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"Building nests to attract birds": China's hi-tech zones and their impacts on transition from low-skill to high-value added process

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Abstract

The special economic zones (SEZs) and open areas in China have led its opening up, making China the largest foreign investment destination since 2002. Global capital and multinational corporations (MNCs) have found their homes in China, especially along the coastal region where the open cities and special economic zones are located. However, there is limited transfer of technology from MNCs home countries and 'made-in-China' products are mainly labour-intense. The introduction of hi-tech zones in many Chinese cities represents an attempt to overcome these obstacles and to draw on both technology transfer and indigenous technology development in a more effective way. Using Shenzhen city as an example, this paper discuss the following three issues: 1) How has a Chinese FDI host city attracted hi-tech firms in its hi-tech zones? 2) Why was it possible for Shenzhen to select FDI it wants and discourage or even ban sanlai yibu within its SEZ? 3) What are the spatial patterns of these hi-tech firms. This paper concludes that Shenzhen has managed to create a strategy to maximise its ability to benefit from economic globalisation. The case study demonstrates an importance of a strong city state of managing growth and reacting decisively to economic globalisation.

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1. Introduction

Acquiring technology from abroad has been advocated as a means by which many developing countries may increase their technological capacity. Foreign direct investment (FDI) and collaboration between enterprises are the major channels for technology transfer (Hoffman and Oldham, 1991). But it has always been difficult to transfer technology and know-how from FDI home countries to host countries, especially from developed to developing countries (Archibugi and Milana, 1998; Archibugi and Michie, 1998). East Asian newly industrialised economies (NIEs) including Japan, South Korea did exceptionally well in developing the ability to absorb and use acquired technology and know-how from developed countries (Wade, 1990). Learning from its neighbours, China's open door policy started from the late 1970s was also based on the assumption that FDI is essential for the transfer of technology regarding best practice into the Chinese economy (Hayter and Han 1998). After 20 years of opening up, China has been very successful in attracting FDI, which has sped up rates of economic growth. For example, in 2002, China surpassed USA, becoming the world's largest FDI destination. FDI has increased China's export, making "Made in China" the most common label for affordable goods in almost every corner of the world. However, technology transfer through FDI into advanced technology sectors is still limited and FDI has played a limited role in China's technology development. Much of the foreign investment in China is still in relatively low technology and labour-intensive manufacturing, taking advantage of low labour costs and the accommodating policy regime in coast region, especially the Special Economic Zones (SEZs) (Bennett et al, 2001; Thoburn and Howell, 1995). In addition, with much foreign investment involving assembly work of components supplied from outside, opportunities for local suppliers to upgrade their capabilities and grow their businesses were also limited.

In response, since the early 1990s, the Chinese government has set new policies and regulations encouraging FDI in hi-tech sectors. This change is part of the government's attempt to redirect growth from basic processing industries (e.g. textile, clothing, shoes

and toys, where there are already signs of adequate or excess capacity) in favour of hi-tech sectors (Wang and Wang, 2002). The important element of its hi-tech industrial development strategy is the establishment of high-tech zones in many cities (Gu and Zhao, 1998). The hi-tech zones are expected to attract foreign hi-tech firms and speed up China's technology development. Have these zones attracted foreign hi-tech firms? Most researchs emphasise selection of assessment criteria and descriptive discussion about major problems of China's hi-tech zone or China's hi-tech development policy (see Xia, 2001; Gu and Zhao, 1998; Yu, 1999; Gu, 1998). Not much research attention has been directed to what makes some hi-tech zones successful. This paper will discuss why the hi-tech zones were developed, what contributes to a successful hi-tech zone, and what the problems are. The first section of this paper discusses China's zone-oriented approach for its opening up and technology acquirement. The second section uses Shenzhen as a case study to examine how Shenzhen has attracted hi-tech firms in its hi-tech zone, why it was possible for Shenzhen to select FDI it would like and discourage or even ban labour intensive FDI within its SEZ. This paper concludes that the development of hi-tech zones in China has the potential to increase economic growth. But more has to be done if China wants its hi-tech zones to narrow the technology gap between itself and developed countries. The case study demonstrates importance of a strong city-state in restructuring its economy, managing its hi-tech zone, and reacting decisively to economic globalisation.

2. Zone-Oriented Approach

It is not exaggerated to say that it was due to the various types of specifically designated zones which led China's transition from planned to market economy. According to their physical size, at least 4 groups of zones have been designated by the Chinese government; each with different emphasises:

1) Coast region was defined in the early 1980s as China's largest open region. The central government gave development priority to this region and allowed it to 'get rich first' while the central and western regions have been left behind. Such coast-led development strategy has brought China wealth, industrial power, and FDI;

2) Five coast economic open zones along the coast including Lower Yangtze Delta, Pearl River delta, Beijing-Tianjin-Tangshan region, Southern Fujian, and Liaodong Peninsula: These sub-regions have also been given development priority (Wang et al, 2002a);

3) Five SEZs, fourteen coast open cities and Shanghai's Pudong New Zone: These have been defined as development centres and have been given permission to practice market economy and granted autonomy to set up rules and regulations based on local interest. They have become China's engine of growth (Zhu et al, 2002); and

4) Over 4210 development/technological zones/areas (Xia 2001): They have been established by local governments in many places to attract FDI. Fifty-three hi-tech zones established by the central government are included in this category. Their sizes range from two to dozens of square kilometres (Gu and Zhao, 1998).

It has been widely discussed about how these different zones have impacted China's opening up and how foreign investment has impacted China's modernisation. In fact these zones have been the leaders for China's gradual integration with global economy (Gu and Zhao 1998). They have been used as experimental sites for practicing market economy in a socialist China. In other words, these zones are part of the Chinese version of reform - gradualism: all important reform packages were implemented nationally after being tested successfully in the zones (Wang et al 2002b). Such zone-oriented reform approach reflects the importance of the role of the government. China's gradual integration into global economy has been in large degree, facilitated and managed by its central government. For example, the central government has attempted to direct FDI where it wants and its coastal region has become FDI's main destination (Wang, 2003). However, such zone-oriented approach, especially its 'let coast get rich first' strategy, has failed to trickle down effect to inland China, leading to increasing economic polarisation among the regions (Wang et al, 2002a). The recent western development policy is an attempt to fix such problems, but the west has a long way to go to catch up to the coast.

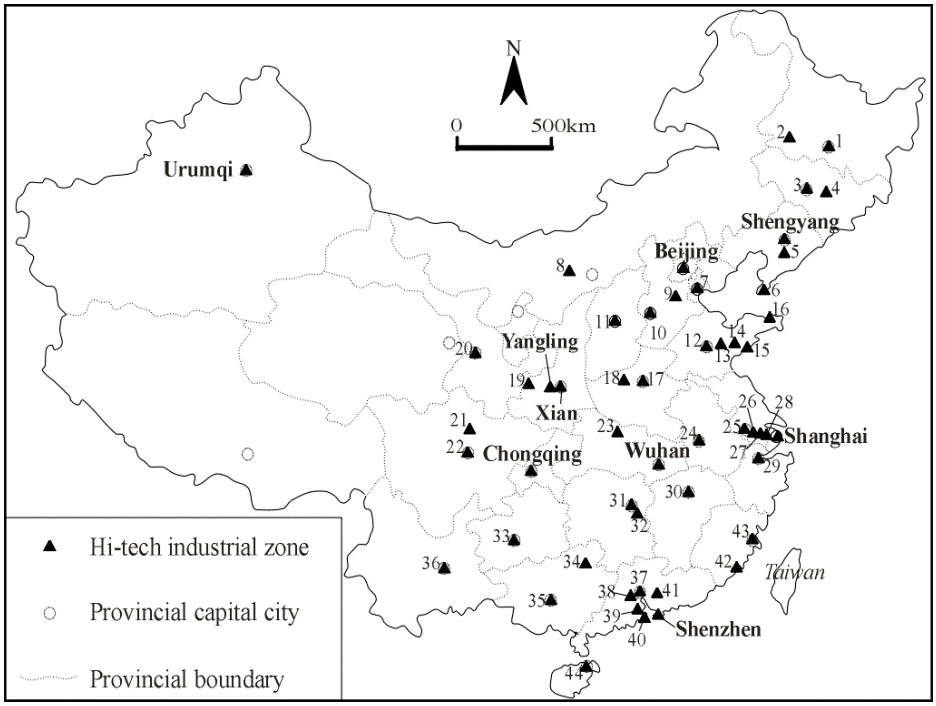
These zones have attracted a large amount of FDI. Overall impacts of FDI in China have been viewed positively as well. FDI has contributed to economic development of China through the expansion of capital formation, employment, output, and foreign trade.

However, like many other FDI host countries, China is also concerned about limited technology spillover from multinationals (Bennett et al, 2000, 2001; Leung et al, 1991). Only few believe that FDI played an important role in increasing technology development in China (Yu, 1999; Hayter and Han 1998), and technologies have been transferred from foreign firms to China both directly from foreign firms to their subsidiaries in China and indirectly from their subsidiaries to Chinese local firms, indicating the presence of technology spill-over (Yu, 1999; Hayter and Hand 1998). Most research argues that such spillover is limited and the extent to which FDI has facilitated technology development has been limited (Bennett et al, 2001). Wallcott (2002) argues that technology transfer from foreign to native companies has fallen short of the pace and the quality anticipated. The reasons for foreign companies investing in China are mainly related to access to the Chinese market and its cheap labour and raw materials, as well as the globalisation strategies of large companies (Bennett et al, 1997; Zhu et al, 1995). For foreign companies, technology transfer raises the risk of losing their technology-based competitive advantage to potential competitor firms, so they attempt to protect their existing technological knowledge and technology 'leakage' (Bennett et al, 2000). In addition, while some foreign companies are setting up R&D facilities in China, this is often done to tailor products to the Chinese market rather than to invent new products (Wallcott, 2002). Therefore, China's "market for technology" strategy has not been very successful. In other words, it has not received a satisfactory result to use China's huge potential market to attract joint venture so that this can transfer technology to the Chinese side.

To facilitate technology transfer, the central government set up 53 hi-tech zones in different cities in the 1990s (Figure 1). These specially designated zones were expected to play a role in encouraging more FDI in advanced technology areas by providing an attractive environment for foreign hi-tech enterprises (Baark, 2001). The zones have been located in areas where there is a concentration of universities and research institutes and therefore, a large number of qualified personnel to work in hi-tech enterprises (Niu 1995). For example, the Xian Hi-Tech Zone is located in a city with 34 universities and 500 research institutes and has over 300,000 undergraduates and 20,000 graduates (Author's

field trip in July, 2002). Similarly, the Zhongguancun Hi-Tech Zone is located in Beijing's Haidian district with more than eight universities (including the well-known Peking University and Qinghua University) and twenty-four research institutes affiliated with the Chinese Academy of Sciences (Wang, 2001). The government invested heavily in these zones to provide infrastructure both for industrial use and to create a comfortable living environment for foreign personnel (Zhang and Gao, 1997); China Economic Review, 1998, 28(3): 31). According to Xian Hi-Tech Industrial Development Zone's information booklet, the zones also offer streamlined administrative procedures and the Administrative Committee of the Zones have the same powers as the municipal government.

Figure 1: Distribution of China's 53 Hi-tech Zones set up by the Central Government



Notes: 1-Harbin; 2-Daqing; 3-Changchun; 4-Jilin; 5-Anshan; 6-Dalian; 7-Tianjin; 8-Baotou; 9-Baoding; 10-Shijiazhuang; 11-Taiyuan; 12-Jinan; 13-Weifang; 14-Zibo; 15-Qingdao; 16-Weihai; 17-Zhengzhou; 18-Luoyang; 19-Baoji; 20-Lanzhou; 21-Mianyang; 22-Chengdu; 23-Xiangfan; 24-Hefei; 25-Nanjing; 26-Changzhou; 27-Wuxi; 28-Suzhou; 29-Hangzhou; 30-Nanchang; 31-Changsha; 32-Zhuzhou; 33-Guiyang; 34-Guilin; 35-

Nanning; 36-Kunming; 37-Guangzhou; 38-Fushan; 39-Zhongshan; 40-Zhuhai; 41-Huizhou; 42-Xiamen; 43-Fuzhou; 44-Haikou

Associated with the establishment of hi-tech zones, the Chinese government has also adopted two interlocking approaches to encourage development of hi-tech industry in these zones. On the one hand, China has focused to develop technologies in specific industries (Gu, 1998). For example, in 1995, China issued new guidelines and the FDI in high technology sectors of chemical fibre, micro-electronics, precision machinery, civilian aircraft, biotechnology and energy development was encouraged. In 1998, the State Planning Commission further listed 18 separate industries – mostly high-tech sectors - where China wished to promote further foreign investment, including high-technology industries, new technologies, transport and telecommunications equipment, electric power generation, aviation, oil and petrochemicals, machinery, electronics, pharmaceuticals, medical equipment, textiles, metals and metallurgy, light industry, the service sector, and agriculture. These sectors were granted a restoration of duty free status on capital equipment imports. The State Planning Commission also reaffirmed broad limits to foreign ownership in businesses in areas considered to be key sectors of the economy - such as nuclear power plants, satellites and civilian aircraft (The Financial Times, 1998). On the other hand, domestic hi-tech firms are also granted similar privileges as their foreign counterparts if they locate in these hi-tech zones. This is China's first major open door policy; treating its domestic firms without discriminatory policies in its specially designated zones.

Have these zones attracted hi-tech firms? Do they facilitate technology transfer? The overall assessment is negative. According to Xia's (2001) comprehensive assessment, only four hi-tech zones are in good performance category and 77 percent of hi-tech zones performed poorly or very poorly (see Table 1). Hi-tech zones performance would be worse if assessment includes these 4210 development zones (many of them are hi-tech zones), established by provincial, municipal, county and even township governments. One of the big problems Chinese hi-tech zones are facing is a failure in attracting foreign hi-tech firms and overseas hi-tech personnel into these zones. According to Xia's (2001)

internationalisation criteria (proportion of foreign hi-tech firms in total hi-tech firms; number of returnees of Chinese graduates after graduation from overseas universities; export value of technology-intensive products; member of APEC science and technology parks), 48 out of 53 hi-tech zones were assessed either poorly or very performed poorly (See Table 2).

Table 1: China's Hi-tech Zones: Comprehensive Assessment Results (1999)

Category	Zone	%
Good	Beijing, Shanghai, Shenzhen, Guangzhou	8
Fair	Nanjing, Wuhan, Shijiazhuang, Xian, Chengdu, Qingdao, Suzhou, Tianjin	15
Poor	Wuxi, Anshan, Changsha, Zhengzhou, Fushan, Shenyang, Hangzhou, Huizhou, Jinan, Guiyang, Lanzhou, Zhongshan, Zhuhai	24
Very Poor	Xiangfan, Weihai, Haikou, Fuzhou, Nanjing, Taiyuan, Harbin, Chongqing, Xiamen, Jilin, Hefei, Weifang, Changchun, Daqing, Mianyang, Nanchang, Dalian, Kunming, Zibo, Zhuzhou, Urumqi, Baoji, Guiling, Yangling, Luoyang, Baoding, Baotou	53

Notes: The assessment criteria include 23 indexes which are divided into four categories: hi-tech zone's innovation capacity, degree of internationalisation, locational advantages, and economic performance.

Source: Xia (2001)

Table 2.:Internationalisation of China's Hi-tech Zones: Assessment result (1999)

Category	Zone (Assessment Value)
Excellent (0.76-1.0)	Shenzhen (0.8245)
Good (0.51-0.75)	Suzhou (0.5566), Shanghai (0.5074)
Fair (0.26-0.5)	Beijing (0.3516), Wuxi (0.2848)
Poor (0.005-0.25)	Zhongshan, Huizhou, Hefei, Xian, Tianjin, Xiamen, Zhuhai, Qingdao, Nanjing, Fushan, Fuzhou, Weihai, Dalian, Changzhou, Baoding, Haikou, Changsha, Shijiazhuang, Harbin, Zhengzhou, Zibo, Daqing, Hangzhou, Guiling, Guangzhou, Chongqing, Shenyang, Wuhan, Weifan
Very Poor <0.005	Nanchang, Changchun, Jinan, Mianyang, Kuming, Zhuzhou, Chengdu, Urumqi, Nanding, Guiyang, Luoyang, Baotou, Baoji, Jilin; Xiangfan, Taiyuan, Anshan, Lanzhou, Yangling

Source: Xia (2001)

In addition, not all foreign hi-tech firms in the zones appear to be engaged in hi-tech areas (Wang, Wu, Li 1998). Not all companies in the zones are substantially involved in technological innovation and the development of new products. A significant number of firms spent a very low proportion of their income on R&D and had less than 30 percent of their employees with the post-secondary education (Wang and Wang 1998). Even among the better-performed hi-tech zones, the Beijing Zhongguancun hi-tech zone primarily serves as a distribution, processing, and trading centre for foreign information technology companies. The hi-tech companies play the role of importer or product transferrer for foreign companies whose technology they license (Cao, 2001). In Xian Hi-Tech Zone, we found a detergent factory joint venture between a Chinese and Japanese company (Author's field trip, July 2002). It has been labelled as a hi-tech firm not because it was involved in hi-tech, but because it was using technology which was new in China.

There are a number of factors constraining both the presence of multinational hi-tech firms in China's hi-tech zones and the degree of technology transfer occurring. There are inherent limits on the degree of technology transfer from FDI home countries to host countries, especially from developed to developing countries (Hayter and Han, 1998). In a study of European companies operating in China, Bennett et al (2001) found that the companies were "well aware of the risks of loss technologies and misappropriation" and that, in response, three quarters of the European firms had not transferred R&D to their operations in China and more than half had no plans to do so. The majority of companies in Bennett et al's study retained key parts of their technology, thereby making it difficult to replicate. In addition, MNCs set up their companies' structure to facilitate control over technology. By breaking up operation into a global network of branch plants, the firm's technology and know-how is dispersed. Branch plants have access to only a segment of this know-how, making it difficult for the technology of foreign multinationals to be diffused into the local economy (Hayter and Han, 1998).

Besides, China is facing some unique constraints. Firstly, failure to meet international standards in quality control may present difficulties for foreign hi-tech enterprises attempting to source supplies and other functions domestically. Wallcott (2002) cites a good example of a global life science company – Becton Dickinson. The company was required to import all its raw materials, due to the failure of local suppliers to meet international standards, and then to send products back to the US for testing as the majority of Chinese labs did not meet industry standards (Wallcott 2002). Secondly, the weak enforcement of intellectual property rights may also deter foreign companies from locating more advanced technology enterprises in the zones. According to Bennet's survey, "there is a wide concern about the lack of intellectual property rights protection in China and this undoubtedly plays an important part in management thinking when it comes to decisions about technology transfer and locating R&D" (Bennet et al, 2001: 169). Thirdly, there is a lack of people with the management experience to run a hi-tech firm (Cao, 2001). This problem is compounded by the 'brain drain' of top personnel, who tend to prefer multinational firms other than local firms, as the salary is higher and research conditions are better (Wang and Wang, 1998). Fortunately, in the recent years,

many who had been trained in foreign universities have returned to China. There is a trend of 'reverse brain drain'. But these returnees prefer Shanghai, Shenzhen and Beijing. Many other hi-tech zones still lack highly-trained hi-tech personnel.

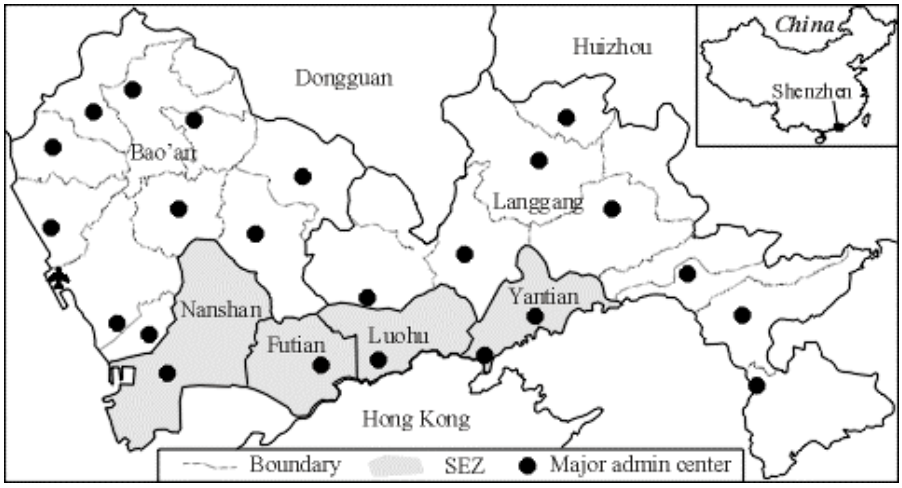
3. How Has Shenzhen Attracted Hi-Tech Firms?

From Tables 1 and 2, we can see only few hi-tech zones have had some success in attracting foreign hi-tech investment. The best-performed are the hi-tech zones in Beijing, Shanghai, Shenzhen, and Guangzhou. Shenzhen stands out as China's only hi-tech zone with the highest degree of internationalisation among the 53 zones. It attracted 4217 returnees of Chinese students after their graduation from overseas universities. Foreign hi-tech firms accounted for over 57 percent of total hi-tech firms (Xia, 2001). It has hosted a large number of foreign hi-tech firms. Hi-tech sectors have contributed significantly to its economic growth. For example, from 1991 to 2000, Shenzhen's hi-tech industry grew at an annual rate of 53.3% and its major hi-tech sectors were electronic information, electromechanical integration, biotechnology and advanced material. By 2000, the output value of hi-tech products in Shenzhen achieved RMB 106.4 billion (current price), 46.6 times more than that in 1991, making up 45.9% of the gross industrial output value, in which Shenzhen ranks number 1 among the Chinese cities (Wang, Meng and Li, 2001). The remaining of this paper will examine how Shenzhen has attracted foreign hi-tech firms and restructured its economy and FDI profile, as well as what Shenzhen's hi-tech case implies for China's hi-tech hunting strategy.

Shenzhen is China's special city. The city itself is a product of China's open door policy (Zhang and Gao, 1997; Wang 2003). It was a fishing village neighboured with Hong Kong but since 1980, Shenzhen has become one of China's five SEZs, many special policies have been granted by the central government. Now it becomes a modern city with over 4.7 million of population (over 7 million if unregistered population is included). Current jurisdiction of the Shenzhen municipality includes six districts of Futian, Luohu, Yantian, Nanshan, Bao'an and Longgang (Figure 2). The first four form the Shenzhen SEZ covering 400 square kilometres and the last two districts – Bao'an and Longgang –

are non-SEZ covering 1557 square kilometres. Shenzhen has become one of the hot spots in China for foreign investment (Wang, Meng and Li 2001).

Figure 2: Shenzhen Municipality and Its Jurisdiction Area



Notes: This map shows both district and sub-zone boundaries

Shenzhen's economic growth and urbanisation has benefited due to rapid increase in foreign investment. Like China's other open areas, sanlai yibu[1] was the major form of Sino-foreign cooperation in Shenzhen. But Shenzhen did not fall into a track as a low-value-added processing centre. It has been attempted to shift from labour-intensive to a high-value added process. In fact, in the early 1990s, the Shenzhen municipal government decided to upgrade its industry by restructuring its economy and foreign investment. It was expected that more technology-intense sectors were encouraged, gradually replacing the dominance of labour-intense sector. Such a strategic shift was based on the harsh reality. Firstly, other Chinese cities are increasingly competing with Shenzhen for labour-intensive FDI. Before 1990, Shenzhen was able to keep its competitive advantage over other Chinese cities/regions because it was one of few cities open to the outside world and special policies were granted. Sanlai yibu made Shenzhen the top FDI destination in

[1] *Sanlai Yibu* means "3 *lais"* and "1 *bu"* : "3 *lais*" are *lailiao jiagong* (processing raw materials on clients' demand); *laiyang jiagong* (processing according to the clients' samples; *laijian zhuangpei* (assembling parts for the clients – parts are supplied by foreign customers. "1 *bu*" is *buchang maoyi* (compensation trade: raw materials and machinery supplied by overseas companies are paid for with products). Here the processed and assembled products are exported by foreign firms. In return, Chinese enterprises charge for the processing and assembling costs.

China in the 1980s. Shenzhen was expanded and its economic growth rate was the highest among the Chinese cities. However, after 1990, many cities and regions in China set up similar facilities to attract sanlai yibu firms. They have been competing with Shenzhen for hosting labour-intensive multinationals. To sustain its economic development, Shenzhen has no choice but to change. Secondly, Shenzhen has found many problems related to sanlai yibu. Sanlai yibu firms contributed little to the local economy and local revenue because many pay only the small processing fees and factory floor rentals.

Shenzhen is perhaps the first Chinese city saying no to labour-intensive foreign investment. For example, in 1994, the Shenzhen government did not approve any sanlai yibu project within the SEZ. According to its Third Master plan (1996-2000), the SEZ was designated a new function: a new landmark to demonstrate the 'modernity' and world city image of Shenzhen, namely sites for producer service and modern urban infrastructure as well as high-tech industries (Ng and Tang, 2002). The new regulations were introduced in its CBD to encourage many former factory sites to move out to a non-SEZ and Liantang zone, except those pollution-free industries. Therefore, many sanlai yibu moved to the non-SEZ as well as to Shenzhen's neighbours – Dongguan and Huizhou (Wang, 2003; Wang and Wang, 2002).

How to attract hi-tech firms to Shenzhen's hi-tech parks? To attract hi-tech firms into its designated hi-tech zones, Shenzhen offered more incentives and more flexible special polices to hi-tech firms than to any other cities in China. It is possible for Shenzhen to do so because since 1992, not only has the central government granted Shenzhen authority to make local policy and set up local regulation, but also the National People's Congress of PRC granted Shenzhen municipal government the power to legislate. In fact, Shenzhen is China's pilot city in practicing "city governance based on law" while the central government increasingly becomes a regulatory state (Wu, 1999). Thus, Shenzhen has enacted about 300 laws, of that, 70% have been related to market economy and economic reform and opening-up (Shenzhen Planning Bureau, 2001). Such power to legislate makes it possible for the Shenzhen municipal government to issue a series of local

policies and regulations encouraging hi-tech firms to locate its hi-tech zones. For example, "Resolutions on Pushing Forward the Progress of Science & Technology" (issued in 1995) and "Regulations on Further Supporting the Development of High-Tech Industries" (issued in 1998) were promulgated in the 1990s. Since 2000, several more new policies have been stipulated by the Shenzhen government including "Regulations On Further Support To The Development Of High-Tech Industries"; "Regulations on Accelerating the Development of Integrated Circuit Manufacturing Industry in Shenzhen"; "Policies of Shenzhen on Encouraging the Development of Software Industry"; and "Regulations on Accelerating the Development of Integrated Circuit Manufacturing Industry in Shenzhen". These local-initiated policies were to promote the development of high-tech industries so as to quicken the realization of the strategic goal of building Shenzhen into a hi-tech industry base.

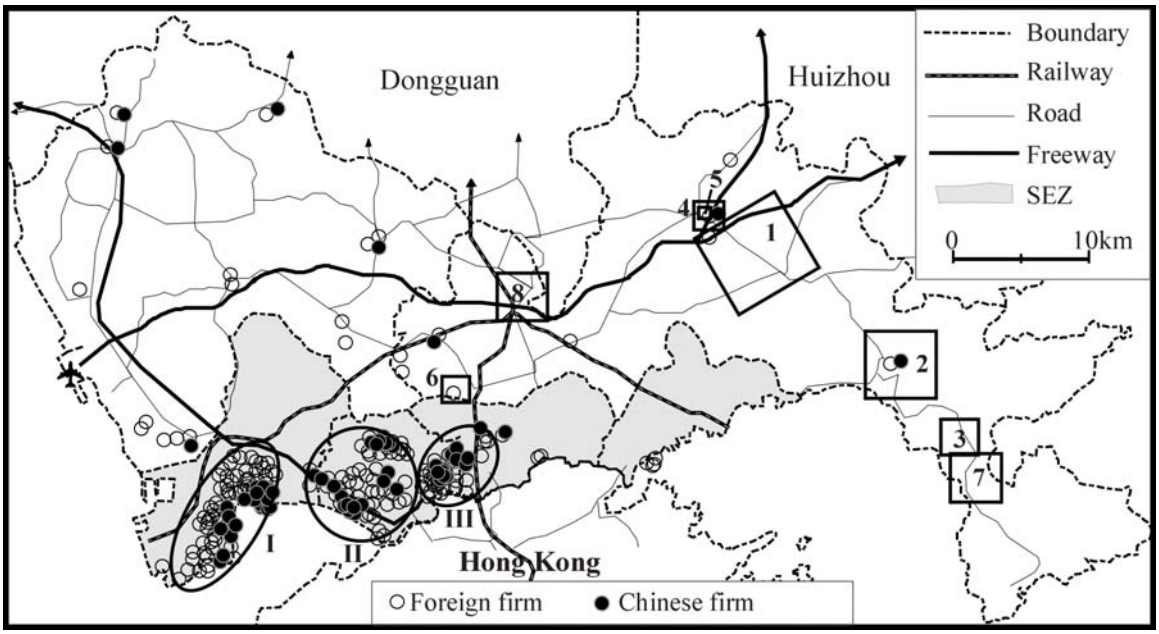
The regulations gave further incentives to high-tech firms located in Shenzhen, including financial investment in science & technology, expanding the funds scale for R&D, further exception of income tax and further reduction of income tax. Also, additional preferential policies are applied to high-tech industries, especially the IC manufacturing industry and the software industry. For example, besides the similar preferential policies offered by other Chinese cities and regions, Shenzhen's new policies, offer additional special privileges.[2] In addition, investors in high tech sector are allowed to sell all their products in the Chinese market. This is the first time foreign joint venture is given permission for targeting China as a sole market. Therefore, the power to legislate enables Shenzhen to make policy and regulations with more consideration of local interests, conditions and priority.

[2] Such special policies include: 1) free of income tax for 2 years, half reduction for the ensuing 8 years. Having successfully absorbed the related technologies and started production, the high-tech projects are given 3 years of income tax exemption on the profit hitherto made regardless of previous tax incentives. 2) newly-established foreign invested enterprises with an export orientation need only pay half of the land use fee for industrial purposes. The same is true of certified projects involving update technology for a span of 5 years. As for the land used by high-tech businesses (projects) no fee is collected from the transfer of land-use rights. 3) the manufacturing and operation sites newly built or purchased by high-tech enterprises are free of property tax for 5 years. Other projects enjoy a 3-year exemption from property tax. 4) high-tech companies run by foreign investors (including those from HK, Macao and Taiwan) can be registered as domestic-funded ones if their capital contribution is below 25 percent of the registered capital.

After 10 years efforts, Shenzhen's hi-tech zones/parks have attracted many high tech industrial clusters in computers and its accessories, telecommunication and networks, micro-electronic and basic device, optical electromechanical integration, digital audio-visual device, biotechnology and new materials. In 2001, majority of 205 hi-tech firms were located within Shenzhen's hi-tech zones (see Figure 3). Such pattern indicates that zone-oriented approach does work; at least physically hi-tech firms were attracted into these zones. Within these zones, many of the World's Top 500 Enterprises including, IBM, Seagate, Compaq, Olympus, Sanyo and Lucent have founded production bases in Shenzhen[3], making Shenzhen hi-tech zone the top three among China's 52 hi-tech zones. However, like many other hi-tech zones in China, Shenzhen shares some of the common problems. For example, physically, hi-tech FDI firms are located in Shenzhen's hi-tech parks, but they still transfer little technology/know-how to the Chinese partners (Liu 2001). Therefore, the Shenzhen government has two important steps to try to fix such problems. One is to offer the preferential policies to Chinese hi-tech firms if they want to locate in Shenzhen's hi-tech parks. As Figure 3 shows, many domestic high-tech firms moved to Shenzhen from other parts of China including the most prestigious universities in the country including Beijing University, Qinghua University, Harbin University of Science and Technology and Central China University of Science and Technology who have established high-tech R/D institutes or enterprises in Shenzhen; even the cities these universities are located in all have their own hi-tech park[4].

[3] See http://www.sz.gov.cn/english/economy/hitech/200112190053.htm
[4] (http://www.sz.gov.cn/english/economy/hitech/200112190053.htm).

Figure 3: Distribution of Hi-Tech Firms in Shenzhen in 2001



Notes: Three circles are the hi-tech zones established before 1996. The eight squares are the recently established or newly proposed hi-tech parks or industrial zones. I - Shenzhen High and New Technology Park around Shenzhen University (established in 1996); II – Shenzhen Science and Technology Zone (established in 1982); and III – Shenzhen's CBD – Louhu District. 1- Baolong Biling Industrial Zone (31 square kilometres); 2 - Ecological Corridor of Kuichong Hi-tech Industry (about 40 square kilometres); 3 - Dapeng Longqiwan Ecological Industrial Park (8.7 square kilometres); 4 - Longcheng Industrial Park (470,000 square kilometres); 5 - Shenzhen Longgang Student Abroad Centre (27,600 square kilometres); 6 - Banxuegang Industrial Zone (5.6 square kilometres); 7 - Eastern Halobios Hi-tech Industrial Park (14 square kilometres); and 8 - Pinghu Commodities Logistic Centre (16.25 square kilometers).

Sources: The firm locations are based on Shi (2002). The information about proposed hi-tech zones and the location of the existing hi-tech zones are based on Shenzhen district governments' websites.

The second step is to further expand its hi-tech parks. In the last few years, Shenzhen's hi-tech parks have been expanded. The three hi-tech parks within the SEZ established before 1996 by the central government, form the central of the Shenzhen hi-tech zone.

But the newly designated Shenzhen High-tech Industrial Belt is about 152.62 square km and includes eight new hi-tech parks (see Figure 3). These proposed new hi-tech parks are all located outside of the SEZ, in eastern and northern parts of Shenzhen municipality. They are expected to develop different types of hi-tech industries, each with a special division. Based on the author's interview and government documents, Baolong Biling Industrial Zone (Square 1 in Figure 3) and Banxuegang Industrial Zone (Square 6 in Figure 3) are both designated as electronic and information technology, but the former one is specialised in integrated circuit, optical-mechanical-electrical integration, new material and information technology. The later one mainly targets electronic information & technology products (computer & external device, applicable software, TV vision, graphic transmission system, new electronic elements etc). Ecological Corridor of Kuichong Hi-tech Industry and Dapeng Longqiwan Ecological Industrial Park (see Square 2 in Figure 3) are emphasised in electronic information and biological-medical technology and ocean. Longcheng Industrial Park (see Square 4 in Figure 3) is to develop low dissipative, non-polluted hi-tech industries and establish an R&D centre for electronic information, biological projects and new material. To assist such ambition, Shenzhen Longgang Student Abroad Centre (Square 5 in Figure 3) is established to attract overseas Chinese students (those Chinese students who have completed high degree education from foreign countries) to Shenzhen to contribute to Shenzhen's know-why development. Eastern Halobios Hi-tech Industrial Park (see Square 7 in Figure 3) is to develop high quality green technology and products. Pinghu Commodities Logistic Centre (see Square 8 in Figure 3) is now China's first "Commodities Logistic Experimental Centre" and will be expanded to a much larger distribution centre and wholesales market.

According to our field interview, many foreign and domestic hi-tech firms are physically neighbours, but they have not established local networks. Foreign hi-tech firms tended to be linked to multinationals while the Chinese ones tended to be linked with their parent or subsidiaries in China. In other words, instead of establishing horizontal links to other companies in Shenzhen, which would facilitate the transfer of knowledge to wider

industry, hi-tech firms have tended to maintain the vertical ties to their parent companies or institution.

But these newly emerging problems can't shadow Shenzhen's achievement in attracting hi-tech firms in its hi-tech zones. While many Chinese hi-tech zones are fighting for survival, Shenzhen can select those FDI it wants and discourage or even ban sanlai yibu within its SEZ. What grants Shenzhen such luxury? All other Chinese cities have not much choice but Shenzhen is able to focus on attract hi-tech FDI without fear of losing sanlai yibu firms. The reasons for Shenzhen's 'luxury' are really related to its relatively developed hardware and software environments for foreign operations. Firstly, its luxury is related to Shenzhen's competitive advantages. Such advantages include: 1) Shenzhen is a city with the best market economy system in China. Its government structure is the most efficient and business-friendly and its regulations and legal system are the mostly conformed to international practice in China. Thus many foreign investors come to Shenzhen first to test Chinese water, although since the mid 1990s, cities such as Shanghai have become another alternative for multinationals. 2) Shenzhen has been the most successful city in China in term of attracting FDI. Unlike other cities in China, Shenzhen is able to be selective for the FDI investment projects.

4. Discussion

Various types of zones in China have been served as experiment sites for transition from planned to market economy, attracting FDI and technology acquirement. In many Chinese cities, the establishment of hi-tech zones represents China's attempt to overcome obstacles of the technology transfer form multinationals and to draw on both technology transfer and indigenous technology development in a more effective way. However, many hi-tech zones have failed to attract many real, qualified hi-tech firms. Shenzhen has been one of China's few hi-tech zones that has attracted a large number of hi-tech firms both from domestic and overseas. Shenzhen's hi-tech industries have been the quickest growing sectors, contributing significantly to its economic growth. From 'stage of

development' point of view, it demonstartes that Shenzhen is at least one step ahead of other Chinese cities. A high degree of hi-tech firm concentration in its hi-tech zones, to a large degree, has indicated that the Shenzhen government's attempt to attract hi-tech firms in its hi-tech zones has been fulfilled. In addition, to attract more technology/capital intensive firms into its soil, the Shenzhen government has to play the game according to international practice – no direct intervention to multinationals' location and sectorial choice – where to invest and in what sectors. Instead, it uses its preferential policies and incentives to attract hi-tech firms into its hi-tech zones.

Shenzhen's hi-tech experience has several implications for both the central government and other city governments. A salient feature of hi-tech industries and zones in Shenzhen is the decisive role of the government. From the central government perspective, decentralisation of decision making and even legislation power to the Shenzhen municipal government has put Shenzhen in the best position to attract hi-tech firms into its hi-tech zones. It is time for the central government to consider granting similar powers to other major FDI hot spots as to Shenzhen. Such empowerment will facilitate upgrading of their FDI profile and economic structure from labour-intensive to capital/technology-intensive, enhancing the technology transfer.

From municipal government perspective, it is not lack of motivation in sustaining their economy, considering Chinese municipal governments are changing from managerial to more entrepreneurial. When the time is right, they will sacrifice labour-intensive FDI projects and try to attract hi-tech. Short-term 'sacrifice' is for sustainable economic growth. The existing practical problem is that the municipal government's 'election' is normally every 5 years. The promotion of mayor or party secretary of a municipal government is not based on how much 'sacrifice' or contribution the mayor or party secretary did to sustain city's economy, but rather immediate GDP growth rate and FDI amount. In other words, these mayors and party secretaries' sacrifices may not be recognised by the performance assessment criteria. Therefore, it is important for the central government to realise importance of local strategy to maximise its ability to benefit from economic globalisation but in order to do so, local governments' efforts to

try and attract hi-tech sectors should be recognised. Finally, this study mainly focuses on how Shenzhen attracted hi-tech firms and what the spatial pattern of its hi-tech firms are. There are many unanswered questions. Further research is needed to understand what the individual hi-tech firm's considerations to set up operation in Shenzhen are. Why are they located in a certain hi-tech zone? How has their technology and know-how been transferred to the Chinese side?

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