THE UNIVERSITY OF ARIZONA
University Libraries

UA CAMPUS REPOSITORY

An assessment of temporal and spatial variations in Italian regional fertility, past and present

Item type	text; Dissertation-Reproduction (electronic)
Authors	Franklin, Rachel Susannah
Publisher	The University of Arizona.
Rights	Copyright © is held by the author. Digital access to this material is made possible by the University Libraries, University of Arizona. Further transmission, reproduction or presentation (such as public display or performance) of protected items is prohibited except with permission of the author.
Downloaded	15-Sep-2016 19:04:37
Link to item	http://hdl.handle.net/10150/290067

NOTE TO USERS

Page(s) not included in the original manuscript and are unavailable from the author or university. The manuscript was scanned as received.

77

This reproduction is the best copy available.

UMI®

AN ASSESSMENT OF TEMPORAL AND SPATIAL VARIATIONS IN ITALIAN REGIONAL FERTILITY, PAST AND PRESENT

by

Rachel Susannah Franklin

A Dissertation Submitted to the Faculty of the

DEPARTMENT OF GEOGRAPHY AND REGIONAL DEVELOPMENT

In Partial Fulfillment of the Requirements
For the Degree of

DOCTOR OF PHILOSOPHY
WITH A MAJOR IN GEOGRAPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

2004

UMI Number: 3132218

INFORMATION TO USERS

The quality of this reproduction is dependent upon the quality of the copy submitted. Broken or indistinct print, colored or poor quality illustrations and photographs, print bleed-through, substandard margins, and improper alignment can adversely affect reproduction.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if unauthorized copyright material had to be removed, a note will indicate the deletion.

UMI®

UMI Microform 3132218

Copyright 2004 by ProQuest Information and Learning Company.

All rights reserved. This microform edition is protected against unauthorized copying under Title 17, United States Code.

ProQuest Information and Learning Company
300 North Zeeb Road
P.O. Box 1346
Ann Arbor, MI 48106-1346

THE UNIVERSITY OF ARIZONA ®
GRADUATE COLLEGE

As members of the Final Examination Committee, we certify that we have read the dissertation prepared by Rachel Susannah Franklin

entitled An Assessment of Temporal and Spatial Variations in Italian Regional Fertility, Past and Present

and recommend that it be accepted as fulfilling the dissertation requirement for the Degree of Doctor of Philosophy

David A. Plane	4/15/04 Date
Brigitte Waldorf	15 April 2004 Date
Gordon F. Mulligan	4/15/04 Date
Stephen R. Yool	4/15/04 Date
Stuart Marsh	4/15/04 Date

Final approval and acceptance of this dissertation is contingent upon the candidate's submission of the final copy of the dissertation to the Graduate College.

I hereby certify that I have read this dissertation prepared under my direction and recommend that it be accepted as fulfilling the dissertation requirement.

Dissertation Director David A. Plane
Brigitte Waldorf

4/15/04
Date

STATEMENT BY AUTHOR

This dissertation has been submitted in partial fulfillment of requirements for an advanced degree at The University of Arizona and is deposited in the University Library to be made available to borrowers under rules of the library.

Brief quotations from this dissertation are allowable without special permission, provided that accurate acknowledgement of source is made. Requests for permission for extended quotation from or reproduction of this manuscript in whole or in part may be granted by the head of the major department or the Dean of the Graduate College when in his or her judgment the proposed use of the material is in the interests of scholarship. In all other instances, however, permission must be obtained from the author.

Signed: Rachel Sarah Franklin

ACKNOWLEDGEMENTS

I gratefully acknowledge the support and guidance of my committee: David A. Plane, Brigitte Waldorf, and Gordon Mulligan. Frank Heins of the Institute for Research on Population and Social Policies of the National Research Council in Rome provided me with the data used for this research. He answered innumerable questions about the data and was kind enough to read drafts of my research and offer comments. I am also appreciative of the patience shown by my family members and the support shown by my work colleagues at the U.S. Census Bureau.

DEDICATION

This dissertation is dedicated to my family.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

Italian fertility rates have been declining since the early 1970s and are now among the lowest in the world. Italy itself, however, remains characterized by wide differences across its regions. Speaking only of national-level fertility trends obscures the true picture of Italian fertility over the past several decades and risks oversimplifying a complex phenomenon. This dissertation suggests the Italian region as the better scale of analysis for a true understanding of Italian fertility. The three studies presented in this dissertation evaluate Italian regional fertility patterns and trends from 1952 to 1995. The first study uses shift-share analysis to show that regional changes in the numbers of births during this period can be attributed to different components, depending on the years and regions in question. The second study uses convergence analysis and demonstrates that, although a strong regional pattern is detectable in fertility rates over the past several decades, fertility rates have been converging in Italy since the 1950s. The third study links contemporary and historical regional fertility trends in Italy to show that today's regional patterns of fertility have been in evidence since the early 20^{th} century. The paper also argues that increases in regional fertility diversity that accompanied political unification were unexpected and offers suggestions for this occurrence. Taken together, the three studies comprising this dissertation represent a thorough assessment of regional fertility in Italy.

1. INTRODUCTION

As an important component of demographic change, fertility is much researched in many of the social sciences. This is perhaps due to the fact that fertility today, in developed countries at least, is a highly controllable, individualized decision. Nonetheless, individuals' fertility decisions, taken on an aggregate level, can determine the present and future fates of countries and even the world. Particularly high or low fertility influences nations' economies, cultures, societies, and politics.

1.1 The Geography of Italian Regional Fertility

Research related to fertility decisions and outcomes can be conducted at a number of different levels. Two of the most common are the individual levels and some geographic entity. Much of this latter type of research tends to confine itself to the national level, which is amenable to inter-country comparisons and also allows for a greater ease of investigation. Although very useful for certain types of fertility research, the national scale tends to mask internal variations in fertility behavior and may lead to an overly general picture of fertility and its determinants within any given country. A national view of fertility ignores the existence of dynamic relationships between smaller geographic units, especially over time, that might affect fertility trends within a country. The national scale of analysis also presupposes that typical explanations of fertility behaviors, which are accepted to vary across time, will not vary across space within a country. As most countries have experienced changes in their national borders over time, the assumption that culturally-based determinants of fertility will be equally important throughout the country requires additional scrutiny. As a result, there is a need for research that considers the contribution a regional-scale analysis can make to the ever-growing body of work related to fertility.

Italy is a country often cited for the social, historical, economic, and cultural diversity of its regions. It is also a country whose very low national fertility rates have attracted the attention of academic scholars, as well as that of the media. The strong regional presence in Italy, along with its fascinating fertility situation, make it an attractive location for research on regional trends in fertility and the ways in which regional fertility trends have varied over time. This research, then, uses Italy as a case study for an investigation of regional fertility trends in the post-war period of 1952-1995. In this study, I consider individually the relevance of the diverse regional characteristics mentioned above, within a historical and a contemporary context, and incorporate them into the extensive body of conceptual and theoretical explanations of fertility behavior developed by economists, sociologists, and demographers. Drawing from the literature on economic convergence, I also show how regional trends have changed over time and have interacted with regional economic trends.

The methods applied to the subject of Italian regional fertility facilitate a better understanding of the changes undergone by Italian regions in the post-World War II decades. This contribution is useful from an academic as well as a policy perspective. The papers contained in this dissertation represent new contributions to demographic research, but are also informative for those in other disciplines who aim for a clearer understanding of Italian regional development over the past several decades. From a policy perspective this collected research shows the importance of considering fertility behavior at the regional, rather than national, level, especially for those places concerned with implementing family policies that would maintain or increase birth rates.

1.2 Explanation of the Problem

My research focuses on the following basic question: How have regional fertility rates varied within Italy over the past fifty years? I investigate not only the spatial variations in Italian fertility, but also the possible explanations for such differences, their historical precedents, the timing of the overall trend towards below replacement level fertility, and finally regional fertility trends over time and their relationship to each other.

To help answer my main research question, I focus on two particular sub-questions. First, what has been Italy's historical fertility experience and how does this history fit into current trends? Furthermore, what role do history and culture play in explaining regional fertility differences? The nature of Italy's political unification, along with its cultural past, suggests that fertility differences seen across regions today, as well as the different trends over the past fifty years, may be partly due to each region's historical economic and cultural experience. The historical analysis of Italy's fertility is also important for a complete understanding of Italy's subsequent, post-World War II fertility decline.

My second sub-question addresses how regional fertility trends have related to each other over time. This goal is accomplished through the use of two methods rarely used in demographic research. First, shift-share analysis, adapted here to decompose regional changes in numbers of births into several components, is applied to provide a descriptive measure of how changes in the numbers of births varied from region to region between 1952 and 1991. Second, conceptualizations and measurements of economic convergence in the regional economics literature are adapted to an evaluation of regional fertility behavior and convergence over time. Have regional fertility rates converged over time in Italy? If so, how does this process relate to that of regional economic convergence? Can a theoretical basis be developed for expecting to find a correspondence between the two convergence processes?

1.3 Background

1.3.1 Italy, Past and Present

Italian regional fertility is best understood when placed in the context of the nation's history, both political and economic, and geography. Italy has existed as a country only since 1871, when Rome and the area surrounding finally joined the remainder of the new Italian state (for an extensive review of Italy's history, geography, and economy see King, 1987). Prior to unification, and since the fall of the Roman Empire, the Italian peninsula and the islands of Sardegna and Sicilia were controlled by a variety of internal and external forces. For the most part, the southern and northern regions have always been administered by different groups, whether Germanic and Moorish in the years following the fall of the Roman Empire, or Austrian and Bourbon in the decades leading up to unification. The central portion of Italy traditionally belonged to the papacy.

The first movements towards a unified Italy can be traced to Napoleon's occupation of Italy in 1789 and the imposition of the Napoleonic Code (King, 1987). According to King, French occupation brought with it not only the notions of equality and liberty, but also increased governmental efficiency and a focus on the development of public infrastructure. Even after the reoccupation of the North by Austria in 1815, the possibility of political unification stayed in the minds of many Italians, leading to the growth of the *Risorgimento.* Under the leadership of such nationalistic thinkers as Cavour and Mazzini, and the might of the military leader, Garibaldi, the constitutional monarchy in Piemonte grew to encompass first Lombardia, much of the papal lands, and the South, in 1860, and then finally Rome and the Veneto in 1870.

Unified Italy hobbled along as a constitutional monarchy until 1922, when Benito Mussolini was named prime minister. Over the next several years, Mussolini consolidated his power, and by the end of the 1920s a fascist dictatorship was firmly in place. Italian fascism, which lasted through the middle of World War II in 1943, was characterized by an increased focus in Italian imperialism, the placing of economic and political power within the hands of a small elite, and the increased interest of the state in demographic matters (Ipsen, 1996; King, 1987). Specifically, internal migration was highly regulated by the fascists, with the main goal being a halt to the growth of urban populations. Emigration from Italy was also halted, and emphasis on increased fertility and the desirability of large families was seen (Ipsen, 1996). After the fall of fascism and the end of the war, a new constitution was written and the monarchy was abolished.

Since then, Italy once again has been characterized by frequent governmental change and the seemingly constant potential of political and economic uncertainty.

Economic dualism in Italy between the South and the rest of the country has persisted for centuries. Up through the middle of the 20th century, the South was largely agricultural, with much of the land owned by wealthy, absentee land-owners and inhabited by an illiterate and poor peasantry. What industry existed at the time of unification, mostly in and around Naples, was unable to compete with the more efficient and better-located industries of the North (Esposto, 1992). Since the end of World War II, regional differences in economic growth have continued, even through the period of rapid economic growth in the late 1950s and 1960s known as the "economic miracle."

Much of Italy's large industry is located in just two cities in two regions: Milano in Lombardia and Torino in Piemonte (King, 1987). From the time of unification onwards, the northwestern regions have benefited from a concentration of "modern" industries that allowed development in these regions to pull ahead of the regions of the South (Esposto, 1992). The center of Italy benefits from the location of the capital, Rome, in the region of Lazio, and the South can be broadly generalized as having a heavy dependence on income redistribution and financial assistance coming from the North and Center (Goglio, 1998).

Italy's geography has probably contributed as much to the North-South contrast as has its history. Although the entire peninsula is isolated from continental Europe by the Alps, long-standing relationships have existed between the northern regions and France and Austria that have helped to surmount the geographical obstacles. Conversely, internal mountain areas along the spine of Italy have effectively slowed regional cohesion throughout Italy's history by limiting communication and have aided in the development of strong regional identities (King, 1987). Italy is an urban country, with many large cities, but most are located in the North or Center of the country (Naples is the main exception). Moreover, as King points out, the South has no extensive, fertile agricultural flatland like that found in the Po Valley in the North, which has helped lead to entrenched poverty in southern regions. Stronger patterns of industrialization in the North and, to a lesser extent, in the Center, meant that larger networks of roads and railroads covered those areas much more than in the South (Livi-Bacci, 1977). All of these factors, historical, economic, and geographical, have meant that the southern regions of Italy have had a different fertility experience than the rest of the country.

1.3.2 Fertility in Italy

This sub-section details changes in fertility rates and related demographic characteristics such as changes in age-specific fertility rates, the average age at first birth, the average age of women in their childbearing years, and parity levels for Italy and its regions. From 1952 to 1995, fertility rates declined across Italy, but regional differences persisted. In common with most developed countries, Italy experienced a baby boom in the post-war years. This peak occurred in 1964 but was not sustained for an extended period of time. Unlike the boom experienced in the United States, Italy's increase in births was slightly delayed after the end of WWII and did not last for more than a few years. Figure 1.1 displays the national trends in fertility rates for 1952 to 1995. In 1952, the total fertility rate (TFR) for the entire country for women age 15 to 49 was 2.3. By 1995 it had fallen to 1.2. The highest TFR recorded for Italy, in 1964, was 2.7. Since replacement level is considered to be a TFR of approximately 2.1, Italian fertility for the entire study period did not greatly exceed the amount needed to replace the existing population. As Figure 1.1 shows, fertility rates climbed very gradually during the period 1952 to 1964. The years following the peak of the baby boom, until about 1973, show a slow decline back to approximate 1952 levels. From the early 1970s to the early 1980s, national TFRs fell to unprecedented levels and then continued to decline slowly until the end of the study period, in 1995.

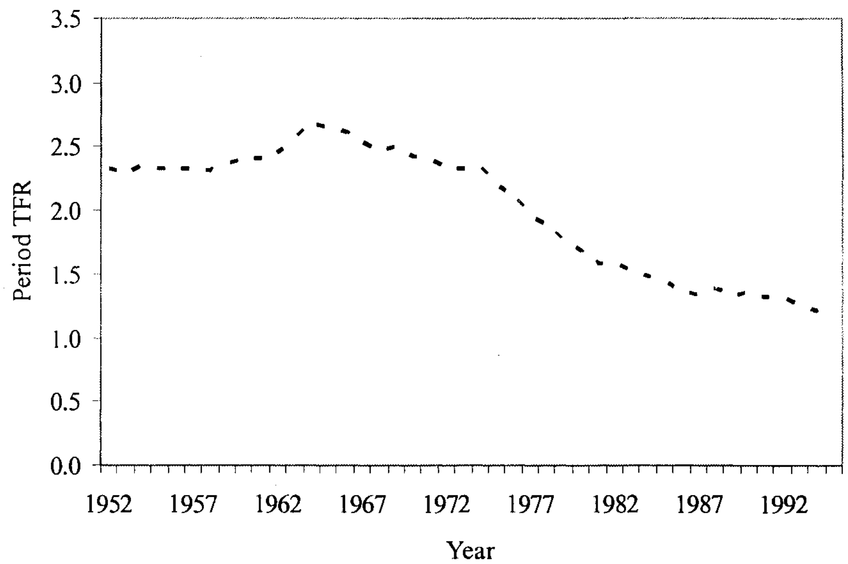
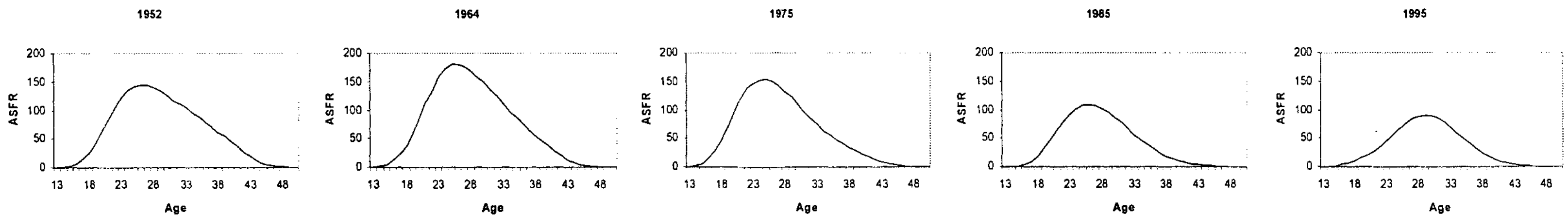


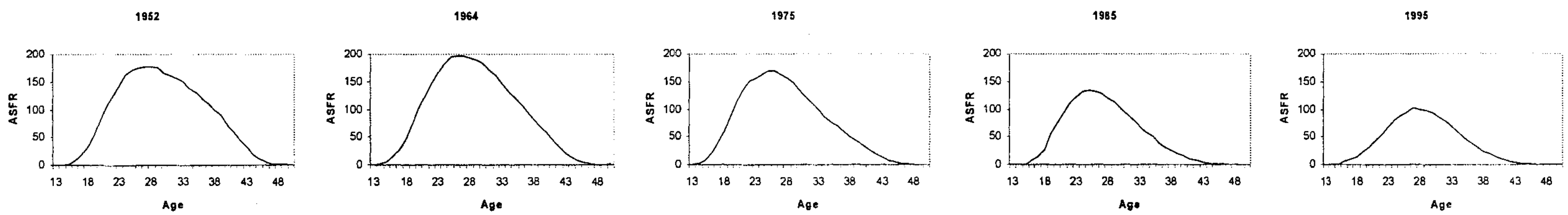
Figure 1.1: Italian Period Total Fertility Rate, 1952-1995

Figure 1.2 shows age-specific fertility rates (ASFRs) for five representative years for Italy, as well as three macro regions of the country: North, Center, and South. ASFRs are defined as the number of children born per 1,000 women in an age cohort, one-year

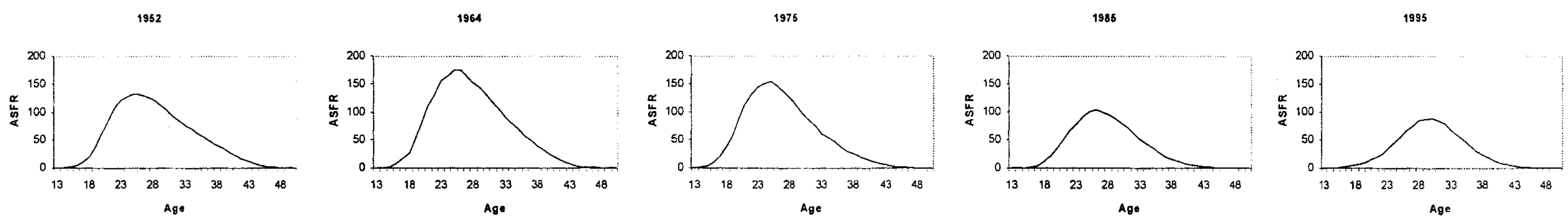
Italy



South



Central



North

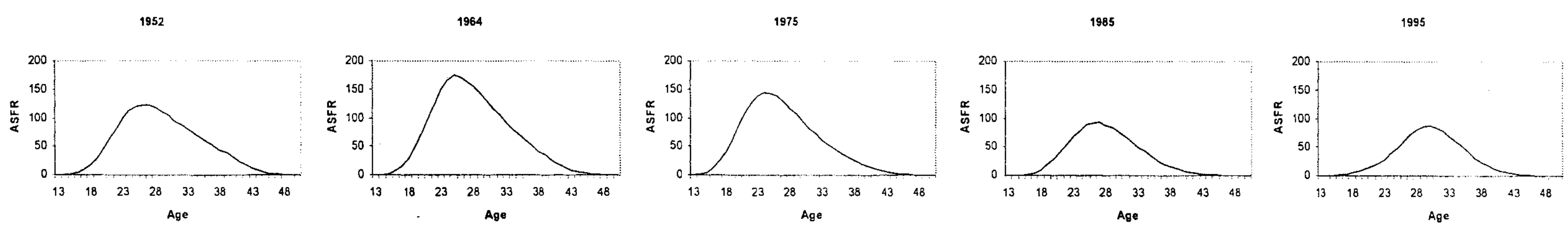


Figure 1.2: Age-Specific Fertility Rates for Italy and the North, Center, and South, Selected Years

cohorts in this case. The temporal changes in the shapes of the curves parallel the trends shown in Figure 1.1. The ASFR peak rose until 1964 and declined thereafter. More interesting, however, is to see how the ASFR peak migrated towards older age cohorts in the later graphs. In 1952, the highest point of the curve was at ages 26 and 27. Moreover, the slope leading up to the peak was much steeper than the decline after it, indicating that women at that time continued to have children well into their late 30s. The ASFR peak in 1964 and 1975 was at age 25, although the peak in 1975 was less pronounced. By 1985, the peak had increased to age 26, however the maximum ASFR value at that age was only 109. In 1995 the highest ASFR occurred in the 29 and 30 age group, but only had a value of 90.

The average age at first birth (AAFB), which is linked to the age-specific peak in fertility rates, offers another view of Italian fertility change. The later the average age at first birth, the later the peak in fertility rates will occur. As AAFB increases, the length of the available childbearing years decreases, which should lower overall fertility rates, all other things being equal. Since AAFB is closely associated with age at first marriage in Italy, where almost all births are legitimate, an increase in AAFB is suggestive of changing social norms that would lead to delayed marriage. Figure 1.3 shows temporal trends in average age at first birth for Italy as a whole. In 1952, the average age at first birth for Italy as a whole was 25.9. By 1995, that number had climbed to 28.1 years of age. This figure declined very slowly until the mid-1970s. In 1976, the AAFB hit its low point of 24.7. For every year since 1976, the AAFB increased, as women have continued to delay starting a family.

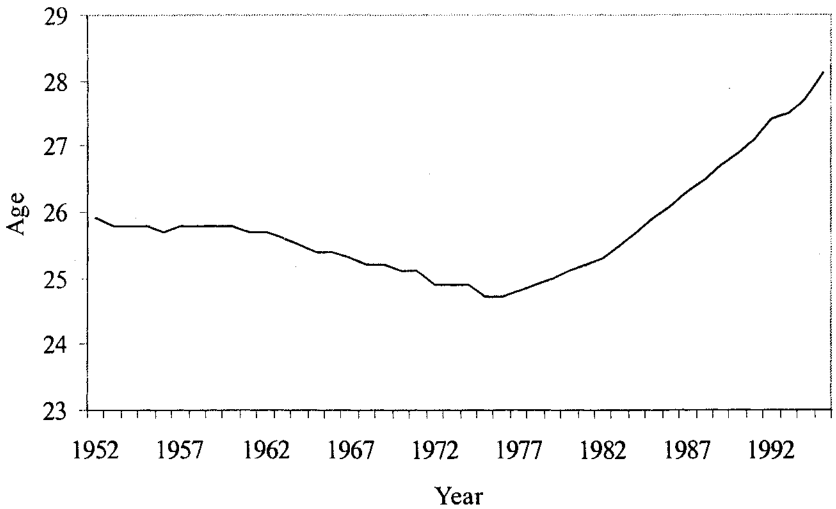


Figure 1.3: Average Age at First Birth for Italy, 1952-1995

1.3.2.1 Fertility in the Regions of the North

At a sub-national level, considerable variation in fertility rates and their related demographic characteristics have been apparent throughout the post-war period. The North is composed of eight regions: Piemonte, Valle d'Aosta, Liguria, Lombardia, Trentino-Alto Adige, Friuli-Venezia Giulia, Veneto, Emilia-Romagna (Figure 1.6 shows a labeled map of the Italian regions). Individually, these regions have, with few exceptions, had lower fertility rates than regions in the rest of the country. For the entire study period, Liguria, Piemonte, Friuli-Venezia Giulia, and Emilia-Romagna have formed the core of low northern fertility. As Figure 1.4 shows, these four northern regions already fell into the lowest fertility category in 1952. These regions, which remained in the lowest fertility category for all years shown on the maps, had TFRs under 1.0 in 1995. This is in contrast to Trentino-Alto Adige and Veneto, in the northeastern part of the country, which have tended to have slightly higher fertility rates than their neighbors throughout the entire study period. Indeed, in 1964 and 1995, Trentino-Alto Adige has higher fertility compared to its neighboring regions. It is important to note, of course, that for 1995 the high fertility category is still only a TFR of 1.2-1.5, which is well below replacement level fertility.

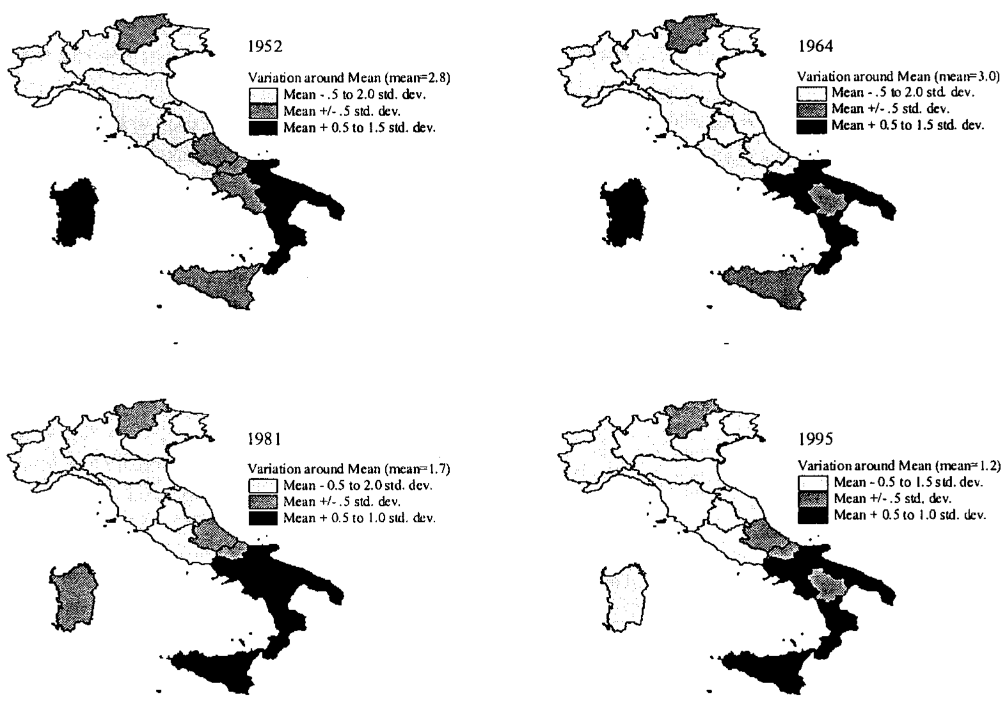


Figure 1.4: Italian Regional Fertility, 1952-1995 Selected Years

Figure 1.5 maps the average age of women in their childbearing years for all Italian regions. The maps show that, although the actual range in average age is relatively small for all time periods, the higher average ages tend to be grouped in the North. For all years shown in the map, the older age classification, which includes most regions in the North, ranges between 30 and 32.

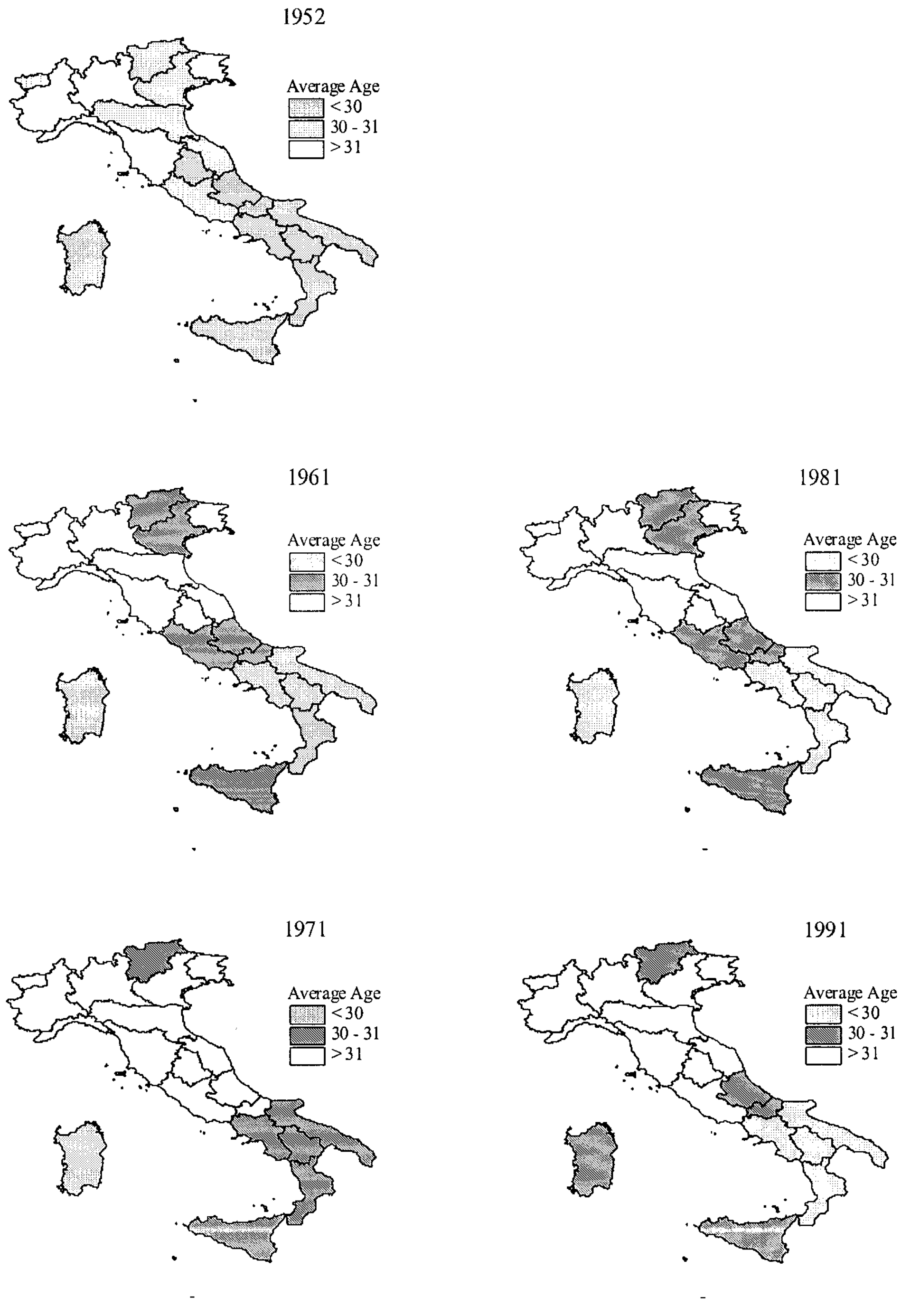


Figure 1.5: Average Age of Women of Childbearing Age, 13-50 by Region, Selected Years

The age-specific fertility rates shown in Figure 1.2 fail to reflect the decrease in higher parity births that accompanied the fertility decline in the North, and indeed all parts of the country. Table 1.1 shows the proportion of the total fertility rate that can be accounted for by first and second order births. In 1952, the proportion was .70 for the North, compared to .59 for the nation as a whole. This proportion increases throughout the study period and is .90 for the North and .86 for all of Italy in 1995, meaning that 90% of total fertility in the North in that year was due to first or second births.

Table 1.1: Proportion of Total Fertility Accounted for by First and Second Order Births

Year	**North**	**Central**	**South**	**Italy**
1952	0.70	0.71	0.47	0.59
1964	0.77	0.78	0.54	0.67
1975	0.83	0.83	0.64	0.75
1985	0.88	0.88	0.74	0.82
1995	0.90	0.90	0.81	0.86

1.3.2.2 Fertility in the Central Regions

There are four regions in the Center: Toscana, Lazio, Umbria, Marche. This portion of Italy falls somewhere between the extremes of the North and South for most measures, demographic and otherwise. This is certainly true where fertility is concerned, although over time much of the Center has been very similar to the North, demographically. In 1952, central Italy's TFR was 1.94. This rate reached a high point in 1964 at 2.34 and by 1995 had declined to 1.07, which was just slightly above the TFR of the North. At no point between 1952 and 1995 did the Center's TFR dip below that for the North.

The central regions display much of the same variation over time found in the northern regions. For all the years shown in Figure 1.4, Toscana is in the lowest fertility category. In 1952, Toscana's TFR was 1.64. In 1995 it was .98, among the lowest TFRs in the country. In contrast, Lazio is classified in the middle category for all four years. The other two regions, Umbria and Marche, are in the low fertility category for 1952 and 1964 but moved into the middle category for 1981 and 1995. No central region falls into the highest fertility category for the years shown in Figure 1.4.

The age-specific fertility curves shown in Figure 1.2 confirm the similarity of the Center's fertility behavior to that of its northern neighbor. For all years shown in the figure, the peak in ASFR occurs at about the same age for both the Center and the North, with at most a year's difference in age. In 1964, the peak rate was 175 for the Center and 174 for the North. Both macro-regions had a peak ASFR of 87 in 1995. For the other years shown, though, the Center tends to be a little higher than the North. In contrast, for all five years shown in the figure, the Center's peak ASFR is below that for the entire country. The proportion of total fertility resulting from first and second births, shown in Table 1.1, was .71 in 1952 and .78 in 1964 for the Center, just slightly above the proportion reported for the North, but negligibly so. For the later years, the proportions are the same for the North and Center, ending with .90 in 1995.

1.3.2.3 Fertility in the Regions of the South

The South began the 1950s with a total fertility rate of 3.16 and ended the period in 1995 at 1.39. Throughout the study period, fertility rates in the South were considerably higher than in the North. Although the South's drop in fertility since 1952 has been impressive, its TFR remains much higher than those for the North and Center. Perhaps because fertility was already so high in the region relative to the rest of the country, the baby boom did not have a large effect on TFRs in the South. The peak in 1964 was a TFR of 3.3, higher than the baby boom peaks in the other two regions, but not a significant increase compared to TFRs for previous years. For the South, the baby boom represents only a small deviation from the overall trend towards lower total fertility rates. This is in keeping with historical fertility research, which has suggested that the South was still completing the demographic transition in the post-war years, while the rest of the country had already completed the transition by this time (Livi-Bacci, 1977; Watkins, 1990).

Eight regions in Italy are classified as being in the South. These are: Abruzzo, Molise[1], Campania, Basilicata, Puglia, Calabria, and the two island regions of Sicilia and Sardegna. Calabria, Basilicata, and Puglia – the portion of the peninsula often referred to as "the boot" – form the high fertility core of the region. As shown in Figure 1.4, these regions consistently fall into the highest fertility category for all years depicted on the map. With the exception of 1952, Campania and Sicilia also fall into this category. Of the remaining regions, Abruzzo and Molise's fertility rates seem to fall between the South and the Center. The fact that Sardegna falls into the high fertility category for all but one of the years in Figure 1.4 masks its fascinating fertility experience over the course of the study period. In 1952, Sardegna had the highest TFR in the country at 3.8.

[1] Molise was a part of Abruzzo until 1964, when it became its own region. For the analysis in this dissertation, Abruzzo and Molise are considered one region.

By 1995, this had declined to 1.06, which is a TFR comparable to that of Umbria, in the Center, or Lombardia in the North. The average age at first birth in Sardegna began at 25.9 in 1952 and increased to 28.3 in 1995, a figure well above the average for the South as a whole.

While the average age of women in their childbearing years has generally been higher in the North and Center, almost all the regions of the South have fallen in the youngest age category for all the years displayed in Figure 1.5. The previous years of relatively high fertility have meant that the South's population has remained younger than the rest of the country. More women of childbearing age also means more births, even as fertility rates continue to fall slowly.

The ASFR curves for the South in Figure 1.2 stand out from the rest of the curves. First, the height of the curves is much higher than those for the North and Center, as well as Italy as a whole. In 1952, when the North and Center had peak ASFRs of 122 and 132, respectively, the South's peak ASFR was 177. The national peak ASFR was 90 in 1995; the South's for the same year was 102. For the earlier years especially, the curves are also fatter than those for other parts of the country, showing that a significant contribution to total fertility is made by women both younger and older than the peak ASFR age.

Table 1.1 shows that, for all years shown, a sizable portion of total fertility was accounted for by higher parity births. In 1952, less than half of the total fertility was due to first or second order births. And, although the trend has been towards an increase in the proportion of fertility accounted for by first or second births, the 1995 figure was only

.81. This represents a considerable decrease in higher order birth rates, but is still nine percentage points lower than the figure for the North or Center.

In 1952, the average age at first birth for the South was not a great deal lower than that found for the rest of the country. During the mid-1970s, however there is a divergence in trends, as the rest of the country tends towards a higher average age at first birth. In 1995, when the AAFB for all of Italy was 28.1, it was only 26.8 in the South. This figure is only slightly higher than the North's AAFB in 1952. One very surprising aspect of the South's fertility decline is that total fertility rates have declined so much in the face of such a stable average age at first birth.

1.3.2.4 Italian Fertility in a European Context

In its completion of the fertility transition, its post-war fertility experience, and its movement towards more progressive family formations or social values, Italy has lagged behind many other western European countries. With the exception of certain early adopters of lower marital fertility among the nobility, Jewish communities, or the upper middle classes of some countries, fertility across Europe was high until the beginning of the fertility transition from high to low fertility levels (see Livi-Bacci, 1977 for a full description of social forerunners in the European fertility transition). Fertility in many of Italy's European neighbors began its permanent decline by the end of the 19th century. France is an exception, where the fertility transition began as early the end of the 18th century. Along with other Mediterranean countries, Italy's decline commenced later, around the second decade of the 20th century (Coale and Watkins, 1986). The fertility transition brought with it smaller family sizes, naturally, but also changes in attitudes towards contraception and marriage.

Fertility levels across European countries continued to vary widely after the end of World War II. In the years immediately following the end of the war, TFRs varied between highs of 3.97 in the Netherlands and 3.40 in Ireland to lows of 2.03 in Austria and 2.09 in West Germany (Coleman, 1996). By the 1990s, fertility levels had fallen across Europe and the highest period rates were to be found in Scandinavian countries such as Norway (1.86 in 1993) and Sweden (2.00 in 1993), along with a TFR of 1.93 in 1993 for Ireland. Along with Italy, the lowest fertility rates were to be found in Spain, Greece, and West Germany (ibid.). Fertility variation within European countries also varied widely during this period; according to Watkins (1991), Sweden, Denmark, and England and Wales had the most homogeneous internal fertility rates, and Switzerland, Italy, and Portugal some of the most heterogeneous rates in 1960. Coleman (1996) cites Italy as having the most regional variability in fertility in the mid-1980s and fertility in Great Britain as among the least variable.

As mentioned above, the fertility transition brought with it much more than a simple decline in fertility rates. In the several decades following the transition, as fertility in most European countries has fallen well below replacement levels, changes in marriage and childbearing patterns have also taken place. For many, if not most, of these countries, the post-war years have brought increases in cohabitation rather than marriage, increases in the average age at first marriage, and increases in the proportions of children born outside marriage. Divorce and abortion have also become more accepted. Broadly speaking, many of these social changes were first evident in northern European countries such as Denmark or the United Kingdom and were adopted later in other neighboring countries. For example, by 1990, almost half of all births in Sweden, Denmark, and Norway took place outside of marriage. This is compared to less than 10 percent of all births in Italy, Greece, and Switzerland (Kiernan, 1996). In Italy, the norm is for unmarried children to remain at home until marriage, which is often delayed until one's late 20s or early 30s. Although legal, divorce and abortion remain relatively rare, especially when compared to other European countries.

1.4 Overview of Data

1.4.1 The Data

The main spatial unit of analysis for the papers contained in this dissertation is the Italian region. There are 20 of these regions, shown on the map in Figure 1.6. Portions of the analysis are also conducted at the provincial scale, of which there are 95.[2] Regions tend to be rather large and subsequently encompass a good deal of internal variation. Table 1.2 provides regional mid-year population figures for 1952, the first year of the study period, and 1995, its final year. Regional populations in 1952 varied in size from over six million in Lombardia to under 100,000 in Valle d'Aosta. In 1995, regional populations ranged in size between approximately nine million and 120,000, again in Lombardia and Valle d'Aosta. The vast majority of regions already had populations greater than one million in 1952. In terms of population density, as of 2001, the most

[2] The number of provinces has increased over time. Unlike regions, whose boundaries are mainly historically-based, provinces serve a mainly administrative purpose and so are subject to periodic change.

densely populated regions were also among the largest. In 2001, the most densely populated region was Campania, at 425 people per square kilometer (Italia in Cifre, 2001). Lazio and Lombardia also had some of the highest population densities in the country, at 308 and 382 people per square kilometer. The most sparsely populated regions are to be found throughout the country and tend to be the smaller regions. For example, Valle d'Aosta in the northwest of the country, had a population density of 37 people per square kilometer and Basilicata, in the South, had only 61 (ibid.).

Figure 1.6: Map of Italy's Regions

Although the relatively large size of the region is a definite disadvantage for research on any type of behavior presumed to vary over space, there are also many advantages of the region that directly serve the purposes of this research. My goal is to gain a complete understanding of variations in sub-national fertility rates, given historical, economic, and demographic factors; the beauty of the Italian region as unit of analysis is the continued integrity of borders over time. The existence of a strong regional identity in Italy is another advantage.

Table 1.2: Regional Populations of Italy, 1952 and 1995

Region	**1952**	**1995**	**Percent Change, 1952-1995**
North			
Emilia-Romagna	3,549,768	3,923,530	10.5
Friuli-Venezia Giulia	1,225,136	1,190,073	-2.9
Liguria	1,569,924	1,661,105	5.8
Lombardia	6,599,910	8,917,661	35.1
Piemonte	3,532,780	4,293,428	21.5
Trentino-Alto Adige	733,183	910,918	24.2
Valle d'Aosta	94,552	118,590	25.4
Veneto	3,911,847	4,427,675	13.2
Center			
Lazio	3,367,286	5,197,666	54.4
Marche	1,363,921	1,442,102	5.7
Toscana	3,164,280	3,524,635	11.4
Umbria	804,451	824,195	2.5
South			
Abruzzi/Molise	1,680,740	1,600,943	-4.7
Basilicata	630,144	609,969	-3.2
Calabria	2,048,072	2,075,985	1.4
Campania	4,365,691	5,754,140	31.8
Puglia	3,238,873	4,079,378	26.0
Sardegna	1,286,842	1,660,084	29.0
Sicilia	4,499,052	5,088,716	13.1

Source: ISTAT

A list and description of data used for the papers in this dissertation is provided in Table 1.3. To answer my first sub-question, dealing with the historical characteristics of Italian fertility and how they relate to economic and political changes that took place across the country and within regions, I rely on data gathered by the Princeton European Fertility Project.

Table 1.3: Data Characteristics

Type of data	Source	Features	Temporal Scale	Spatial Scale
Fertility data	ISTAT	ASFRs disaggregated by one year age cohorts and parity	Annual, 1952-1995	19 regions (Abruzzi/Molise are merged into one region)
Fertility data	ISTAT	ASFRs in five year age cohorts, average age at first birth, period total fertility rates	Annual, 1975-1994	95 provinces
Population data	ISTAT	Estimates of populations in one year age cohorts and by gender; based on census data and corrected using population register information	Annual, 1952-1999	19 regions (Abruzzi/Molise are merged into one region)
Economic data	CRENoS	GDP, value added by sector, units of labor by sector	Annual, 1951-1993 (more detailed data available, 1960-1996)	20 regions
Urban population data	Italian census	Municipal populations	Decennial, 1961-1991	20 regions
Historical fertility data	Princeton European Fertility Project	Index of total fertility, marital fertility, non-marital fertility, and marital status (based on fertility rates of the Hutterites)	Quasi-Decennial, 1861-1961	18 regions

The European Fertility Project gathered data on fertility indicators for Italian regions for every decade between 1861 and 1961. Because of the lack of demographic information during this time span, the European Fertility Project related fertility levels to those of the Hutterites, the population with the highest documented natural fertility rates in the world, creating a set of unique fertility indices. One advantage of these indices is that they enable direct comparison across regions and countries for this time period. Unfortunately, it is not straightforward or even possible to compare these measures to the more sophisticated data now collected in most developed countries. Therefore, a certain amount of discontinuity is necessarily present in my analysis as I move from the early time period (1861-1961) to the later one of 1952-1995.

The data used to answer questions dealing with this latter period come from the Italian statistical office, ISTAT, the Italian census, and CRENoS, an Italian economic research institute. Data for this project can be broken into two parts. First, I use Italian fertility data as the basis for analyzing regional and temporal variations in fertility. These data include age-specific fertility rates in one-year cohorts from 1952-1995 for twenty Italian regions. Parity, or birth order, is also recorded for each age cohort, allowing the researcher to determine how many births to a women of age x were first, second or third births. From these data, period total fertility rates can be constructed that provide a global measure of fertility for a particular region in a given year[3]. A second fertility dataset for the period 1974 to 1994 is also used. These data record age-specific fertility rates (in five year cohorts), period total fertility rates, and average age at birth for the Italian provinces, of which there are 95, and therefore allow a more detailed spatial resolution of analysis as well as a limited differentiation between rural and urban provinces. ISTAT also provides population data for the years 1952-1995 which include regional breakdowns of population by gender and one-year age cohorts.

---

[3] This project uses the standard ages of 15-49 to construct the period total fertility rate, even though data are available for ages 13-50.

The second part of the data collected consists of economic data that are used for the paper addressing convergence in regional fertility rates in the post-war years. These data come from CRENoS and include annual data for 1951-1993 on regional GNP, value added by sector, and employment by sector.

1.4.2 Scale Dependence in Italian Regional Fertility

As with any type of geographical analysis, the choice of unit of observation can have a large impact on the results. Ideally, the phenomenon being studied, in this case fertility, will be constant within each geographic unit of observation. That is, the choice of geographic unit should match the extent of the behavior under investigation (Anselin and Bera, 1998). For example, research on employment change in an area should use labor markets rather than census tracts for the analysis and, depending on which geographic unit is used, the results will differ. Although in reality it can be difficult to match geography to the phenomenon being studied, it remains important to consider that results might vary with a change in geographic scale.

The subject of this research is regional fertility variation in Italy. However there is internal variation in fertility rates within the regions, as well. Although provincial data are not available for the entire 1952-1995 study period, they do exist for the shorter 1975-1994 period mentioned above. Some regions are comprised of only a couple of provinces (e.g. Trentino Alto-Adige or Umbria) while others contain between eight and ten provinces (e.g. Lombardia or Sicilia). Valle d'Aosta is the equivalent of one province. Across all these regions there is provincial-level variation in Total Fertility Rates for at least the 1975-1994 period and most likely for the decades preceding these years, as well. In general, the gap between the highest and lowest fertility provinces in each region remained fairly constant during the 1975-1994 period. In some cases, such as Lombardia, Friuli, or Lazio the gap declined over the twenty-year period. The gap between lowest and highest fertility provinces in each region ranged from about .10 to .40. In some regions, such as Basilicata or Liguria, the gap is fairly small, meaning that provincial fertility rates in those regions are fairly similar. In others, such as Sicilia, the range is much wider with the highest fertility province showing a TFR of 1.63 and the lowest a TFR of 1.37 in 1994. Although this is more regional internal variation than desired, it is important to consider that fertility likely varies substantially within each province and even within cities, too. The region remains the first choice for geographical unit of observation in the present research because boundaries are longstanding, are more than simply administrative areas, and are generally considered to possess their own identities (some characteristics of which may be posited to influence fertility levels).

1.5 Significance of Research

The determinants of fertility have been studied in depth at both the individual and the societal levels. However, most fertility research focuses on between-country variations, as opposed to within-country differences. I submit that the study of fertility at a regional level is important for two reasons. First, the use of national level variables, and the testing of hypotheses related to those variables, assumes that these characteristics do not vary within the national boundaries. Since most countries are comprised of multiple labor markets, political entities, historical backgrounds, and levels of economic development, this is an enormous assumption to make. Because much research has focused on the national (or individual, but not regional) scale, the relative importance of different explanations of fertility behavior has not been adequately tested. Second, by undertaking fertility research at the sub-national level, a better understanding of the historical, economic and social determinants of fertility is obtained. This research fine-tunes previous conceptualizations or explanations for fertility levels by simultaneously considering the effects of history, culture, economics, age structure, and location at a smaller geographical scale.

Also, although geographers are well represented in the field of population studies, they have been substantially silent in the area of fertility research. Even though fertility is not a spatial behavior, as is migration, it does vary from location to location, and is strongly affected by the characteristics of a place. Fertility research at the regional level emphasizes the strengths that the discipline of geography has to offer in terms of spatial analysis, multi-scale research, and region-specific knowledge. Because fertility, particularly at the high and low extremes, is of much concern to researchers, policy makers, and individuals in today's world, it is important for geography as a discipline to offer its expertise where possible.

1.6 Review of the Literature

This section places my research question within the broader context of Italian demographic research, fertility research in general and within geography, and research using methods that are applied in this dissertation. Although not all of the theories discussed in fertility research, both in Italy as well as in the general literature, are tested in the papers appended to this dissertation, collectively they provide the context for research on regional fertility variations across time and space.

1.6.1 Italian Fertility Literature

Italy's fertility is notable for two main reasons, and subsequently much of the fertility research on Italy has concentrated on these two areas. These are, first, the wide variation in fertility behaviors that characterizes the country and, second, explanations for these variations and especially for the very low fertility rates prevailing in much of Italy. Starting with Livi-Bacci's (1977) work on historical fertility in Italy, there has been a great deal of documentation of Italy's heterogeneous regional fertility behaviors. Livi-Bacci not only describes the differences over the past couple of centuries, but also offers some explanation for the variation. At a broad level, for example, he sees emigration from the higher fertility areas of the country as having contributed to the continuation of demographic behaviors that might have been forced to change, had emigration not been an option. He also notes that the southern regions were more isolated than other parts of the country and were therefore exposed to changing fertility behaviors later.

Watkins (1990, 1991) notes that, unlike most other European countries, diversity in Italian regional fertility rates actually increased between the 1870s and the 1960s. Her explanation for this is the delayed onset of the fertility transition in portions of the country, which meant that some regions experienced declines while others continued to experience the same levels of fertility. Her expectation is that, as all regions complete the transition to lower fertility rates, there should be increased homogeneity in fertility rates across all Italian regions. Addressing contemporary regional fertility trends, Terra Abrami and Sorvillo (1993) analyze fertility rates by region and generation in Italy for the post-World War II years. They emphasize the necessity of studying Italian fertility at the regional level, arguing that the national figures alone present a misleading picture of fertility rates in Italy. Dalla Zuanna et al (1998) present a similar regional picture in their description of marriage timing across Italian regions.

Explanations for both regional variations and very low fertility rates in Italy vary. Chesnais (1996) has suggested that an increase in women's status in Italy, accompanied by the continued pressure of traditional roles, has forced Italian women to choose a life of double burden – both work and domestic duties – or no children. Dalla Zuanna (1999) argues that Italian "familism" is one of the root causes of Italy's low fertility rate. According to Dalla Zuanna, familism is characterized by a society in which individuals choose to put family needs before individual desires. Applied to Italy's case, parents are encouraged to invest time and money in their children, keeping them at home as long as possible. The children, then, tolerate unemployment and are willing to wait at home for the perfect job opportunity. One result of this is late marriage and associated lower fertility outcomes. Traditional explanatory variables such as female status, education levels, and economic development are also found to be related to fertility behavior in Italy (Castiglioni and Dalla Zuanna, 1990).

1.6.2 The Fertility Literature

In the broader field of demography, examinations of the demographic transition and explanations for changing fertility behaviors have dominated fertility research. For the purposes of the present study, contributions made in the areas of spatial variations in fertility and non-economic and economic explanations of fertility are most relevant.

The spatial characteristics of the fertility transition in Europe, as well as in lesser developed countries, have also attracted attention. The seminal work in the area stemmed from the Princeton European Fertility Project and resulted in the detailed analysis of the fertility transition as it took place across European countries and regions between the 1870s and the 1960s (Coale and Watkins, 1986). Livi-Bacci's (1977) work on Italy provides a details breakdown of the timing and causes of fertility change across Italy's regions and provinces through the 1950s. Pollak and Watkins (1993) suggest that one difficulty inherent in the analysis of the diffusion of fertility behavior is the difficulty of differentiating between the diffusion of norms and that of techniques. Nonetheless, some research on the spatial diffusion of fertility is evident in the literature. Tolnay (1995) concentrates his analysis of fertility diffusion in the American South on measuring spatial diffusion. Montgomery and Casterline (1993) develop models to explain within township and inter-township diffusion of marital fertility in Taiwan, finding evidence for diffusion within townships but not necessarily between them.

Geographers have also contributed to the discussion on fertility variations across space, explicitly exploring the importance of spatial relationships in the evaluation of fertility levels. Pandit and Bagchi-Sen (1993), for example, use the dual expansion method to develop a model that accounts for both spatial and temporal variations in regional fertility in the United States from 1970-1990. The authors do a thorough job of detailing temporal and spatial variations in fertility across the U.S. states, emphasizing the increased importance of internal and international migration in smoothing regional fertility differences. More recently, Akkerman and He (1998) commented on the importance of studying fertility levels at a sub-national level in China. They noted that researchers, as well as the Chinese government, have tended to develop policies and conclusions regarding the one child policy based on national trends in fertility rates. This tendency has overlooked the fact that there has been a great deal of variation across regions in adaptation to lower fertility regulations. They also attempt to link economic development to fertility declines, finding that provinces that experienced the most economic development also had the sharpest declines in fertility.

More recently, Waldorf and Franklin (2002) employed spatial autoregressive models to evaluate the relative importance of Easterlin's Relative Income Hypothesis, discussed below, across Italian regions. They found that the validity of the hypothesis varied from region to region, especially when comparing the southern regions to those in the rest of the country. Weeks (2000) has incorporated the use of remote sensing and GIS technologies into the study of the spatial variation of fertility in Egypt. Although this work was mainly concerned with linking non-spatial explanations for fertility levels (female literacy, for example) with the spatial structure of the region, it is a valuable contribution to the literature for its application of new technologies to the area of fertility research.

Another important area of fertility research for this project, especially for the historical perspective, is Watkins' work on demographic diversity across European regions and the explanations for differences found. Watkins (1990, 1991) discusses the changing amount of variation in marital fertility rates across European regions between the 1870s and the 1960s. She relates decreasing diversity seen in most countries to a shift from local to national influences on fertility behavior. On one hand, decreases in fertility rates in Western Europe during that period are linked to a shift from institutional and societal control over fertility to individual control over fertility. At the same time, individuals have become more affected by national rather than local fertility norms. Where once individuals' fertility decisions might be governed by local traditions or regional marriage markets, for example, they are now more influenced by national-level causes, such as mass media, national governments, and the development of national markets for goods and labor. The homogenization of fertility rates across countries, moreover, is due to the increased interdependence of national economies, markets, and institutions.

Economics has also informed a good deal of the fertility research that has taken place over the past several decades. The bulk of the literature in economic demography stems from the work of two economists, Becker and Easterlin. Easterlin's basic theory is often referred to as the Relative Income Hypothesis, which suggests that fertility decisions will be shaped by individuals' perceptions of their ability to realize their economic potential. These perceptions will be formed during late adolescence and will be weighed against the standard of living the individual experienced while living at home. Easterlin posits that labor market experiences and earnings potentials will be tied to the size of the individual's generation and that of his parents (Easterlin, 1966; Easterlin, 1980). Those members of a large generation following a smaller one will face a tight labor market, an increased supply of workers competing for jobs and, therefore, lower wages. In response, marriage will be postponed and childbearing, when it occurs, will result in smaller families than in the previous generation. Fertility trends over time, then, will tend to be cyclical. Easterlin has also suggested that the "output" of children is dependent on the difference between the supply and demand for children, as well as the costs of fertility regulation (Easterlin, 1975; Easterlin and Crimmons, 1985). Easterlin's hypothesis, although intuitively appealing, has been criticized by neoclassical economists for its suggestion that preferences for children are not fixed, but instead vary by generation (Pollak and Watkins, 1993). Studies on European countries have had mixed results. Artzrouni and Easterlin (1982) find support for the theory in many West European countries, as does Bielli (1983). Pampel (1993), however does not find clear support for the importance of generation size in determining fertility rates, suggesting that strong governmental social support will likely mitigate the effects of a tighter labor market due to a large generation. In noting the applicability of the relative cohort size ratio to Western European countries, Bielli (1983) does note that Italy appears to be an anomaly and that the ratio has little explanatory power in this case.

Becker has argued that the desire for children is comparable to that for any durable good and will be subject to the same preferences and constraints (Easterlin, 1975; Becker and Barro, 1988; Panopoulou and Tsakloglou, 1999). Becker's theory is generally considered to be the foundation of the "new home economics" view of fertility and has subsequently been modified to account for trade-offs between the quantity and quality of children (since, otherwise, it would follow that, the wealthier the couple, the more children they would have). According to Becker, preferences for children are fixed; variations in fertility will simply be the outcome of changes in households' ability to consume specific numbers of children. As women achieve higher educational attainment and enter the workforce, for example, their time will become more valuable and it will no longer make economic sense for them to stay home producing children (Pollak and Watkins, 1993). The major criticism of Becker's work is the assumption of fixed preferences, and subsequent versions of the theory have loosened this requirement (ibid.).

1.6.3 The Convergence Literature

While much of the literature on the determinants of fertility implicitly considers the role of economic development, much of this work has been done on lesser-developed countries (e.g. Bongaarts and Watkins, 1996) or has offered comparisons between lesser and more developed countries (e.g. Panopoulou and Tsakloglou, 1999). In many cases this is understandable; demographers have traditionally been interested in the fertility transition and how its onset and progress relates to changing levels of economic development.

The wealth of literature in economic convergence offers a number of ways in which regional processes can be characterized, and yet researchers have to take full advantage of this literature to either evaluate fertility trends on their own or to relate those trends to regional economic trends in convergence or divergence. A possible exception is a paper by O'Connell (1981), which argues that the regions of the U.S. are characterized by different trends in the total fertility rate over time. O'Connell offers the observation that regional fertility rates will tend to converge during upswings in fertility and diverge during downswings. This hypothesis is borne out in Pandit and Bagchi-Sen's (1993) article on spatial trends in U.S. regional fertility over time. The remainder of the present discussion on economic convergence will focus on identifying the main trends in that literature and on relating them to regional fertility trends.

Three types of economic convergence are cited in the literature, two of which are applied in the current study. The first, *sigma* convergence, measures the amount of dispersion apparent in regional or national cross-sectional data. Conceptually, *sigma* convergence implies that, over time, regional per capita incomes or GDP will approach each other at some point. This type of convergence is easily computed, but does not convey a great deal of information on its own. The usefulness of *sigma* convergence emanates from its ability to tell us whether differences between groups, individuals, or countries are increasing or decreasing over time (Sala-i-Martin, 1996). The second type of convergence found in the literature also relies on cross-sectional data and is termed *beta* convergence, where *beta* is an estimate of convergence obtained from a regression model using average growth in GDP over a given time period as the dependent variable and the initial level of GDP as the key independent variable. *Beta* convergence is based on neoclassical growth theory and suggests that regions or nations will converge to a steady-state over time.[4] For this to occur, poorer regions will experience faster growth rates than richer regions because of decreasing returns to capital. Because multiple economies may have different steady-states, the existence of *beta* convergence does not necessarily imply the presence of *sigma* convergence, as well. It is possible for regional economies to converge over time to their respective steady-states, for example. The occurrence of *sigma* convergence, however, requires that *beta* convergence also be taking place.

The literature further distinguishes between absolute and conditional *beta* convergence. Conditional convergence allows for the inclusion of other pertinent covariates, such as human capital, in the regression model that may account for regional differences in rates of convergence, while absolute convergence suggests that poorer economies grow unconditionally faster than rich economies (Cuadrado-Roura et al, 1999).

The literature suggests certain variables that may be informative in judging the extent of economic convergence that occurs among regions or nations. Changing economic structure or industry mix affects whether convergence takes place and also places limits on the amount of *sigma* or *beta* convergence that can occur among regions (ibid.; Barro and Sala-i-Martin, 1992). Governmental regional economic policies will also affect convergence rates. An empirical study of Finnish regions found that solid economic policy has resulted in a high degree of convergence across most of the regions (Kangasharju, 1998). A comparable study of Greek regions, however, found that

[4] Barro and Sala-i-Martin (1992) define regions as having a common steady state when they are "similar in respect to preferences and technology." (p. 224)

regional inequalities have persisted over the past century, even in the face of regional economic policies geared towards helping poorer regions catch up to the richer ones (Siriopoulos and Asteriou, 1998). Siriopoulos and Asteriou refer to the difference between northern and southern regions as "economic dualism" and seem to suggest the possibility that the two broader regions may have different steady-states, so that absolute convergence will never occur. Migration is also expected to assist in the process of convergence by moving workers from poorer regions to richer regions until an equilibrium has been established. Carlino and Mills (1996) and Austin and Schmidt (1998) both cite migration as an important aid in helping poorer regions grow faster than rich ones.

In an acceptance that regions within a nation may be subject to differing steady-states, some studies have incorporated regional dummy variables into the regression models. Rey and Montouri (1999) go a step further in their analysis of U.S. state income convergence by taking spatial effects into account. They do this first by computing global Moran's I statistics for different years to show that spatial autocorrelation varies over time and shows some correspondence to levels of income convergence and divergence. They also compute local measures of spatial autocorrelation to aid in the identification of hot spots. Most importantly, however, Rey and Montouri suggest a number of different models that may be useful in measuring the degree of spatial dependence that exists in a typical beta convergence model. In testing for beta convergence in the EU regions, Fingleton (1999) also emphasizes the importance of spatial relationships in the evaluation of regional convergence trends.

Italy, with its longstanding North-South gradient in almost all socio-economic aspects has drawn a great deal of attention in this area. Terrasi (1999) uses measures of *sigma* convergence to show that, in general, economic convergence occurred in Italy up until the mid-1970s and was then followed by a period of divergence, which continues today. Leonardi (1995) comes to a similar conclusion, but emphasizes the consequent importance for a national or European government attempting to administer regional economic policy across all regions. He notes that policy must take into consideration regional differences that exist even within the southern provinces. Carmeci and Mauro (2002) go so far as to state that the pattern of Italy's regional economic convergence has become known as a "stylized fact" among researchers in this area. They reinforce the finding that limited regional convergence took place up until the early 1970s and then ceased. Special attention is drawn towards persistent large regional difference in unemployment, as well. Stannard (1999), while emphasizing the role of globalization and localization in Italy, also makes a valid argument for working at least at the scale of provinces when doing research in that country. He suggests that, even within the northern regions, there are areas that have failed to catch up with the rest of the country, just as the South can boast of some highly developed localities.

All of the above arguments add an important dimension to current research on fertility. First and foremost, the economic convergence literature offers a range of quantitative measures that can be applied to regional fertility rates over time to show whether *sigma* convergence has occurred across the Italian regions. It also becomes possible to ask whether, based on concepts of *beta* convergence, one would expect regions displaying higher fertility rates to decrease faster than those whose fertility rates are already low. Also, the possible links between different types of economic convergence and changes in regional fertility rates over time have not been considered in the literature.

1.6.4 The Shift-Share Analysis Literature

Shift-share analysis is an umbrella term for a family of techniques typically used to describe how regional employment change in a set of industries compares to that taking place in other regions and in the nation as a whole. Over the years, the basic shift-share method as seen in Perloff et al. (1960) and later Barff and Knight (1988), for example, has been expanded and elaborated upon in order to accommodate new applications and to account for structural weaknesses in the technique (see Haynes and Dinc, 1997; Knudsen, 2000; Stevens and Moore, 1980 for discussions of many permutations of shift-share analysis). In its simplest form, the method allows the researcher to decompose change in a variable into different components. These components are then useful for describing how regional change in one area, say an industry, is related to growth at the national level, within that particular industry, or within the region itself.

There are many criticisms of shift-share analysis, however many of them have been leveled at the predictive abilities of the method; for basic descriptive purposes, it is still an accepted technique. As it applies to this research project, a more noticeable shortcoming of shift-share analysis, especially when compared to the discussion of convergence analysis above, is its lack of theoretical underpinnings (Stevens and Moore, 1980).

Although shift-share analysis has not been frequently applied in population geography or demography, its use is not unprecedented. Most frequently, applications of shift-share to population topics have focused on changes in flows or movement of people. Ishikawa (1999), for example, used shift-share analysis to study cohort size and its relation to population concentration and deconcentration. Plane (1987, 1992) applied variations of the method to migration flows in the U.S. On a different topic, Wright and Ellis (1997) used shift-share analysis in their study of ethnic employment change across industries in Los Angeles. In all of the above cases, straightforward extensions to the original shift-share method were successfully used to enhance descriptions of change across a set of geographical entities or groups of people. With similar enhancements, this technique can also be applied to regional changes in births over time, across a set of cohorts.

1.7 Dissertation Format

This dissertation presents research findings from three research papers. The format of the dissertation is as follows. Chapter 2 outlines the contents of the three papers forming the body of this research. Summaries of the main findings from these three papers are included, as are suggestions for future research. The three research papers are appended to the dissertation as appendices. Appendix A presents a shift-share analysis of regional changes in numbers of births in Italy from 1952 to 1991.

Convergence in regional fertility rates is the subject of the paper contained in Appendix B. Appendix C contains a paper that addresses the importance of historical regional fertility trends for a complete understanding of contemporary regional fertility differences.

2. PRESENT STUDY

The methods, results, and conclusions of this study are presented in the three papers appended to this dissertation. The following chapter is a summary of the most important findings in these papers. The format of this chapter is as follows. In the next section I highlight the main objectives, methods, and results contained in the three papers attached to the dissertation. I then offer suggestions for future research, based on the findings of the three papers presented below. Section 2.3 highlights the links across the three papers and concludes the chapter.

2.1 Summary

The three papers presented in this dissertation reflect the common goal of evaluating regional patterns and changes in fertility levels in Italy since 1952. Collectively, the three papers describe the historical origins of regional differences in fertility rates, the components of change in childbearing levels in the post-World War II years, and the evolution of regional fertility rates as they have converged over time. Below I briefly outline the methods used in the three papers attached to this dissertation and highlight the main findings of each paper.

2.1.1 Shift-Share Analysis of Regional Changes in Childbearing

As discussed in the introductory chapter, shift-share analysis decomposes change, traditionally in employment across a set of economic sectors, into several components. These components are often a national effect, a competitive effect, and an industry mix (or structural) effect. Application of shift-share analysis enables the researcher to judge the provenance of a region's economic performance across the set of economic sectors and to ascertain its position relative to the nation as a whole. In the case of the present paper, I have used shift-share analysis to parse regional change in the number of births into several components. In place of industries, I use births within a set of cohorts. Doing this shows the extent to which changes in numbers of births in a region are due to increases or decreases in births to women of a particular age. When each regional component is summed for all the cohorts, regional measures for the component are obtained and can be used for cross-region comparisons. As an extension to the shift-share analysis, I also graph regional changes for two of the components. Based on these graphs, a typology of regional fertility characteristics is developed and a table of "quadrant mobility" for all periods of analysis is composed.

In this application of shift-share analysis, there are three main components, which are further decomposed to account for population and fertility rate changes. The first main component is a national effect, which reflects the extent to which the number of births in a region would have increased or decreased if that region had experienced the same rate of change in births as the nation. The national effect is then sub-divided into pool, rate, and age effects that account for changes due to population growth, actual fertility rate declines, and age cohort effects. The second main component is a cohort effect, which measures the effects of differences in age composition across regions. If regions have a high number of women in age cohorts that are experiencing faster growth in births than the nation, they will have a positive number for the cohort effect. The third component is the regional differential effect, which measures the degree to which birth levels within a region's cohorts differ from what is taking place a the national level. If a region's measure for this component is zero, then the region's cohorts exhibit the same rates of change in births as their national counterparts. The regional differential effect is also sub-divided into pool, age, rate, and cohort rate effects.

The shift-share results demonstrate the applicability of the technique to fertility research, particularly if the subject of interest is a set of regions or even nations. In this analysis, the regional differential effect determined a great deal of the regional change in levels of childbearing. The analysis, completed for five periods, shows that the northern and central regions differed substantially from the southern regions. The northern regions, for example, have region-specific characteristics, as measured by the regional differential effect, that predisposed them towards increases in numbers of births in the 1950s while the southern regions' characteristics predisposed them towards the opposite effect. This was also the case for the period encompassing the Italian baby boom, 1961 to 1971. At a cohort-specific level, southern regions also behaved differently than the remainder of the nation, with decreases in births mainly originating from older age cohorts. Younger age cohorts would often maintain or increase their numbers of births relative to national levels, unlike northern regions. In the North, declines would be seen in all cohorts, with the exception of the 30-34 age cohort. These findings are consistent with the South's delayed completion of the fertility transition but also with the persistence of different fertility expectations and behaviors in the South. The quadrant analysis also reinforces the finding that southern regions displayed different fertility trends than the rest of the country.

2.1.2 Convergence Analysis of Italian Regional Fertility Rates

The convergence analysis of Italy's regional fertility rates uses methods and concepts developed in the regional economics literatures to evaluate the extent to which fertility rates across regions have converged since the Second World War. The analysis uses two concepts of convergence, *sigma* and *beta*, found in the literature for the study. The process of regional fertility convergence is also conceptualized, exploring the possible links between fertility and economic convergence.

Sigma convergence measures changes in the dispersion of regional fertility rates over time – the distance between high and low fertility regions. Several different measures of dispersion can be used; this application uses the standard deviation of the log of fertility rates. Over time, the expectation is that regional fertility rates will become increasingly homogeneous, showing that *sigma* convergence is taking place. *Beta* convergence measures the process by which *sigma* convergence might take place. For *beta* convergence to take place, higher fertility regions need to experience faster declines in fertility rates than their lower fertility counterparts. If all regions share the same fertility tastes and preferences, fertility rates should eventually converge to the same level across all regions. Aspatial *Beta* convergence is measured, in this paper, using a regression model that can be estimated using ordinary least squares:

$$\ln\left(\frac{TFR_{i,t+k}}{TFR_{i,t}}\right) = \alpha + \beta \ln(TFR_{i,t}) + \varepsilon_{i,t}$$

where the TFR $_{i,t}$ is the total fertility rate in region *i* at time *t*, and *k* is the number of years in the time period. A negative estimate for β indicates that absolute convergence has taken place. The addition of other variables to the right side of the model allows for the convergence process to be mediated by region-specific characteristics such as differences in per capita GDP. This is often referred to as conditional convergence.

The results of the analysis show that regional fertility rates in Italy converged during the 1952 to 1995 period. *Sigma* convergence peaked in the years leading up to the height of the baby boom in 1964 and then declined thereafter. This result complements the findings from the shift-share analysis and suggests that the convergence process was driven by increases in births in the northern regions, rather than decreases in fertility in the southern regions. The results from the absolute *beta* convergence models do indicate that convergence took place through higher fertility regions experiencing faster declines than lower fertility regions. Results from spatial dependence convergence models do not contribute substantially to the convergence discussion but do help ensure that confidence can be had in the negative estimates for β. Although convergence did take place during the entire period, the goodness of fit of the two sub-period models varies, as does the strength of the negative measure for β, suggesting that the process of convergence has not been a smooth one over the past decades.

2.1.3 Analysis of Historical Regional Fertility Patterns

Italian historical fertility trends have been thoroughly studied, however the link between them and contemporary fertility trends has not been fully established. This paper ties the two periods together, with two main aims. The first is to show that regional fertility trends seen in today's Italy have been in existence since the beginning of the 20th century and owe at least part of their current existence to historical factors. The second goal is to demonstrate that, although political unification could have been expected to lead to increased homogeneity in fertility behaviors, the opposite effect is found. Using a methodology developed by Watkins (1990, 1991), the analysis builds on Watkins' findings and suggests explanations for Italy's peculiar case. The data used for the analysis come from the Princeton European Fertility Project and are available every decade from 1871 to 1960 (data are also available for 1864 but were excluded from the analysis because of missing data). The Fertility project provided regional measures for marital fertility, illegitimate fertility, overall fertility, and the proportion of women of childbearing age who were married.

The empirical portion of the paper is an extension of Watkins' study of all European regions, but focuses on Italy alone and in more detail. Watkins assessed increases in "demographic diversity" based on changes in the interquartile range (IQR) of marital fertility between 1871 and 1961. This analysis also uses the IQR, but looks at changes on a decade-by-decade basis and for overall fertility as well, relating these changes to Italy's political development. As a further extension to Watkins' research, the present paper also extends the time period of analysis into the 1990s, which effectively links the historical period to the post-World War II period.

The results show regional fertility variation, both marital and total, increasing in the early decades of the 20th century and peaking in the 1950s and 1960s. The analysis for marital fertility ends of necessity in the 1960s. However, the measures for overall fertility show increased homogeneity in regional fertility behaviors after the 1950s and 1960s. The trends for the latter, contemporary portion of the analysis mirror the results seen in the convergence analysis and reinforce the finding that regional fertility rates are becoming more similar over time. The results showing increased diversity in fertility rates during the early decades following Italy's political unification are interesting. In the paper I suggest that, as an elaboration of Watkins' hypothesis that the late 1800s and the 1900s marked a shift from local to national influences on fertility, regional characteristics played – and continue to play – an important role in Italy's regional fertility patterns. Constraining the new national Italian government's efforts at unification, I suggest, were the difficulties of emigration, physical geography, and uneven economic development.

2.2 Future Research Directions

Although the three papers presented in the appendices offer new contributions to both the methods and understanding of regional fertility change in Italy, several avenues of research remain. In some cases, new research possibilities are possible, based on the conclusions drawn from the present study. The methods and theoretical bases of the analytical tools might also be strengthened. For example, the shift-share analysis of changes in regional childbearing patterns produced a wealth of information on regional differences and cohort-specific changes in numbers of births. Many of the findings are only briefly discussed in the paper. In addition, the results of the shift-share analysis, although useful in and of themselves, could be rendered more useful if some measure of statistical confidence could be attached to them.

The convergence analysis of regional fertility rates presented in Appendix B similarly offers opportunities for future research. The link between economic and fertility convergence, though hypothesized in the paper to exist, requires further elaboration before more far-reaching conclusions can be drawn. The convergence literature offers a wealth of analytical tools that can be used to evaluate convergence trends across regions. The application of some of these methodological tools might provide more direct evidence of convergence in regional fertility rates over the past several decades.

Historical regional fertility trends in Italy have been well-documented in the literature. The paper presented in Appendix C offers a new perspective on these trends and places them in the context of contemporary regional fertility patterns. The paper notes the importance of national governments, particularly the fascist government under Mussolini, in legislating fertility behavior. It would be nice, in the future, to develop some way of measuring the differential impact of the fascist demographic policies on the regions. Ipsen (1996) offers a thorough documentation of the fascist pro-natalist and general demographic policies (the halt to emigration and the control of internal migration, for example), but does not address the likelihood that these policies were better received and achieved better results in some regions than in others. Pursuing this question is a next logical step following from the research presented here.

Finally, the three papers on which this dissertation is based have as their goal the assessment of regional patterns and trends in regional fertility rates. Explanations of these changes are only tangentially touched upon in the papers. Further examination of the causes for the changes and patterns found in the three papers would complement the findings described here. The wealth of literature dealing with explaining fertility behavior, especially the work of Easterlin and Becker as well as many of the Italian demographers, offers many insights to the regions patterns seen in Italy.

2.3 Conclusions

The main question I sought to answer in this dissertation was: how have regional fertility rates varied within Italy over the past 50 years. The background section in the introductory chapter of this dissertation established the wide variation in fertility levels and trends that has prevailed since the 1950s. To answer my question, I relied on shift-share and convergence analyses to evaluate regional trends and patterns of fertility from 1952 through the 1990s. In addition, with the assumption that post-war fertility trends must be placed within their proper historical context, I evaluated regional fertility patterns from 1871 through 1951. The results of the three pieces of analysis present a number of findings, summarized above. Taken collectively, these findings present a picture of deeply entrenched regional fertility differences, as well as an evolution towards a more national fertility norm. Although Italy's regions continue to display individual fertility behaviors, as shown in the shift-share analysis and the historical analysis, the trend appears to be towards convergence in fertility rates as shown in the convergence results.

The convergence trend appears to be towards very low, below replacement-level fertility across Italy. Even in the higher fertility regions of the South and Northeast, total fertility rates are well below replacement level. However, fertility rates can only decrease so far. Eventually, regional fertility rates will stabilize at some low level or will possibly increase. Prognostication of the future of fertility rates in Italy and its regions offers infinite possibility for speculation and research.

REFERENCES

Akkerman, Abraham and Jiao Sheng He. 1998. "Geographical Patterns of Fertility Decline in Guangdong: China's Population Policy through the Censuses of 1982 and 1990," *The Canadian Geographer*, 42, 174-192.

Anselin, Luc and Anil K. Bera. 1998. "Spatial Dependence in Linear Regression Models with an Introduction to Spatial Econometrics," in Ullah, Aman and David E.A. Giles (eds.) *Handbook of Applied Economic Statistics*. New York: Marcel Dekker Inc.

Artzrouni, Marc A. and Richard A. Easterlin. 1982. "Birth History, Age Structure, and Post World War II Fertility in Ten Developed Countries: An Exploratory Empirical Analysis," *Genus*, 38, 81-99.

Austin, John S. and James R. Schmidt. 1998. "Convergence amid Divergence in a Region," *Growth and Change*, 29, 67-89.

Barff, Richard A. and Prentice L. Knight III. 1988. "Dynamic Shift-Share Analysis," *Growth and Change*, 19, 1-10.

Barro, Robert J. and Xavier Sala-i-Martin. 1992. "Convergence," *The Journal of Political Economy*, 100, 223-251.

Becker, Gary S. and Robert J. Barro. 1988. "A Reformulation of the Economic Theory of Fertility," *The Quarterly Journal of Economics*, 103, 1-25.

Bielli, Carla. 1983. "La Teoria di Easterlin: Un Tentativo di Applicazione all Realtà Italiana," from *Miscellanea di Studi Demografici*. Rome: Pubblicazioni dell'Istituto di Demografia.

Bongaarts, John and Susan Cotts Watkins. 1996. "Social Interactions and Contemporary Fertility Transitions," *Population and Development Review*, 22, 639-682.

Carlino, Gerald A. and Leonard Mills. 1996. "Testing Neoclassical Convergence in Regional Incomes and Earnings," *Regional Science and Urban Economics*, 26, 565-590.

Carmeci, Gaetano and Luciano Mauro. 2002. "The Convergence of the Italian Regions and Unemployment: Theory and Evidence," *Journal of Regional Science*, 42, 509-532.

Castiglioni, Maria and Gianpiero Dalla Zuanna. 1990. "An Ecological Approach to the Italian Fertility Decline: 1971-81," Working paper, University of Padova.

Castiglioni, Maria and Gianpiero Dalla Zuanna. 1994. "Innovation and Tradition: Reproductive and Marital Behaviour in Italy in the 1970s and 1980s," *European Journal of Population*, 10, 107-141.

Chesnais, Jean-Claude. 1996. "Fertility, Family, and Social Policy in Contemporary Western Europe," *Population and Development Review*, 22, 729-739.

Coale, Ansley J. and Susan Cotts Watkins, eds. 1986. *The Decline of Fertility in Europe: The Revised Proceedings of a Conference on the Princeton European Fertility Project*. Princeton: Princeton University Press.

Coleman, David. 1996. "New Patterns and Trends in European Fertility: International and Sub-National Comparisons," in Coleman, David (ed.), *Europe's Population in the 1990s*. Oxford: Oxford University Press.

Cuadrado-Roura, Juan R., Begona Garcia-Greciano, and Jose Luis Raymond. 1999. "Regional Convergence in Productivity and Productive Structure: The Spanish Case," *International Regional Science Review*, 22, 35-53.

Dalla Zuanna Gianpiero, Makoto Atoh, Maria Castiglioni, and Katsuhisa Kojima. 1998. "Late Marriage Among Young People: The Case of Italy and Japan," *Genus*, 54, 187-232.

Dalla Zuanna, Gianpiero. 1999. "The Banquet of Aeolus. An Interpretation of the Italian Lowest Fertility," 2nd Workshop on Lowest Fertility, Max Plank Institute, Rostock, Germany, 1999.

Easterlin, Richard A. 1966. "On the Relation of Economic Factors to Recent and Projected Fertility Changes," *Demography*, 3, 131-153.

Easterlin, Richard A. 1975. "An Economic Framework for Fertility Analysis," *Studies in Family Planning*, 6, 54-63.

Easterlin, Richard A. 1980. *Birth and Fortune: The Impact of Numbers on Personal Welfare*. Chicago: The University of Chicago Press.

Easterlin, Richard A. and Eileen M. Crimmons. 1985. *The Fertility Revolution*. Chicago: The University of Chicago Press.

Esposto, Alfredo G. 1992. "Italian Industrialization and the Gerschenkronian 'Great Spurt': A Regional Analysis," *The Journal of Economic History*, 52, 353-362.

Fingleton, Bernard. 1999. "Estimates of Time to Economic Convergence: An Analysis of Regions of the European Union," *International Regional Science Review*, 22, 5-34.

Goglio, Silvio. 1998. "The Crisis of the Italian Unitary State," *Mediterranean Quarterly*, 9, 82-93.

Haynes, Kingsley E. and Mustafa Dinc. 1997. "Productivity Change in Manufacturing Regions: A Multifactor/Shift-Share Approach," *Growth and Change*, 28, 201-221.

Ipsen, Carl. 1996. *Dictating Demography: The Problem of Population in Fascist Italy.* Cambridge: Cambridge University Press.

Ishikawa, Yoshitaka. 1999. "Contribution of the Demographic Factor to the Migration Turnarounds in Japan, Sweden and Canada," *International Journal of Population Geography*, 5, 1-17.

ISTAT, *Italia in Cifre*, 2001. www.istat.it.

Kangasharju, Aki. 1998. "ß Convergence in Finland: Regional Differences in Speed of Convergence," *Applied Economics*, 30, 679-687.

Kiernan, Kathleen E. 1996. "Partnership Behavior in Europe: Recent Trends and Issues," in Coleman, David (ed.), *Europe's Population in the 1990s*. Oxford: Oxford University Press.

King, Russell. 1987. *Italy*. London: Harper & Row Ltd.

Knudsen, Daniel C. 2000. "Shift-Share Analysis: Further Examination of Models for the Description of Economic Change," *Socio-Economic Planning Sciences*, 34, 177-198.

Leonardi, Robert. 1995. "Regional Development in Italy: Social Capital and the Mezzogiorno," *Oxford Review of Economic Policy*, 11, 165-80.

Livi-Bacci, Massimo. 1977. *A History of Italian Fertility During the Last Two Centuries*. Princeton: Princeton University Press.

Montgomery, Mark R. and John B. Casterline. 1993. "The Diffusion of Fertility Control in Taiwan: Evidence from Pooled Cross-Section Time-Series Models," *Population Studies*, 47, 457-479.

O'Connell, Martin. 1981. "Regional Fertility Patterns in the United States: Convergence or Divergence?," *International Regional Science Review*, 6, 1-14.

Pampel, Fred C. 1993. "Relative Cohort Size and Fertility: The Socio-Political Context of the Easterlin Effect," *American Sociological Review*, 58, 496-514.

Pandit, Kavita and Sharmistha Bagchi-Sen. 1993. "The Spatial Dynamics of U.S. Fertility, 1970-1990," *Growth and Change*, 24, 229-246.

Panopoulou, Giota and Panos Tsakloglou. 1999. "Fertility and Economic Development: Theoretical Considerations and Cross-Country Evidence," *Applied Economics*, 31, 1337-1351.

Perloff, Harvey S., Edgar S. Dunn Jr., Eric E. Lampard, and Richard F. Muth (1960). *Regions, Resources, and Economic Growth.* Baltimore: Johns Hopkins Press.

Plane, David A. 1987. "The Geographic Components of Change in a Migration System," *Geographical Analysis*, 19, 283-299.

Plane, David A. 1992. "Age-Composition Change and the Geographical Dynamics of Interregional Migration in the U.S.," *The Annals of the Association of American Geographers*, 82, 64-85.

Pollak, Robert A. and Susan Cotts Watkins. 1993. "Cultural and Economic Approaches to Fertility: Proper Marriage or Mesalliance?," *Population and Development Review*, 19, 467-496.

Rey, Sergio J. and Brett D. Montouri. 1999. "US Regional Income Convergence: A Spatial Econometric Perspective," *Regional Studies*, 33, 143-156.

Sala-i-Martin, Xavier X. 1996. "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence," *European Economic Review*, 40, 1325-1352.

Siriopoulos, Costas and Dimitrios Asterliou. 1998. "Testing for Convergence across the Greek Regions," *Regional Studies*, 32, 537-546.

Stannard, Kevin. 1999. "How Many Italies? Process and Scale in the Development of the Italian Space-Economy," *Geography*, 84, 308-318.

Stevens, Benjamin H. and Craig L. Moore. 1980. "A Critical Review of the Literature on Shift-Share as a Forecasting Technique," *Journal of Regional Science*, 20, 419-437.

Terra Abrami, Valerio and Maria Pia Sorvillo. 1993. La Fécondité en Italie et dans Ses Régions: Analyse par Période at par Génération. *Population*, 48, 735-752.

Terrasi, Marinella. 1999. "Convergence and Divergence across Italian Regions," *The Annals of Regional Science*, 33, 491-510.

Tolnay, Stewart E. 1995. "The Spatial Diffusion of Fertility: A Cross-Sectional Analysis of Counties in the American South, 1940," *American Sociological Review*, 60, 299-308.

Waldorf, Brigitte and Rachel Franklin. 2002. "Spatial Dimensions of the Easterlin Hypothesis: Fertility Variations in Italy," *Journal of Regional Science*, 42, 549-578.

Watkins, Susan Cotts. 1990. "From Local to National Communities: The Transformation of Demographic Regimes in Western Europe, 1870-1960," *Population and Development Review*, 16, 241-272.

Watkins, Susan Cotts. 1991. *From Provinces into Nations: Demographic Integration in Western Europe, 1870-1960*. Princeton: Princeton University Press.

Weeks, John R., M. Saad Gadalla, Tarek Rashed, James Stanforth and Allan G. Hill. 2000. "Spatial Variability in Fertility in Menoufia, Egypt, Assessed through the Application of Remote-Sensing and GIS Technologies," *Environment and Planning A*, 32, 695-714.

Wright, Richard and Mark Ellis. 1997. "Nativity, Ethnicity, and the Evolution of the Intraurban Division of Labor in Metropolitan Los Angeles, 1970-1990," *Urban Geography*, 18, 243-263.

APPENDIX A

Reprinted with permission from *Geographical Analysis*, volume 36, number 1.
Copyright 2004 by the Ohio State University Press.
All rights reserved.

A Shift-Share Method for the Analysis of Regional Fertility Change: An Application to the Decline in Childbearing in Italy, 1952-1991[5]

Rachel Franklin
Statistician
Population Division
U.S. Census Bureau
Washington, DC
rachel.s.franklin@census.gov

David A. Plane
Professor
Department of Geography and Regional Development
University of Arizona
Tucson, Arizona
plane@u.arizona.edu

Abstract: This paper applies shift-share analysis, a tool often used in economic geography and regional science, to regional fertility change in Italy, 1952-1991. During this post World War II period, Italian fertility declined by over 33 percent, but the decline varied widely from region to region. Moreover, the demographic originations of the decline in births are not fully understood. Using birth data for 19 Italian regions, this analysis is able to break regional change in births into three main components, a national

---

[5] Earlier versions of this paper were presented at the 49th Annual North American Meetings of the RSAI in San Juan, Puerto Rico (November 2002) and at the 42nd Annual Meeting of the Western Regional Science Association in Rio Rico, Arizona (February-March 2003). Grateful appreciation to Frank Heins at the Institute for Research on Population and Social Policies, National Research Council in Rome, who provided the data used in this research. The authors are also grateful for the helpful comments of three anonymous reviewers and the editor.

This paper reports the results of research and analysis undertaken by U.S. Census Bureau staff. It has undergone a more limited review than official U.S. Census Bureau publications. This report is released to inform interested parties of research and to encourage discussion.

effect, a cohort effect, and a regional differential effect, which in turn provide insight into the roots of fertility change at the regional level. These three components of change are then further disaggregated to account for the differences between changes due to population change and those related to actual changes in birth rates (the number of children produced by each woman). Strong regional differences between the North and South of Italy are demonstrated.

1. Introduction

Changing demography, among other factors, has contributed to a substantially different regional picture of Italian fertility in the 1990s than in the 1950s. The downward trend in fertility rates has not been uniform for all regions or for the entire time period; declines were more precipitous for some regions, while others have experienced a slow and steady decrease in fertility rates.

Fertility behavior can be affected at a range of geographic scales. Some of the change might be due to national-level causes, other portions to cohort-specific changes in fertility behavior, and still others to region-specific preferences for a particular fertility schedule (number and timing of children). We employ shift-share analysis, which is able to provide a quantification of these different influences on fertility change, to evaluate the influence of all these different elements, for all regions, across 40 years.

Shift-share analysis is frequently used by regional scientists, geographers, and planners to understand the drivers of regional economic growth. The traditional shift-share method is easily applied and understood, and its use for descriptive purposes is well established (Perloff et al., 1960; Fothergill and Gudgin, 1979; Stevens and Moore, 1980).

Although shift-share analysis is a tool usually employed by regional economists to study regional employment change (e.g. Barff and Knight, 1988), evolution of regional industrial structures (e.g. Haynes and Dinc, 1997; Hanham and Banasick, 2000), or policy effects on regional growth (e.g. Thirwall, 1967; Tervo and Okko, 1983), population geographers have used shift-share for the analysis of regional migration trends. Plane (1987) applied a variation of the shift-share methodology to U.S. internal migration trends, and later (1992) used it to assess the relative importance of age in explaining temporal variations in migration rates. Ishikawa (1999), too, made use of shift-share to evaluate the influence of cohort size on the concentration and deconcentration of population in Japan, Sweden, and Canada as a result of migration. In a newer twist, Wright and Ellis (1997) used shift-share to assess employment changes by ethnic group for various sectors of the Los Angeles economy.

The application of shift-share to demographic change has not extended to regional fertility analysis. Often, demographers know that fertility has been increasing or decreasing in a set of regions, but are unable to link this change directly to national, local, or age-specific trends. Shift-share offers that ability. This paper applies the shift-share methodology to regional fertility change in Italy from 1952 to 1991. Rather than examining regional growth in employment, output, or number of firms across a set of economic sectors, we investigate the growth or decline in numbers of births in 6 age cohorts for 19 Italian regions. Shift-share analysis enables us to parse regional growth or decline in births into what are commonly called in economic approaches the national, structural, and competitive effects. For fertility applications these effects control for national-level age-specific fertility trends and for the impacts of differential age structure within regions in order to expose region-specific differences in fertility by age of mother. The results indicate that, although all regions experienced a decline in births over the past 50 years, the decrease in births may be attributable to different causes for different regions and time periods.

The format of this paper is as follows. Section 2 provides a brief description of Italian post-war fertility at both the national and regional levels. It also examines some of the demographic context to the fertility decline, showing how fertility evolved between 1952 and 1991. Section 3 explains the shift-share methodology used in the analysis, and Section 4 describes the data used. Results are presented in Section 5. Section 6 offers some concluding remarks.

2. Temporal and Spatial Regional Fertility Trends in Italy, 1952-1991

Table 1 provides background on regional fertility change over time by showing the percent change in births for the entire period, 1952-1991, as well as four shorter sub-periods. The percent changes recorded for Italy act as benchmarks for the regions, showing which regions experienced more or less change than the country as a whole during each time period. For all time periods shown, some regions experienced declines in births that were more or less rapid relative to the level of national change. For example, between 1952 and 1991, many of the traditionally higher fertility regions, including the Veneto and Basilicata, experienced greater percentage declines in births than the nation as a whole. Other regions, such as Piemonte and Lombardia, experienced lesser declines than Italy as a whole. Across the four sub-periods, the most dramatic decline in births occurred between 1971 and 1981.

In common with most developed countries, Italy experienced a baby boom in the post-war years. This peak occurred in 1964 but was not sustained for an extended period of time. Unlike the boom experienced in the United States, Italy's increase in births was slightly delayed after the end of WWII and did not last for more than a few years. Figure 1 displays the national trends in fertility rates for 1952-1991. In 1952, the period total fertility rate (TFR) for the entire country was 2.3.[6] By 1991 it had fallen to 1.3. The highest TFR recorded for Italy during these years, in 1964, was 2.7. For the entire study period, Italian fertility never greatly exceeded replacement level.

At a sub-national level, throughout the study period fertility rates in the South were considerably higher than in the North. Although the South's drop in fertility since 1952 has been impressive, its TFR remains much higher than those for the North and Center. Perhaps because fertility was already so high in the region relative to the rest of the country, the baby boom did not have a large effect on TFRs in the South. During this period, the average age at first birth increased across all regions, as did the average age of women in their childbearing years. The peak in age-specific fertility rates shifted towards later ages and lowered. When women marry later and wait longer, on average, to start having children, the end effect will be lower fertility rates. The percentage of first or second births increased during the study period, but remained lower for the South than

[6] The period Total Fertility Rate is the number of children a woman can expect to have, on average, by the end of her childbearing years given current age-specific fertility behaviors. Replacement level fertility is approximately 2.1 children per woman.

for the rest of the nation. Although these changes took place in all regions, some regions experienced more dramatic changes than others, and these changes were then reflected in regional fertility trends over time.

Additional variation is apparent at the regional level (see Figure 2 for labeled map of Italy's regions).[7] Individually, regions in the North, with few exceptions, have had lower fertility rates than regions in the rest of the country. As Figure 3 shows, Liguria, Piemonte, Friuli-Venezia Giulia, and Emilia-Romagna already had below replacement level fertility rates in 1952, forming the core of low northern fertility. The southern regions tend to fall into the highest fertility category for all years shown in Figure 3, although by the end of the study period the "high" range is still only a TFR of 1.2-1.5 – well below replacement level fertility. Trentino-Alto Adige and Veneto, in the northeastern part of the country, have tended to have fertility levels closer to those seen in many southern regions. Another outlier, Sardegna had the highest TFR in the country in 1952 at 3.8, but one of the lowest by 1991 (1.3). The average age at first birth in Sardegna, which began at 25.9 in 1952, increased to 27.3 in 1991, a figure well above the average for the South as a whole.

The above discussion points to two general conclusions. First, all regions experienced a decline in fertility during this period. Second, there has been a great deal of regional variation in this fertility decline as well as in its demographic causes. The South has tended to lag behind the remainder of the country, but even in this part of the country fertility change has not been uniform. With this mass of information, it remains

[7] The regions of Abruzzi and Molise were merged in the early 1960s and are treated as one region for the entire study period of 1952-1991.

unclear how the process of fertility decline evolved over time. For a clearer picture of how regional fertility change relates to change at the national level, as well as to changes taking place in other regions, we turn to the application of shift-share analysis.

3. Methodology

Shift-share methodologies abound. The present analysis uses as a starting point the basic shift-share method – what might be termed "classic" or "traditional" shift-share – because it generates the most easily interpreted and straightforward descriptive results. Dinc and Haynes (1999) and Haynes and Dinc (1997) summarize many of the criticisms that have been leveled at basic shift-share analysis: its lack of predictive ability, the problem of choosing a correct spatial unit of analysis, and difficulties attributing growth to changes in output and productivity. They also show how some of these shortcomings have been dealt with through extensions to the basic model. Knudsen (2000) cites the continued popularity of shift-share analysis in many disciplines, but also points out that the basic model is rarely used today because of its many failings. Others, for example Brown (1969) and Stevens and Moore (1980), have argued that shift-share used for projective purposes is problematic, but have offered far fewer criticisms of shift-share as a purely descriptive tool. Fothergill and Gudgin (1979) offer a thorough rebuttal of many of the more common criticisms of shift-share, emphasizing the importance of having realistic expectations of the technique in the first place – failures appear when researchers expect more of shift-share than it can reliably deliver.

The above are legitimate concerns; however we feel that the advantages of interpretation and simplicity, and the fact that our needs do not demand the use of more sophisticated shift-share models, justify the selection of the traditional, "stripped-down" version of the tool for this application. For this paper, we use shift-share only as a descriptive tool to decompose regional changes in births into three different components of change. Our main interest lies in attributing regional change in births to national or region-specific causes. For such an application the original version of the method is adequate.

Traditional shift-share breaks regional change into three elements (e.g. Barff and Knight, 1988), posited to account for different portions of fertility growth or decline. The shift-share analysis fulfills two descriptive objectives. First, the results show which regions experienced faster declines in births than the nation, and which experienced increases or slower decreases than the nation. More interesting, the results suggest the extent to which such growth or decline might be attributed to national or regional causes.

Here, absolute or total change in births in region j, T_j, during a particular time period is the sum of three components: a National Effect (N_j), a Cohort Effect (C_j), and a Regional Differential Effect (D_j). Or:

$$T_j = N_j + C_j + D_j$$

N_j and D_j are then further decomposed to differentiate changes in numbers of births due to population growth or decline within age cohorts from changes due to decreases or increases in fertility rates (the "productivity" of women in their childbearing ages). The sub-components of N_j and D_j are as follows:

$$N_j = N_j^{pool} + N_j^{age} + N_j^{rate}$$

$$D_j = D_j^{pool} + D_j^{age} + D_j^{rate} + D_j^{cohort\text{-}rate}$$

where N_j^{pool} measures a National Pool Effect, N_j^{age} a National Age Structure Effect, and N_j^{rate} a National Rate Effect. D_j^{pool} accounts for the Regional Pool Effect. D_j^{age} is the Regional Age Structure Effect. D_j^{rate} measures the Regional Rate Effect, and $D_j^{cohort\text{-}rate}$ accounts for a Regional Age-Specific Rate Effect.

The elements of change are calculated as follows:

$$N_{x,j}^{pool} = \mathrm{B}_{x,j}(p_n)$$

$$N_{x,j}^{age} = \mathrm{B}_{x,j}(p_{x,n} - p_n)$$

$$N_{x,j}^{rate} = B_{x,j}(r_n - p_{x,n})$$

$$C_{x,j} = B_{x,j}(r_{x,n} - r_n)$$

$$D_{x,j}^{pool} = B_{x,j}(p_j - r_{x,n})$$

$$D_{x,j}^{age} = B_{x,j}(p_{x,j} - p_j)$$

$$D_{x,j}^{rate} = B_{x,j}(r_j - p_{x,j})$$

$$D_{x,j}^{cohort\text{-}rate} = B_{x,j}(r_{x,j} - r_j)$$

where: $B_{x,j}$ = births in cohort x in region j at start of time period

r_n = growth rate in births for the nation, n

$r_{x,n}$ = growth rate in births for cohort x for the nation, n

r_j = growth rate in births for region j

$r_{x,j}$ = growth rate in births for cohort x in region j

p_n = population growth rate for the nation, n

$p_{x,n}$ = population growth rate for cohort x for the nation, n

p_j = population growth rate for region j

$p_{x,j}$ = population growth rate for cohort x in region j

Components of growth can be summed for all age cohorts (x) in a region (j) to come up with regional totals for all components. $D_j^{cohort\text{-}rate}$ will sum to zero, however, as total cohort-specific births rates should equal regional birth rates. Sub-components for N_j and D_j can, in turn, be aggregated for a total measure of the impact of those components of regional birth change. As shown above, the sum of the eight elements of change gives the absolute change in births that occurred between the base year and the end year.

N_j reflects endogenous or exogenous phenomena that affect all regions, a war or economic crisis for example. It is the regional change in births that would be expected if all cohorts in the region experienced the same rate of change in births as the nation as a whole. The National Pool Effect (N_j^{pool}) measures the extent to which regional changes in births are due to population increase or decrease at the national level and will always be positive, since national population growth was always positive during these years. The National Age Structure Effect (N_j^{age}) accounts for changes in numbers of births that can be attributed to concentrations of births in age cohorts that nationally are experiencing higher growth than the nation as a whole. The National Rate Effect (N_j^{rate}) measures changes in births due to national birth rate changes outstripping cohort-specific population growth (or decline).

C_j, the Cohort Effect, is often termed the Structural or Mix effect in regional economic applications of shift-share. This component accounts for differences in age composition across regions that will affect the number of births that take place. Regions that "specialize" in cohorts that are growing faster than the nation will have a positive C_j, simply due to their cohort structure of births. For example, regions that have a concentration of births in, for example, the 30-34 age cohort will have a positive C_j measure if, at the national level, this age cohort grew faster than (or did not decline as fast as) the national rate. If instead, a region's peak number of births occurs in a cohort that is growing slower than the nation as a whole, the Cohort Effect will be negative. This suggests that, in fact, C_j is also measuring the impact of national change on individual regions.

This supposition is reinforced when one considers that the national rate of change is composed of several individual changes taking place within cohorts. A negative national rate of change (r_n) is likely driven by change in specific age cohorts, with cohorts at very young and older ages being particularly susceptible to change as society evolves over time. For instance, if teen births at the national level declined faster than the nation as a whole, $r_{x,n} - r_n$, the resulting rate will be negative. If a particular region has already made the transition away from births in the 15-19 age cohort, this negative rate of change will have a minimal effect on the overall Cohort Effect. If, however, a region still has a strong concentration of births in that age cohort, relative to the other age cohorts, the negative effect will have a much stronger influence on the total C_j. The bulk of births take place in the middle age cohorts, in core fertility cohorts. In this case, if births in these national-level cohorts remain robust (that is, decrease less than the total national rate) compared to the nation as a whole, regions that have a high number of births in those cohorts, relative to other cohorts, will likely have a positive C_j.

Finally, the Regional Age-Specific Rate Effect ($D_j^{cohort\text{-}rate}$) will capture cohort-specific changes in the number of births due to cohort-specific births rates deviating from the regional birth rate.

4. Data

Shift-share analysis relies on comparisons between a base year and an end year. Because the entire study period, 1952-1991, is a fairly long one and encompassed a great deal of fertility variation, the analysis was completed for four sub-periods as well as for the entire study period. The sub-division of the study period into smaller parts also facilitates a clearer understanding of the contribution of the three components of change in different fertility environments (boom years, slow-decline years, and steep-decline years).

The data used for this analysis originate from two sources, both of which are products of ISTAT, the Italian statistical office. Because annual, age-specific birth data were not available at the regional level for the time period 1952-1991, we used age-specific fertility rate data and regional population data to reconstruct total births within age cohorts at the regional and national level.[8] The age-specific regional births were then

---

[8] Because the regional population data were for January 1 of each year rather than mid-year, as is required to calculate proper rates, some further manipulation of the data was necessary. In order to approximate as closely as possible the true number of annual births that took place in each one-year age cohort for each region, the following simple transformation of the population data was used:

$$P'_{xj} = .5(P_{xj}) + .5(P_{x-1,j})$$

where P_{xj} is the population of age x in region j for a given year. One shortcoming of this method is that it does not account for migration or mortality. The age-specific mid-year population was then multiplied by its corresponding age-specific fertility rate to generate the number of births to women of age x in a given year. The one-year age cohort data were then aggregated into the six cohorts described above. Births were summed across all cohorts and regions for each year to approximate the total number of births at the collapsed into six cohorts: 13-19, 20-24, 25-29, 30-34, 35-39, and 40-50. The choice of these six cohorts was governed by two considerations. First, it was important that important age detail be retained in the new set of age cohorts. For example, teen births and births to those over 40 tend to be very different in nature from those in peak fertility cohorts, such as 25-29 and 30-34. Second, we wanted to ensure that interpretation of the results would not be impeded by an overwhelming number of categories. Six cohorts provides a fair amount of differentiation across the age groups, without compromising ability to deliver comprehensible results.

5. Analysis and Results

The results of the analysis are presented for the 1952-1991 period, as well as for four sub-periods: 1952-1961, 1961-1971, 1971-1981, and 1981-1991. These sub-periods are distinguishable by the character of national fertility during each time period. As Table 1 showed, 1952-1961 was the only period with an increase in the birth rate. The following time period, 1961-1971, contains the study period's peak fertility years, but shows a slight decline in the rate of births between the starting and ending years. 1971-1981 covers the years of the steepest decline in births, and 1981-1991 shows a lesser drop in the births rate.

---

national level. Appreciation is owed to Brigitte Waldorf for help in determining the most accurate approximation of an age-specific mid-year population.

only 4,376. The results for Lombardia, Lazio, and Campania are similar. In Campania, N_j is a decline of 35,856 births, which is offset by an increase in births coming from D_j.

Although the results are similar for these four regions, explanations for the results differ. It is unlikely that regions such as Lombardia and Piemonte, which had very low fertility already at the beginning of the 1950s and had largely completed the demographic transition by this time, fall into the same category as high fertility regions like Campania or even middle-ranging regions such as Lazio. One possible explanation is that, since fertility was so low in the Northern regions, they could not possibly experience fertility declines such as those experienced by the nation as a whole. By nature of their low fertility, they were bound to have slower declines in cohort-specific births than their national counterparts. Campania's large D_j seems to be more indicative of a region displaying resistance to national trends in fertility decline.

Looking at cohort-specific rates of decline at the national and regional level helps bear out this supposition. At the national level, between 1952 and 1991, each age cohort experienced a decline in births, but the bulk of the decline was borne by the young and old cohorts. Births to women aged 40-50 declined by 80 percent during this period, and by 50 percent in the 35-39 cohort. Births to 13 to 19 year-olds declined by 49 percent across Italy, as well. In contrast, Campania actually had an *increase* – though small – in births in both the 13-19 and the 20-24 cohorts. In the 25-29 cohort, Campania's births declined by 8 percent, but the nation experienced a 23 percent decline for the same age cohort, resulting in a positive number for D_j. For all three older age cohorts, Campania's births declined more than the national cohorts, but these negative numbers are insufficient to overcome the increases in the younger three cohorts. These cohort-specific fertility variations are seen in the $D_j^{cohort\text{-}rate}$ results, as well, which show above regional average fertility rates for younger cohorts, and below average rates for older age cohorts. Taken together, the decline in fertility at old ages is in line with regional decreases in total fertility and even with the increases in percentages of first-order and second-order births seen during these years. That is, Calabria's total fertility rates declined during this period, apparently due to a decrease in fertility at older ages. The persistence and even slight increase in the number of births in the younger cohorts suggests that Calabrian women continued, during this period, to start their families at an earlier age than women in the rest of the country and to also complete their families at an earlier age.

In the northern regions, Lombardia and Piemonte, the 30-34 age cohort was the only one to experience an increase in births during this time period. All other cohorts experienced decreases in births, although often not to the same extent as the nation as a whole. For $D_j^{cohort\text{-}rate}$ in Lombardia and Piemonte, age cohorts 25-29 and 30-34 experienced increases in fertility rates relative to the region's overall fertility rate, while all other age cohorts experienced relative declines in fertility rates. This pattern of decline is consistent with the supposition that birth rates in many northern Italian regions were already at a minimum and were poised for some increase. This pattern is also one that might be expected in a population in which women are delaying their fertility until later ages in favor of education and labor opportunities. Although births in most cohorts did decline, there was a limit to the amount of decline that could occur because birth levels were already low in 1952. The 30-34 cohort increase in births is also consistent with a hypothesis that women during this period began to delay fertility until the older ages. This would mean that some of the decreases seen in the younger cohorts were simply births being postponed until a later age. This is very different from Campania, where increases were reserved for younger ages and decreases for the older cohorts.

The results for the 1952-1991 shift-share show that many regions had a negative D_j that compounded, rather than mitigated, the decline in births coming from the National Effect, N_j. The total change in births for these regions was a greater decline than occurred at the national level. These regions are scattered throughout the country, with the bulk located in the Center and South. A couple of the regions, such as Emilia-Romagna and Friuli-Venezia Giulia, already had some of the lowest fertility rates in the country in 1952 (see Figure 3). The remaining regions, however, are those that were in the midst of the transition from high to low fertility at the beginning of the time period.

5.2 The 1952-1961 Period

Of course, the 1952-1991 time frame masks a great deal of fluctuation in birth rates that took place during that time period. The analysis for the shorter time periods helps compensate for this deficiency by showing shift-share results that better track changes in fertility over time. Table 3 shows the results for the 1952-1961 analysis. This first portion of the study period is one characterized by the slow recovery of the economy and by steady or increasing birth rates. This is the only sub-period in which there was an increase in births at the national level, an increase leading to a positive N_j for all regions.

For this sub-period C_j is the least important of the three elements of growth. Responsibility for the total change in births is equally divided between N_j and D_j, with D_j determining whether the total change in births was actually positive or negative. For the majority of regions – Lazio and Sardegna being major exceptions – D_j^{pool} was negative, meaning that based on regional population change for this period, a decrease in the number of births would have been expected. D_j^{rate}, however, tended to be positive in northern and central regions and negative in southern regions, suggesting that regional increases in births in the North and Central portions of the country were due to increases in regional cohort-specific birth rates, or increases in "productivity."

In addition to an increase in over 7,000 births attributable to N_j, the results for Campania also show an increase coming from D_j. As mentioned above, a positive D_j means that, on balance, age-specific births either increased more than the national rate or decreased less than the country as a whole, after controlling for differences in the age composition of potential mothers. In four other regions, D_j was not only positive, but exceeded the increase in births projected by N_j. These regions, Piemonte, Lombardia, Liguria, and Lazio are located primarily in the North, where the beginning of the post-war economic recovery was focused. Another possible explanation is that fertility may have been unnaturally depressed in the early 1950s and was only rebounding to "normal" levels in this first post-war decade.

With the exception of Campania, the results for all of the southern regions show a negative D_j that either lessened the effect of the expected increase in births or negated it entirely. The depressing effects of D_j appear to come from both the Regional Pool Effect

(D_j^{pool}), which accounts for regional population growth, as well as from the Regional Rate Effect (D_j^{rate}), which account for changes in age-specific fertility rates. Further north, the Central regions of Umbria and Marche also had negative measures for D_j that resulted in an overall decrease in births over the decade. Two regions in the North, Veneto and Friuli-Venezia Giulia, had relatively high negative values for D_j.

5.3 The 1961-1971 Period

The 1961-1971 decade covers the peak of post-war fertility in Italy. As discussed in Section 2, the peak of the Italian baby boom occurred in 1964. Nonetheless, an overall decrease in births took place between 1961 and 1971, resulting in a negative measure for N_j for this period. Results for the 1961-1971 shift-share are shown in Table 4, where the wide spread in changes in regional births is evident. Although N_j is negative, some regions showed large increases in births during this decade, mostly due to D_j. Still others experienced declines, also mainly attributable to D_j, which completely overshadowed any decline coming from N_j. For the first time, C_j began to influence the regional total change in births.

Piemonte and Lombardia, as in the previous decade, show the most startling increases in births for this period of analysis. Lombardia had a total increase in births of almost 16,000, which would have been higher had the region benefited from a more favorable age structure (reflected by C_j). In Piemonte every age cohort experienced an increase in births during this time period, and in Lombardia there was growth in every cohort except for the 35-39 group. And even then, the decline was less than that found in the national level cohort. The result is a positive measure for D_j within each age cohort in Lombardia and Piemonte. The D_j sub-components offer further insight into the increases in births found in several of the northern regions. In only one case, for example, did D_j^{age} contribute a positive number of births to the total D_j component. Piemonte's increase in births during this period appears to be mainly due to higher fertility rates, rather than simple population growth (reflected by D_j^{pool}). For Lombardia, the opposite is true.

During this decade surrounding the Italian post-war baby boom, every region in the South had decreases in births. The majority of the decline is attributed to D_j, with all three sub-components sharing in the decrease for the majority of regions. In Campania, Puglia, and Sardegna, regional population growth (D_j^{pool}), the result of either natural increase or net inmigration, would have contributed a positive number of births according to this analysis. Campania and Abruzzi/Molise also had positive results for D_j^{rate}, suggesting increases in births due to fertility rates outstripping population growth (or not declining as quickly). Only one region, Campania, had a positive measure for total D_j (718) and even this was insufficient compensation against decreases of approximately 4,000 coming from C_j and N_j combined.

The most dramatic decreases in births were in Calabria and Sicilia, where N_j decreases were tiny compared to D_j decreases of 10,684 and 13,444, respectively. For both regions, D_j was negative across all cohorts; in both regions there were increases in births during this period in the younger age cohorts, but national level increases were higher, resulting in negative measures even for those cohorts. In the middle age cohorts, where the bulk of births usually occurs, both regions experienced higher decreases than their national counterparts. The cohort pattern of fertility increases and decreases is clearly exposed by $D_j^{cohort\text{-}rate}$, which shows increases in fertility rates relative to the region as a whole for the younger and the oldest age cohorts, but decreases in the middle cohorts. Between 1961 and 1971, births in the 25-29 cohort decreased by 22 percent in Sicilia and by 35 percent in Calabria, compared to only 8 percent at the national level.

5.4 The 1971-1981 Period

1971-1981 marks the period of steepest decline in Italian fertility in the post-war years. During this decade, the number of Italian births fell by 31.2 percent. Unlike the previous two decades, which were characterized by differential growth across the regions, all regions experienced a decrease in their total number of births between 1971 and 1981. Table 5 displays the results for this sub-period's analysis. This time, much of the total change in births was driven apparently by national-scale factors, as revealed by the large decreases in births attributed to N_j. If one accepts that the fertility decline during this period was at least partly due to the outside economic effects of the oil price shock of the early 1970s, then it makes sense that birth rates in all regions would be negatively impacted and that this effect would be captured by N_j.

In contrast to the two previous decadal analyses, the trend for this sub-period is a positive D_j in the southern regions and a negative D_j in most of the northern regions. For both the 1952-1961 and 1961-1971 periods, D_j for low fertility regions – mainly in the North and Central portions of the country – was positive. Depending on the decade, D_j

either offset decreases or augmented increases due to N_j and C_j. Declining fertility rates, reflected in the negative outcome for D_j^{rate}, suggest a decrease in the number of births. Because of regional and cohort specific population growth, D_j^{pool} and D_j^{age}, the total measure for D_j is positive.

At first glance, the negative T_j values for all regions might suggest that southern regions fell in line with national trends in fertility decline. A look at the results for D_j, however, indicate that, although the overall result was a decline in fertility, most southern regions had a measure for D_j that offset a sizable portion of this decline. In the South and half of the Central regions, D_j mitigated the negative effects of N_j. Campania, Puglia, and Sicilia, for example, would have had declines in births ranging between 23,000 and 35,000 had their cohort-specific birth trends mirrored those of the nation. Instead, with the positive D_j, the declines ranged between 16,000 and 24,000. The increase in births projected by D_j is the result of slow declines in births in peak fertility cohorts. For most of the southern regions, births in the 35-39 and the 40-50 cohorts actually decreased faster than they did at the national level. The same is true for the 13-19 cohort. The three middle cohorts, 20-24, 25-29, and 30-34, however, had much slower decreases in births than their national counterparts, resulting in an overall positive D_j.

Across the northern regions, along with Toscana and Lazio in the Center, D_j was negative and reinforced the decrease in births ascribed to N_j. Predominantly positive values for both D_j^{pool} and D_j^{age}, coming from increases in total and cohort-specific population growth, were unable to outweigh the high negative values coming from fertility rate decreases exceeding cohort-specific population change (D_j^{rate}). For the bulk of these regions, the negative D_j can be linked to decreases in births in the peak fertility cohorts. These cohorts, covering ages from 20 to 34, saw more rapid declines in births than their national counterparts. In the upper cohorts, ages 35-50, the declines were slower than at the national level or even positive. This is very different from the pattern in southern regions seen above, where peak fertility age-cohorts experienced more declines in older cohorts than in the core fertility cohorts (that is, those cohorts responsible for the majority of births), which displayed positive measures for D_j in most cases.

5.5 *The 1981-1991 Period*

Results for the 1981-1991 analysis are shown in Table 6. One of the most striking elements of the results for this sub-period is the regional total change in births for this decade. Although most regions continued to experience declines in births (the two exceptions are Valle d'Aosta and Trentino-Alto Adige), the actual amounts of change are relatively small compared to previous decades. For example, Puglia's total change, which was the largest decline in births of all the regions, was just under 9,000. The balanced importance of the three components of change is also notable. Unlike previous decades, when N_j or D_j would dominate the total change, all three effects influence the total change for this decade.

Unlike the results for the 1971-1981 decade, this set of results displays much less geographic uniformity for C_j and D_j in the South and North. Although all southern regions experienced a decline in the total number of births during this period, the influence of D_j is much more varied. For Campania and Sicilia it is positive, suggesting that, once again, births declined at a slower pace in these regions than they did at the national level. In the remaining southern regions, D_j is negative, putting those places in company with northern regions such as Lombardia or Piemonte. For many of the southern regions, too, especially Calabria and Sicilia, C_j plays a significant role in determining the extent of the total change in births.

D_j also varies a good deal for the northern and central regions for the 1981-1991 analysis. Piemonte and Lombardia, which experienced some of the largest increases in births during the first portion of the study period and then some of the largest declines in the 1970s, continued to have a negative measure for D_j. Emilia-Romagna, on the other hand, had a positive D_j which helped bring the amount of total change in births during this period to -970.

5.6 Quadrant Mobility and the Geographic Distribution of Results

Another useful approach to evaluating shift-share results is the examination of the numerical and geographical distributions of the three components of regional fertility change. Our approach to this is twofold. First, to investigate the numerical distribution of the results, we plot the regional C_j and total D_j for each period. This facilitates the comparison of regions over time, but also shows the evolution of the entire system over time. It also allows us to propose a typology of quadrant characteristics. We then compare regional quadrant locations across each period of analysis, to evaluate regional mobility from quadrant to quadrant.

Each graph of C_j and D_j is divided into four quadrants, following the horizontal and vertical axes. Those regions falling into quadrant I, with a positive measure for both C_j and D_j during this period, were positioned to experience increases in births from both components of change. This does not mean these regions actually experienced an increase in births, since N_j also played a role in determining total change. In general, regions in this category are those located in lower fertility areas, but poised to experience relative fertility increases. Regions in quadrant II had a positive C_j, and a negative D_j. Since D_j plays an influential role for most regions for most of the analyses, these regions were positioned to experience declines in births. Regions in this quadrant tended to be those located in lower fertility areas and to be experiencing decreases in births relative to the nation. Quadrant III regions are those with both a negative C_j and D_j. Here, both effects are contributing to decreases in fertility for regions falling into this quadrant. These are regions in higher fertility parts of the country that are experiencing relative decreases in births. Finally, quadrant IV regions have a negative C_j, but a positive D_j – which would most likely lead to increases in births coming from those components of growth. Regions falling into this quadrant tend to be located in higher fertility regions, and are experiencing relative increases in numbers of births (or they were experiencing slower declines than the nation). This type of region would appear to be more resistant to fertility change.

Figure 4 depicts D_j (y-axis) and C_j (x-axis) for each region for the 1952-1991 period. This picture of results, which covers the entire study period, shows a scattered pattern across quadrants. Regions falling into quadrant I were in the North or Center of the country, two parts of the country which mainly displayed lower fertility rates during the entire study period. Regions falling into quadrants III or IV tended to be in the South, a higher fertility area of the country for the entire time period. The exception to this is Trentino-Alto Adige, a quadrant IV region located in the Northeast of the country. A look back at Figure 3, however, shows that Trentino-Alto Adige fell into the middle to high fertility classifications for the entire 1952-1991 period. Although located in a lower fertility area of the country, this region displayed fertility characteristics more similar to southern regions than northern or central regions.

The static picture provided by Figure 4 essentially represents an average of regional fertility changes over a forty year period. More interesting is the mobility of regions from one quadrant to another during the study period. This can be seen in Table 7 and Figure 5, which together show the movement of regions across quadrants, as well as changes in the overall shape of the numerical distribution of results over time.

With the exception of Campania, all regions show some migration across quadrants during the four sub-periods of analysis. Campania, in quadrant IV for all periods of analysis, appears to be the most resistant to fertility change (captured by D_j in the analysis); its TFR definitely declines over time (see Figure 3), but the shift-share results attribute much of this to N_j. The quadrant mobility for Trentino-Alto Adige is also interesting, as it seems to show that region's progression from a high fertility region to a lower fertility region. Veneto and Friuli, two other northeastern regions with fertility levels higher than the rest of their northern neighbors, also show some movement towards quadrant I, perhaps indicative of their eventual conformation with the rest of the low regions, it was their region-specific characteristics that led them to experience faster declines or increases than the nation. In some cases, the demographic differential led regions to faster declines in births than the nation, while in others it prompted them towards slower declines or even increases in births relative to the nation. N_j, on the other hand, would often account for a large portion of the fertility change in many regions.

The 1961-1971 decade was the only one in which local characteristics seemed to have more influence on total change in births than national trends. For the most part, events (whether global or national in scope) that affected the entire nation uniformly played an important role in the determination of the total change in births. But this was never the complete story; regional characteristics always came into play. The combination of the two components across regions, which either offset each other or augmented the total change, also provided insight into the dynamics of regional changes in births.

One shortcoming of this and many other applications of shift-share is the lack of statistical confidence that can be attached to the results. Ideally, and as a possible future extension of this use of shift share, measures of statistical significance would accompany the results. One positive offshoot of the shift-share analysis not fully explored in this paper is the ability to compare regional cohort-specific changes to changes within the national cohort. Examining the age-disaggregate results gives us the ability to see which regions appear to be resisting national fertility trends – in teen births or persistence of higher fertility at older ages, for example. These detailed findings offer further confirmation that some southern regions truly are different from their neighbors to the North in terms of fertility behavior.

Works Cited

Barff, R.A. and P.L. Knight III (1988). "Dynamic Shift-Share Analysis," *Growth and Change*, 19, 1-10.

Brown, H.J. (1969). "Shift and Share Projections of Regional Economic Growth: An Empirical Test," *Journal of Regional Science*, 9, 1-18.

Dinc, M. and K.E. Haynes (1999) "Sources of Inefficiency: An Integrated Shift-Share, Data Envelopment Analysis and Input-Output Approach," *The Annals of Regional Science*, 33, 469-489.

Fothergill, S. and G. Gudgin (1979). "In Defence of Shift-Share," *Urban Studies*, 16, 309-319.

Hanham, R.Q. and S. Banasick (2000). "Shift-Share Analysis and Changes in Japanese Manufacturing Employment," *Growth and Change*, 31, 108-123.

Haynes, K.E. and M. Dinc (1997) "Productivity Change in Manufacturing Regions: A Multifactor/Shift-Share Approach," *Growth and Change*, 28, 201-221.

Ishikawa, Y. (1999) "Contribution of the Demographic Factor to the Migration Turnarounds in Japan, Sweden and Canada," *International Journal of Population Geography*, 5, 1-17.

Knudsen, D.C. (2000) "Shift-Share Analysis: Further Examination of Models for the Description of Economic Change," *Socio-Economic Planning Sciences*, 34, 177-198.

Perloff, H.S., E.S. Dunn Jr., E.E. Lampard, and R.F. Muth (1960). "*Regions, Resources, and Economic Growth*," Johns Hopkins Press: Baltimore.

Plane, D.A. (1987) "The Geographic Components of Change in a Migration System," *Geographical Analysis*, 19, 283-299.

Plane, D.A. (1992) "Age-Composition Change and the Geographical Dynamics of Interregional Migration in the U.S.," *The Annals of the Association of American Geographers*, 82, 64-85.

Stevens, B.H. and C.L. Moore (1980). "A Critical Review of the Literature on Shift-Share as a Forecasting Technique," *Journal of Regional Science*, 20, 419-437.

Tervo, H. and P. Okko (1983). "A Note on Shift-Share Analysis as a Method of Estimating the Employment Effects of Regional Economic Policy," *Journal of Regional Science*, 23, 115-121.

Thirwall, A.P. (1967). "A Measure of 'The Proper Distribution of Industry'," *Oxford Economic Papers*, 19, 46-58.

Wright, R. and M. Ellis (1997). "Nativity, Ethnicity, and the Evolution of the Intraurban Division of Labor in Metropolitan Los Angeles, 1970-1990," *Urban Geography*, 18, 243-263.

Tables

Table 1: National Versus Regional Percent Change in Births in Italy, 1952-1991

	1952-1991	1952-1961	1961-1971	1971-1981	1981-1991
Italy	-34.1	7.1	-1.6	-31.2	-9.1
North:					
Piemonte	-11.1	27.3	27.9	-40.2	-8.8
Valle d'Aosta	-24.6	9.0	9.0	-43.1	11.5
Lombardia	-22.7	18.3	13.6	-37.1	-8.6
Trentino-Alto Adige	-28.3	12.0	-4.6	-33.2	0.5
Veneto	-46.5	0.6	-3.6	-39.0	-9.6
Friuli-Venezia Giulia	-47.3	-2.4	1.3	-43.3	-6.1
Liguria	-32.4	22.5	10.1	-47.5	-4.6
Emilia-Romagna	-42.2	6.9	-1.0	-43.5	-3.3
Center:					
Toscana	-35.9	10.0	4.5	-38.4	-9.6
Umbria	-47.8	-5.1	-11.6	-27.2	-14.5
Marche	-45.3	-2.7	-10.7	-29.7	-10.6
Lazio	-19.0	21.5	7.5	-33.4	-6.9
South					
Abruzzi/Molise	-52.0	-15.9	-16.8	-21.0	-13.3
Campania	-21.8	9.8	-2.9	-21.6	-6.5
Puglia	-36.4	3.4	-8.6	-21.1	-14.7
Basilicata	-55.6	-6.4	-25.2	-25.6	-14.8
Calabria	-48.6	-4.9	-22.7	-18.0	-14.7
Sicilia	-33.6	2.5	-12.1	-22.2	-5.3
Sardegna	-49.0	1.7	-11.1	-27.1	-22.6

Table 2: Shift-Share Analysis of Italian Regional Fertility, 1952-1991

Region	Total National Effect (N_j)	Cohort Effect (C_j)	Differential Effect (D_j)				Total Change (T_j)
			(D_j^{pool})	(D_j^{age})	(D_j^{rate})	Total (D_j)	
Emilia-Romagna	-16,529	-14	14,705	-154	-18,503	-3,951	-20,494
Friuli-Venezia Giulia	-5,614	147	3,459	338	-6,134	-2,337	-7,804
Liguria	-5,738	256	3,850	547	-4,378	20	-5,462
Lombardia	-33,718	1,257	57,056	5,683	-52,755	9,984	-22,476
Piemonte	-13,383	455	17,511	2,247	-11,206	8,552	-4,376
Trentino-Alto Adige	-4,664	-46	7,232	953	-7,349	836	-3,874
Valle d'Aosta	-453	5	622	49	-551	120	-327
Veneto	-24,198	27	29,729	3,458	-42,059	-8,871	-33,042
North Total	**-104,296**	**2,088**	**134,164**	**13,122**	**-142,934**	**4,352**	**-97,856**
Lazio	-20,876	526	47,580	453	-39,336	8,696	-11,654
Marche	-7,632	267	5,173	217	-8,187	-2,797	-10,162
Toscana	-13,837	432	13,470	7	-14,657	-1,180	-14,584
Umbria	-4,231	149	2,479	-498	-3,835	-1,854	-5,937
Center Total	**-46,576**	**1,375**	**68,702**	**179**	**-66,016**	**2,865**	**-42,337**
Abruzzi/Molise	-11,253	31	5,523	793	-12,290	-5,974	-17,196
Basilicata	-5,603	-69	3,910	1,043	-8,433	-3,480	-9,152
Calabria	-17,868	-547	16,452	2,255	-25,792	-7,085	-25,500
Campania	-35,856	-105	64,677	3,687	-55,409	12,955	-23,006
Puglia	-27,420	-703	50,186	2,026	-53,409	-1,198	-29,320
Sardegna	-11,255	-747	25,070	2,422	-31,679	-4,187	-16,189
Sicilia	-34,916	-1,322	43,122	1,575	-42,946	1,751	-34,487
South Total	**-144,170**	**-3,463**	**208,941**	**13,799**	**-229,957**	**-7,217**	**-154,850**

Table 3: Shift-Share Analysis of Italian Regional Fertility, 1952-1961

Region	Total National Effect (N_j)	Cohort Effect (C_j)	Differential Effect (D_j) (D_j^{pool})	(D_j^{age})	(D_j^{rate})	Total (D_j)	Total Change (T_j)
Emilia-Romagna	3,432	216	-3,427	-502	3,653	-275	3,373
Friuli-Venezia Giulia	1,166	111	-2,517	-221	1,074	-1,664	-388
Liguria	1,191	128	-504	394	2,586	2,476	3,795
Lombardia	7,001	237	-856	5,883	5,903	10,930	18,169
Piemonte	2,779	263	-1,555	2,809	6,448	7,702	10,744
Trentino-Alto Adige	968	-158	-77	250	664	837	1,648
Valle d'Aosta	94	9	-54	43	28	16	120
Veneto	5,025	-306	-7,785	1,312	2,212	-4,262	457
North Total	**21,656**	**501**	**-16,774**	**9,967**	**22,568**	**15,761**	**37,918**
Lazio	4,335	346	3,936	550	4,032	8,519	13,200
Marche	1,585	177	-2,767	244	155	-2,368	-607
Toscana	2,873	295	-2,944	-315	4,167	908	4,077
Umbria	879	128	-1,312	-383	59	-1,637	-630
Center Total	**9,671**	**947**	**-3,087**	**96**	**8,413**	**5,422**	**16,039**
Abruzzi/Molise	2,337	68	-6,052	825	-2,425	-7,652	-5,248
Basilicata	1,163	-59	-1,583	1,442	-2,020	-2,161	-1,057
Calabria	3,710	-160	-6,068	1,302	-1,359	-6,124	-2,574
Campania	7,445	-291	-2,083	2,723	2,575	3,215	10,369
Puglia	5,693	-438	-564	2,015	-3,994	-2,544	2,712
Sardegna	2,337	-480	1,386	1,221	-3,899	-1,293	564
Sicilia	7,250	-87	-7,120	828	1,669	-4,623	2,540
South Total	**29,936**	**-1,448**	**-22,085**	**10,357**	**-9,454**	**-21,182**	**7,306**

Table 4: Shift-Share Analysis of Italian Regional Fertility, 1961-1971

Region	Total National Effect (N_j)	Cohort Effect (C_j)	Differential Effect (D_j) (D_j^{pool})	(D_j^{age})	(D_j^{rate})	Total (D_j)	Total Change (T_j)
Emilia-Romagna	-806	1,151	-1,956	-2,590	3,683	-863	-518
Friuli-Venezia Giulia	-250	175	-764	179	874	289	214
Liguria	-321	-51	0	-1,039	3,505	2,466	2,094
Lombardia	-1,820	-1,057	16,017	-4,341	7,101	18,778	15,900
Piemonte	-777	561	5,107	-2,529	11,607	14,185	13,969
Trentino-Alto Adige	-238	-478	1,095	-441	-637	16	-701
Valle d'Aosta	-23	25	41	-89	175	128	130
Veneto	-1,111	-748	3,559	-2,215	-2,085	-741	-2,600
North Total	**-5,346**	**-423**	**23,099**	**-13,065**	**24,223**	**34,257**	**28,488**
Lazio	-1,157	437	11,391	-4,583	-504	6,303	5,583
Marche	-339	206	-1,001	-1,766	576	-2,191	-2,324
Toscana	-694	412	-59	-1,536	3,908	2,313	2,030
Umbria	-183	165	-940	-830	416	-1,355	-1,373
Center Total	**-2,374**	**1,219**	**9,390**	**-8,715**	**4,396**	**5,070**	**3,916**
Abruzzi/Molise	-432	181	-2,527	-2,905	1,023	-4,410	-4,661
Basilicata	-239	-143	-833	-1,981	-685	-3,499	-3,881
Calabria	-775	147	-1,916	-4,300	-4,468	-10,684	-11,312
Campania	-1,796	-2,324	8,449	-8,517	786	718	-3,402
Puglia	-1,293	-415	3,440	-4,382	-4,493	-5,435	-7,143
Sardegna	-522	-648	2,982	-1,259	-4,296	-2,573	-3,743
Sicilia	-1,632	2,406	-2,995	-6,061	-4,388	-13,444	-12,670
South Total	**-6,689**	**-797**	**6,600**	**-29,406**	**-16,520**	**-39,327**	**-46,813**

Table 5: Shift-Share Analysis of Italian Regional Fertility, 1971-1981

Region	Total National Effect (N_j)	Cohort Effect (C_j)	Differential Effect (D_j) (D_j^{pool})	(D_j^{age})	(D_j^{rate})	Total (D_j)	Total Change (T_j)
Emilia-Romagna	-16,024	502	15,671	59	-22,587	-6,857	-22,380
Friuli-Venezia Giulia	-5,086	182	5,029	-407	-6,783	-2,161	-7,065
Liguria	-7,090	43	6,094	-686	-9,164	-3,757	-10,804
Lombardia	-41,495	542	48,531	-6,646	-50,285	-8,401	-49,354
Piemonte	-19,958	502	21,153	-1,749	-25,665	-6,261	-25,717
Trentino-Alto Adige	-4,566	-119	5,524	-118	-5,589	-183	-4,867
Valle d'Aosta	-492	10	516	-3	-711	-198	-681
Veneto	-21,488	180	25,866	-1,350	-30,067	-5,551	-26,859
North Total	**-116,200**	**1,841**	**128,384**	**-10,901**	**-150,851**	**-33,368**	**-147,728**
Lazio	-24,971	352	29,974	-1,650	-30,438	-2,115	-26,734
Marche	-6,075	152	5,923	485	-6,268	140	-5,782
Toscana	-14,573	278	14,709	-781	-17,565	-3,638	-17,933
Umbria	-3,249	100	2,882	136	-2,705	313	-2,836
Center Total	**-48,868**	**883**	**53,488**	**-1,811**	**-56,977**	**-5,300**	**-53,285**
Abruzzi/Molise	-7,215	46	7,217	1,559	-6,473	2,302	-4,867
Basilicata	-3,591	-184	3,733	519	-3,421	830	-2,944
Calabria	-12,031	-411	13,755	1,772	-10,046	5,481	-6,961
Campania	-35,002	-1,100	45,980	2,201	-36,348	11,833	-24,270
Puglia	-23,725	-452	31,148	230	-23,284	8,094	-16,083
Sardegna	-9,314	-574	13,186	235	-11,617	1,804	-8,084
Sicilia	-28,811	-49	33,021	2,779	-27,476	8,324	-20,536
South Total	**-119,688**	**-2,724**	**148,039**	**9,295**	**-118,666**	**38,668**	**-83,744**

Table 6: Shift-Share Analysis of Italian Regional Fertility, 1981-1991

Region	Total National Effect (N_j)	Cohort Effect (C_j)	Differential Effect (D_j) (D_j^{pool})	(D_j^{age})	(D_j^{rate})	Total (D_j)	Total Change (T_j)
Emilia-Romagna	-2,638	-216	2,436	1,996	-2,548	1,883	-970
Friuli-Venezia Giulia	-841	143	645	615	-1,126	134	-564
Liguria	-1,085	531	-452	1,377	-918	6	-548
Lombardia	-7,612	2,440	4,983	7,256	-14,258	-2,020	-7,191
Piemonte	-3,481	404	1,347	2,648	-4,289	-294	-3,371
Trentino-Alto Adige	-889	327	927	932	-1,251	609	47
Valle d'Aosta	-82	6	108	78	-8	179	103
Veneto	-3,824	714	4,473	3,844	-9,247	-929	-4,039
North Total	**-20,451**	**4,349**	**14,467**	**18,746**	**-33,645**	**-432**	**-16,534**
Lazio	-4,850	478	6,408	4,826	-10,565	669	-3,703
Marche	-1,245	60	1,136	1,010	-2,409	-263	-1,449
Toscana	-2,619	440	2,035	2,012	-4,626	-579	-2,758
Umbria	-690	76	595	481	-1,559	-483	-1,097
Center Total	**-9,404**	**1,054**	**10,173**	**8,329**	**-19,158**	**-657**	**-9,007**
Abruzzi/Molise	-1,661	-485	2,720	1,332	-4,326	-275	-2,421
Basilicata	-779	-65	863	831	-2,119	-425	-1,269
Calabria	-2,875	-1,067	4,902	2,241	-7,854	-712	-4,653
Campania	-7,999	-563	15,231	6,511	-18,882	2,859	-5,703
Puglia	-5,455	-925	11,202	3,322	-16,950	-2,426	-8,806
Sardegna	-1,981	405	3,446	928	-7,725	-3,350	-4,926
Sicilia	-6,534	-2,704	12,311	3,176	-10,070	5,417	-3,820
South Total	**-27,285**	**-5,403**	**50,675**	**18,341**	**-67,927**	**1,089**	**-31,599**

Table 7: Quadrant Mobility, Shift-Share Analysis of Italian Region Fertility 1952-1991

Region	1952-1961	1961-1971	1971-1981	1981-1991	1952-1991
North:					
Emilia-Romagna	II	II	II	IV	III
Friuli-Venezia Giulia	II	I	II	I	II
Liguria	I	IV	II	I	I
Lombardia	I	IV	II	II	I
Piemonte	I	I	II	II	I
Trentino-Alto Adige	IV	IV	III	I	IV
Valle d'Aosta	I	I	II	I	I
Veneto	III	III	II	II	II
Center:					
Lazio	I	I	II	I	I
Marche	II	II	I	II	II
Toscana	I	I	II	II	II
Umbria	II	II	I	II	II
South:					
Abruzzi/Molise	II	II	I	III	II
Basilicata	III	III	IV	III	III
Calabria	III	II	IV	III	III
Campania	IV	IV	IV	IV	IV
Puglia	III	III	IV	III	III
Sardegna	III	III	IV	II	III
Sicilia	III	II	IV	IV	IV

Figures

Figure 1: Italian Period Total Fertility Rate, 1952-1991

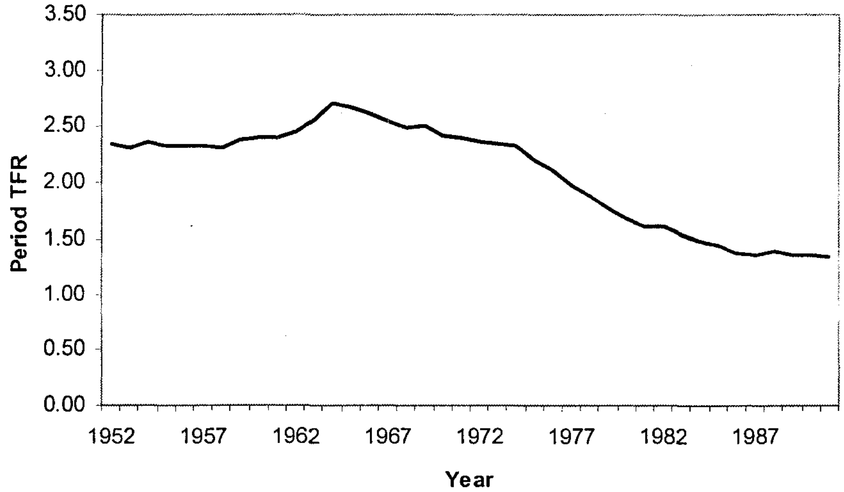


Figure 2: Italian Regions

Figure 3

Italian Regional Fertility, 1952-1991, Selected Years

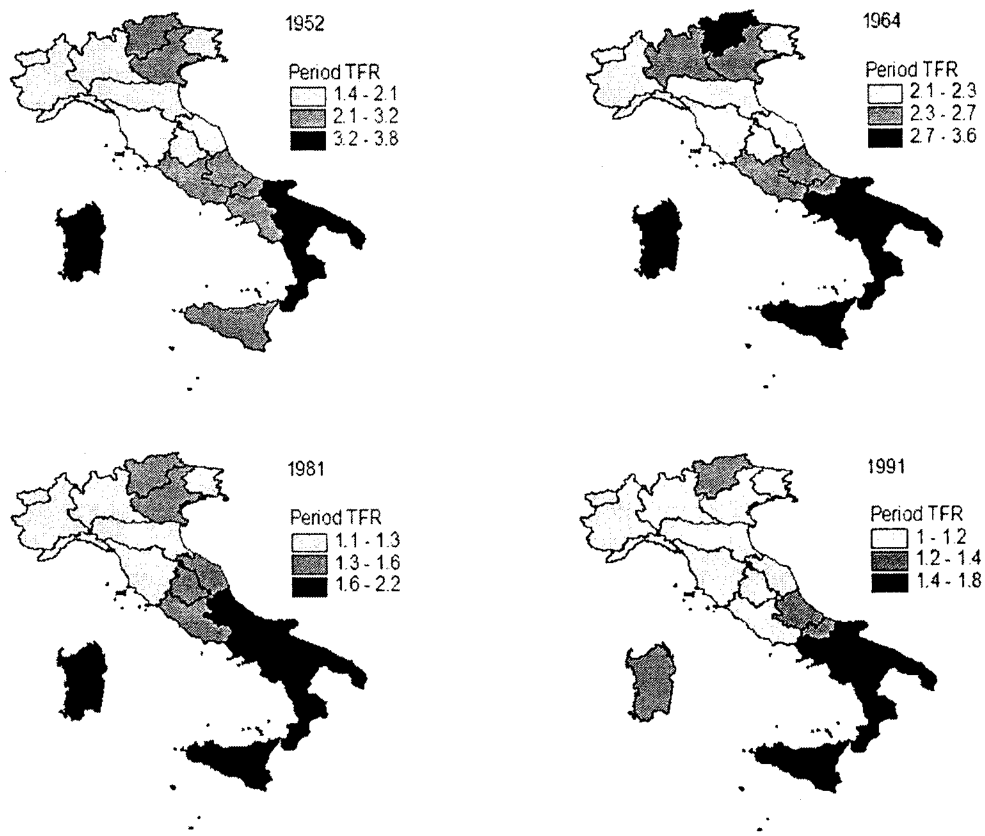


Figure 4: Shift-Share Analysis, 1952-1991

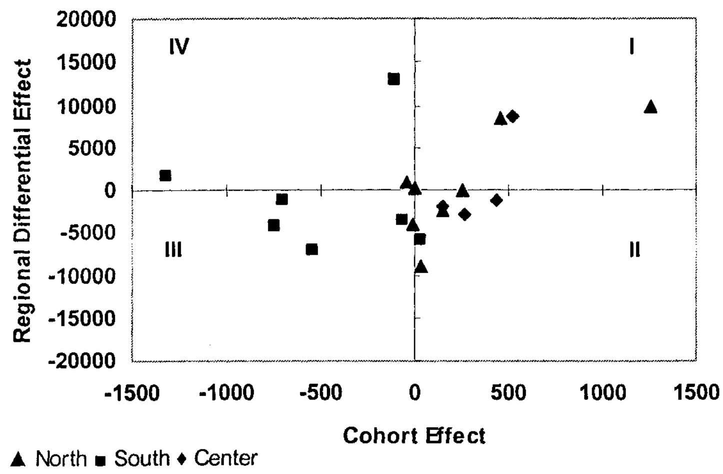
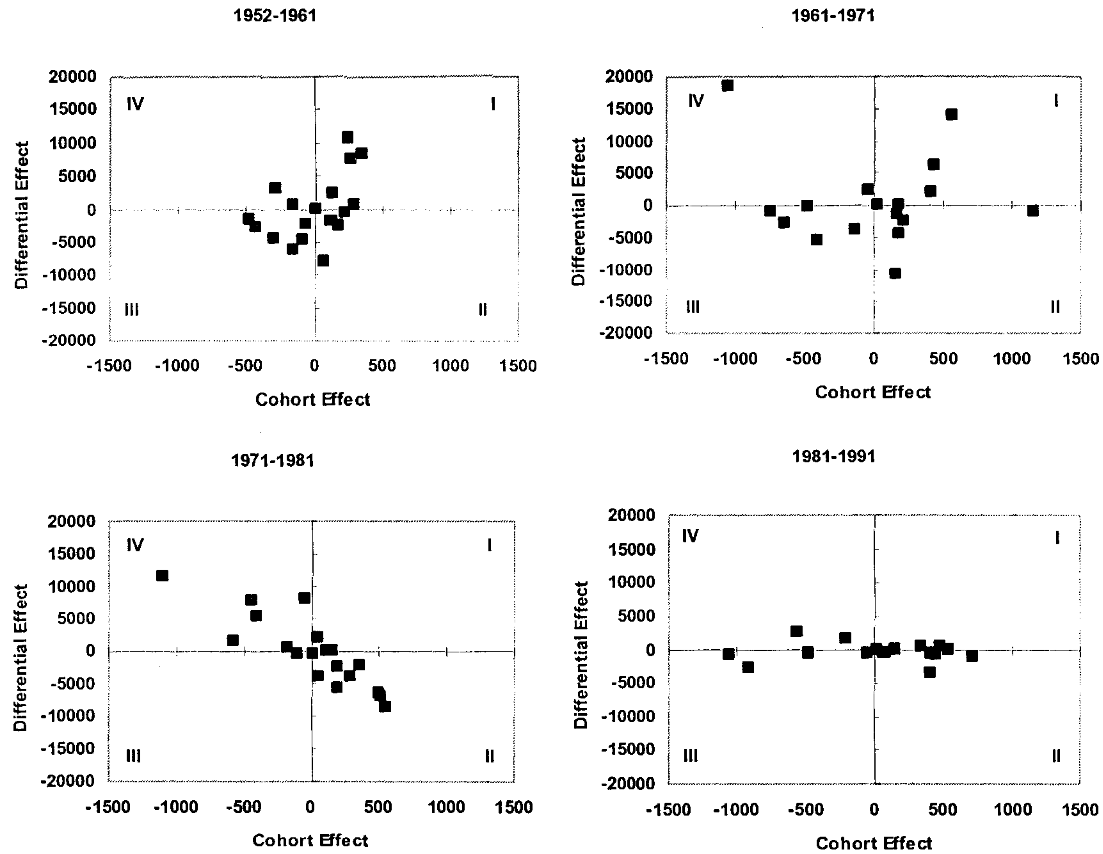


Figure 5: Shift-Share Results Plotted for Four Decades of Analysis



APPENDIX B
For submission the *International Journal of Population Geography*

Fertility Convergence Across Italy's Regions, 1952 – 1995

Author:
Rachel Franklin
Department of Geography and Regional Development
The University of Arizona
Tucson, Arizona 85721 USA

E-mail: rachel.s.franklin@census.gov
Phone: 301-763-6051

The research conducted for this paper was completed with the financial support of the Benjamin H. Stevens Graduate Fellowship in Regional Science, academic year 2001-2002. I also gratefully acknowledge the assistance of Frank Heins at the Institute for Research on Population and Social Policies of the National Research Council in Rome, who provided me with the demographic data needed for this research.

Abstract: Italian fertility rates have been below replacement level for several decades and are now among the lowest in the world. Many of the social changes that have accompanied low fertility in many European countries, such as increases in proportions of births taking place outside of wedlock, have not gained a foothold in Italy, even as fertility rates have fallen to very low levels. At the regional level, however, a more disparate picture of Italian fertility is apparent, with consistently lower fertility rates in the North and Center of the country than in the South. Many researchers have addressed the importance of studying Italian fertility at a sub-national level, emphasizing the persistence of regional fertility differentials in that country over time. A broader question, whether the regional fertility differential has been increasing or decreasing over time, has not been directly addressed in the literature. This paper uses the regional economics convergence literature as a starting point for a discussion of the potential for convergence in Italian regional fertility rates. An empirical analysis is then conducted, using Italian regional fertility data for 19 regions from 1952 to 1995, and 95 provinces for a shorter period, to assess the extent to which Italian fertility levels have converged over time. Spatial dependence is also accounted for in these models. The results show that convergence did occur over the entire time period, but that the convergence process was by no means constant during that time.

Keywords: fertility, Italy, demographic change, convergence

INTRODUCTION

Even among the low fertility countries of Western Europe, Italy's very low fertility rates are remarkable. Part of the fascination with this country's fertility behavior is likely due to the common misperception of Italy as the land of big, Catholic families (The Economist, 1998), even though overall fertility in Italy has not exceeded replacement level since the late 1970s. Italy's fertility stands out from the rest of Europe for other reasons, as well. While increases in cohabitation, out-of-wedlock births, and divorce have accompanied other nations' modern fertility declines, these phenomena remain relatively rare in Italy (Castiglioni and Dalla Zuanna, 1994). Instead, the decrease there has been accompanied by a number of seemingly contradictory trends. Women's educational attainment has increased: the percentage of women enrolled in university today is higher than for men (ISTAT, 2000). However, women's labor force participation rates remain fairly low (ibid.). At the same time, later ages at first marriage and first birth, suggestive of a progressive society, are commonly preceded by very high numbers of children living at home with their parents until marriage. In 1991, over 90 percent of those aged 15 to 24 lived with their parents, with almost 70 percent of men and 50 percent of women aged 25 to 29 doing the same (Castiglioni and Dalla Zuanna, 1994).

At the same time, regional differences in Italian fertility have persisted. Over the years, fertility rates in northern and central regions have been consistently lower than those in the South. The fertility transition, from high to low fertility rates, was completed by the 1950s in the North and is arguably just now being completed in the South. Research on many aspects of regional fertility in Italy has documented structural, cultural, and behavioral differences in fertility behavior between the North and South of Italy (Livi-Bacci, 1979; Terra Abrami and Sorvillo, 1993; Dalla Zuanna et al, 1998; Waldorf and Franklin, 2002; Franklin and Plane, 2004). Terra Abrami and Sorvillo (1993) pose what they refer to as a brutal question by asking whether “Italian” fertility exists or is only a statistical abstraction. Their argument is that a complete understanding of Italian fertility necessitates a study of fertility at the regional level in order to truly understand national-level fertility dynamics.

Although the importance of a regional scale of analysis has been addressed in the Italian fertility literature, there has been little discussion of whether regional homogenization of fertility rates has been occurring over time. If homogenization has been taking place, the persistently higher fertility rates of the southern regions are less indicative of permanent structural differences in Italian regional fertility and are instead a dynamic and even, perhaps, temporary phenomenon. This paper uses the concept of “convergence”, taken from the regional economics literature, to meet two main goals. First, the convergence literature is used as a starting point for the development of a conceptual framework for assessing regional fertility change over time. This follows a growing interest in convergence methodologies to be found in demography (see e.g. Coleman, 2002; Wilson, 2001; and Herbertsson et al, 2000). Second, methods commonly found in the economic convergence literature are applied to Italian regional fertility rates from 1952 to 1995 to show whether convergence has taken place over time in Italy. The empirical analysis is also conducted at the provincial level, which provides more geographical detail of analysis, for the years 1975 to 1994. In order to account for possible structural or nuisance spatial dependence (Anselin and Florax, 1995), estimation of spatial dependence models for the regions and provinces is also conducted.

In the following section I provide background information about Italy's post-World War II fertility and economy. Following that, I develop a conceptual framework for regional fertility convergence using the economic convergence literature as a foundation and also link it to the process of regional economic convergence. The next section describes the data used for this paper. I then detail the results of the analysis. The final section concludes the paper.

BACKGROUND

Italy's period total fertility rate (TFR)[9] in 1952 was 2.3, slightly above replacement level. Fertility rates for the nation remained constant during the 1950s and then began to increase in the early 1960s, when Italy experienced its version of the baby boom. The peak of the boom was reached in 1964, with a TFR of 2.7. National fertility rates have only decreased in the succeeding years. As Figure 1 shows, fertility rates declined slowly until about 1974, when they began to drop more sharply. Since the late 1980s, Italian TFRs have remained low and constant, hovering between 1.4 and 1.2. Figure 2, which separates Italian TFRs into three macro regions (North, Center, and South), shows that the three portions of the country have tended to display similar trends over time. The main difference is that the South has tended to have higher fertility during the entire study period and its baby boom peak was scarcely noticeable.

[9] The period Total Fertility Rate is the number of children a woman can expect to have by the end of her childbearing years, given prevailing age-specific fertility rates.

The regional picture of Italian post-War fertility is slightly different. Figure 3 shows Italian regional fertility rates for four representative years of the study period. Two important pieces of information can immediately be gleaned from the four maps. First, the range in regional fertility rates decreased enormously between 1952 and 1995. In 1952, the lowest fertility regions had TFRs between 1.4 and 2.1, and mean fertility for all regions was 2.8. By 1995, the mean fertility rate had fallen to 1.2. Second, higher fertility rates were found in southern and northeastern regions throughout the study period. Perhaps because of this, the impact of the baby boom in the 1960s was somewhat dampened. Although fertility decreased dramatically in the southern regions between 1952 and 1995, it remained higher there than in the remainder of the country.

During the time that Italian regional fertility was experiencing its upswing and subsequent decline, Italy's economy was also undergoing substantial change. The late 1950s and 1960s marked a period of strong economic growth which benefited, to some extent, the entire country. This period of growth, referred to as the "economic miracle," was cut off by the oil shock of the early 1970s (Terrasi, 1999). The regional economic convergence literature dealing with Italy is inconclusive about whether economic convergence has taken place across Italy's regions in the past 50 years. There are those who contend that the South remains far behind the rest of the country in terms of economic development, but that convergence is taking place at a moderate pace (Barro and Sala-i-Martin, 1991, Sala-i-Martin, 1996). Others argue that, although convergence may have been taking place in the years leading up to the oil crisis, the latter period has been more characterized by divergence, or at best, a maintenance of the *status quo* (Mauro and Podrecca, 1994; Paci and Pigliaru; 1997, Terrasi, 1999).

Figure 4 shows a breakdown in regional per capita Gross Domestic Product (GDP) for the South and Center/North areas. In what is now a familiar dichotomy, the South has a demonstrably lower per capita GDP than the Center/North regions for the entire period of 1951 to 1993. A visual evaluation of the gap in per capita GDP supports the view that there has been little or no economic convergence across Italy's regions over the past several decades. Indeed, it appears as though the gap has only increased between the South and the rest of the country.

CONVERGENCE IN ITALIAN REGIONAL FERTILITY

Economic Convergence

The economic convergence literature hypothesizes that, over time, convergence will take place in incomes or productivity across nations or regions that share similar technology and preferences (Barro and Sala-i-Martin, 1992). Within this literature, two types of convergence are often discussed. The first, dubbed *sigma* convergence, postulates that convergence is taking place when the dispersion of some variable, often per capita income or GDP, decreases. That is, as time passes, we expect the gap between rich and poor to become continually smaller. Extending this logic to the case of fertility, we expect the difference between high fertility and low fertility regions to eventually shrink.

In another common conceptualization of convergence, poor regions or countries will "catch up" to richer ones over time. To do this, according to neoclassical growth theory, those areas that are poorer will grow faster than those that are already rich. This type of convergence, where the gap between rich and poor shrinks specifically due to higher growth rates in poorer regions or countries, is called *beta* convergence. Assuming that both rich and poor share similar economic structures, tastes, and preferences, they should converge at some common rate, usually estimated with a regression model, towards one steady state. This is referred to as absolute *beta* convergence.

When the analysis takes place at the national level, it is not reasonable to assume that all countries will share the same technology and preferences; indeed, this is very unlikely to be the case unless a very biased sample of nations is chosen. It is still possible for convergence to take place across this set of countries, however it is recognized that each country may be converging towards its own steady state, but at a rate that is common to all of them (Kangasharju, 1998). This is referred to as conditional *beta* convergence. The established way to account for conditional convergence is to introduce variables into the basic convergence model that will account for varying technologies and preferences across countries. If, after accounting for these cross-country differences, the convergence estimate is still negative and significant then convergence is deemed to exist (Chatterji and Dewhurst, 1996).

It is also possible that, with or without apparent convergence across an entire set of countries or regions, convergence does take place within smaller groups. This is typically referred to as club convergence. One way in which these smaller groups, or clubs, may be identified is through the specification of a dummy variable that is included in the conditional convergence model.

Analysis at the regional level, especially for the U.S. states, generally makes the case that differing tastes and preferences are not a concern when the research is dealing with regions within one country. Evidence from European countries, however, has not shown this to be the case. The literature provides several examples of countries, including the well-established case of Italy, where the assumption of convergence towards one national steady state does not hold. These include Greece and Finland, where convergence studies show that, although convergence is taking place, regional economic dualism persists (ibid.; Siriopoulos and Asteriou, 1998).

Conceptual Model of Fertility Convergence

Following the above description, convergence in regional fertility rates could be manifested in two different ways. First, the gap between high and low fertility regions should close over time (*sigma* convergence). Second, convergence occurs because higher fertility regions are experiencing faster declines in fertility rates than their lower fertility counterparts (*beta* convergence). Because much of the fertility literature posits a negative relationship between economic development and fertility (see e.g. Bongaarts and Watkins, 1996; Panopoulou and Tsakloglou, 1999), the construction of the conceptual framework should take economic development into account. There are at least three ways in which fertility convergence and economic convergence could take place.

A first possible outcome of this process is that fertility rates follow the same path of convergence as the regional economies. As poorer regions experience elevated economic growth rates, which are driven by shifts in the economic structure of the region, the value and cost of children will change, resulting in lower fertility rates. Rich regions, whose fertility is already low, will experience slower declines in fertility. At some point all Italian regions will reach a "fertility steady state," a national equilibrium of fertility. This result is shown in Figure 5, where a higher fertility region experiences a steeper decline in fertility rates than the lower fertility region, thereby "catching up" to the lower fertility region.

For a regional homogenization of fertility rates to occur, the same rules apply for fertility as for economic growth. Specifically, regions within the nation must share common tastes and preferences for children in order for absolute convergence to take place. Put another way, attitudes towards marriage and children, as well as the behaviors that allow attitudes to come to fruition, must be harmonized across all regions. This view of fertility convergence sees regional economic convergence as the driving force behind fertility convergence.

A second possibility is that, just as regions might converge to different economic steady states, so might their fertility rates converge to different fertility steady states. That is, absolute convergence might not take place, but conditional convergence is a possibility. This possibility is shown graphically in Figure 6, where the higher fertility region experiences a steeper decline in fertility, leading to convergence with the lower fertility region, but two separate fertility steady states are reached. This outcome would be in keeping with research on both Italian regional fertility and economics. As described above, both the economic and the fertility literatures have posited a permanent dualism in fertility regimes and economic structures in Italy. In her study of historical fertility across European regions, Watkins (1990) suggests that regional or local influences on marriage and fertility were superceded eventually by national influences, in the form of national media, strong centralized governments, or national political parties. She also notes that Italy was resistant to this trend even at the end of the 19th century. It appears that the North and South are fundamentally different in their attitudes towards fertility, and to expect regional fertility rates to converge to one national norm may not be reasonable. This result would also be in keeping with the existence of a southern convergence club which, although tending to converge with the remainder of the country, possesses its own convergence trajectory.

A third possibility is that fertility convergence takes place independently of any regional economic convergence. The economic convergence literature identifies technological catch-up or diffusion (Paci and Pigliaru, 1997; Sala-i-Martin, 1996) as one means by which poor regions catch up to rich regions. That is, poor regions are able to make use of new technologies developed by rich regions without having to incur any of the expenses involved in research and development. This concept is easily transferred to fertility, and is indeed well-established in fertility research. High fertility regions are able to make use of innovations in fertility control or changes in attitudes towards high fertility behaviors without undergoing the actual development of such innovations or attitudes themselves. This is consistent with research of the demographic transition in

Europe, which has established that changes in fertility behavior can spread to neighboring regions without those regions necessarily sharing the same levels of economic development (Bongaarts and Watkins, 1996).

Because the literature on Italian regional economic convergence is inconclusive, the analysis in this paper tests for regional fertility convergence. Economic convergence across Italy's regions may have taken place through the early 1970s (Terrasi, 1999), and slowed thereafter. In the absence of more conclusive evidence than this, however, there is no way to establish a definite link between the processes of economic and fertility convergence.

DATA

The data for this research come from the Italian Statistical Office (ISTAT) and background economic data from an Italian economic research institute, CRENoS[10]. The analysis relies on period TFRs for 19 Italian regions[11] for the years 1952-1995, and 95 provinces for the years 1975-1994. Total Fertility Rates were used to measure fertility for this application because they capture, with one number, fertility rates across all fertile age cohorts. The regional TFRs were computed using age-specific fertility rates in one-year age cohorts for the ages 15-49. Provincial TFRs are published by ISTAT for the years 1975-1994 (ISTAT, 1998). The study period is broken into two smaller components, 1952-1974 and 1975-1995, to allow for the trend break seen in Italian

[10] CRENoS data and information about the institute are available at http://www.crenos.unica.it/databanks/italian.html

[11] The regions of Abruzzi and Molise were one region until 1964 and so, to facilitate the analysis, they are treated as one region for the entire study period of 1952-1995. This brings the number of regions from 20 to 19.

economic convergence research as well as in visual inspection of the Italian post-war fertility trend.

In order to assess the importance of spatial dependence in the convergence analysis, it is first necessary to define the regional and provincial neighborhood structure. This is done by specifying a weights matrix, ***W***, which here defines two neighbors as regions if they share any length of border. The two islands of Sardegna and Sicily were linked to the mainland regions by looking at established ferry routes, distance, and migration intensity between those two regions and those on the mainland. Once specified, the weights matrix is used to determine the extent of spatial autocorrelation existing in the nonspatial models and is also used to create spatial variables in the spatial dependence models.

SIGMA CONVERGENCE

Studies in economic convergence often begin with an assessment of changes in the dispersion of income or some other economic variable across a set of regions or countries over time, commonly referred to as *sigma* convergence. This type of convergence is typically measured by assessing temporal variation in the standard deviation of the log of a variable.[12] Figure 7 shows the evolution of this measure for the period 1952-1995. In common with results from previous work on Italian regional economic convergence (Paci and Pigliaru, 1997; Terrasi, 1999) and Italian regional fertility (Waldorf and Franklin, 2002), the mid-1970s signal a change in the earlier trend

[12] The coefficient of variation is also commonly found in the literature. It was also assessed for this research and provided similar graphical results to those seen with the standard deviation.

from 1952-1975. Until about 1975, Italian regional fertility rates are slowly converging, with the most marked convergence taking place in the years leading up to the peak of the Italian baby boom (1964). These are years during which northern regional fertility rates increased fairly rapidly, but southern regions experienced little change in fertility. Hence, convergence during these years is due to low fertility regions experiencing increases to the same levels of southern regions, rather than *vice versa*. Little change is detected between 1964 and 1975. Thereafter follows a period of regional divergence which lasts through the 1980s. Another decline begins in the 1990s.

Figure 8 shows the evolution of the dispersion of the *sigma* convergence measure for the 95 Italian provinces for the years 1975-1994. The dispersion of TFRs at the provincial level does not change a great deal during this time period. In fact, it ends the period at basically the same level at which it began. The late 1970s and the 1980s seem to be a time of marginal divergence when compared to earlier and later periods.

BETA CONVERGENCE

Absolute beta convergence

Absolute convergence means that, unconditionally, higher fertility regions experienced a faster decline in fertility rates than lower fertility regions during the study period, 1952-1995. To test for this type of convergence, the following linear regression model was specified, following Rey and Montouri (1999):

$$\ln\left(\frac{TFR_{i,t+k}}{TFR_{i,t}}\right) = \alpha + \beta \ln(TFR_{i,t}) + \varepsilon_{i,t}$$

where $TFR_{i,t}$ is the period Total Fertility Rate in region *i* in year *t*, and $TFR_{i,t+k}$ is the fertility rate in region *i* at the end of the time period. A negative estimate for β lends support to the hypothesis that absolute convergence took place during the period under consideration. This model was estimated using ordinary least squares for Italy's 19 regions for the entire study period of 1952-1995 (i.e. $k = 43$), as well as for two shorter time intervals within that time span. The shorter intervals, 1952-1974 and 1975-1995, were chosen to account for the break in fertility trends seen in the early 1970s.

A similar model was also estimated at the provincial level for the shorter time period of 1975-1994. As mentioned above, the mid-1970s mark the beginning of Italy's final descent into below replacement level fertility, as well as the end of the "economic miracle" that took place in the late 1950s and 1960s. The provincial level of analysis, although shorter than might be desirable, is able to provide insight into the dynamics of the fertility decline at a higher spatial resolution than the regional level.

The results for the absolute *beta* convergence model at the regional level are provided in Table 1. For the entire time period, the results strongly indicate that regional convergence in fertility rates took place. The estimate for beta is negative and statistically significant, and the goodness of fit as measured by the adjusted R^2 is high, at 0.798. For the time period leading up to the 1970s, the goodness of fit is even higher (0.906) and the estimate for beta is, again, negative and statistically significant. However, for the later time period, 1975-1995, the model has a more difficult time establishing the presence of absolute convergence. The adjusted R^2 is much lower than for the earlier period or for the period as a whole, and the estimate for beta has a p-value of 0.049. The strength of the convergence results mirrors the trend seen in the sigma convergence graph, with strong convergence apparent through the earlier to mid-1970s, followed by a more complicated pattern. The convergence rates shown in Table 1 do indicate that convergence was taking place throughout the entire period, however the implied annual convergence rate for 1952-1974 was nearly twice that seen in the later period (0.014 compared to 0.031). Over the course of the entire study period, regional fertility rates are shown to have been converging at an implied annual rate of 2.2%. These results are consistent with O'Connell's (1981) suggestion that fertility levels across U.S. states tend to converge during upswings in fertility and diverge during downswings.

Table 1 also provides the results for the provincial model for absolute convergence. Although the beta estimate is negative, indicating that convergence was taking place, the adjusted R^2 is quite low for the provincial model and the rate of convergence is lower than 1%. This suggests that at the provincial level the picture of fertility change is more complex than for the larger regions. Alternatively, the provincial picture is simply emphasizing the regional results for this time period, which showed a much slower convergence path than seen in the 1950s and 1960s, when the economy was growing rapidly.

Conditional and Club Convergence

Although the absolute convergence models show strong support for unconditional convergence in Italian regional fertility rates without the mitigating effects of any additional variables, the above models were adjusted to include several other mediating variables that might allow for regional differences in the convergence process. Conditional convergence allows each region to reach its own particular steady state, but at a convergence rate that is the same for all regions in the country (Kangasharju, 1998). Regional per capita GDP and agricultural labor activity were included in the models to allow for the possibility that lower incomes or higher percentages of regional labor employed in agriculture might lead to more than one fertility equilibrium across Italy's regions. However, neither variable substantially improved the models' goodness of fit and, indeed, the variables themselves were often not statistically significant.

The introduction of a regional dummy variable allows for a different fertility steady state to be reached in the South. A significant estimate for the dummy variable also lends strength to the idea that the South might represent its own convergence club, with convergence taking place within those regions, independently of convergence taking place across all regions. The results for these models are shown in Table 2. As with the absolute convergence models, the best fits are seen in the overall model and in the 1952-1974 model. The inclusion of the dummy variable has the effect of increasing the convergence rates for these two periods, however the dummy variable itself is only significant for the 1952-1974 regional model. This indicates that, as convergence was taking place across all regions, the southern regions represented their own convergence club.

The later time period is more problematic, at both the regional and the provincial levels. At the regional level, neither the beta estimate nor the estimate for the dummy variable is statistically significant, and the convergence rate has shrunk to 0.5%. At the provincial level, however, both estimates are statistically significant, although the goodness of fit continues to be very low (0.076). This model gives a convergence rate of nearly 2% - higher for this time period than the previous model or the regional models for the same period.

Spatial Dependence in Italian Fertility Convergence

Whenever geographical entities are the unit of analysis there is the risk of spatial dependence occurring. If not accounted for, spatial dependence poses the threat of model misspecification (Rey and Montouri, 1999). The presence of spatial dependence can be considered as either extraneous "noise" in the model or as offering additional understanding of the phenomenon being studied (Anselin and Bera, 1998; Anselin and Florax, 1995). In the case of regional fertility convergence, the inclusion of spatial dependence models in the current analysis allows for any dependence to be accounted for so that more confidence may be had in the results. Moreover, the process of fertility convergence may have a spatial component, as changing behaviors might diffuse across regions or external shocks causing a decline in one region's fertility might then spread to neighboring regions.

Table 3 provides commonly applied tests for spatial dependence for the conditional convergence models discussed above.[13] Of these tests, Moran's I is probably the best known and does a good job of recognizing the general presence of spatial dependence in regression models (Anselin and Florax, 1995). It does not, however,

[13] All tests for spatial dependence and spatial modeling were done using GeoDa 0.9.5.1-i. Information about GeoDa and the software are available at http://www.csiss.org/clearinghouse/GeoDa/.

distinguish between different types of spatial dependence. For that reason, Table 3 also includes p-values for robust Lagrange Multiplier (LM) tests for both the error and lag. These tests are useful because they not only highlight the presence of spatial dependence but can also show when attention should be focused on the error or the lag; generally the more significant the test result, the more likely it is that that type of dependence needs to be accounted for in the model (Rey and Montouri, 1999).

The results for all three tests are mixed, with Moran's I failing to show a significant amount of spatial dependence in any of the regional models. The LM test results are also mixed in the sense that they do not point consistently to either error or lag dependence in the regional models. For the 1952-1995 and 1975-1995 periods, both tests are statistically significant, but for the 1952-1974 period neither is. All three tests for the provincial models indicate the presence of spatial dependence. Without a clear sense of the degree or type of spatial dependence present in the aspatial convergence models, three types of spatial regression models are estimated and evaluated.

The first type of spatial model estimated is a spatial error model, which accounts for spatial dependence in the errors. Estimating a spatial error model reduces the potential for inefficient regression estimates. It takes the form:[14]

$$\ln\left(\frac{TFR_{i,t+k}}{TFR_{i,t}}\right) = \alpha + \beta \ln(TFR_{i,t}) + (I - \xi W)^{-1} u_i$$

Second, a spatial lag model is estimated. The spatial coefficient in this model can be viewed as either filtering out spatial effects so the true amount of convergence can be

[14] The specification of the three spatial dependence models following that shown in Rey and Montouri, 1999.

assessed or as measuring the extent to which regional interaction is driving the convergence process. The form of this model is:

$$\ln\left(\frac{TFR_{i,t+k}}{TFR_{i,t}}\right) = \alpha + \beta \ln(TFR_{i,t}) + \rho W \ln\left(\frac{TFR_{i,t+k}}{TFR_{i,t}}\right) + \varepsilon_i$$

Third, a cross-regressive model is estimated. The lag in this model is on the starting levels of fertility and, as Rey and Montouri (1999) put it, neglecting to include this lag can result in spatially autocorrelated errors:

$$\ln\left(\frac{TFR_{i,t+k}}{TFR_{i,t}}\right) = \alpha + \beta \ln(TFR_{i,t}) + \tau W \ln(TFR_{i,t}) + \varepsilon_i$$

For each model, $\boldsymbol{W}$ is the weights matrix described above in the data section.

In most cases the estimation of a spatial regional convergence model does not change the initial convergence results much (Table 4). The estimate for the spatial coefficient is rarely statistically significant at any level, with the exception of the spatial lag model for the 1952-1995 period and the cross-regressive model for the 1975-1995 period. In those cases, the goodness of fit as measured by the AIC is higher for all spatial dependence models than seen with the conditional convergence models, suggesting somewhat better performance of the spatial models. The regional convergence rates, based on the spatial error model results, are quite similar to those based on the absolute convergence model results (Table 1).

At the provincial level, the spatial coefficient is statistically significant for all three models, indicating the importance of accounting for spatial dependence in those models. For the provinces, the best-performing model appears to be the spatial error model and the convergence rate, computed after accounting for spatial dependence in the model, is an implied annual rate of 2.2% -- higher than for either the absolute or conditional convergence model.

CONCLUSIONS

Although controversy is rife about regional economic convergence in Italy, the results presented in this paper indicate that regional fertility convergence took place during the years 1952-1995, but that this process occurred more quickly in the years leading up to 1975 than in later years. Over the entire period of 1952 to 1995, regional fertility converged at a rate greater than 2%. The provincial-level results were more mixed, but the spatial error model of convergence showed a convergence rate for the later period that was just as strong as that seen at the regional level for the entire period. This suggests that, although southern fertility rates may be higher than those seen in the rest of the country, this may yet prove to be a temporary phenomenon, with regional and provincial fertility rates eventually attaining some common level across the entire country.

The possibility presence of spatial dependence is often ignored in geographically-based regression models and in this application the necessity of doing so was not clear-cut. However, the exercise of estimating the three types of spatial dependence models accounts for any autocorrelation "noise" present in the model and also allows the models to account for the spatial aspects of the convergence process. These models represent a more accurate depiction of regional and provincial convergence in Italy. Certainly, at the provincial level the estimation of spatial dependence models was necessary.

On the theoretical side, this paper has presented an argument for assessing regional fertility change over time from the point of view of convergence. Simply showing that one region has higher fertility rates than another does not allow potentially insightful judgments to be made about the movement occurring towards a "steady state". This paper has posited three ways in which these two processes of convergence may be related. One difficulty in drawing stronger conclusions about the possible link between economic and fertility convergence is due to the lack of conclusive evidence either for or against regional economic convergence in Italy. Also, many previous conceptualizations of fertility changes over time have viewed it to be a cyclical process (see Easterlin's 1980 work, for example, as well as O'Connell, 1981 and Pandit and Bagchi-Sen, 1993) with booms and busts following each other. Possibly, though, fertility in developed countries is finally reaching a "steady state," when we might no longer expect to see increases in fertility rates that might offset the enormous decline in fertility rates seen over the past several decades. Whichever the case, persisting questions about the nature of Italy's regional differences in terms of both fertility and economic change make it an ideal study site for both theoretical and empirical research on the subject of fertility and economic convergence.

REFERENCES

Anselin L, Bera AK. 1998. Spatial Dependence in Linear Regression Models with an Introduction to Spatial Econometrics in Ullah A, Giles DEA (eds.) *Handbook of Applied Economic Statistics*. New York: Marcel Dekker Inc.

Anselin L, Florax RJGM. 1995. New Directions in Spatial Econometrics: Introduction in *New Directions in Spatial Econometrics*. Heidelberg: Springer-Verlag

Barro RJ, Sala-i-Martin X. 1991. Convergence across States and Regions. *Brookings Papers on Economic Activity* **1**: 107-158

Barro RJ, Sala-i-Martin X. 1992. Convergence. *The Journal of Political Economy* **100**: 223-251

Bongaarts J, Watkins, SC. 1996. Social Interactions and Contemporary Fertility Transitions. *Population and Development Review* **22**: 639-682

Carlino GA, Mills L. 1996. Testing Neoclassical Convergence in Regional Incomes and Earnings. *Regional Science and Urban Economics* **26**: 565-590

Castiglioni M, Dalla Zuanna G. 1994. Innovation and Tradition: Reproductive and Marital Behavior in Italy in the 1970s and 1980s. *European Journal of Population* **10**: 107-141

Chatterji M, and Dewhurst JHLl. 1996. Convergence Clubs and Relative Economic Performance in Great Britain: 1977-1991. *Regional Studies* **30**: 31-40

Coleman DA. 2002. Populations of the Industrial World – A Convergent Demographic Community? International Journal of Population Geography **8**: 319-344

Dalla Zuanna G, Atoh M, Castiglioni M, Kojima K. 1998. Late Marriage Among Young People: The Case of Italy and Japan. *Genus* **54**: 187-232

Easterlin RA. 1980. *Birth and Fortune: The Impact of Numbers on Personal Welfare.* Chicago: The University of Chicago Press

The Economist. 1998. *Why Italians Don't Make Babies.* www.economist.com. Accessed 6/18/03

Franklin R, Plane DA. 2004. A Shift-Share Method for the Analysis of Regional Fertility Change: An Application to the Decline in Childbearing in Italy, 1952-1991. *Geographical Analysis*, 36, 1-20.

Herbertsson TT, Orszag JM, Orszag PR. 2000. Population Dynamics and Convergence in Fertility Rates. Accessed at www.econ.bbk.ac.uk/wp/ewp/ewp9921.pdf

ISTAT. *Indicatori Provinciali di Fecondità, Anni 1975-1994.* Rome: Istituto Nazionale di Statistica

ISTAT. 2000. Italy in Figures. Rome: Istituto Nazionale di Statistica

Kangasharju A. 1998. β Convergence in Finland: Regional Differences in Speed of Convergence. *Applied Economics* **30**: 679-687

Livi-Bacci M. 1977. *A History of Italian Fertility During the Last Two Centuries.* Princeton University Press: Princeton, NJ

Mauro L, Podrecca E. 1994. The Case of Italian Regions: Convergence or Dualism?, *Economic Notes* **23**: 447-472

O'Connell M. 1981. Regional Fertility Patterns in the United States: Convergence or Divergence? *International Regional Science Review* **6**: 1-14

Paci R, Pigliaru F. 1997. Structural Change and Convergence: An Italian Regional Perspective. *Structural Change and Economic Dynamics* **8**: 297-318

Pandit K, Bagchi-Sen S. 1993. The Spatial Dynamics of U.S. Fertility, 1970-1990. *Growth and Change* **24**: 229-246

Panopoulou, G, Tsakloglou P. 1999. Fertility and Economic Development: Theoretical Considerations and Cross-Country Evidence. *Applied Economics* **31**: 1337-1351

Rey SJ, Montouri BD. 1999. US Regional Income Convergence: A Spatial Econometric Perspective. *Regional Studies* **33**: 143-156

Sala-i-Martin X. 1996. Regional Cohesion: Evidence and Theories of Regional Growth and Convergence. *European Economic Review* 40: 1325-1352

Siriopoulos C, Asterliou D. 1998. Testing for Convergence across the Greek Regions. *Regional Studies* **32**: 537-546

Terra Abrami V, Sorvillo MP. 1993. La Fécondité en Italie et dans Ses Régions: Analyse par Période at par Génération. *Population* **48**: 735-752

Terrasi M. 1999. Convergence and Divergence across Italian Regions. *The Annals of Regional Science* **33**: 491-510

Waldorf B, Franklin R. 2002. Spatial Dimensions of the Easterlin Hypothesis: Fertility Variations in Italy. *Journal of Regional Science* **42**: 549-578

Watkins SC. 1990. From Local to National Communities: The Transformation of Demographic Regimes in Western Europe, 1870-1960. *Population and Development Review* **16**: 241-272

Wilson C. 2001. On the Scale of Global Demographic Convergence 1950-2000. Population and Development Review **27**: 155-171

TABLES

Table 1: Regional Absolute Convergence

	Adjusted R^2	AIC	Beta (p value)	Convergence Rate
Regions				
1952-1995	0.798	-32.901	-0.615 (0.000)	0.022
1952-1974	0.906	-57.805	-0.497 (0.000)	0.031
1975-1995	0.163	-38.391	-0.243 (0.049)	0.014
Provinces				
1975-1994	0.035	-185.621	-0.107 (0.039)	0.006

Regions: n=19; df=17
Provinces: n=95; df=93
AIC is the value of the Akaike Information Criterion, which is a measure of goodness of fit. The lower the value, the better the fit of the model.

Table 2: Conditional Convergence

	Adjusted R^2	AIC	Beta (p-value)	SOUTH dummy (p-value)	Convergence Rate
Regions					
1952-1995	0.790	-31.299	-0.687 (0.000)	0.053 (0.569)	0.027
1952-1974	0.920	-60.059	-0.614 (0.000)	0.086 (0.062)	0.043
1975-1995	0.132	-36.844	-0.097 (0.719)	-0.057 (0.543)	0.005
Provinces					
1975-1994	0.076	-188.372	-0.275 (0.003)	0.076 (0.026)	0.017

Regions: n=19; df=16
Provinces: n=95; df=92
AIC is the value of the Akaike Information Criterion, which is a measure of goodness of fit. The lower the value, the better the fit of the model.

Table 3: Tests for Spatial Dependence of Conditional Convergence Models

	Robust LM (error) p-value	Robust LM (lag) p-value	Moran's I (error) MI/p-value
Regions			
1952-1995	0.082	0.024	0.090 / 0.185
1952-1974	0.495	0.669	-0.187 / 0.641
1975-1995	0.009	0.008	0.053 / 0.339
Provinces			
1975-1994	0.000	0.000	0.317 / 0.000

Table 4: Convergence Results for Spatial Dependence Models

	AIC	Beta (p-value)	p-value, spatial coefficient	p-value, likelihood ratio test/MI p-value	Convergence Rate
Regions					
1952-1995					
Spatial error	-36.697	-0.623 (0.000)	0.812	0.051	0.023
Spatial lag	-34.296	-0.710 (0.000)	0.059	0.065	
Cross regressive	-37.774	-0.786 (0.000)	0.280	0.265	
1952-1974					
Spatial error	-60.643	-0.497 (0.000)	0.992	0.092	0.031
Spatial lag	-57.146	-0.532 (0.000)	0.298	0.247	
Cross regressive	-57.730	-0.548 (0.000)	0.210	0.366	
1975-1995					
Spatial error	-41.439	-0.259 (0.023)	0.764	0.081	0.015
Spatial lag	-36.621	-0.254 (0.026)	0.684	0.632	
Cross regressive	-42.482	-0.558 (0.004)	0.026	0.501	
Provinces					
1975-1994					
Spatial error	-229.743	-0.339 (0.000)	0.000	0.000	0.022
Spatial lag	-216.400	-0.083 (0.054)	0.000	0.000	
Cross regressive	-190.028	-0.453 (0.003)	0.013	0.000	

Regions: n=19; df=16 for lag and cross-regressive models, 17 for the error model
Provinces: n=95; df=92 for lag and cross-regressive models, 93 for the error model
AIC is the value of the Akaike Information Criterion, which is a measure of goodness of fit. The lower the value, the better the fit of the model.

FIGURES

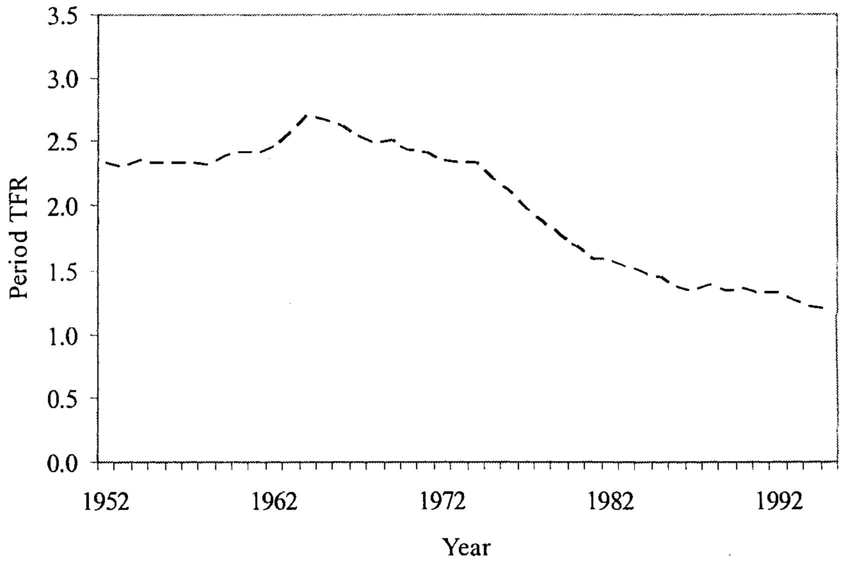


Figure 1: Period Total Fertility Rate for Italy, 1952-1995

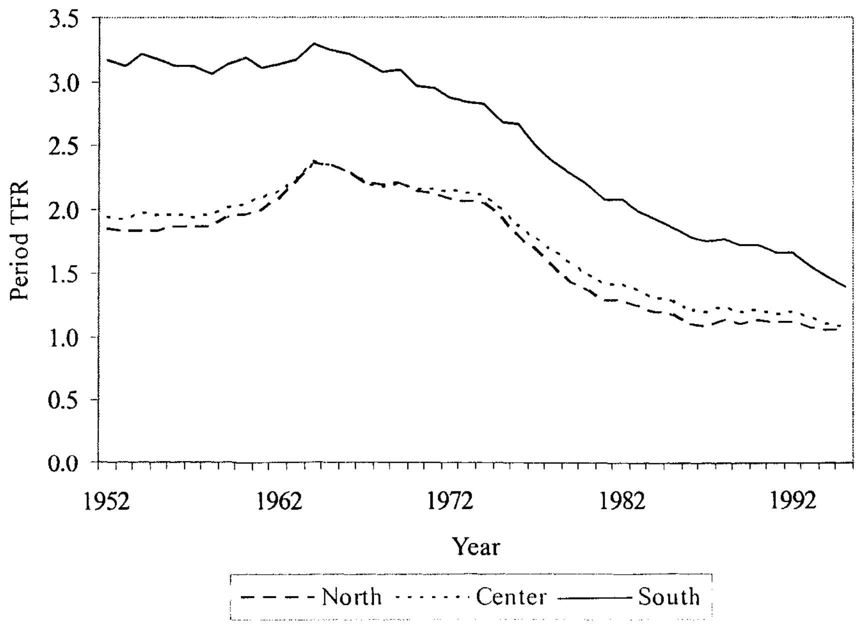


Figure 2: Period Total Fertility Rates for North, Center, and South of Italy, 1952-1995

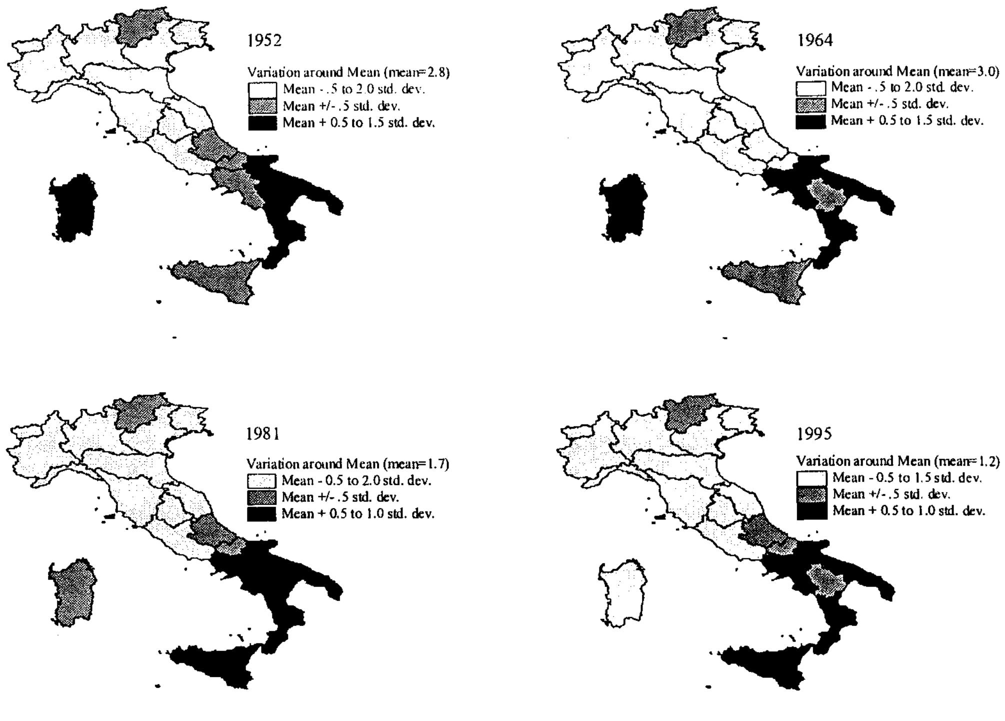


Figure 3: Italian Regional Total Fertility Rates, Selected Years

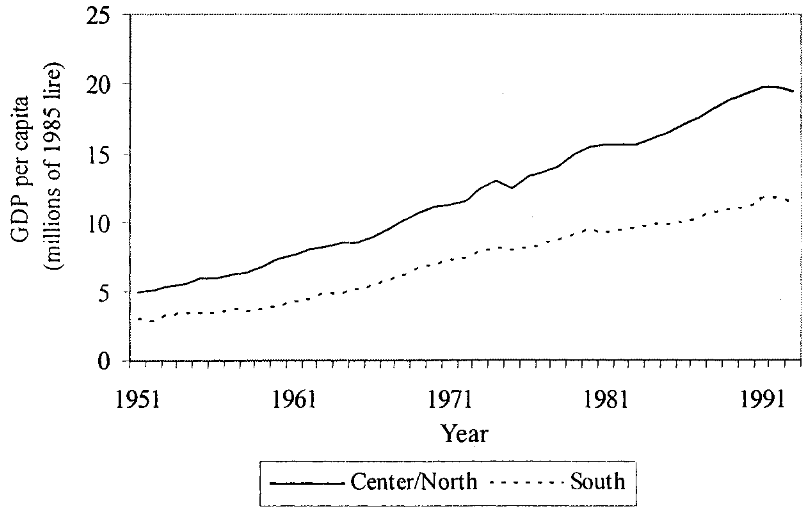


Figure 4: Per Capita GDP for Center/North and South, 1951-1993

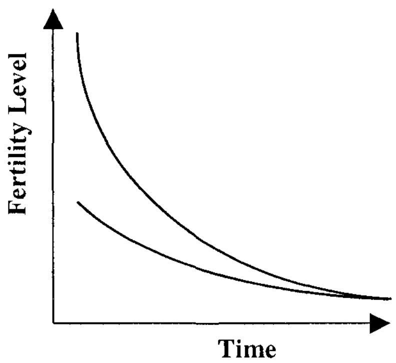


Figure 5: Absolute *Beta* Convergence in Fertility Rates

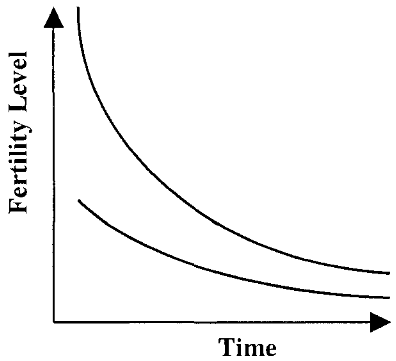


Figure 6: Conditional *Beta* Convergence in Fertility Rates

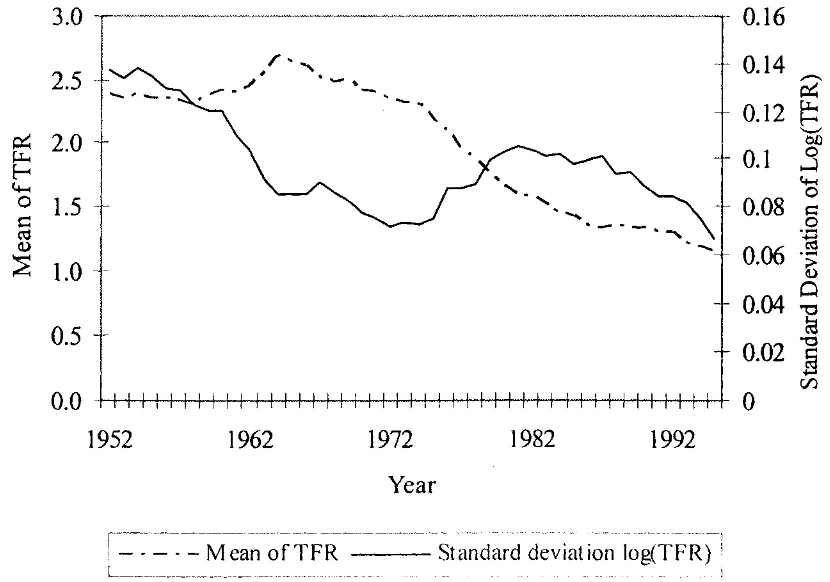


Figure 7: Regional *Sigma* Convergence, 1952-1995

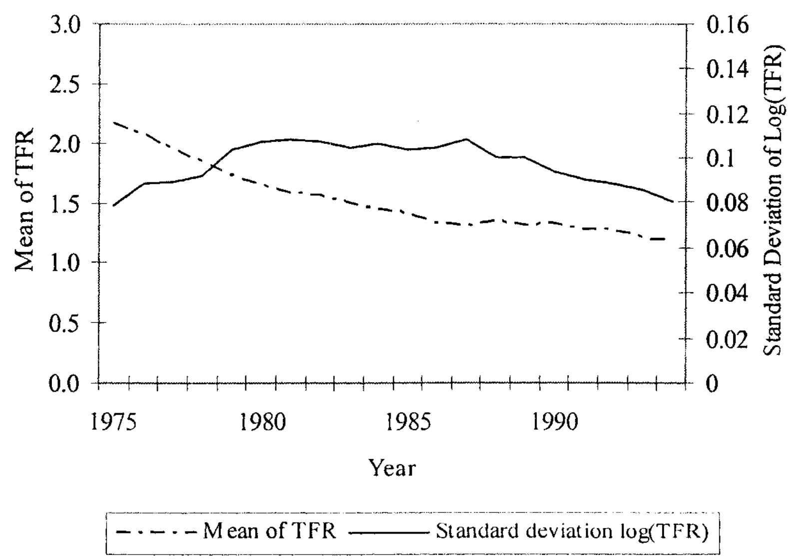


Figure 8: Provincial *Sigma* Convergence, 1975-1994

APPENDIX C
For submission to the *Journal of Historical Geography*

The Geography of Regional Fertility and the Consolidation of the Italian State

Rachel Franklin
Department of Geography and Regional Development
The University of Arizona
Tucson, Arizona USA
e-mail: rachel.s.franklin@census.gov

Abstract: Italy has been a unified country for almost 140 years. During this time, previously independent or semi-independent regions have been brought together as one country under a monarchy, a dictatorship, and now a democracy. One constant throughout all these changes has been the persistence of regional social, cultural, and economic differences, with the most common characterization being the stark contrast existing between the South and the remainder of the country. Regional demographic differences, especially in fertility levels, are one example. Here, the evolution of regional fertility behavior is taken as an indicator of the extent to which the Italian regions have exchanged regional individuality for a national identity. Increasing regional homogeneity is taken as a sign that the nation has superceded the region as a reference point for fertility behaviors and expectations. Using historical and contemporary fertility data, this paper investigates regional disparities in Italian fertility levels over time to measure the unity of the Italian nation-state. The conclusions show that regional fertility diversity actually increased during the several decades after unification until the post-World War II years, when regional demographic uniformity is more apparent. Regional patterns of fertility established in the early 20th century are also shown to be persistent, however. Emigration, industrialization, and geography are offered as clues to the change and persistence of regional fertility characteristics during this time period.

Italy has been a unified country for almost 140 years. The *risorgimento*, a social and political movement in 19th century Italy, sowed nationalistic sentiment and persuaded residents of Italy's regions that their destiny was to be a part of a unified Italian state. This goal was partially accomplished by 1861 and completed in 1870. Under first a constitutional monarchy, then a fascist dictatorship under Mussolini, and finally a parliamentary democracy Italy has become an established unified country with control over many aspects of public life resting firmly with the national government (for a thorough survey of Italy, see King, 1987). One constant throughout all these changes, however, has been the persistence of regional social, cultural, and economic differences, particularly between the regions of the South and the remainder of the country. The South is considered by many to be a different world compared to the rest of the country, marked by a different culture and level of economic development.

Fertility change can act as a marker of social, economic, and even political change. Improvements in women's status, increases in education attainment, and secularization of social mores often impact fertility decisions, as do increases in economic well-being and government policies aimed at promoting family well-being. Increases or decreases in fertility, in turn, can affect social norms, the economy, and the government. Since the decision to have children is at once a hugely important personal decision and one that eventually impacts all of society, it is interesting to speculate about the extent to which growing consensus within a population regarding fertility also reflects consensus within the broader society. The evolution of regional fertility disparities over time, then, can be used to gauge the relative influence of national identity, as opposed to regional identity. This paper uses changing disparities in regional fertility levels, from the time of unification through the 1990s, to answer the question whether, over time, Italy has become a nation in more than name or remains better characterized as a collection of disparate regions.

The goals of this paper are threefold. First, by extending research on European regional fertility diversity done by Watkins (1990, 1991) to a focused, decade-by-decade analysis of Italian regional fertility rates, trends in regional fertility homogenization are more thoroughly assessed for the historical 1864 to 1961 period. Watkins' work concentrated on most West European countries, and so was unable to devote in-depth attention to Italy's case.[15] Second, linking the historical and contemporary periods offers a longer-term view of Italian regional fertility, extending the analysis to the 1990s. In this way, post-war fertility patterns can be better understood by having been placed in their proper historical context. Third and finally, the description of the geography of historical fertility, with its consideration of the forces both encouraging and inhibiting regional fertility differentiation, allows for a more thorough understanding of post-war Italian fertility, which has been the subject of a great deal of attention in both the media and the academic literature.

In the next section I describe the conceptualized relationship between demographic diversity and national unity, and how it applies to the Italian case. I then outline the historical and contemporary data sources used for this research. Subsequently, I provide a brief overview of Italian fertility and describe regional

[15] Although Watkins uses the term "province" as her unit of analysis, her unit of analysis is, in fact, the region.

differences in fertility, highlighting the increased regional differentiation in fertility levels and trends during the study period. Because post-war regional fertility trends have been well-documented for Italy (see e.g. Terra Abrami and Sorvillo, 1993; Franklin and Plane, 2004), this section focuses on the geography of historical regional fertility up until the 1960s, concentrating on regional differences in the timing of the fertility transition and the development of regional patterns of fertility still seen today in Italy. Next, I measure the uniformity of regional fertility behavior over time in order to gauge the expansion of national fertility norms and offer some explanations for changing regional fertility patterns seen between 1871 and 1995. I then conclude the paper.

"Demographic Diversity" and National Unity

There are many different ways in which national unity can be measured. Here, the evolution of regional "demographic diversity", a concept coined by Susan Cotts Watkins (1990), is taken as an indicator of the extent to which the Italian regions have exchanged regional individuality for a national identity. Increasing regional homogeneity is taken as a sign that the nation has superceded the region as a reference point for fertility behaviors and expectations. National and regional identities are not mutually exclusive, however the assumption is that one would prevail over the other, especially where fertility decisions are concerned. Using historical and contemporary fertility data, this paper investigates the degree of homogeneity of Italian regional fertility levels over time to measure the unity of the Italian nation-state.

This paper hypothesizes that historical and contemporary fertility rates and their geographic patterns can be seen as an indicator of the degree of national unity, and that historical regional fertility patterns during this period are best understood within a context of tension between national and local factors, whether economic, demographic, or political. These differences likely still influence the geographic pattern of fertility found in Italy today. Watkins (ibid.) argues that a shift in influences on fertility behavior occurred in the late 19th century from local to national. In particular, she cites the development of national markets, the increasing influence of national governments, and the process of "nation-building" as important driving forces in this shift. Rather than looking to the behavior of geographically proximate peers for guidance on the number of children to have, when to marry, or whether to breastfeed infants, individuals' frame of reference increased to include the entire nation. Italy's change from more or less individually governed regions to a unified state should have intensified this experience, as unification brought down internal regional barriers and helped in the construction of new external, national boundaries. Italy is only one country considered in Watkins' study and so does not receive individual attention to explain its particular case.

A newly centralized national government and its attendant legislation might be expected to speed the process of convergence in regional fertility rates, leading to more uniform demographic behaviors, in terms of both fertility and mortality, across the nation. In Italy's case, unification brought with it the necessity of creating a national community more powerful than the leftover regional structures (Barbagallo, 2001). The government's influence could be felt indirectly; actual pro-natalist or anti-natalist legislation would not be necessary. For example, a unified nation facilitates the construction of transportation and communications routes that facilitates the movement of ideas and people. The growth of a national economy might help equalize wages across the country and lead to the creation of national markets and media. The encouragement of nationalistic feelings that originated in the *risorgimento* would also have acted to bring the various regions together. Development of national sentiment and community in Italy was encouraged by the new central government through mandatory military service and education (ibid.).

Working against the national tide, region-specific characteristics, such as geography, levels of industrialization, and emigration might slow or even reverse the process of demographic integration induced by unification. Even as, at the national level, the government might be working towards the creation of nationally uniform education policies, markets, or media, individual regions might continue to be affected by events taking place in their own localized area. Longstanding regional characteristics or contemporary economic or social changes could affect fertility in one region but not another. Measuring changes in the uniformity of regional fertility over time shows the extent to which national influences may have outweighed local or regional influences, and during which time period.

Historical Fertility: Princeton European Fertility Project

The Princeton European Fertility Project, initiated in 1963 and concluded in 1979, collected fertility and related data for over 20 countries and 1,200 provinces in Europe.

The stated goals of the fertility project were to document the fertility transition in Europe and to ascertain the social changes that accompanied this decline (Coale and Watkins, 1986). Over the years, these data have been exhaustively analyzed for all of the countries involved, usually with the common aim of understanding regional differences in fertility and in the timing of the fertility transition.[16] The Italian portion of the project collected data for the Italian regions and provinces. As administrative creations, provincial boundaries changed frequently after unification, rendering the provincial-level data unreliable for comparisons over time. There is a much higher degree of confidence in the quality of the regional data, however, and those are used in this paper. Massimo Livi-Bacci, the Italian demographer chiefly responsible for the compilation and analysis of the Italian data, covers the Italian case thoroughly in his book (1977), "*A History of Italian Fertility During the Last Two Centuries*". This paper uses fertility and marriage statistics compiled for 18 Italian regions published in Livi-Bacci's book.[17] The data used cover the years 1864 to 1961 and are available for 11 different years within this period.

In order to develop statistics that could be compared across all European nations and provinces in a straightforward manner, the researchers for the European Fertility Project developed indices that related births in a region to a predetermined fertility maximum. The maximum fertility used was that recorded by the Hutterites (who not only kept good birth statistics but also abjured contraception and abortion) from 1921 to

---

[16] The fertility transition represents one component of the demographic transition, which was the shift from high to low fertility and mortality rates that took place in most European countries starting in the mid-19th century.

[17] The current number of regions in Italy is 20; Molise, created in 1963, is treated as part of Abruzzi for the entire analysis and Valle d'Aosta, created in 1947, as part of Piemonte.

1930 (Coale and Watkins, 1986).[18] According to Coale and Watkins (ibid., p.34), "women subject to Hutterite fertility from age 15 to age 50 would bear an average of 12.4 children." These indices, then, relate the level of fertility recorded in a place to the high natural level achieved by the Hutterites. This allowed the researchers to compare standardized fertility levels in one area to levels in others places, even if the nature of the original birth data was very different for the two locations.

The Fertility Project generated four fertility indices to describe changes in historical regional fertility in Italy[19]. The first was a measure of overall fertility and the second a measure of fertility within marriage. The third measure accounted for fertility occurring outside of marriage. The fourth index measured the proportion of women aged 15 to 50 who were married. An index of one means that all women 15 to 50 were married. Index measures of one for marital and overall fertility indicate that women in a given population have the same fertility levels as did the Hutterites, both within marriage and overall. When illegitimate births form a very small proportion of overall fertility, then overall fertility is simply the product of marital fertility and the proportion of women married (ibid.). The number of births out of wedlock was low for Italy during the entire period (Livi-Bacci, 1977; Perez and Livi-Bacci, 1992). In addition, the product of the index for overall fertility and 12.4 (the Hutterite average fertility) generates a crude approximation of the total fertility rate (TFR) which can be used to compare historical

---

[18] The Hutterite population used for this project was a religious sect living in the upper plains of the United States and parts of Canada in the 1920s.

[19] In the late 1800s the Italian government ruled that civil marriage was required for a couple to be legally married. Because so many couples resisted this, and continued to marry in the church only, the measures for proportion married and extramarital fertility are misleading for this period. Livi-Bacci constructed adjusted series for these measures, and those are the ones used in this paper.

and contemporary trends more directly (Coale and Watkins, 1986). The total fertility rate offers a simple, straightforward way of measuring fertility levels; it is the number of children a woman can be expected to have by the end of her childbearing years, given current fertility levels.

Helpfully, Livi-Bacci (1977) identified several levels for marital fertility that benchmark important social changes in fertility behavior. These are useful for identifying when regions passed certain fertility thresholds. For example, when marital fertility has fallen below 0.6, the population has most likely adopted efficient means of fertility control. Marital fertility above 0.5 (half of the marital fertility experienced by the Hutterites) is considered moderately high, and "strongly controlled fertility" is taken to exist when marital fertility falls below 0.4. Taken together, these benchmarks help identify when regions have passed certain momentous demographic landmarks. Since the goal of this paper is to not only identify regional differences in fertility but also describe the development of regional patterns over time, these landmarks provide additional insight.

Background: Italian Fertility Following Unification

When the historical fertility data are converted to estimated total fertility rates, these numbers can be directly compared to rates seen in post-war Italy. Post-war data come from the Italian statistical office, ISTAT. Figure 1 graphs the two data series side by side to present a continuous picture of Italian fertility over almost 150 years. The TFR for Italy as a whole was almost 5.0 at the time of Italian unification in 1861. This means that, on average, for all of Italy, women bore about five children each by the end of their childbearing years. This rate remained constant until the early 20th century, when it began to fall to just above replacement level in the early 1950s. The small increase in fertility during the 1960s represents the Italian baby boom, which was then followed by a prolonged decrease in fertility rates that continued through the mid-1990s.

[Figure 1 about here]

Italy completed the demographic transition later than many other Western European countries. For the Italian population as a whole, the permanent decline in fertility did not begin until about 1870, and proceeded from North to South and from West to East (Livi-Bacci and Breschi, 1990). Figure 2 shows the evolution of overall fertility, marital fertility, and illegitimate fertility from 1871 to 1961. The proportion of women who were married remained nearly constant at approximately 50 percent throughout the entire period, with only a slight increase around the 1920s. The very slight decrease seen in the decades immediately prior to the 1920s could be an effect of mortality from World War I or from the effects of emigration from Italy in the late 1800s and early 1900s – both of which might cause imbalances in the marriage market, leading to increases in unmarried women in the population. During the same period, marital fertility decreased, leading to a decrease in overall fertility. Since the proportion of women marrying was increasing contemporaneously with decreasing marital fertility, the total effect on overall fertility was muted.

[Figure 2 about here]

The geographical diffusion of a new behavior can be separated from the diffusion of that behavior throughout the population. As in other European countries, the demographic transition began earlier for some social groups than for others. Members of the aristocracy and upper echelons of society limited their fertility much sooner than society as a whole. These groups showed a decrease in married fertility dating back to at least the 18th century. In the late 1800s, agricultural workers had, on average, about 6.4 children, while members of the professional class tended to have about 3.3. In the South these averages tended to be higher, while in the Central-North part of the country, they were lower (ibid.).

Because most fertility in Italy throughout history, and even today, has taken place within marriage, the average age at marriage has played an important role in overall fertility outcomes. Rettaroli (1990) places Italian marriage trends in the 19th century somewhere between those of Northwest Europe and those of Eastern Europe. The average age at marriage for both genders over the past three centuries has tended to be relatively high (mid to late 20s) in most Western and Northern European countries, while Eastern European countries are typified by early age at marriage for both sexes. Within Italy, regional differences are apparent, with a higher age at marriage for both men and women in the Central-North part of the country and a lower age at marriage in the South. The range tends to be smaller for men, throughout the country, but noticeably different for women (ibid.). Many regional differences in average age at marriage can be attributed to variations in the legal treatment of women and inheritances at the turn of the 19th century (Barbagli and Kertzer, 1990).

Contemporary Italy has its own set of particular characteristics. Post-war development and economic growth have produced a society with very low fertility rates, in which individuals marry late and tend to remain at home until they do marry – occasionally until their late 20s or early 30s (Castiglioni and Dalla Zuanna, 1994) – at least partially because of tight housing markets and relatively high unemployment among younger people (Dalla Zuanna, 1999). Between 1952 and 1995, the average age at first birth increased from 25.9 to 28.1. Women's educational attainment has increased over time, as has their labor force participation (Perez and Livi-Bacci, 1992). Society has become more liberal, with contraception, divorce, and abortion all legalized by the late 1970s. Out-of-wedlock births, however, have remained low in Italy even as they have increased over much of Western Europe (ibid.).

Regional Historical Fertility

This section describes regional fertility changes between 1864 and 1961 and highlights those aspects of fertility most relevant to regional differentiation in fertility during that period. As each Italian region brought its own history and cultural background to a unified Italy, it is not surprising that regional fertility levels should have differed some from each other in 1864. Although in 1864 most regions had similar fertility levels – estimated TFRs were around 5.0 for most regions – the extent to which each region experienced a decline in fertility in subsequent years varied widely (Table 1 provides measures of overall fertility from the Princeton European Fertility Project as reported by Livi-Bacci, 1977). Fertility levels seen in the southern regions in 1951 and

1961, for example, could be found in most northern and central regions between the turn of the century and World War II, about thirty years earlier. In general, northern and central regions also experienced higher declines in fertility than southern regions, as shown by the percentage change in overall fertility. Regions such as Toscana and Liguria experienced declines in overall fertility of over 60 percent between 1864 and 1961, while fertility in regions in the South such as Basilicata and Campania only declined by about a third (Figure 3 gives a labeled map of the Italian regions). Calabria and Sicilia experienced much lower declines than that.

[Figure 3 about here]

[Table 1 about here]

Regional differences are highlighted when trajectories in overall fertility are seen over time. Figure 4 shows trends over time in overall fertility for four selected regions: Liguria in the North, Toscana and Lazio in the Center, and Calabria in the South. All four regions began the period with approximately the same levels of fertility. Toscana ended the period with the steepest decline in fertility, however. The strongest differences appear when Calabria is compared to the remaining three regions. In that region, fertility remained fairly constant and high until the early 1900s, when it began a shallow decline. Instead of an increase in fertility after World War II, as seen in the other regions, Calabria's overall fertility remained constant. This is consistent with research findings on regional fertility in post-war Italy, which showed that regions in the South experienced much less of a baby boom than regions in the Center and North, perhaps because of delays in post-war recovery or because fertility levels were already relatively high at that time, compared to fertility in the rest of the country (Franklin and Plane, forthcoming; Franklin, 2002). Lazio's fertility trajectory over time falls somewhere between that seen for the northern and southern regions. With the exception of Liguria, though, where the fertility decline had already begun by 1864, the main decline in fertility appears to have begun around the early 1900s.

[Figure 4 about here]

When fertility rates are mapped for selected years, a revealing spatial picture of fertility trends in Italy is presented (Figure 5). Fertility levels across the newly unified peninsula in 1871 show a random pattern, with the highest fertility regions scattered across the entire country. In 1901, the higher fertility levels tend to be located along the eastern spine of the country and the lowest levels are seen in the Northwest. This follows Livi-Bacci and Breschi's (1990) description of the fertility transition in Italy as proceeding from North to South and from West to East. By 1936, the height of the fascist government, however, a clear regional differentiation in fertility levels is apparent and, in fact, is equivalent to geographic patterns still seen in Italy's fertility rates today. In both 1936 and 1961, the highest fertility levels are found in the South, with regions in the Northeast also displaying higher fertility levels than the Northwest and Center.

[Figure 5 about here]

Overall fertility is a function of the proportion of women who are married and therefore "at risk" of having children, the number of children those women are likely to have once they are married, and the amount of illegitimate fertility in the population. Societies can maintain a relatively high level of overall fertility even if a high proportion of its women are unmarried and childless, if the married women then have a high fertility rate. Since out of wedlock births were rare in Italy during this period, overall fertility is the product of marital fertility and the proportion of women of childbearing age who are married. Tables 2 and 3 show marital fertility and the proportion married for the Italian regions from 1864 to 1961, providing the details for regional changes seen in overall fertility during the same period. Recollecting that a decrease in *marital* fertility below .40 is indicative of "highly controlled fertility," Table 2 shows the vast amount of variation apparent in the entrenchment of controlled fertility behaviors across all the regions. Cells are shaded gray for the first year in which marital fertility fell below .40 for that region.

Northern regions, with the exception of Veneto, were exercising a good deal of fertility control by the 1920s and 1930s. In the central regions, this transition was apparent by 1951 at the latest, although these regions had moved away from having "moderately high fertility" (marital fertility greater than .50) by 1921. Of the southern regions, only Abruzzi had even fallen below the level required for "highly controlled fertility" by 1961, and this event only occurred in 1951. All remaining southern regions had marital fertility greater than .40 in 1961, and indeed many surpassed the level for "moderately high fertility" in that year. Figure 6, which maps the regions with "highly controlled fertility" in 1936 and 1961, reinforces the geographical disparities apparent in the timing of the completion of the fertility transition. For both years, the South and Northeast remained entrenched in a higher fertility regime, while most central and northwestern regions exhibited strongly controlled fertility behaviors.

[Table 2 about here]

[Figure 6 about here]

In a few regions, Lazio for example, decreases in both the proportion of women who were married and marital fertility contributed to the declines in overall fertility seen between unification and the post-war years. Veneto and Sardegna, too, experienced declines between 1864 and 1961 in the proportion of women who were married, which contributed to the declines seen in overall fertility during the same period. Most other regions across the entire country increased their proportions of women married, but since fertility within marriage was declining they still experienced decreases in overall fertility levels.

[Table 3 about here]

Measuring "Demographic Diversity"

The above discussion of changes in regional fertility, both overall and within marriage, demonstrates the existence of regional variations in fertility change from the time of Italian political unification through the early post-war years. Fertility levels began to decline later for southern and northeastern regions and were still relatively high after World War II. Many northwestern and central regions experienced early and steep transitions to controlled levels of fertility. One indication of the effectiveness of the newly unified government would be the extent to which, after 1861, regional fertility rates were harmonized. A direct reason for regional homogenization in fertility behaviors would be efforts at the national level to guide fertility expectations, whether for higher or lower fertility. These types of national directives were not unusual during the inter-war years, especially in countries such as Germany and Italy, when pro-natalist and other demographic policies were enacted. In Italy, for example, emigration was tightly controlled, internal resettlement plans were enacted (with the thought that resettlement to rural areas might halt the fertility decline), and women were encouraged to fulfill their rightful roles as mothers (Ipsen, 1996). Another reason for expectation of regional homogenization in the late 1800s, though, would be the indirect effects of changing legislation, economic development, and the development of a sense of national unity in the form of national media, for example.

Two means of measuring the diversity of regional fertility rates over time are presented here. First, borrowing from regional economics, convergence in regional fertility rates over time is evaluated. Second, a descriptive measure used by Watkins (1990, 1991) is applied to measure the extent of homogenization of fertility rates during the study period. Together these measures provide a sense of the evolution of regional fertility rates over time.

A straightforward means of measuring regional dispersion can be found in the regional economics literature, where regional convergence or divergence over time is considered. The closing of a gap between regional "haves" and "have nots" is often referred to as *sigma* convergence and can be measured by looking at the change in some measure of dispersion over time (Barro and Sala-i-Martin, 1992; Sala-i-Martin, 1996). This paper uses the standard deviation of the log of fertility to account for changing amounts of dispersion. As the gap between high and low fertility regions closes, the standard deviation will decrease, and *vice versa*. When the variable under consideration is regional income, for example, the hope is that the gap will close over time, or that convergence in incomes will take place. Here, the expectation would be that convergence would take place as regional cohesion increased in newly unified Italy.

[Figure 7 about here]

Figure 7 shows the standard deviation of the log of overall fertility from 1871 to 1995.[20] The measure was nearly constant during the early years of unification and then increased markedly from about 1891 to 1951 before declining until the early 1970s. Dispersion then increased for a short period before resuming its downward trend. These results suggest that unification, and also the years of strong central government under Mussolini in the 1920s and 1930s, did not lead to convergence in regional fertility rates. Indeed, these decades are characterized by increased *divergence* in regional fertility. In her analysis of European fertility 1870 to 1960, Watkins (1990) found that, although most European countries' provincial fertility became more homogenous during those years, Italy's did not. Delays across regions in the onset of the fertility transition and differences in the levels of decline that occurred, which together contributed to the divergent trend seen in Figure 7, also helped to solidify regional differences in fertility that persist today. Geographic differences evident in Figures 5 and 6 are still to be found in post-war maps of Italian regional fertility.

Watkins (1990, 1991) applies an approach for measuring uniformity similar to that found for *sigma* convergence in the regional economics literature. In her analysis,

[20] Because of so many missing values in 1864, this portion of the paper uses 1871 as a starting date for the analysis. Regions missing values for any year were omitted from the analysis.

she uses changes in the midspread (or interquartile range) to evaluate changes in fertility diversity at the regional level.[21] A decreasing midspread is an indication of decreasing variation and *vice versa*. Watkins' use of a ratio of midspreads (e.g. 1995 to 1871) across time periods offers an intuitively appealing way to grasp changes in diversity over time, but only measures changes in marital fertility and confines itself to the ratio of the midspread for 1871 to 1961. I choose to apply the ratio on a decade-by-decade basis so that the timing of changes can be better assessed. For two reasons, I use overall fertility rather than marital fertility as the basis for analysis. First, overall fertility captures the entire universe of changing fertility, which includes changing timing of marriage and extramarital fertility, as well as fertility within marriage. Although this renders interpretation more difficult, it allows for the possibility that regions, as they move to attain some national fertility norm, might choose to operationalize that change in different ways. Not all regions would use a decline in marital fertility to achieve a goal of lower fertility. Second, the use of the overall fertility index permits the extension of the study period to 1995 by converting the overall fertility measures to estimated TFRs.

[Figure 8 about here]

Figure 8 shows the midspread of regional fertility rates from 1871 to 1995 and exhibits about the same trend as the CV in Figure 7. According to the midspread, diversity held constant in the final decades of the 19th century before increasing at the turn of the century until the 1950s. Thereafter it declined. Table 4 presents the ratio of

---

[21] The midspread or interquartile range is computed by subtracting the first quartile value from the third quartile value. It is a descriptive measure with no statistical properties, but has the advantage of not including outlying values. The ratio of midspreads is year $_t$/year $_{t-1}$.

midspreads for the entire 1871 to 1995 period, along with the shorter time periods. A ratio under one suggests that diversity in 1871 was greater than in 1995; a measure greater than one suggests an increase in diversity over time. For the entire period, then, regional fertility rates were more similar to each other in 1995 than in 1871. Within this period, the pace of homogenization appears to have varied, with increasing regional diversity in fertility found especially during the 1901 to 1951 years. After that, each period shows increasing uniformity across the regions. The greatest drop is found between 1981 and 1995, when the ratio is only .43.

[Table 4 about here]

Contributing Factors

The trends in Figures 7 and 8 indicate that up until the 1950s, as Italy's national government was becoming more established, regional fertility behaviors were becoming more, not less, different from each other. This finding can be at least partially explained by a few mitigating factors. Although the country was politically unified in 1864, there continued to be several important phenomena that affected some regions more than others.[22] Many of these variables are precisely those that are likely to have affected fertility in the post-war years, as well. Chief among these were emigration, industrialization, and geography. As Barbagallo (2001) states, post-unification Italy remained for some time a "regional Italy," with vast economic differences, poor

---

[22] In his book, Livi-Bacci (1977) identifies a host of factors that contributed to regional differentiation in fertility rates, including variations in breastfeeding, urbanization, and education.

communication routes across regions, and indeed poor language communication resulting from only two percent of the total population speaking Italian.

[Figure 9 about here]

Most emigration prior to 1870 came from the North and Center of the country, but these involved relatively small numbers of people (Livi-Bacci, 1977). After 1870 the number of emigrants increased rapidly from about 1.3 million between 1876 and 1885 to 6 million between 1906 and 1915 (Bosworth, 1996). Figure 9 tracks emigration from Italy between 1876 and 1975 and shows a steep decline in emigration after 1915, when destination countries began to close their borders to immigrants and, later, the Fascist government began to discourage emigration to non-colonial territories. The origin of Italy's emigrants shifted after 1876, with increasing percentages of emigrants leaving regions in the South and Northeast of the country (see Figure 10).

Emigration is posited to have affected fertility change in a couple of ways. First, emigration can be seen as a pressure valve that allowed individual regional societies to shed excess population without being forced to adopt different demographic behaviors, such as lower fertility, in order to meet changing societal needs. In regions having already mostly completed the fertility transition, this would not have been as detrimental as it was to regions still experiencing high levels of fertility. Although emigration by default also benefited the entire country by lessening the potential impact of internal migration, the region-specific nature of much of the emigration meant that some regions were more impacted than others. Also, as Livi-Bacci points out, emigrants often represent that portion of the population most amenable to innovations and change; when they leave, the more traditional parts of society are left which reinforces the demographic *status quo* in terms of expectations and behaviors. The impacts of emigration on southern and northeastern regions, then, can be seen as one phenomenon that might have slowed the process of fertility decline in the southern regions while the remainder of the country moved towards completion of the fertility transition.

[Figure 10 about here]

The economic structure of a region – the extent to which it specializes in agriculture or industry, especially – is hypothesized to influence fertility behaviors, as well. In most European countries, the demographic transition was accompanied by the industrial revolution and, as people moved from a traditional agriculture-based society to an industrialized one the value of having many children began to change (among other important developments). According to Livi-Bacci (1977), the South at the time of unification was to some extent more industrialized than the Center and North. 23.7 percent of the workforce in the South was employed in industry, compared to 20.4 in the Center and North. This changed in the late 19th century, as the North not only caught up but industry in the South experienced a decline. In 1911, 23 percent of the workforce was working in industry in the South, while the North and Center had increased its percentage to 29.9. At the time of unification and in the decades after, the South, with its repressed and impoverished peasantry, was viewed by the rest of the country as backwards and incapable fully contributing to the nation as a whole (Agnew, 2000). It is also important to consider that the origins of the industrial revolution in Italy are truly to be found in the Northwest of the country (A'Hearn, 1998) and that it is likely here that the attendant societal changes brought on by the revolution also found their beginnings. As with emigration, the lack of economic development in southern regions likely contributed to the slow decline in fertility seen there.

Geographical factors also likely played a role in increased regional fertility differentials in the late 19^{th} and early 20^{th} centuries. First, the northern regions' proximity to the rest of Europe meant that they were exposed to new attitudes and behaviors sooner and more frequently than the rest of the peninsula. The North also benefited from established communication routes and relationships with surrounding European countries (King, 1987). This applies not only to fertility attitudes, which would directly affect fertility levels, but also to industrial technology and new societal attitudes, as well. The southern regions, in contrast, were not only more distant from the rest of Europe, but were also surrounded on three sides by water. In the case of the southern island regions, isolation was much more complete. To exacerbate this isolation, there were many fewer roads and railroad lines in the South than in the remainder of the country (King, 1987; Livi-Bacci, 1977). This made the movement of people and ideas much more difficult and slowed the diffusion of new attitudes and innovations, such as those related to fertility control, that were transmitted much more easily in the North.

The increased pace of regional homogenization after 1950 is likely due to a number of factors. First, by this time all of Italy's regions had completed the fertility transition. This meant that fertility had permanently declined in all regions by this time and suggests that attitudes towards higher fertility and fertility control had also experienced a permanent adjustment (even if the southern regions maintained higher fertility levels within this range of lower fertility levels). The post-war baby boom, which peaked in 1964, may also have served to increase northern fertility rates so that the cross-regional gap was not as extensive.

Second, the rapid economic growth experienced by Italy in the 1950s and 1960s, although certainly benefiting the North and Center more than the South, helped propel the entire country into a new social, economic, and demographic arena. The Cassa per il Mezzogiorno, established in 1950 to aid the South in catching up to the rest of the country, did not succeed in closing the gap but did offer many advantages to the South that encouraged the location of industry there (Sundquist, 1975). The Cassa's method of forcing northern companies to open new factories in the South and its practice of importing northern plant managers likely aided in the exposure to southerners of different work and fertility expectations and attitudes. All regions during this time experienced shifts away from (traditional) agricultural employment and towards industrial and service employment. Educational attainment and employment increased across the entire population and particularly among women (Perez and Livi-Bacci, 1992). Access to national media increased, as radio, television, and film become accessible to the majority of the population. Perhaps most importantly, the internal and international migration encouraged by the end of the war and then the economic boom meant that fertility expectations were more likely to be influenced by factors other than local ones. Enormous South to North migration had several implications (for more details on post-war migration in Italy see Bonifazi and Heins, 2000). First, higher-fertility southerners were exposed to different attitudes in the North that would have exposed them to different possible fertility behaviors. In cases where entire families had moved North, their higher fertility likely contributed to the early onset of the Italian baby boom, which was much more pronounced in the North than in the South. Finally, in those cases where migration North had necessitated the separation of spouses, subsequent fertility in the South would have been depressed, at least temporarily.

Nonetheless, it is important to recall that the increased uniformity was accompanied by persistent geographic patterns of fertility, although lower over time, with higher rates in the South and Northeast and lower rates in the North and Center of the country. That this geography has remained constant since at least the 1930s (see Figure 5) suggests that there is still a strong regional component to fertility rates even though the overall diversity across the country has declined notably. For example, Perez and Livi-Bacci (1992) note that the gap in TFRs between the highest fertility and lowest fertility regions declined from 1.1 in 1975 to .7 in 1990. However, the highest fertility regions remained in the South and the lowest in the North.

Conclusions

The unifying forces of government during the years 1871 to 1961 had less of an effect on regional fertility than did region-specific forces such as emigration, industrialization, and geography. All three of these factors had a disproportionate effect on southern regions by preventing fertility decline taking place earlier. They also contributed to the development of the spatial patterns of fertility still evident across Italian regions today. Since World War II, increased regional uniformity in fertility rates suggests that national unity has prevailed over regional-level factors. Local factors likely continue to play a role in regional fertility levels, however national norms now also have a role to play.

Political unification, which brought together the regions of the peninsula of Italy, might have been thought to have created a nation of uniform values and behaviors. This could have occurred through governmental actions or through the development of national-scale activities, such as newspapers or railroads. The highly centralized fascist government of the 1920s and 1930s, too, might have been expected to succeed in creating a sense of national unity where the previous government had failed. However, what is seen in the several decades after unification is an actual increase in regional differentiation in terms of fertility levels and acceptance of new behaviors that led to the fertility decline. Fertility levels actually diverged rather than converged from 1871 through the post-war years. Although overall fertility and marital fertility both declined for all regions during this period, the decline started much later in southern and northeastern regions, and did not reach the same low levels as in the rest of the country. Since the 1950s, regional differences in fertility levels have declined, so that homogenization has indeed taken place after a long period of increased diversity in fertility. National unity, measured in terms of regional uniformity of fertility, appears to have increased. However, the persistence of regional fertility geography, higher in the South and lower elsewhere, is indicative of entrenched regional differences that have yet to disappear.

References

Agnew, John. 2000. "Italy's Island Other: Sicily's History in the Modern Italian Body Politic," *Emergences*, 10, 301-311.

A'Hearn, Brian. 1998. "Institutions, Externalities, and Economic Growth in Southern Italy: Evidence from the Cotton Textile Industry, 1861-1914," *Economic History Review*, 51, 734-762.

Barbagallo, Francesco. 2001. "Italy: The Idea and the Reality of the Nation," *Journal of Modern Italian Studies*, 6, 388-401.

Barbagli, Marzio and David Kertzer. 1990. "An Introduction to the History of Italian Family Life," *Journal of Family History*, 15, 369-383.

Barro, Robert J. and Xavier Sala-i-Martin. 1992. "Convergence," *The Journal of Political Economy*, 100, 223-251.

Bonifazi, Corrado and Frank Heins. 2000. "*Long-term Trends of Internal Migration in Italy*," International Journal of Population Geography, 6, 111-131.

Bosworth, Richard J.B. 1996. *Italy and the Wider World*. London: Routledge.

Castiglioni, Maria and Gianpiero Dalla Zuanna. 1994. "Innovation and Tradition: Reproductive and Marital Behaviour in Italy in the 1970s and 1980s," *European Journal of Population*, 10, 107-141.

Coale, Ansley J. and Susan Cotts Watkins, eds. 1986. *The Decline of Fertility in Europe: The Revised Proceedings of a Conference on the Princeton European Fertility Project*. Princeton: Princeton University Press.

Dalla Zuanna, Gianpiero. 1999. "The Banquet of Aeolus. An Interpretation of the Italian Lowest Fertility," 2nd Workshop on Lowest Fertility, Max Plank Institute, Rostock, Germany, 1999.

Franklin, Rachel. 2002. "Fertility Convergence Across Italy's Regions, 1952-1995," Paper presented at the *41st Annual Meeting, Western Regional Science Association, Monterey, CA, February 2002.*

Franklin, Rachel and David A. Plane. 2004. "A Shift-Share Method for the Analysis of Regional Fertility Change: An Application to the Decline in Childbearing in Italy, 1952-1991," *Geographical Analysis*, 36, 1-20.

Ipsen, Carl. 1996. *Dictating Demography: The Problem of Population in Fascist Italy.* Cambridge: Cambridge University Press.

King, Russell. 1987. *Italy*. Harper & Row Ltd., London, England.

Livi-Bacci, Massimo. 1977. *A History of Italian Fertility During the Last Two Centuries.* Princeton University Press, Princeton, New Jersey.

Livi-Bacci, Massimo and Marco Breschi. 1990. "Italian Fertility: An Historical Account," *Journal of Family History*, 15, 385-408.

Perez, Margarita Delga and Massimo Livi-Bacci. 1992. "Fertility in Italy and Spain: The Lowest in the World," *Family Planning Perspectives*, 24, 162-171.

Rettaroli, Rosella. 1990. "Age at Marriage in Nineteenth-Century Italy," *Journal of Family History*, 15, 409-425.

Sala-i-Martin, Xavier X. 1996. "Regional Cohesion: Evidence and Theories of Regional Growth and Convergence," *European Economic Review*, 40, 1325-1352.

Sundquist, James L. 1975. *Dispersing Population: What America Can Learn from Europe*. Washington, D.C.: The Brookings Institution.

Terra Abrami, Valerio and Maria Pia Sorvillo. 1993. La Fécondité en Italie et dans Ses Régions: Analyse par Période at par Génération. *Population*, 48, 735-752.

Watkins, Susan Cotts. 1990. "From Local to National Communities: The Transformation of Demographic Regimes in Western Europe, 1870-1960," *Population and Development Review*, 16, 241-272.

Watkins, Susan Cotts. 1991. *From Provinces into Nations: Demographic Integration in Western Europe, 1870-1960*. Princeton: Princeton University Press.

Tables

Table 1: Overall Regional Fertility, 1864 to 1961

	1864	1871	1881	1891	1901	1911	1921	1931	1936	1951	1961
North											
Emilia-Romagna	0.40	0.38	0.37	0.38	0.38	0.39	0.30	0.22	0.19	0.14	0.15
Liguria	0.38	0.37	0.34	0.31	0.29	0.25	0.18	0.15	0.13	0.11	0.14
Lombardia	0.40	0.39	0.38	0.38	0.38	0.34	0.26	0.21	0.20	0.16	0.17
Piemonte	0.38	0.37	0.37	0.34	0.32	0.25	0.18	0.16	0.15	0.12	0.15
Trentino-Alto Adige							0.29	0.23	0.22	0.21	0.22
Veneto*		0.41	0.38	0.40	0.42	0.40	0.35	0.27	0.25	0.19	0.20
Venezia Giulia							0.27	0.20	0.19	0.11	0.13
Center											
Lazio*		0.39	0.35	0.34	0.33	0.33	0.28	0.26	0.23	0.18	0.19
Marche	0.38	0.35	0.37	0.37	0.37	0.38	0.32	0.26	0.24	0.17	0.17
Toscana	0.43	0.41	0.37	0.36	0.35	0.31	0.26	0.19	0.17	0.14	0.15
Umbria	0.37	0.36	0.36	0.36	0.36	0.32	0.33	0.27	0.24	0.16	0.16
South											
Abruzzi/Molise**	0.39	0.39	0.39	0.39	0.38	0.35	0.37	0.32	0.30	0.21	0.19
Basilicata	0.42	0.40	0.43	0.42	0.40	0.42	0.42	0.39	0.37	0.28	0.27
Calabria	0.38	0.39	0.37	0.37	0.37	0.37	0.39	0.35	0.33	0.28	0.28
Campania	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.31	0.25	0.27
Puglia	0.43	0.42	0.44	0.43	0.42	0.41	0.41	0.36	0.34	0.27	0.26
Sardegna	0.38	0.39	0.39	0.37	0.35	0.35	0.34	0.32	0.31	0.29	0.27
Sicilia	0.44	0.42	0.42	0.40	0.38	0.36	0.34	0.30	0.28	0.24	0.25
Mean	0.40	0.39	0.38	0.37	0.37	0.35	0.31	0.27	0.25	0.19	0.20
Standard Deviation	0.02	0.02	0.03	0.03	0.03	0.05	0.07	0.07	0.07	0.06	0.05

Data Source: Livi-Bacci, 1977.
* Percent change for Lazio and Veneto is computed for a base year of 1871.
**Abruzzi and Molise were one region for the entire period.

Table 2: Regional Marital Fertility, 1864 to 1961

	1864	**1871**	**1881**	**1891**	**1901**	**1911**	**1921**	**1931**	**1936**	**1951**	**1961**
North											
Emilia-Romagna	0.65	0.63	0.66	0.67	0.67	0.65	0.54	0.39	0.35	0.24	0.24
Liguria	0.70	0.65	0.64	0.60	0.57	0.49	0.37	0.40	0.27	0.23	0.22
Lombardia	0.67	0.66	0.65	0.68	0.69	0.64	0.53	0.42	0.38	0.29	0.29
Piemonte	0.66	0.64	0.66	0.63	0.61	0.49	0.38	0.30	0.27	0.23	0.23
Trentino-Alto Adige							0.70	0.54	0.49	0.43	0.42
Veneto*		0.69	0.68	0.71	0.76	0.81	0.71	0.57	0.53	0.36	0.35
Venezia Giulia							0.52	0.38	0.35	0.23	0.22
Center											
Lazio*		0.59	0.61	0.59	0.54	0.56	0.52	0.47	0.44	0.36	0.36
Marche	0.71	0.71	0.76	0.73	0.69	0.70	0.62	0.49	0.46	0.30	0.28
Toscana	0.74	0.69	0.68	0.65	0.61	0.57	0.48	0.35	0.32	0.24	0.24
Umbria	0.63	0.64	0.69	0.66	0.60	0.64	0.56	0.44	0.40	0.26	0.24
South											
Abruzzi/Molise**	0.71	0.68	0.70	0.70	0.70	0.72	0.74	0.62	0.57	0.36	0.35
Basilicata	0.69	0.66	0.68	0.68	0.68	0.72	0.75	0.65	0.63	0.47	0.46
Calabria	0.65	0.65	0.63	0.65	0.67	0.73	0.77	0.67	0.65	0.52	0.52
Campania	0.69	0.67	0.68	0.68	0.68	0.72	0.80	0.67	0.63	0.51	0.51
Puglia	0.74	0.70	0.72	0.70	0.68	0.72	0.74	0.65	0.63	0.50	0.49
Sardegna	0.64	0.63	0.65	0.65	0.65	0.67	0.71	0.66	0.63	0.59	0.55
Sicilia	0.71	0.70	0.68	0.65	0.62	0.62	0.62	0.54	0.51	0.43	0.42
Mean	0.68	0.66	0.67	0.66	0.65	0.65	0.61	0.51	0.47	0.36	0.35
Standard Deviation	0.04	0.03	0.04	0.04	0.06	0.09	0.13	0.13	0.13	0.12	0.12

Data Source: Livi-Bacci, 1977.
*Percent change for Lazio and Veneto is computed for a base year of 1871.
**Abruzzi and Molise were one region for the entire period.

Table 3: Regional Proportion Married, 1864 to 1961

	1864	1871	1881	1891	1901	1911	1921	1931	1936	1951	1961
North											
Emilia-Romagna	0.60	0.58	0.53	0.53	0.53	0.54	0.49	0.51	0.52	0.56	0.62
Liguria	0.55	0.56	0.52	0.51	0.50	0.49	0.46	0.47	0.48	0.54	0.59
Lombardia	0.56	0.57	0.56	0.55	0.55	0.54	0.48	0.50	0.50	0.53	0.58
Piemonte	0.56	0.57	0.56	0.54	0.52	0.51	0.48	0.51	0.54	0.57	0.62
Trentino-Alto Adige							0.39	0.40	0.41	0.45	0.51
Veneto*		0.59	0.55	0.54	0.53	0.51	0.46	0.47	0.48	0.52	0.57
Venezia Giulia							0.42	0.47	0.51	0.54	0.59
Center											
Lazio*		0.58	0.50	0.50	0.50	0.51	0.51	0.52	0.52	0.54	0.52
Marche	0.54	0.50	0.48	0.51	0.54	0.54	0.51	0.53	0.54	0.57	0.62
Toscana	0.55	0.56	0.53	0.53	0.54	0.54	0.52	0.54	0.55	0.57	0.62
Umbria	0.55	0.53	0.49	0.51	0.53	0.48	0.55	0.57	0.58	0.61	0.65
South											
Abruzzi/Molise**	0.57	0.58	0.58	0.59	0.60	0.57	0.54	0.56	0.57	0.55	0.61
Basilicata	0.58	0.61	0.63	0.64	0.64	0.63	0.57	0.60	0.61	0.51	0.62
Calabria	0.55	0.57	0.56	0.58	0.60	0.58	0.53	0.55	0.55	0.54	0.59
Campania	0.54	0.56	0.55	0.55	0.55	0.52	0.48	0.50	0.49	0.49	0.54
Puglia	0.55	0.58	0.59	0.59	0.60	0.56	0.54	0.54	0.53	0.53	0.55
Sardegna	0.57	0.57	0.54	0.52	0.50	0.49	0.47	0.47	0.47	0.48	0.44
Sicilia	0.59	0.56	0.57	0.57	0.58	0.57	0.53	0.55	0.55	0.56	0.59
Mean	0.56	0.57	0.55	0.55	0.55	0.54	0.50	0.52	0.52	0.54	0.58
Standard Deviation	0.02	0.02	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.04	0.05

Data Source: *Livi-Bacci, 1977.*

*Percent change for Lazio and Veneto is computed for a base year of 1871.

**Abruzzi and Molise were one region for the entire period.

Table 4: Midspread Ratio for Overall Fertility, 1871 to 1995

1871-1995	0.78
1871-1881	0.65
1881-1891	1.69
1891-1901	0.96
1901-1911	1.82
1911-1921	1.57
1921-1931	1.19
1931-1952	1.07
1952-1961	0.83
1961-1971	0.67
1971-1981	0.83
1981-1995	0.43

FIGURES

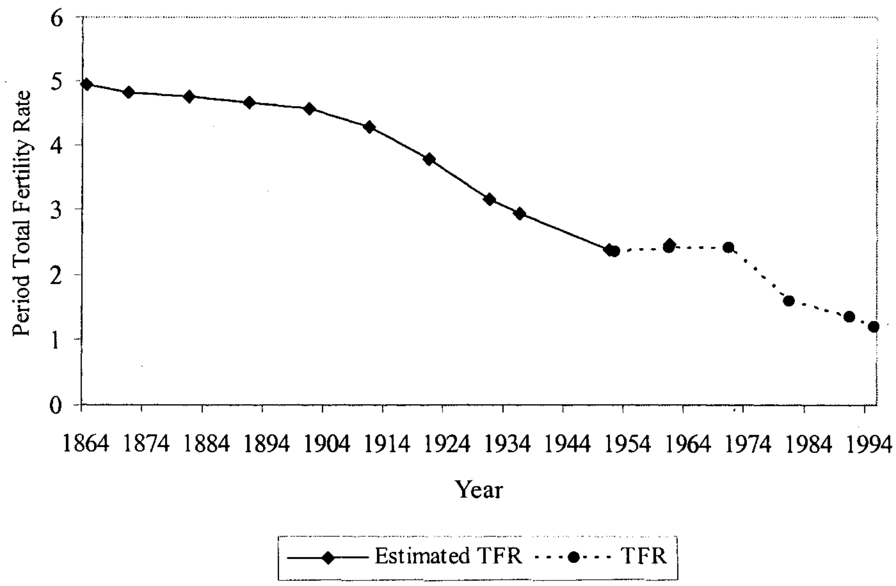


Figure 1: Historical and Contemporary Fertility Trends, 1864 to 1995

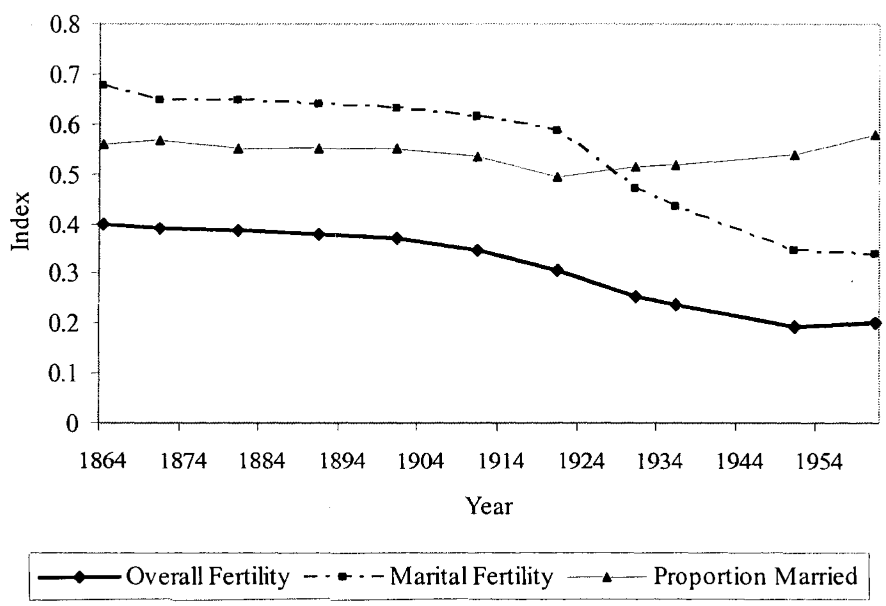
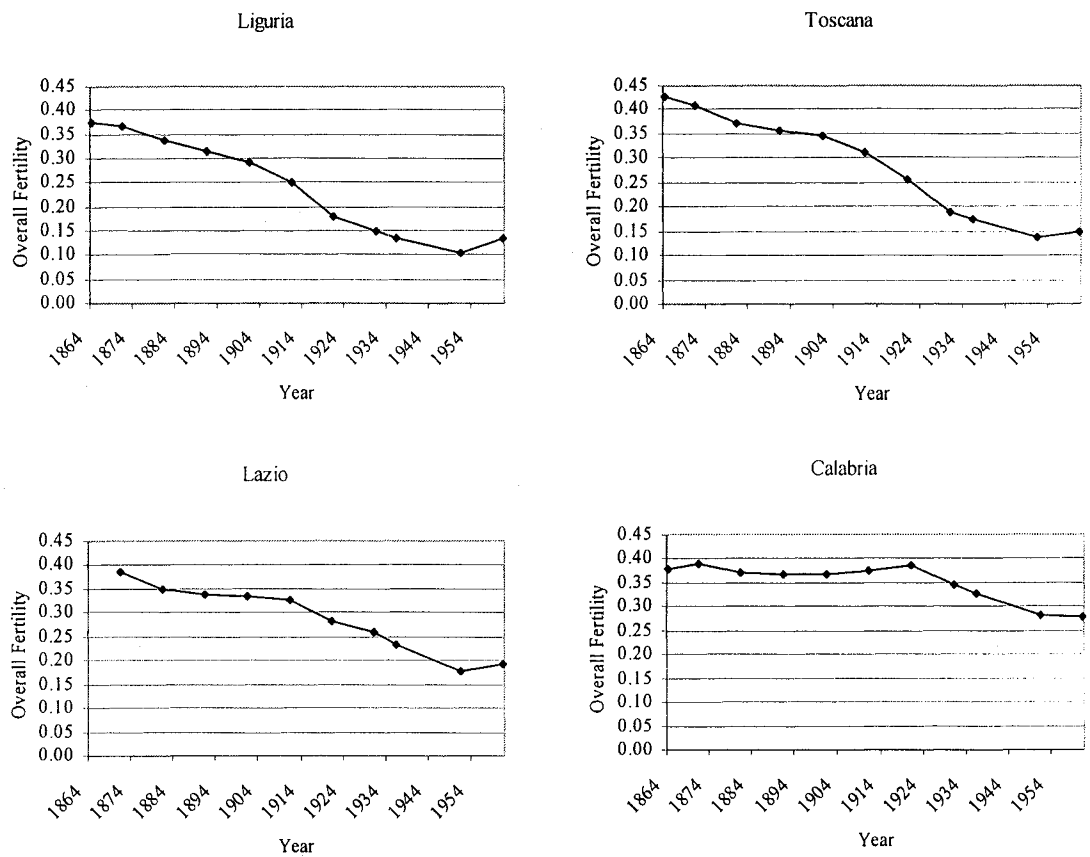


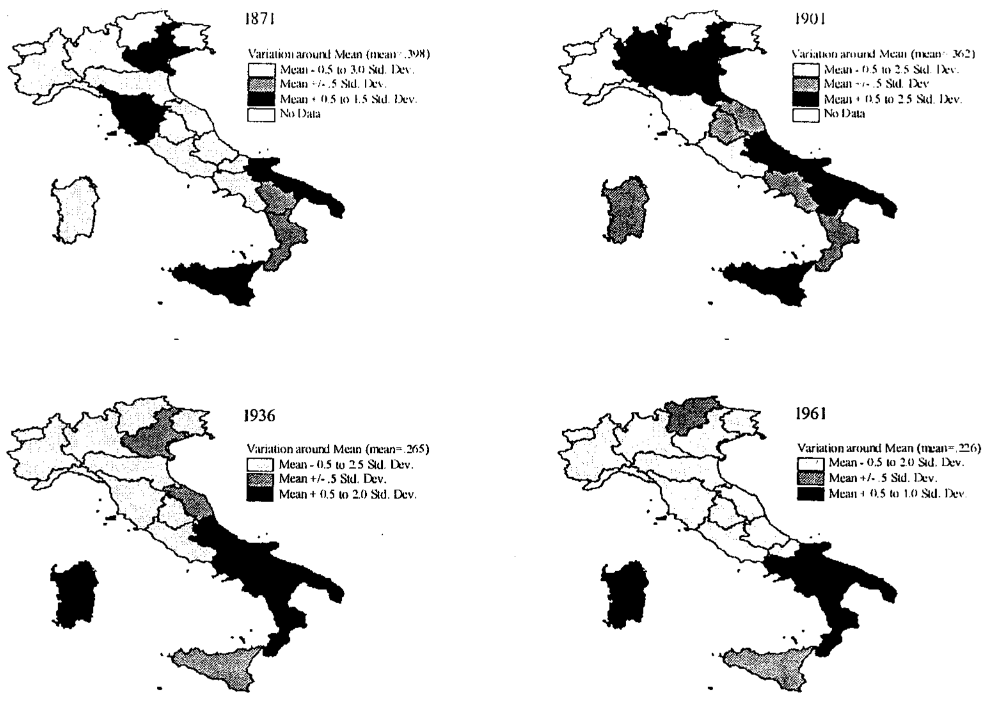
Figure 2: Historical Fertility Measures for Italy, 1864 to 1961

Figure 3: Italy's Regions



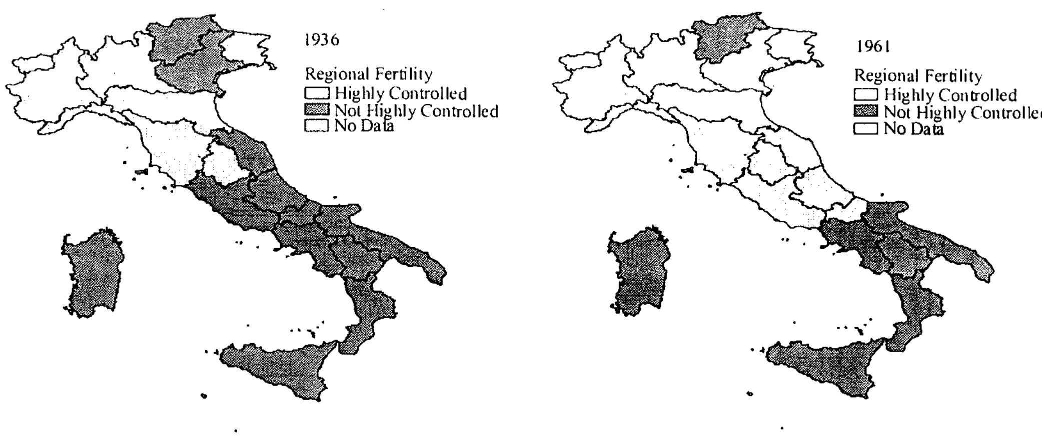
Data Source: Livi-Bacci, 1977.

Figure 4: Fertility Trajectories for Overall Fertility for Selected Regions, 1864 to 1961



Data Source: Livi-Bacci, 1977.

Figure 5: Italian Overall Fertility for Selected Years, 1871 to 1961



Data Source: Author's calculation, based on Livi-Bacci, 1977.

Figure 6: Regions with "Highly Controlled Fertility", 1936 and 1961

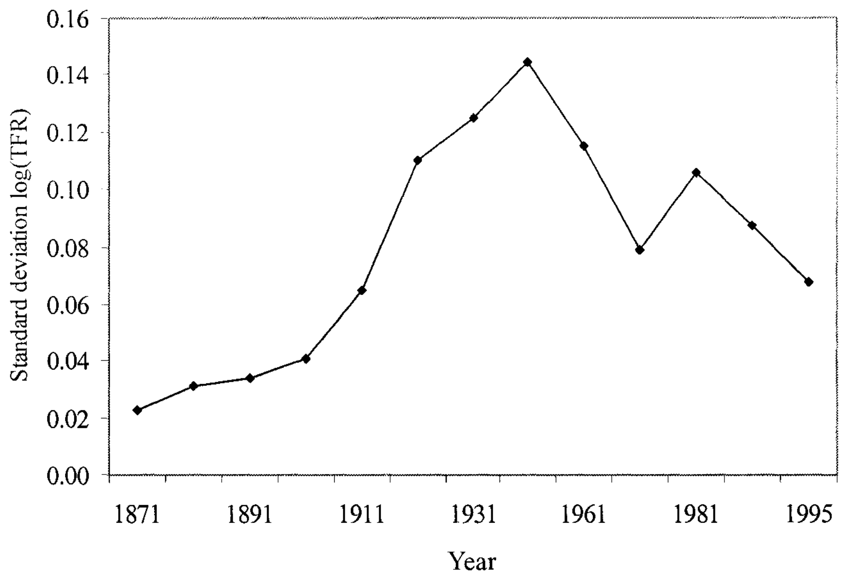


Figure 7: Dispersion of Regional Total Fertility, 1871 to 1995

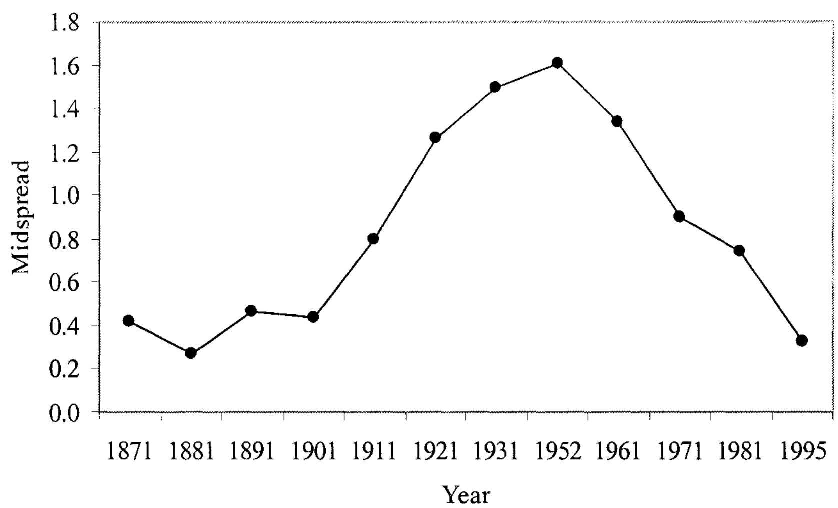
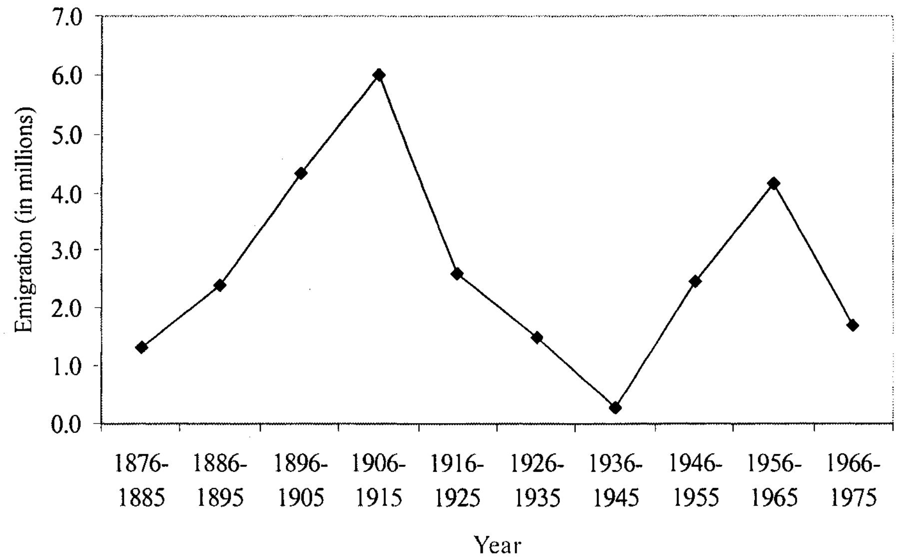
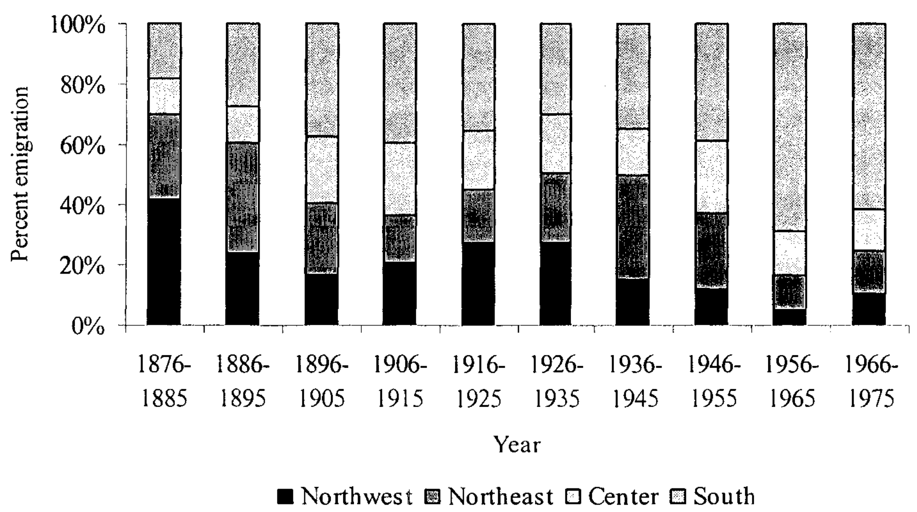


Figure 8: Midspread of Regional Total Fertility, 1871 to 1995



Data Source: Adapted from G. Rosoli in Bosworth, 1996.

Figure 9: Emigration from Italy, 1876 to 1975



Data Source: Adapted from G. Rosoli in Bosworth, 1996.

Figure 10: Emigration from Italy by Area, 1876 to 1975