---	---	---
- Petroleum and coal products, nec	---	0.421	0.654	---	---	---	---	---	---	---	0.385	---
- Petroleum wholesale trade	---	---	---	---	---	---	---	---	---	---	---	---
Manufacturing	0.275	---	0.309	0.313	0.277	0.313	0.297	0.220	0.425	0.413	0.464	0.489
Food and kindred products	0.174	---	0.160		0.443	0.486	0.496	0.035		0.395	0.427	0.432
- Grain mill and bakery products	---	---	---	---	---	---	---	---	---	---	---	---
- Beverages	---	---	---	---	---	---	---	---	---	---	---	---
Chemicals and allied products	---	0.211	---	---	---	---	---	---	---	---	---	---
- Industrial chemicals and synthetics	---	0.525	---	---	---	---	---	---	---	---	---	---
- Drugs	0.365	---	0.544	0.448	0.438	0.361	0.486	0.361	0.360	0.366	0.490	0.457
- Soap, cleaners, and toilet goods	0.223	---	0.023	0.174	0.326	0.438	0.000	0.037	0.255	0.308	---	0.060
- Agricultural chemicals	---	0.807	---	---	---	---	---	0.333	---	---	---	---
- Chemical products, nec	---	0.352	---	---	---	---	0.467	---	---	---	---	---
Primary and fabricated metals	0.773	---	0.809	0.745	0.558	0.674	0.586	0.463	---	0.844	0.906	0.866
- Primary metal industries	---	---		0.975		0.947	0.960	---	---	---	0.985	---
- Ferrous	---	---	---	---	0.600	---	---	---	---	---	---	0.244
- Fabricated metal products	---	---	---	---	---	---	0.015	---	---	---	0.735	---
Machinery, except electrical	0.642	---	0.699	0.802	0.485	0.376	0.396	0.618	0.732	0.702	0.659	0.822
- Farm and garden machinery	---	---	---	---	---	---	0.444	0.500	---	---	---	---
- Construction, mining, and materials handling machinery	---	0.188	0.496	0.452	---	---	0.000	---	0.014	---	0.492	0.514
- Office and computing machines	0.954	---	0.989	---	0.906	0.897	0.952	0.991	0.961	0.958	0.980	
Electric and electronic equipment	0.059	---	0.583	0.569	0.014	0.049	0.500	0.421	0.031	0.079	0.819	0.629
- Household appliances	---	0.260	---	---	---	---	---	---	---	---	---	---
- Radio, television, and communication equipment	0.438	---	0.120	0.139	0.556	---	0.100	0.083	---	---	0.058	0.443
- Electronic components and accessories	0.124	---	0.721	---	0.111	0.200	0.500	0.714	---	0.171	0.908	---
- Electrical machinery, nec	---	---	---	---	---	---	0.688	0.632	---	---	---	---
Transportation equipment	0.256	---	0.215	0.263	0.235	0.304	0.248	0.224	0.668	0.671	0.667	0.699
- Motor vehicles and equipment	---	---	0.116		0.090	0.104	0.074	---	0.616	0.589	0.618	---
- Other	---	---	0.942		0.981	0.982	0.871	---	0.994	0.995	0.820	---
Other manufacturing	0.040	---	0.044	0.164	0.054	0.087	---	0.251	---	---	0.109	0.193
- Textile products and apparel	---	0.344	---	---	---	---	---	---	---	---	---	---
- Lumber, wood, furniture, and fixtures	1.000	---	---	---	1.000	1.000	0.500	0.500	1.000	1.000	---	---
- Paper and allied products	0.429	0.397	---	0.147	0.407		0.033	0.263	0.461	---	0.258	0.508
- Printing and publishing	0.449	---	0.303	0.091	0.206	0.429	0.160	0.098	0.384	0.432	0.201	0.092
- Rubber products	0.362	---	0.943	0.897	0.333	0.333	0.800	0.500	---	---	0.979	0.971
- Miscellaneous plastics products	---	0.398	---	0.535	---	---	0.063	0.500	---	---	0.609	0.522
- Glass products	---	---	0.808	1.000	---	---	---	1.000	---	---	0.872	---
- Stone, clay, and other n on-metallic mineral products	---	---	---	---	---	0.111	---	---	---	---	---	---
- Instruments and related products	0.081	---	0.205	0.455	0.113	0.277	0.205	0.581	0.078	0.227	0.203	0.314
- Other	---	---	---	---	---	---	---	---	0.015	0.195	---	---

(Table A-8 continued)

	Sales				Employment				Assets			
	1989	1991	1996	1998	1989	1991	1996	1998	1989	1991	1996	1998
Wholesale trade	---	0.846	---	---	---	---	---	---	---	---	---	---
- Durable goods	---	0.894	---	---	---	---	---	---	---	---	---	---
- Nondurable goods	---	0.695	---	---	---	---	---	0.200	---	---	---	0.147
Finance (except banking), insurance, and real estate	---	0.401	---	---	0.085	0.103	0.169	0.077	---	---	---	---
- Finance, except banking	---	---	---	---	---	---	---	---	---	---	---	---
- Insurance	0.423	---	0.023	---	0.500	0.333	---	---	0.218	0.060	---	---
- Real estate	---	---	---	---	---	---	---	---	---	---	---	---
- Holding companies	---	---	0.814	---	---	1.000	0.867	0.900	---	---	---	---
Services	---	0.487	---	---	---	---	---	---	---	---	---	---
- Hotels and other lodging places	---	---	0.019	0.025	---	---	0.000	0.000	---	---	0.022	0.023
- Business services	---	0.408	---	---	---	---	---	---	---	---	---	---
- Advertising	---	0.667	---	---	---	---	---	---	---	---	---	---
- Equipment rental (ex. automotive and computers)	---	---	---	---	---	---	---	---	---	---	---	---
- Computer and data processing services	---	0.336	---	---	---	---	---	---	---	---	---	---
- Business services, nec	0.266	---	0.117	0.263	---	0.149	0.103	0.167	---	0.269	0.101	0.169
- Automotive rental and leasing	---	---	---	---	---	0.100	---	---	---	---	---	---
- Motion pictures, including television tape and film	---	---	---	---	0.500	0.000	---	0.000	---	---	---	---
- Health services	---	---	---	1.000	---	---	---	---	---	---	---	1.000
- Engineering, architectural, and surveying services	---	---	---	---	---	---	---	---	---	---	---	---
- Management and public relations services	---	0.507	---	---	---	---	---	---	---	---	---	---
Other industries	---	0.278	---	---	---	---	---	---	---	---	---	---
- Agriculture, forestry, and fishing	---	1.000	---	---	---	---	---	---	---	---	---	---
- Mining	---	0.764	---	---	---	---	---	---	---	---	---	---
- Construction	0.412	0.129	---	---	0.400	---	---	---	0.415	---	---	---
- Transportation	---	0.000	0.017	0.191	---	---	0.357	0.433	---	---	0.111	0.310
- Communication and public utilities	0.740	---	0.549	0.190	0.486	0.600	---	---	0.535	0.523	---	---
- Retail trade	---	0.488	---	---	---	---	---	---	---	---	---	---

Table A-9

The Share of Vertical MNEs in Australian Sales, Employment and Assets by US MNEs – By Industry of Parent												
Lower Bound of Share of VMNEs (θ) if $a_i > b_i$	Sales				Employment				Assets			
	1989	1991	1996	1998	1989	1991	1996	1998	1989	1991	1996	1998
Petroleum	---	0.102	---	---	---	---	---	---	---	---	---	---
- Oil and gas extraction	---	---	---	---	---	---	0.833	0.760	---	---	---	0.916
- Crude petroleum extraction (no refining) and natural gas	---	---	---	---	---	---	0.941	0.941	---	---	---	---
- Oil and gas field services	---	---	---	---	---	---	0.714	0.500	---	---	---	---
- Petroleum and coal products	---	---	---	---	---	---	---	---	---	---	---	---
- Integrated petroleum refining and extraction	---	1.000	---	---	---	---	---	---	---	---	---	---
- Petroleum refining without extraction	---	---	---	---	---	---	1.000	---	---	---	---	---
- Petroleum and coal products, nec	---	---	---	---	---	---	---	---	0.444	0.545	---	---
- Petroleum wholesale trade	---	---	---	---	---	---	0.813	0.875	---	---	---	---
Manufacturing	---	0.286	---		---	---	---	---	---	---	---	---
Food and kindred products	---	0.230	---	0.004	---	---	---	---	---	---	---	---
- Grain mill and bakery products	---	---	---	---	---	---	0.886	0.902	---	---	---	---
- Beverages	---	---	---	---	---	---	---	---	---	---	---	---
Chemicals and allied products	0.282	---	0.132	0.149	0.080	0.029	0.123	0.272	0.453	0.395	0.416	0.407
- Industrial chemicals and synthetics	0.557	---	0.606	0.628	0.527	0.457	0.706	0.766	0.670	0.672	0.807	0.804
- Drugs	---	0.316	---	---	---	---	---	---	---	---	---	---
- Soap, cleaners, and toilet goods	---	0.379	---	---	---	---	0.000	---	---	---	0.285	---
- Agricultural chemicals	---	---	---	---	0.333	0.333	---	---	---	---	---	---
- Chemical products, nec	---	---	---	---	0.615	0.333	---	0.600	---	---	---	---

(Table A-9 continued)

	Sales				Employment				Assets			
	1989	1991	1996	1998	1989	1991	1996	1998	1989	1991	1996	1998
Primary and fabricated metals	---	0.774	---	---	---	---	---	---	---	---	---	---
- Primary metal industries	---	---	---	---	---	---	---	---	---	---	---	---
- Ferrous	---	---	---	---	---	---	---	0.750	---	---	---	---
- Fabricated metal products	---	---	---	0.067	---	0.359	---	---	---	---	---	---
Machinery, except electrical	---	0.575	---	---	---	---	---	---	---	---	---	---
- Farm and garden machinery	---	---	---	---	---	---	---	---	---	---	---	---
- Construction, mining, and materials handling machinery	0.130	---	---	---	0.500	0.541	0.000	0.295	---	0.004	---	---
- Office and computing machines	---	0.945	---	---	---	---	---	---	---	---	---	---
Electric and electronic equipment	---	0.095	---	---	---	---	---	---	---	---	---	---
- Household appliances	---	---	---	---	---	0.192	0.500	0.500	---	0.161	---	---
- Radio, television, and communication equipment	---	---	---	---	---	---	---	---	---	---	---	---
- Electronic components and accessories	---	0.122	---	---	---	---	---	---	0.223	---	---	---
- Electrical machinery, nec	---	---	---	---	---	---	---	---	---	---	---	---
Transportation equipment		0.316										
- Motor vehicles and equipment	---	0.183	---	---	---	---	---	---	---	---	---	---
- Other	---	0.991	---	---	---	---	---	---	---	---	---	---
Other manufacturing	---	0.090	---	---	---	---	0.084	---	0.019	0.097	---	---
- Textile products and apparel	0.299	---	0.719	0.730	0.214	0.167	0.743	0.652	0.394	0.793	0.808	0.750
- Lumber, wood, furniture, and fixtures	---	1.000	---	---	---	---	---	---	---	---	---	---
- Paper and allied products	---	---	0.002	---	---	0.415	---	---	---	0.399	---	---
- Printing and publishing	---	0.461	---	---	---	---	---	---	---	---	---	---
- Rubber products	---	0.407	---	---	---	---	---	---	---	---	---	---
- Miscellaneous plastics products	0.676	---	0.085	---	0.143	0.125	---	---	0.558	0.469	---	---
- Glass products	0.833	---	---	---	---	---	---	---	---	---	---	---
- Stone, clay, and other n on-metallic mineral products	---	---	0.415	1.000	0.625	---	---	1.000	---	---	0.310	1.000
- Instruments and related products	---	0.306	---	---	---	---	---	---	---	---	---	---
- Other	0.093	---	---	0.675	---	---	---	---	---	---	---	---
Wholesale trade	0.867	---	0.778	0.714	0.942	0.920	0.599	0.528	0.910	0.872	0.624	0.601
- Durable goods	---	---	0.891	0.876	0.954	0.948	0.828	0.820	0.945	0.900	0.877	0.891
- Nondurable goods	---	---	0.512	0.315	0.891	0.843	0.040	---	0.761	0.749	0.058	---
Finance (except banking), insurance, and real estate	0.303	---	0.366	0.281	---	---	---	---	0.675	0.696	0.780	0.764
- Finance, except banking	0.664	---	0.707	0.537	0.429	0.394	0.381	0.271	---	0.749	0.866	0.777
- Insurance	---	0.162	---	0.139	---	---	0.048	0.091	---	---	0.008	0.114
- Real estate	---	---	---	---	---	---	---	---	---	---	---	1.000
- Holding companies	---	---	---	---	---	---	---	---	---	0.914	0.831	---
Services	0.476	---	0.448	0.461	0.145	0.253	0.333	0.310	0.194	0.318	0.397	0.353
- Hotels and other lodging places	---	---	---	---	---	---	0.000	0.000	---	---	---	---
- Business services	0.517	---	0.435	0.373	---	0.210	0.277	0.260	0.102	0.200	0.468	0.373
- Advertising	0.659	---	0.181	0.189	0.333	0.484	0.111	0.100	---	0.255	0.160	0.234
- Equipment rental (ex. automotive and computers)	---	---	1.000	1.000	---	---	---	---	---	---	1.000	1.000
- Computer and data processing services	0.387	---	0.485	0.412	---	0.412	0.425	0.391	---	0.277	0.552	0.452
- Business services, nec	---	0.491	---	---	---	---	---	---	---	---	---	---
- Automotive rental and leasing	---	---	---	---	---	---	---	---	---	---	---	---
- Motion pictures, including television tape and film	---	---	0.237	0.321	---	0.000	---	0.000	---	---	---	0.121
- Health services	---	---	---	---	---	---	---	---	---	---	---	---
- Engineering, architectural, and surveying services	---	---	0.856	0.908	0.857	0.643	0.737	0.857	---	---	0.845	0.810
- Management and public relations services	0.677	---	0.432	0.345	0.500	0.286	0.591	0.621	0.861	0.777	0.443	0.372
Other industries	0.171	---	0.306	0.045	0.380	0.430	0.404	0.117	0.497	0.509	0.254	0.109
- Agriculture, forestry, and fishing	---	---	---	---	---	---	0.714	---	---	1.000	---	---
- Mining	---	---	0.731	---	---	0.762	0.240	---	---	---	0.739	---
- Construction	---	---	0.215	---	---	---	0.759	---	---	---	0.286	0.094
- Transportation	---	0.000	---	---	---	---	---	---	---	---	---	---
- Communication, public utilities	---	0.766	---	---	---	---	---	---	---	---	0.754	0.614
- Retail trade	0.380	---	---	---	0.508	0.509	---	---	0.295	0.158	---	0.090

Table A-10

Data Sources, FDI Forms		
Variable	**Source and Name of Series**	**Unit of measurement**
VMNE Intensity		
aassetsi **(Assets by Industry of Affiliate)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Total Assets of Affiliates, Industry by Country (Australia). 1989 – 1998.	US$ million
aempi **(Employment by Industry of Affiliate)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Employment of Affiliates, Industry by Country (Australia). 1989 – 1998.	'000 employees
asalesi **(Sales by Industry of Affiliate)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Sales by Affiliates, Industry by Country (Australia). 1989 – 1998.	US$ million
avii (aviassetsi, aviempi, avisalesi, aviratioi) **(Vertical MNE Intensity or Ratio of Vertical MNEs by Industry of Affiliate)**	Constructed as shown in Chapter 6.2.1	---
passetsi **(Assets by Industry of Parent)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Total Assets of Affiliates, Industry of US Parent by Country (Australia). 1989 – 1998.	US$ million
pempi **(Employment by Industry of Parent)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Employment of Affiliates, Industry of US Parent by Country (Australia). 1989 – 1998.	'000 employees
psalesi **(Sales by Industry of Parent)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Sales by Affiliates, Industry of US Parent by Country (Australia). 1989 – 1998.	US$ million
pvii (pviassetsi, pviempi, pvisalesi, pviratioi) **(Vertical MNE Intensity or Ratio of Vertical MNEs by Industry of Parent)**	Constructed as shown in Chapter 6.2.1	---
Explanatory Variables		
ausrgdpi **(Real Annual Industry-Specific Australian GDP)**	See Industry-specific data. 1989 – 1998.	A$ million, 2001/02 prices
ausempi **(Number of Employed Person in Australia, by Industry)**	See Industry-specific data. 1989 – 1998.	'000 employees
ausrwages1i **(Australian Industry-Specific Real Wages 1)**	See Industry-specific data. 1989 – 1998.	A$ per week, 2001/02 prices
ausindusi **(Working Days Lost due to Industrial Disputes in Australia, by Industry)**	See Industry-specific data. 1989 – 1998.	Days per annum per 1000 employees
capexi **(Industry-Specific Capital Expenditure)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Capital Expenditure by Affiliates, Industry by Country (All Countries). 1989 – 1998.	US$ million
firmsi **(Number of Foreign Affiliates, by Industry)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Selected Data for Foreign Affiliates and US Parents, by Industry, Number of Affiliates. 1989 – 1998.	---
pscalei **(Industry-Specific Plant-level Economies of Scale)**	Capital Expenditure per US Parent Firm by Industry Constructed as: *pscalei = capexi/firmsi.* 1989 – 1998.	US$ million
rdi **(Industry-Specific R&D Expenditure for all Countries)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Research and Development Performed by Affiliates, Industry of US Parent by Country (All Countries). 1989 – 1998.	US$ million
psalesalli **(Industry-Specific Affiliate Sales by Industry of Parent for all Countries)**	US Department of Commerce, Bureau of Economic Analysis, International Investment Division, US Direct Investment Abroad, Benchmark Survey (various issues), Sales by Affiliates, Industry of US Parent by Country (All Countries). 1989 – 1998.	US$ million

(Table A-10 continued)

(Explanatory Variables continued)		
fscalei **(Industry-Specific Firm-level Economies of Scale)**	Constructed as: *fscalei = rdi/psalesalli*. 1989 – 1998.	---
fserve **(Ratio of Service Sales to Manufacturing and Mining Sales)**	See Sales by Industry of Affiliate (*asalesi*) data. Constructed as: *fserve* = $asalesi_{Services}/asalesi_{Manufacturing+Mining}$. 1989 – 1998.	---

Table A-11

Summary Statistics, FDI Forms							
Variable	Observations			Mean	Std. Dev.	Minimum	Maximum
	n	T	N				
VMNE Intensity							
aassetsi	21	10	187	2,532.556	4,106.196	0.000	20,299.000
aempi	21	10	188	8.774	12.021	0.000	62.500
asalesi	21	10	195	1,983.241	2,754.139	0.000	11,211.000
passetsi	21	10	193	2,520.699	3,567.508	0.000	21,144.000
pempi	21	10	201	8.847	9.953	0.000	55.600
psalesi	21	10	195	2,106.518	2,474.043	0.000	9,872.000
aviassetsi	12	10	92	-0.064	1.684	-3.854	3.846
aviempi	13	10	102	-0.639	1.128	-4.263	1.386
avisalesi	14	10	94	-0.461	1.506	-4.060	2.806
aviratioi	14	10	116	-0.535	1.366	-4.292	2.282
pviassetsi	8	10	63	0.268	1.327	-2.442	2.779
pviempi	9	10	55	-0.347	1.655	-4.025	2.791
pvisalesi	8	10	57	-0.316	1.639	-6.488	2.333
pviratioi	9	10	72	-0.082	1.468	-6.488	2.472
Explanatory Variables							
ausgdpi	21	10	210	18,327.086	13,683.753	5,070.000	64,245.000
ausempi	21	10	210	866.224	420.422	82.275	1,779.725
ausrwages1i	20	10	200	727.627	156.303	345.190	1,399.740
ausindusi	21	10	210	361.581	1,000.894	7.000	7,171.000
pscalei	21	10	210	0.626	1.274	0.034	10.382
fscalei	21	10	210	0.006	0.007	0.000	0.024
fserve	21	10	210	2.127	2.014	1.183	8.121

A. 5 Consequences of Quarterly Aggregate FDI (Analysed in Chapter 8)

Table A-12

Data Sources, Analysis of Consequences of Quarterly Aggregate FDI		
Variable	**Source and Name of Series**	**Unit of measurement**
FDI and Other Capital		
ausnfdi **(Nominal Quarterly Aggregate FDI Inflows into Australia)**	ABS 5302.0 Balance of Payments and International Investment Position, Table 1: Balance of Payments, summary: original, Direct Investment in Australia. Q3/1985 – Q2/2003.	A$ million
ausinvdef **(Australian Investment Deflator)**	dxEcondata, ABS Treasury Model Database, NIF – Current Series, Table N12: NIF.P – Price Indexes, Price indexes: Private gross fixed capital expenditure: Plant & equipment investment. Q3/1985-Q1/2003.	Index, 2000/01 = 1
ausrfdi **(Real Quarterly Aggregate FDI Inflows into Australia)**	Constructed as *ausrfdi = ausnfdi/ausinvdef*. Q3/1985 – Q1/2003.	A$ million, 2000/01 prices
ausninv **(Nominal Investment in Australia)**	dxEconData, ABS Time Series Statistics Plus, N.National Accounts, ABS 5206.0 National Accounts: National Income, Expenditure and Product, Table 5206-09: Expenditure on GDP: Current Prices, seasonally adjusted. Total gross fixed capital formation. Q1/1985 – Q2/2003.	A$ million
ausrinv **(Real Investment in Australia)**	Constructed as *ausrinv = ausninv/ausinvdef.* Q3/1985 – Q1/2003.	A$ million, 2000/01 prices
ausrdi **(Real Domestic Investment in Australia)**	Constructed as *ausrdi = ausrinv - ausrfdi.* Q3/1985 – Q1/2003.	A$ million, 2000/01 prices
Market Size		
ausrgdp **(Real Quarterly Australian GDP)**	dxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-05: Expenditure on GDP: Chain Volume Measures: seasonally adjusted, CVM: Gross domestic product. Q3/1985 – Q1/2003.	A$ million, 2000/01 prices
Trade		
ausrexpo **(Real Quarterly Australian Exports)**	dxEcondata, ABS Time Series Statistics Plus, B. Balance of Payments, ABS 5302.0 Balance of Payments and International Investment Position, Table 5302-06: Goods & Services: Chain Volume Measures & Price Indexes, seasonally adjusted: CVM: Goods & services: Credits: Total. Q3/1985 – Q2/2003.	A$ million, 2000/01 prices
ausrimpo **(Real Quarterly Australian Imports)**	dxEcondata, ABS Time Series Statistics Plus, B. Balance of Payments, ABS 5302.0 Balance of Payments and International Investment Position, Table 5302-06: Goods & Services: Chain Volume Measures & Price Indexes, seasonally adjusted: CVM: Goods & services: Debits: Total. Q3/1985 – Q2/2003.	A$ million, 2000/01 prices

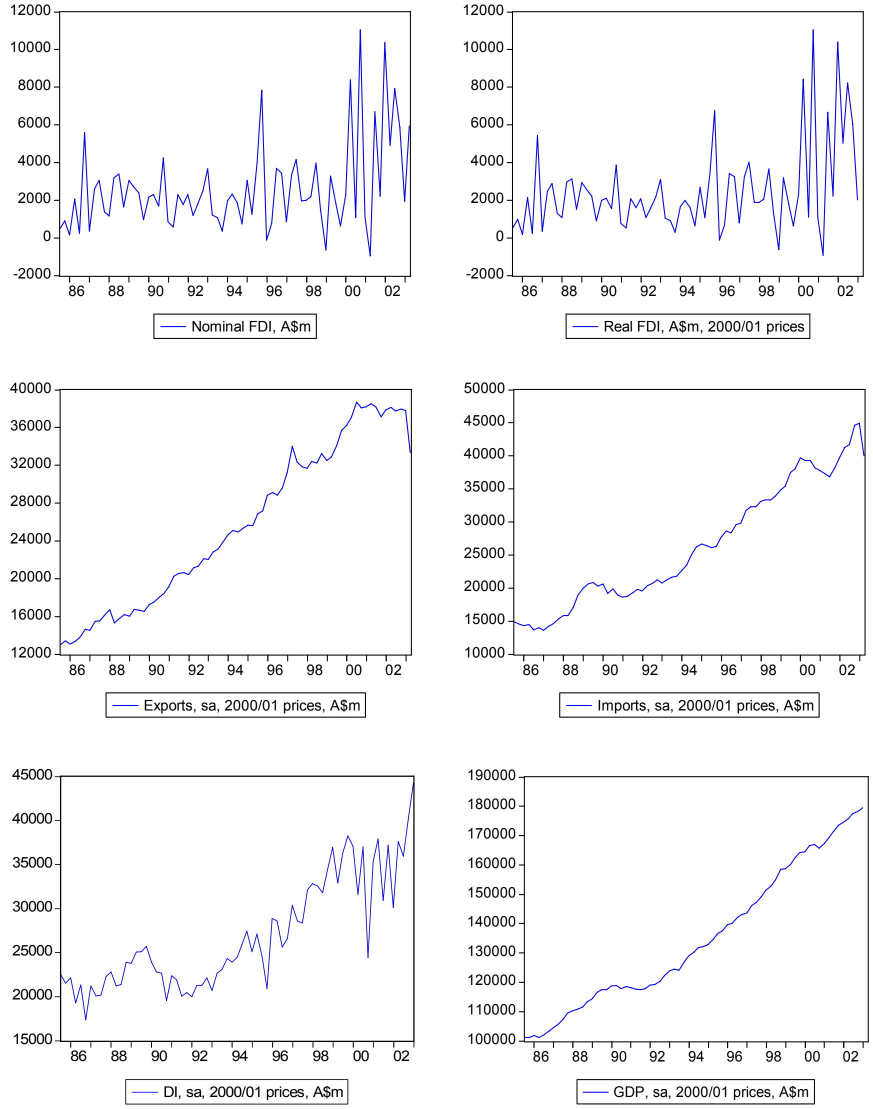
Table A-13

Summary Statistics, Analysis of Consequences of Quarterly Aggregate FDI					
Variable	**Observations**	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
FDI and Other Capital					
ausnfdi	72	2,636.431	2,361.683	- 960.000	11,028.000
ausrfdi	71	2,647.507	2,327.317	-941.177	11,050.100
ausrdi	71	25,909.598	6,323.226	17,372.659	44,278.417
Market Size					
ausrgdp	71	135,011.500	23,861.58	101,121.000	179,453.000
Trade					
ausrexpo	72	25,597.760	8,530.785	13,029.000	38,683.000
ausrimpo	72	26,362.220	9,190.078	13,584.000	44,912.000

Table A-14

Pairwise Correlation Matrix, Analysis of Consequences of Quarterly Aggregate FDI					
	ausrfdi	***ausrdi***	***ausrimpo***	***ausrexpo***	***ausrgdp***
ausrfdi	1.000	0.081	0.389	0.369	0.398
ausrdi	0.081	1.000	0.916	0.858	0.901
ausrimpo	0.389	0.916	1.000	0.976	0.993
ausrexpo	0.369	0.858	0.976	1.000	0.984
ausrgdp	0.398	0.901	0.993	0.984	1.000

Figure A-8: Time Series Plots, Analysis of Consequences of Quarterly Aggregate FDI



A. 6 CONSEQUENCES OF INDUSTRY-SPECIFIC FDI (ANALYSED IN CHAPTER 9)

Table A-15

Data Sources, Analysis of Consequences of Industry-Specific FDI		
Variable	**Source and Name of Series**	**Unit of measurement**
FDI and Other Capital		
ausnfdii **(Nominal Annual Industry-Specific FDI Inflows into Australia)**	Australian Bureau of Statistics, International Investment Section, unpublished data, cited in: UNCTAD (2003), p.9, Table 6a. 1992 – 2001.	A$ million
ausinvdef **(Australian Investment Deflator)**	dxEcondata, ABS Treasury Model Database, NIF – Current Series, Table N12: NIF.P – Price Indexes, Price indexes: Private gross fixed capital expenditure: Plant & equipment investment. 1992 – 2001.	Index, 2002/03 = 1
ausrfdii **(Real Annual Industry-Specific FDI Inflows into Australia)**	Constructed as *ausrfdii* = *ausnfdiic/ausinvdef.* 1992 – 2001.	A$ million, 2002/03 prices
ausnfdisti **(Nominal Annual Industry-Specific Inward FDI Stock in Australia)**	Australian Bureau of Statistics, International Investment Section, unpublished data, cited in: UNCTAD (2003), p.15, Table 11a. 1992 – 2001.	A$ million
ausrfdisti **(Aggregate Real FDI stock into Australia, by Industry)**	Constructed as *ausrfdisti* = *ausnfdisti/ausinvdef.* 1992 – 2001.	A$ million, 2002/03 prices
ausrinvi **(Industry-Specific Investment in Australia)**	dxEconData. ABS National Accounts (2002/03). Capital Estimates. Table 5204-71: Capital Stock: by Industry. CVM: Gross fixed capital formation 1992 – 2001.	A$ million, 2001/02 prices
ausrdi **(Industry-Specific Domestic Investment in Australia)**	Constructed as *ausrdi* = *ausrinvi* – *ausrfdii*. 1992 – 2001.	A$ million, 2001/02 prices
auscapi **(Real Industry-Specific Australian Capital Stock)**	dxEconData. ABS National Accounts (2002/03). Capital Estimates. Table 5204-71: Capital Stock: by Industry. CVM: End-year net capital stock. 1992 – 2001.	A$ million 2001/02 prices
auskli **(Capital Intensity of Industry-Specific Production)**	Constructed as *auskli* = *auscapi/ausempi.* 1992 – 2001.	A$ per employee
Market Size and Structure		
ausrgdpi **(Real Annual Industry-Specific Australian GDP)**	DxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-16: Industry Gross Value Added: Chain Volume Measures, Seasonally Adjusted, by Industry. 1992 – 2001.	A$ million, 2002/03 prices
aussalesi **(Nominal Industry-Specific Australian Sales)**	ABS 8140.0 Business Operations and Industry Performance – Australia, various issues. 1995 – 2001.	A$ million
ausipd **(Australian GDP Implicit Deflator)**	DxEcondata, ABS Time Series Statistics Plus, N. National Accounts, ABS 5206.0 – National Accounts: National Income, Expenditure and Product, Table 5206-12: Expenditure on GDP: Implicit Price Deflators: Seasonally adjusted: IPD: Gross domestic product. 1992 – 2001.	Index, 2002/03 prices
ausrsalesi **(Real Industry-Specific Australian Sales)**	Constructed as *ausrsalesi* = *aussalesi/ausipd.* 1995 – 2001.	A$ million, 2002/03 prices
ausprofmargi **(Australian Industry-Specific Profit Margin)**	ABS 8140.0 Business Operations and Industry Performance – Australia, various issues. Profit Margin (calculated as the percentage of operating income as operating profit before tax. 1992 – 2001.	%
ausni **(Number of Businesses in Australia, by Industry)**	ABS Data Cubes, Excel Spreadsheet 8140.0.55.002 Business Operations and Industry Performance, Australia, various issues. 1995 -2001.	Number of businesses

(Table A-15 continued)

(Market Size and Structure continued)		
auslni **(Number of Large Businesses in Australia, by Industry)**	ABS Data Cubes, Excel Spreadsheet 8140.0.55.002 Business Operations and Industry Performance, Australia, various issues. 1995 -2001.	Number of businesses
aussni **(Number of mall Businesses in Australia, by Industry)**	ABS Data Cubes, Excel Spreadsheet 8140.0.55.002 Business Operations and Industry Performance, Australia, various issues. 1995 -2001.	Number of businesses
auslfirmsi **(Australian Industry Percentage of Large Businesses)**	Constructed as auslfirmsi = (auslni/ausni)*100. 1992 – 2001.	%
aussfirmsi **(Australian Industry Percentage of Small Businesses)**	Constructed as aussfirmsi = (aussni/ausni)*100. 1992 – 2001.	%
ausempi **(Number of Employed Person in Australia, by Industry)**	See Industry-specific data. 1992 – 2001.	'000 employees
ausvaluei **(Nominal Industry-Specific Value Added by Australian Firms)**	ABS 8155.0.55.002 Australian Industry: Summary of industry Performance, Australia, various issues. 1995 – 2001.	A$ million
auslvaluei **(Nominal Industry-Specific Value Added by Large Australian Firms)**	ABS 8155.0.55.002 Australian Industry: Summary of industry Performance, Australia, various issues. 1995 – 2001.	A$ million
ausassetsi **(Nominal Industry-Specific Assets by Australian Firms)**	ABS 8155.0.55.002 Australian Industry: Summary of industry Performance, Australia, various issues. 1995 – 2001.	A$ million
ausassetsi **(Nominal Industry-Specific Assets by Large Australian Firms)**	ABS 8155.0.55.002 Australian Industry: Summary of industry Performance, Australia, various issues. 1995 – 2001.	A$ million
auslsalesi **(Nominal Industry-Specific Australian Sales by Large Firms)**	ABS 8140.0 Business Operations and Industry Performance – Australia, various issues. 1995 – 2001.	A$ million
auslempi **(Number of Employed Person by Large Firms in Australia, by Industry)**	ABS 8155.0.55.002 Australian Industry: Summary of industry Performance, Australia, various issues. 1995 – 2001.	'000 employees
ausconc1i **(Large Firms' Industry Value Added as a Percentage of Industry Value Added in Australia)**	Constructed as *ausconc1i = (auslvaluei/ausvaluei)*100.* 1992 – 2001.	%
ausconc2i **(Large Firms' Assets as a Percentage of Industry Assets in Australia)**	Constructed as *ausconc2i = (auslassetsi/ausassetsi)*100.* 1992 – 2001.	%
ausconc3i **(Large Firms' Sales as a Percentage of Industry Sales in Australia)**	Constructed as *ausconc3i = (auslsalesi/auslsalesi)*100.* 1992 – 2001.	%
ausconc4i **(Large Firms' Employment as a Percentage of Industry Employment in Australia)**	Constructed as *ausconc4i = (auslempi/ausempi)*100.* 1992 – 2001.	%
Economies of Scale		
ausscalei ***(Industry-Specific Plant-level Economies of Scale in Australia)***	Constructed as *ausscalei = ausempi/ausni.* 1992 – 2001.	%

(Table A-15 continued)

(Economies of Scale continued)		
ausrd1i **(Australian Industry-Specific R&D Intensity 1)**	ABS 8104.0 Research and Experimental Development, Businesses, Australia, various issues. Table 1 "Resources devoted to R&D, by Industry". % R&D expenditure/GDP. 1992 – 2001 average.	%
ausrd2i **(Australian Industry-Specific R&D Intensity 2)**	ABS 8104.0 Research and Experimental Development, Businesses, Australia, various issues. Table 1 "Resources devoted to R&D, by Industry". % Human Resources devoted to R&D/Total employment. 1992 – 2001 average.	%
Labour Market Conditions and Labour Characteristics		
ausjobvac **(Number of Australian Job Vacancies)**	See Country-specific data. 1992 – 2001..	'000 vacancies
ausjobvaci **(Number of Industry-Specific Australian Job Vacancies)**	See Industry-specific data. 1992 – 2001.	'000 vacancies
ausuer **(Australian Unemployment Rate)**	See Country-specific data. 1992 – 2001.	%
ausrwages1i **(Australian Industry-Specific Real Wages 1)**	See Industry-specific data. 1992 – 2001.	A$ per week, 2001/02 prices
ausrwages11i **(Australian Industry-Specific Real Wages 11)**	See Industry-specific data. 1992 – 2001.	A$ per week, 2001/02 prices
uswagesi **(US Industry-Specific Nominal Wages)**	ILO LABORSTA Database. Yearly Data. Table 5A "Wages, by Economic Activity". Earnings per Week. US$ converted into A$ using USEXR. 1992 – 2001.	A$ per week
exrus **(US Dollar-Australian Dollar Exchange Rate)**	See Country-specific data. 1992 – 2001.	US$/A$
uscpi **(US Consumer Price Index)**	U.S. Department of Labor, Bureau of Labor Statistics. Inflation and Consumer Spending. CPI Inflation Calculator. www.bls.gov 1992 – 2001.	Index 2002 = 1
ruswagesi **(US Industry-Specific Real Wages)**	Constructed as *ruswagesi = uswagesi/upcpi.* 1992 – 2001.	A$ per week
auslp1i **(Australian Labour Productivity per Employee)**	Constructed as *auslp1i = ausrgdpi/ausempi.* 1992 – 2001.	A$ output per person employed
auslp2i **(Australian Labour Productivity per Hour)**	Constructed as *auslp2i = ausrgdpi/austhouri.* 1992 – 2001.	A$ output per hour worked
aushouri **(Industry-Specific Number of Hours Worked per Week)**	dxEconData. ABS Labour Force Statistics. Industry: Total Hours. Total Hours Worked: by Industry: Australia. Table LQHI-903: Aus: Total hours worked: By Industry: Persons. 1992 – 2001.	Total hours per week
ausavhouri **(Industry-Specific Average Number of Hours Worked per Week)**	Constructed as *ausavhouri = aushouri/ausempi.* 1992 – 2001.	Hours per employee per week
austhouri **(Industry-Specific Number of Hours Worked per Annum)**	Constructed as *austhouri = aushouri*52.* 1992 – 2001.	Total hours per annum
auscompi **(Industry-Specific Use of Information Technology in Australia)**	ABS 8129.0 Business Use of Information Technology, various issues. 1992-2001.	%
auslq1i **(Industry-Specific Labour Quality in Australia 1)**	ABS 6278.0 Education and Training Experience 2001. Table 12 "Wage and Salary Earners, Level of highest educational attainment". % Salary earners with tertiary education/total number of wage and salary earners. 1992 – 2001 average.	%
auslq2i **(Industry-Specific Labour Quality in Australia 2)**	ABS 6278.0 Education and Training Experience 2001. Table 12 "Wage and Salary Earners, Level of highest educational attainment". % Salary earners with more than high school degree/total number of wage and salary earners. 1992 – 2001 average.	%
ausfemi **(Industry Percentage of Female Employees in Australia)**	dxEconData. ABS Labour Force Statistics. Industry: Employed. Employed: by Industry: Australia. Table LQEI-906: Aus: Employed: By ANZSIC industry: Females: Total & Table LQEI-909: Aus: Employed: By ANZSIC industry: Persons: Total. Constructed as % Females/Total Employees. 1992 – 2001.	%

(Table A-15 continued)

International Influence		
ausexpinti **(Industry-Specific Australian Export Intensity)**	See Industry-specific data. 1992 – 2001.	%
ausimpinti **(Industry-Specific Australian Import Intensity)**	See Industry-specific data. 1992 – 2001.	%
ausopeni **(Australian Industry-Specific Openness)**	See Industry-specific data. 1992 – 2001.	%
oecdlpgr **(OECD Labour Productivity Growth)**	OECD Statistics. Labour. Statistical Annex Table from OECD Economic Outlook No. 75. Annex Table 12 "Labour productivity in the business sector. Percentage change from previous period. www.oecd.org. 1992 – 2001.	%
uslpgr **(US Labour Productivity Growth)**	OECD Statistics. Labour. Statistical Annex Table from OECD Economic Outlook No. 75. Annex Table 12 "Labour productivity in the business sector. Percentage change from previous period. www.oecd.org. 1992 – 2001.	%
Risk Factors		
ausbb30 **(Nominal Australian Interest Rate)**	See Country-specific data. 1992 – 2001.	% per annum
ausinf **(Australian Inflation Rate)**	See Country-specific data. 1992 – 2001.	% per annum
ausindusi **(Working Days Lost due to Industrial Disputes in Australia, by Industry)**	See Industry-specific data. 1992 – 2001.	Days per annum per 1000 employees
Other Factors		
prim, man, tert **(Industry Dummy)**	See Industry-specific data. 1992 – 2001.	---

Table A-16

Summary Statistics, Analysis of Consequences of Industry-Specific FDI							
Variable	**Observations**			**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
	n	**T**	**N**				
FDI and Other Capital							
ausnfdii	12	10	109	706.670	1,682.789	-6,299.000	11,290.000
ausrfdii	12	10	109	767.304	1,761.654	-6,406.083	11,278.710
ausnfdisti	11	10	106	13,895.528	14,323.089	568.000	57,611.000
ausrfdisti	11	10	106	15,087.677	15,396.315	614.576	59,512.163
ausrdi	12	10	109	5,284.816	3,879.844	-8,372.710	13,883.550
auskli	12	10	120	344.143	480.127	27.062	1,771.409
Market Size and Structure							
ausrgdpi	12	10	120	32,465.483	17,568.025	8,884.000	77,456.000
ausrsalesi	12	10	120	77,739.108	68,712.537	19,875.000	251,759.000
ausprofmargi	12	10	120	10.631	6.626	1.500	28.400
auslfirmsi	11	10	110	8.186	24.056	0.025	83.874
aussfirmsi	11	10	110	86.155	23.765	12.174	98.000
ausempi	12	10	120	510.046	366.530	64.400	1,346.900
ausconc1i	8	7	56	49.507	25.923	19.062	96.556
ausconc2i	8	7	56	64.187	25.400	24.145	97.412
ausconc3i	8	7	56	51.435	24.130	18.686	96.758
ausconc4i	8	7	56	47.185	25.274	13.839	95.977
Economies of Scale							
ausscalei	11	10	110	18.013	16.061	3.997	82.352
ausrd1i	12	10	120	0.780	0.859	0.304	3.267
ausrd2i	12	10	120	0.339	0.437	0.067	1.280
Labour Market Conditions and Labour Characteristics							
ausjobvac	12	10	120	79.790	24.147	33.890	115.830
ausjobvaci	11	8	88	6,063.068	5,406.784	230.000	26,070.000
ausuer	12	10	120	8.300	1.427	6.300	10.600

(Table A-16 continued)

Variable	Observations			Mean	Std. Dev.	Minimum	Maximum
	n	T	N				
(Labour Market Conditions and Labour Characteristics continued)							
ausrwages1i	12	10	120	564.356	402.958	66.411	1,407.101
ausrwages11i	12	10	120	645.760	465.071	67.906	1,727.839
ruswagesi	12	10	120	852.200	265.234	368.560	1,822.809
auslp1i	12	10	120	101,670.803	91,792.485	23,739.668	438,132.147
auslp2i	12	10	120	50.173	41.110	14.139	189.403
ausavhouri	12	10	120	37.637	3.540	30.034	45.289
austhouri	12	10	120	18,687.254	12,699.335	2,380.700	43,823.000
auscompi	12	10	114	66.587	18.111	21.000	95.000
auslq1i	12	10	120	23.297	11.672	9.925	42.246
auslq2i	12	10	120	43.315	12.454	24.596	68.157
ausfemi	12	10	120	0.324	0.154	0.092	0.570
International Influence							
ausexpinti	12	10	120	20.708	31.427	0.000	104.577
ausimpinti	12	10	120	23.592	40.461	0.231	146.061
ausopeni	12	10	120	44.301	60.413	0.231	200.031
oecdlpgr	12	10	120	1.754	0.648	0.564	2.745
uslpgr	12	10	120	1.880	1.045	0.277	3.960
Risk Factors							
ausbb30	12	10	120	7.517	1.763	4.130	9.824
ausinf	12	10	120	2.350	1.756	-0.100	5.700
ausindusi	12	10	120	346.808	1,107.416	7.000	7,171.000
Other Factors							
prim	12	10	120	0.167	0.374	0.000	1.000
man	12	10	120	0.083	0.278	0.000	1.000
tert	12	10	120	0.750	0.435	0.000	1.000