

**DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN
CHINA: A SECTORAL ANALYSIS**

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Abstract

This study contributes to the existing literature by examining the determinants of foreign direct investment at the sectoral level in the Chinese economy. A review of foreign investment policy in China and China's inward FDI is presented. The empirical analysis in this study is based on the pooled data of 13 sectors for China and 9 sectors for Guangdong province over the period from 1997 to 2002. The findings indicate that market size, wage rate, degree of economic reform and innovation activities are important determinants of sectoral FDI in China. Except for the innovation factor, the other three factors are also significant for Guangdong province. Overall, the findings reveal that (i) high labour cost and state ownership might deter the inflow of sectoral FDI; (ii) the large market size encourages inward foreign investments in both China and Guangdong province; (iii) high innovation activities attract FDI in China, but have no effect in Guangdong province and (iv) the elasticity of market size and labour wage in Guangdong province is greater than that in China as a whole.

Keywords: Foreign direct investment, sectoral analysis, economic reform, Chinese economy.

JEL Classification: F14, F23, P33

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1. Introduction

The growth of foreign direct investment (FDI) in China has experienced dramatic changes since the beginning of the economic reform in the late 1970s. It grew slowly in the early years but increased rapidly in the late 1980s. The huge amounts of FDI have been utilised to help accelerate the process of technology transfer, to augment China's foreign exchange receipts, and to supplement domestic capital formation. Since the early 90s, China has been the second largest foreign capital recipient in the world, with most developing and neighbouring countries in Asia such as Taiwan, Hong Kong and Korea as the major investors.

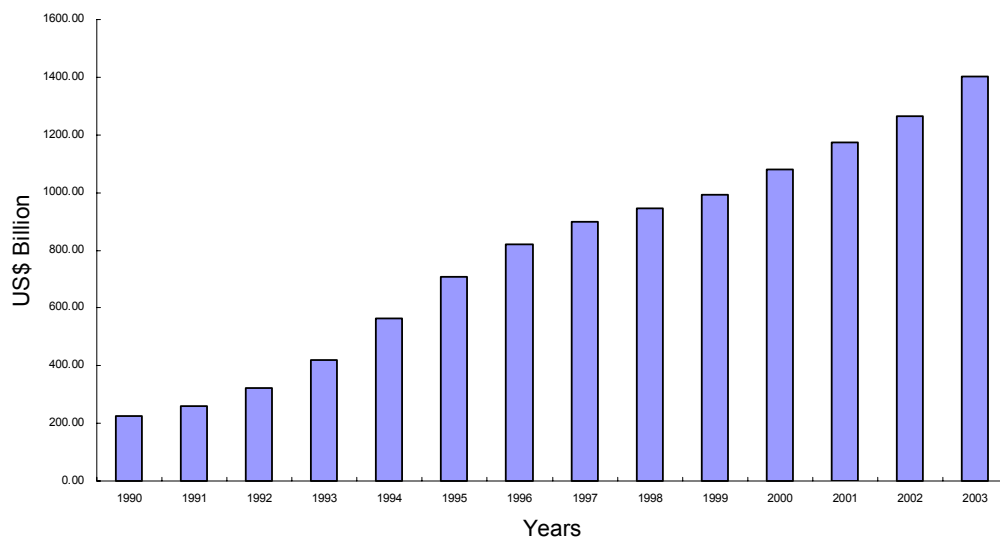
Interest in the study of FDI in China has grown rapidly. Research has especially focused on the factors that are important to FDI in the Chinese economy, but many of these studies have focused on the determinants of FDI at the national or regional level. None has focused on the sectoral level. As such, we have learned little about the factors that determine FDI across sectors in China. The purpose of this study is to examine the factors that are important for FDI distribution across different economic sectors in China. The rest of the paper is organised as follows: Section 2 provides an overview of FDI development in China; Section 3 gives a brief background about China's inward FDI at the sectoral level; Section 4 presents a review of related studies and conceptual frameworks; Section 5 discusses the modellings and data issues; and Section 6 analyses the empirical results. Some concluding remarks are presented in Section 7.

2. Evolution of China's Foreign Investment Policy

The success of the economic reforms and the open-door policy in China after 1979

has raised global awareness of the Chinese market and economy. The reforms have enhanced economic conditions and boosted economic growth. As a result, China's gross domestic product (GDP) reached 11,624.96 billion Yuan (US\$1403.98 billion) in 2003. The reform of foreign investment policy in particular has played an important role in attracting foreign capital inflows (see Figure 1).

Figure 1 Gross Domestic Product in China



Source: State Statistical Bureau, 2004.

Following the communist party take over of Mainland China in 1949, the national trade policy was based on self-reliance, where the economy was mainly controlled and planned by the central government. Almost 90% of China's population were rural and employed in the agriculture sector, which contributed 70% of the national income (Negandhi and Schran, 1990). The central government ruled all aspects associated with the development of the economy. It made decisions on macro and micro-economic activities and monopolised purchasing, marketing of commodities and the supply and allocation of materials. The central government provided all the

capital, raw material and labour for enterprises. Moreover, all production processes and products manufactured were determined according to the state plan and all profits generated by enterprises and local government had to be handed over to the state government. In the meantime, there was no law to serve as a viable institutional framework to govern the participation of foreign capital in the country's economy. Production mainly relied on labour with low growth being associated with inflow of foreign capital. Such a system resulted in lack of economic development, low production efficiency, government corruption and very poor living conditions. During 1960-1970, China's GDP growth was only 3.5% on average, and foreign trade value was below US\$6.4 billion.

In the 70s, the Chinese central government started to pay attention to improving people's living standards and set about realising economic development goals by accumulating foreign capital as a main source of funding the improvement of the economy. The reason for the reform can be traced back to the mid-70s, when the former Chinese leader Deng Xiaoping took the lead in criticizing Chinese economic policies, and emphasised the need for export promotion, arguing for co-operative ventures with foreigners (Pomfret, 1991). The initial goals of inducing foreign direct investment begun in the late 1980s by the state government were (Qu, 1997):

- To capture advanced technology know-how and equipment to upgrade existing structure and improve economic efficiency;
- To utilize foreign capital to improve China's economic development;
- To gain access to foreign markets and promote exports for the purpose of increase foreign exchange earnings; and
- To learn and gain advanced managerial skill from foreign companies.

Fu (2000) and Zhang (1999) identified three periods of reform of foreign investment policy after 1979: the initial phase (1979-85); the continuous development stage (1986-91); and the high-growth period (1992 onward). In the initial phase, a number of laws and regulations were released to attract foreign investors into China. Four Special Economic Zones (SEZs) were established in 1980 with preferential treatment for foreign investors. During the continuous development stage, the state extended its open-door policy towards more provinces. The state promulgated the “Law in Enterprises Operated Exclusively with Foreign Capital” and “Provision on Encouraging Foreign Investment” in the mid 80s, which motivated and removed uncertainty to investment in China. A noticeable inflow of foreign capital surged into China in the period of high-growth. The central government started lifting its ban on foreigners from having joint ventures. The open policy in the 1990s shifted from coastal regions to the western inland area. The Chinese government began to open more inland cities and regions for foreign investment. In the late 90s, China continued to open up more markets and reduce barriers to foreign investors in an effort to enter the World Trade Organisation (WTO).

2.1 Stages of FDI Development

2.1.1 The Initial Phase (1979-85)

The promulgation of the Equity Joint Venture Law (Sino-foreign Joint Ventures) in July 1979 formally opened up China’s market to the world. The law provided the legal framework for foreign investors to form equity joint ventures with Chinese partners. The law pointed out that China permits foreign companies, enterprises, other economic entities, or individuals to incorporate themselves in the territory of China in joint ventures with Chinese local companies, enterprises or other economic entities, and the state shall not nationalise or expropriate foreign investment interest

(Fu, 2000). A number of related laws and regulations in regard to labour management, taxation, registration and foreign exchange were soon formulated.

Later in 1979, Guangdong and Fujian were granted special autonomy in dealing with foreign trade and investment by the central government. Furthermore, four SEZs were established within the two provinces in August 1980: three in Guangdong and one in Fujian. The authorities of local government in the SEZs had independent power to draw up and implement development plans, examine and approve investment projects, issue licenses and land-use permits, and coordinate the work of banking, taxation, customs and frontier inspection (Fu, 2000). The establishment of the SEZs had three core objectives (McKenney, 1993):

- To develop the coastal area of China through experimental, controlled enclaves;
- To attract and exploit foreign investment; and
- To serve as China's window to the outside world.

Some extended objectives have been identified (Fu, 2000):

- To attract not only foreign capital, but also advanced technology, both hardware and software;
- To promote export-led growth, in other words, to accelerate exports, create local employment, and generate foreign exchange;
- To serve as 'policy laboratories', where policies can be tested which, if successful, could then be adopted elsewhere in China; and
- To enhance the link of Hong Kong, Macao and Taiwan with mainland China.

It is noticeable from these objectives that the reform policy was directed strongly

toward the south-east coastal region. The aim was to take advantage of location to attract investment from Hong Kong and Taiwan.

In 1984, the government announced 14 coastal port cities would open to foreign trade and development. The state government further decentralised its power to these open cities. The local governments of the 14 open cities were allowed autonomy to plan the legal framework and regulations for foreign investment. During this year, these cities soon established their own Economic and Technological Development Zones (ETDZs) and a variety of favourable treatments were adopted to encourage foreign business.² In early 1985, the economic open area was further extended to three delta regions in South Fujian Province.³ Similar to the other economic areas, the local authorities of the delta regions were also allowed to adopt certain administrative and regulation changes in trade and investment.

The majority of FDI inflow came mainly from Hong Kong and Macau and investment projects were mostly directed to labour-intensive manufacturing, hotel and restaurant development. However, despite the investments from Hong Kong and Macau, the overall performance of foreign capital inflow was insignificant and did not meet the expectation of the reform. There were several factors behind this disappointment (Zhang, 1999):

- The legal environment for foreign investors was not well defined;
- There was a lack of communications and transport infrastructure developments; and
- There was a shortage of skilled labour.

² Most of the treatments already had been practiced in the SEZs

³ The three delta regions include the Yangtze River Delta, the Pearl River Delta and the Xizmen Zhangzhou-Quanzhou area.

Another point that caused the slow growth in FDI was that local authorities tended to seek short-term returns and restricted the currency flows on joint ventures to earn foreign exchange. Moreover, the chairmen of each joint venture had to be local Chinese rather than a foreign national. Such problems made foreigners very unwilling to invest in China at that time.

2.1.2 Continuous Development Stage (1986-91)

In 1986, the state promulgated the “Law on Enterprises Operated Exclusively with Foreign Capital” and the “Provision on Encouraging Foreign Investment” with regard to wholly foreign owned enterprises (WFOEs). These policies lifted the restrictions on foreign ownership, and implemented new incentives and removed uncertainties for foreign investors. The laws provided that the property rights of WFOEs be protected by the state and that foreign investors could remit profits out of China and were entitled to any funds that might be left over if WFOEs were to be liquidated (Fu, 2000). For joint ventures involving advanced technology, developing new products and producing export substitutes could lead to additional tax benefits. Equity joint ventures were granted privileged access to supplies of water, electricity and transportation, paying the same price as state-owned enterprises (SOEs), and to low interest loans.

The government took three significant steps in regards to regional policy development between 1988 and 1990 (Zhang, 1999),

1. In 1988, the coastal open economic area was extended to North China;⁴
2. Hainan Island was separated from the Guangdong province and became the 30th province of China and the 5th SEZ;

⁴ The area includes the Liaodong Peninsula, the Shandong Peninsula and the Bohai Sea Rim

3. Shanghai was approved to develop the Pudong New Area, which was expected to become an international economic, financial and transport centre.

After the new policies and incentives were promulgated in 1986, investments into China increased dramatically. Between 1986 and 1991, the total foreign investment actually used was US\$33.2 billion, an average of US\$6.6 billion per year. These figures increased by 142 percent compared with the previous period.

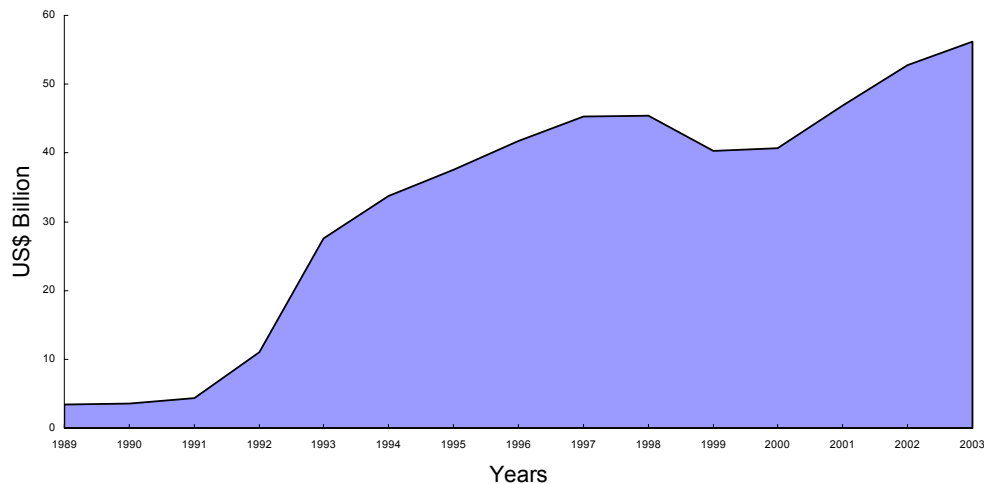
2.1.3 High-Growth Period (1992 onwards)

A noticeable inflow of foreign capital surged into China in the period of high growth. The phenomenon began after the southern tour of former leader Deng Xiaoping in 1992. He urged the country to accelerate economic reform and open up further. In the meanwhile, many previously suspended reform policies were ready to be implemented, after three years of harsh measures had brought inflation under control. However, unlike in the 1980s, the reform policy in the 1990s shifted from coastal regions to western inland areas. This was mainly because the large amounts of foreign investment in the coastal areas had widened the income gap between the east and west of China. The Chinese government began to open up more inland cities and regions to foreign investment. The inland cities covered cities along the Yangtze River and along the inland provinces bordering neighbouring countries. These cities enjoyed the same policy treatment as that given to coastal open areas.⁵ In the same year, there were 13 inland border cities opened up for promoting border trade and economic co-operation with neighbouring countries. As a result, 14 border economic co-operation areas were soon established to attract foreign investment. In the late 90s, the state government began to implement build-operate-transfer (BOT) projects with foreign participation.

⁵ China has over 20,000 kilometres of inland borders with 15 countries.

Foreign investors were permitted to build, and operate a business for a certain period for capital recuperation, and then transfer it to the host country. By the end of 1996, China had approved 283,575 foreign invested projects. These projects had a contract value of US\$488.1 billion and the total amount of foreign capital actually used reached US\$52.743 billion in 2002. The east coastal areas have attracted most foreign capital invested in China. Foreign capital flowed into China from 150 countries, the majority of these countries in Asia.

Figure 2 Total Amount of Foreign Capital Actually Used



Source: China's Statistical Yearbook, 2003.

In December 2001, China became the 143rd member of WTO. The state government has committed to a wide range of reforms as part of WTO accession in late 1990s and early 2000s. The reforms include:

- Boosting transparency in both legal and administrative systems;
- Improving intellectual property protection;
- Reducing tariffs and tax; and

- Privatising SOEs

Foreign investors could now have confidence in investing in China due to the reforms within the nation and the entry to WTO. In early 2002, the contracted and realised FDI inflows grew strongly and reached US\$50 billion. This growth phenomenon is expected to continue in the future.

3. FDI at the Sectoral Level in China: 1997-2002

The share of FDI in terms of amounts actually used across sectors fluctuated slightly from 1997 to 2002. According to the available statistical data, as shown in Table 1 and Figure 3 and 4, Sector 2 or manufacturing, mining and quarrying had the strongest attraction for foreign investments, accounting for 64% of the total actually used amount of FDI in 1997. This figure then dropped somewhat to nearly 57% in 1999, but it then rose to almost 71% in 2002, with the highest percentage of shares from 1997 to 2002. The sector with the second most inflow of FDI is Sector 7, which consists of banking, insurance and real estate. The movement of percentage shares of Sector 7 was quite different from Sector 2. Sector 7 had approximately 11% of the total amount of FDI used in 1997, and increased to about 14% in the year 1998 and 1999, but its share then dropped slightly back to nearly 11% from 2000 to 2002. Note that the sum of the shares between Sectors 2 and 7 accounted for more than 70% of the total amount FDI used over 5 years (75% share in 1997; 72% share in 1998; 71.5% share in 1999; 76.5% share in 2000; 78.7% share in 2001; and 81.81 share in 2002).

However, some sectors were less attractive to foreign investment from 1997 to 2002. Referring to Table 1 and Figures 3 and 4, it can be noticed that the shares of the actually used FDI in Sectors 3, 4, 5, 6 and 10 decreased every year. The share of Sector 3 went down from 4.6% in 1997 to 2.6% in 2002. Sector 4 decreased its shares

from 3.2% to 1.4% in 2002. Sector 5 dropped from 3.7% to 1.7% in 2002. Sector 6 moved down slightly to 1.8% in 2002 from 3.1% in 1997. Sector 10 also moved down slightly from 3.41% in 1997 to 2.5% in 2002. Thus it is clear those different sectors attracted different levels of FDI.

In accordance with the growth trend of inward FDI across sectors, foreign investors have realised the importance of China's advantages in terms of a large market, fast economic growth and low labour costs for their investments and operations. The huge population means there are more potential customers and investors would be willing to move in.

Table 1 Shares of Actually Used FDI in Percentage (%) by Sector (1997-2002)

	1	2	3	4	5	6	7	8	9	10	Total
1997	1.39	64.21	4.58	3.21	3.66	3.10	11.42	4.39	0.64	3.41	100.00
1998	1.37	57.54	6.82	4.54	3.62	2.60	14.10	6.33	0.79	1.87	100.00
1999	1.76	57.44	9.18	2.28	3.85	2.39	14.10	6.33	0.79	1.87	100.00
2000	1.66	64.91	5.51	2.24	2.49	2.11	11.63	5.37	0.53	3.57	100.00
2001	1.92	67.66	4.85	1.74	1.94	2.49	11.03	5.54	0.59	2.24	100.00
2002	1.95	70.87	2.61	1.36	1.73	1.77	10.94	5.58	0.69	2.50	100.00

Source: China Statistical Yearbook, (1998-2003).

Sector 1 consists of farming, forestry, animal, husbandry and fishery.

Sector 2 represents secondary industry which consists of mining, quarrying and manufacturing.

Sector 3 consists of production and supply electric power, gas and water.

Sector 4 consists of construction, geological prospecting and water conservancy.

Sector 5 consists of transport & storage, post and telecommunication services.

Sector 6 consists of wholesale & retail trade and catering services.

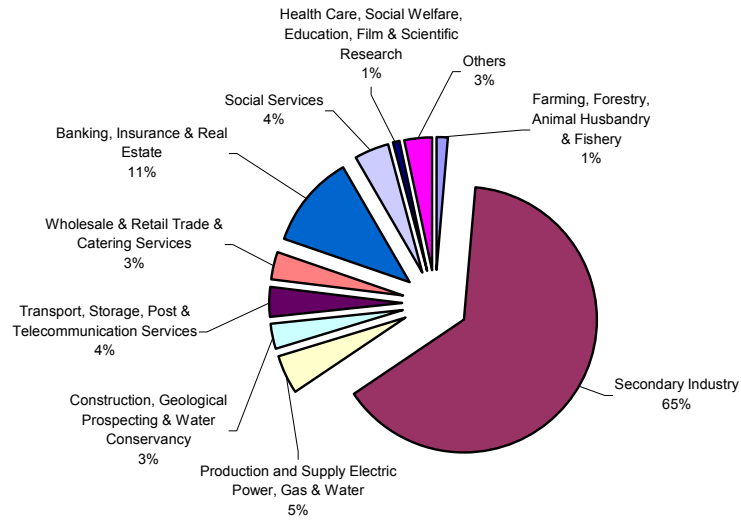
Sector 7 consists of banking, insurance and real estate.

Sector 8 consists of social services.

Sector 9 consists of health care, sports, social welfare, education, arts, film, scientific research and polytechnic services.

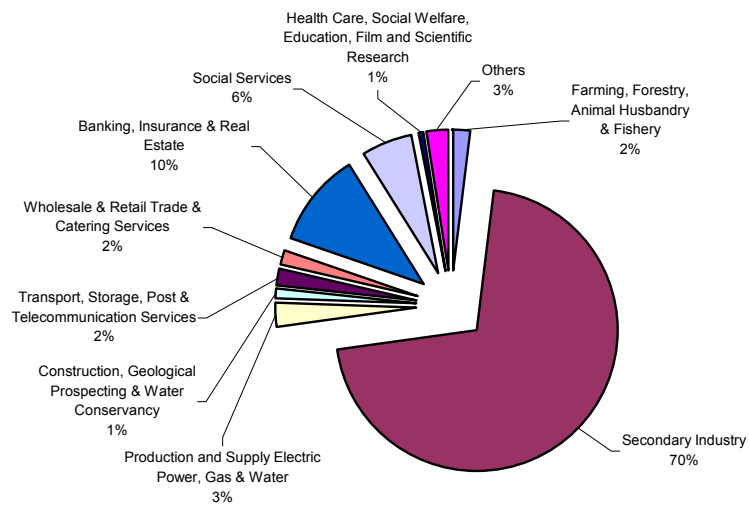
Sector 10 consists of other industries.

Figure 3 Shares of Actually Used of FDI in 1997



Source: China Statistical Yearbook, 1998.

Figure 4 Shares of Actually Used of FDI in 2002



Source: China Statistical Yearbook, (2003).

4. Studies of FDI in China: A Review

Numerous studies have been conducted to explain the level of FDI activity in China since the reforms in late 70s. From the aspect of conventional microeconomics, firms seeking business abroad are motivated by production cost, resource acquisition, minimization of competition risk and market penetration (Daniels and Radebaugh, 1998). From the locational advantage aspect, Bende-Nabende *et al.* (2000) has noticed that FDI is influenced by four categories of factors: cost-related factors; the investment environment improving factors; macro-economic factors; and the development strategy of the host country. As there are international differences in production resources and market imperfections of one kind or another, firms move across the borders and produce in higher-return countries. A paper by Razin, (2002) has provided a comprehensive review on the theories of FDI. He pointed out that early literature tried to explain FDI at the micro-economic level in terms of market imperfections, ownership, product superiority, cost advantages, economies of scale, multi-plant economies, advanced technology, marketing, and product distribution. In macro-economic terms, FDI focussed in the positive effects of exchange rates, as a depreciated exchange rate lowers the cost of production and investment in the host countries. Alternatively explanations for FDI have focused on regulatory restrictions, tariffs, quotas, infrastructure quality and political stability.

The existing studies of determinants of FDI in China can be grouped into three categories (Table 2). First, there are studies which focused on the explanation of FDI across China using province-level data (Coughlin and Segev, 2000; Zhang, 2001; Shan, 2002). These studies found that the most important factors that attracted FDI inflow were average wage, labour quality, market size, and level of infrastructure development.

The second category in the existing literature is the studies which investigated FDI determinants in individual provinces only. The example study is by Ng and Tuan (2003), who investigated the locational distribution of FDI in the Guangdong province. Their study shows that transaction cost, firm size, and quota effects are all significant in the locational choice of foreign firms.

The last category is concerned with the aspect of investors from various countries and the motivation behind Western and Asian direct investment (Fung *et al*, 2000, 2002; Zhang, 2000, 2001). The studies of Fung *et al*, (2000, 2002) found that both the United States (U.S.) and Japanese direct investment are significantly influenced by labour quality. However, comparing U.S. direct investment in China to Hong Kong direct investment in China, U.S. direct investments are more sensitive to local market demand. However, Hong Kong investments are much more sensitive to low labour cost. The findings by Fung *et al*, (2000, 2002) are supported by Zhang (2000, 2001).

Table 2 Description of Literature in Determinants of FDI in China

Author(s)	Topic	Data	Explanatory Variables	Empirical
Cheng and Kwan (2000)	Determinants of the location of FDI in China	Panel data for 29 Chinese regions from 1985 to 1995	Labour wage; Infrastructure level; Per capital income; Education level; Policy designations	Regional income, infrastructure, policy designations (i.e. SEZs) have a positive effect; Wage cost has a negative impact on FDI; Education level is not statistically significant on FDI
Coughlin and Segev (2002)	Pattern of FDI location across China	Provincial data of FDI inflows from 1990 to 1997	GDP; Wage; Labour productivity; Length of highway; Population working in SOEs	Economic size, labour productivity and coastal location attract FDI; Higher wages and illiterature rates deter FDI
Dees (1998)	Determinants and effects of FDI in China	Panel data of 11 countries from 1983 to 1995	Market size; Labour wage; Exchange rate; Stock of patents	Inward FDI was motivated by the large Chinese market, the low cost of labour force, real exchange rate, and degree of innovation
Fung, Iizaka, Lee and Paker (2000)	Determinants of FDI from U.S. and Japan in China	Provincial data of FDI from U.S. and Japan in China from 1991 to 1997	GDP of provinces; Labour wage; Kilometres of roads; Kilometres of railways	GDP and Wage rate affect the inflow of FDI; SEZs and Open Coastal Cities (OCCs) have great advantages in attracting FDI; FDI from U.S. and Japan are influenced by labour quality
Fung, Iizaka, Lin and Siu (2002)	Location choice of HK and U.S. direct investment in China	Investments into each region of China from HK and the U.S. for the period 1990 to 1999	GDP; Average wage; Number of student higher education; Kilometres of roads and	U.S. investments are more sensitive to local demand and HK investment is more sensitive to local labour cost; U.S. investments in China tend to be more capital- and skilled- intensive than from HK;

			railway; Number of SEZs; Number of OCCs;	Rise in regional labour quality raises both investment inflows
Ng and Tuan (2003)	Location decision of manufacturing FDI in China	Cross-section data of firm (micro) level data of a total of 37,724 samples in 1998	Transaction costs; Firm size; Trade constraints	Transaction costs, firm size and quota were all significant effects to firm location choice, especially in firm size factor
Shan (2002)	Interrelationships between FDI and economic variables	Quarterly time series data over the period 1986-1998 from China	Output; Labour supply; Labour cost; Energy consumption; Exports; Exchange rate; Regional income difference	FDI and output growth affect each others, a two way-causality was found between FDI and output growth; FDI is influenced by regional income differences; FDI in China was found to be sensitive to the changes of a number of economic variables
Sun, Tong and Yu (2002)	Determinants of foreign direct investment across China	Panel data for 30 provinces from 1986 to 1998	Market size (GDP); Labour cost; Domestic investment per worker; Labour quality; Agglomeration infrastructure	Wage has positive relationship with FDI before 1991 but has a negative relationship after then; Provincial GDP has no significant relationship before 1991 but becomes highly significant after 1991; Labour quality and infrastructure are important determinants of the distribution of FDI
Tung (2001)	Tax rates and tax incentives and FDI into certain designated areas in China	Panel data from 1988 to 1994 of 43 zones and cities	Agglomeration economics (population); Unemployment rate; Wage rate; Infrastructure; Percentage of tax rate (dummy)	Zones and cities with lower tax and greater tax incentives attract more FDI; The 1991 tax laws are effective in increasing FDI during 1992-1994 period as compared to the 1988-1991 period

Zhang (2000)	Determinants of U.S. direct investment compare to Hong Kong direct investment in China	Time series data from 1979 to 1997 for U.S. direct investment and 1977 to 1997 for Hong Kong direct investment	Market size; Labour costs; Trade barriers; U.S. policy of containing China; Political stability; Tax incentives	U.S. direct investment in China was primarily motivated by market access and Hong Kong direct investment was export oriented
Zhang (2001)	Determinants of China's FDI boom	Panel data for direct investment from Hong Kong and Taiwan form 1977 to 1997	Market size (GDP); Economic growth; Labour costs; Trade barriers; FDI incentives (dummy); Political instability (dummy)	China's FDI in the past two decades has been substantially determined by its market size, rapid economic growth, and liberalised FDI regimes; Hong Kong direct investment and Taiwan direct investment were encouraged by the liberalised trade policy, cheap labour and political stability in China

5. Methodology and Data Issues

The literature on FDI issues in China commonly used panel data analysis and translog models (Dees, 1998; Fung *et al.*, 2000, 2002; Sun *et al.*, 2002). The model can be presented as follows:

$$\ln Y_{it} = \alpha_i + \sum \beta_k \ln X_{k_{it}} + \varepsilon_{it} \quad (1)$$

where Y_{it} is the value of FDI, X_{it} 's are factors determining the level of FDI, α_i is the individual effect which is assumed to be constant over time t and specific to the individual cross-sectional unit i . The ordinary least square method can provide consistent and efficient estimates of α and β . The determinants of FDI, X_{it} , include market size, labour cost, innovation activities, and degree of economic reform.

In practice, the advantage with panel data is that they allow us to test and relax some of the assumptions, and allow for greater flexibility in modelling differences in behaviour across individuals. The use of panel data in economic issues is in the context of estimation of production function.

The empirical form of equation (1) for this study is presented as follows:

$$\ln FDI_{it} = \alpha_i + \beta_1 \ln GDP_{it} + \beta_2 \ln WR_{it} + \beta_3 \ln IL_{it} + \beta_4 \ln OE_{it} + \varepsilon_{it} \quad (2)$$

where subscript i refers to individual sector, t refers to years from 1997 to 2002, and α is the intercept. The β s are the regression parameters to be estimated and ε is the stochastic disturbance. The dependent variable FDI is the actually used amount of FDI by sector. The explanatory variables are gross domestic product (GDP) by sector; wage rate (WR); innovation level (IL); ownership level in terms of number of staff and workers (OE).

Dee (1998) assumes that all variables in his study are stationary throughout the period except the endogenous variable (the level of FDI), the market size variable (GDP), the relative real wage rate and the real exchange rate. Estimation in an error correction model is then used to avoid running a regression with both stationary and non-stationary variables. In addition, the error correction model is estimated with only one step analysis, due to the short period data available.

Another study by Sun *et al.* (2002) transformed all variables into natural logarithm form and stacked these transformed variables up across 30 provinces, then calculated the correlation coefficients between them to ascertain the degree of multi-co linearity. Highly correlated variables were excluded. The estimation of their study was done using Ordinary Least Square (OLS) with standard White correction for heteroskedasticity. Because the provincial characteristics may give rise to cross-sectional heteroskedasticity, Generalised Least Square (GLS) estimation was then used to correct potential provincial heteroskedasticity. However, due to the short time data series, it was not necessary for their study to use Praise-Winsten correction and they did not adjust for autocorrelation. The findings provide evidence that GDP, wage, labour quality and infrastructure have a positive relation with FDI.

A number of factors have been mentioned and analysed as potential determinants of FDI in China (Wei *et al.*, 1999; Cheng and Kwan, 2000; Sun *et al.*, 2002). The most commonly tested factors include market size, infrastructure development, labour costs, labour quality, exchange rate, degree of openness, level of foreign investment, level of research and development (R&D) and country risk. The selection of potential determinants for regression analysis depends on data availability and the particular focus of the research. For example, in research into FDI across industrial sectors in a

country, country-level variables such as exchange rate or country risk are unlikely to have strong explanatory power.

In this study, FDI, the dependent variable, is taken from China's Statistical Yearbook for China and Guangdong Statistical Yearbook for the Guangdong province, both titled 'Actually Used Amount of FDI' at sectoral level. The variable initially measured in U.S. dollars, was then exchanged into Chinese currency, Yuan, and converted using the official exchange rate.

This study had chosen four sectoral-level factors to be potential determinants of FDI flow across different sectors in China: market size, labour wage, innovation investment, and degree of state ownership. The choice of these explanatory variables was dictated by the availability of data. The justification for the factors is as follows:

Market Size

Theoretically the level of FDI is positively related to the size of a foreign market. Therefore, we expect that the larger the market size of an industrial sector, other things being constant, the more FDI the sector should attract. Thus the market size factor in our expectation should be positively related to the level of FDI.

Hypothesis A: Holding other factors constant, the larger the market size in a sector, the greater the inflow of FDI that sector would attract.

GDP is a proxy for market size. The data for GDP by sector for China as a whole has not been listed in China's Yearbook. We obtained the value by adding up all provinces in each sector for China. The unit of the GDP value is measured in 100 million Yuan.

Labour Cost

This factor should have a negative impact on the level of FDI as firms wanted to cut production costs by cutting down labour costs as much as possible. If per-unit labour cost in a sector is lower or expected to fall below the home country sector, a firm could save considerably in labour cost by moving its operation to China. This factor is proxied by average wage. Thus, the sectors with lower wage rates should be more attractive to foreign investors.

Hypothesis B: A high wage rate in a sector discourages foreign investment and thus has a negative influence on the level of inward FDI.

WR (average wage rate) is a proxy for labour cost. The data can be obtained from China and Guangdong Statistical Yearbook for China and the Guangdong province. The labour cost in this paper is denominated in the Chinese currency, Renminbi (RMB) measured in Yuan.

Innovation Investment

The level of innovation activities reflects the level of technological progress. This is measured in terms of the volume of investment in innovation over total GDP. A higher level of investment in innovation should promote FDI across sectors. In this study we assume the innovation (technology development) has a positive effect on both labour- and capital-intensive FDI, because it is said that technological innovation would be one of ways to boost productivity. Since investors are concerned with more production and more efficient ways to produce goods, thus, the level of innovation activities is expected to have a positive impact on the inflow of FDI.

Hypothesis C: Innovation activities promote general development in industries.

The higher level of innovation activities, the more inward FDI a sector attracts.

Innovation level (IL) is proxied by the amount of investment in innovation. It is calculated in terms of the ratio of amount of investment in innovation to total GDP at

the sectoral level for both China and the Guangdong province. We then take the value as a proxy for the level of innovation activities.

State Ownership

Ownership of firms in China can be categorised into two major groups, either State-owned or non-state owned. The level of ownership in China can be an indicator measuring the degree of economic reform or privatisation level. In other words, we use this indicator to assess the role of market forces and to investigate how efficient the markets are. Most firms, of course, would not bother to operate in an environment which lacks market freedom. Therefore, we expect the level of state ownership should be a negative factor in FDI flow, that is, the higher the ownership by government the less the inflow of FDI.⁶

Hypothesis D: *High degree of state ownership across sectors causes less flow of FDI at sectoral level.*

OE (state ownership) is a proxy for the degree of economic reform. We measured the ownership level in terms of numbers of staff and workers in SOEs over total numbers of staff and workers in all types of ownership at sectoral levels for both China and the Guangdong province.

Officially published data on FDI and characteristics of industrial sectors are limited and a relatively small sample would suffer from low efficiency. Most of the data used in this study are obtained from various issues of China's Statistical Yearbook. We use the 'Actually Used Amount of FDI' provided in the China's Statistical Yearbook, which is the actual amount invested in the sectors. In addition, due to the lack of data

⁶ It is argued that, in the early stage of reforms in China, the SOEs attracted most FDI flows. However, in this study, the sample data was collected for the period in the late 90s and early 21st century and the role of SOE has shrunk.

sets of sectoral variables in the earlier period, the sample begins in 1997 and covers up to 2002 on an annual basis with 13 sectors for China and with 9 sectors for the Guangdong province.

While previous literature on the subject has suggested several possible explanatory variables, it is not possible to include all of them. Additional variables that could be tested for their ability to explain foreign capital inflows into different sectors include import share and value-added production. Unfortunately, some of these potential FDI determinants are difficult to measure, while for others no appropriate data are available. The descriptive statistics for the entire variables used in the study are presented in Table 3

Table 3 Descriptive Statistics of the variables used in the study

	LFDI	LGDP	LIL	LOE	LWR
Mean	22.2889	7.7150	-3.6378	-0.3067	9.1623
Median	22.7437	8.0106	-3.3799	-0.2682	9.1797
Maximum	26.4579	10.7703	-1.3059	-0.0175	9.8615
Minimum	17.4377	5.1345	-6.5910	-0.9545	8.3650
Std. Dev.	2.1360	1.4640	1.3650	0.2505	0.3303
Skewness	-0.2472	0.0362	-0.1947	-0.6466	-0.2191
Kurtosis	2.6770	2.2268	1.9362	2.4262	2.7753
Jarque-Bera	1.0756	1.9599	4.1707	6.5045	0.7884
Probability	0.5840	0.3753	0.1243	0.0387	0.6742
Sum	1649.3790	601.7700	-283.7474	-23.9222	714.6614
Sum Sq. Dev.	333.0738	165.0248	143.4720	4.8332	8.3993
Observations	74	78	78	78	78

6. Empirical Results and Interpretation

The regression results of equation (2) are reported in Table 3 with 13 sectors for China as a whole and with 9 sectors for the Guangdong province from 1997 to 2002. As can be seen in Table 3, the sign of the variables is consistent with our expectation. The major findings from the estimates together with discussion and interpretation are summarised as follows.

The level of GDP (market size) is found to have a statistically significant and positive effect on the magnitude of inward investment in both China and the Guangdong province. The coefficient for market size is 0.34 in China and 0.45 in the Guangdong province, indicating that a 1% increase in market size of China or the Guangdong province would cause the stock of FDI to rise by 0.34% or 0.45% at the sectoral level (See Table 4). The finding implies that for foreign investments at sectoral levels in both China and the Guangdong province, the market size is a determinant and motivation behind inward direct investments. The larger the market, the more investors are willing to penetrate that market.

Concerning the effect of labour cost (wage rate), the coefficient is negative and statistically significant in both China and the Guangdong province. It reveals that the cheaper labour wage cost in China or in the Guangdong province might encourage more inward FDI across sectors. The coefficient of labour wage in China is about -0.99 and in the Guangdong province is about -1.18, indicating that a 1% increase in labour wage of China and the Guangdong province would deter the stock of FDI by 0.99% or 1.18% at the sectoral level.

The degree of impact of market size and labour wage in the Guangdong province is

greater than the whole of China. This can be explained by the number of choices of provinces available in terms of investment in China as a whole. In other words, there are more than 30 provinces in China that can be considered for investment, and as the market size of the Guangdong province shrinks or labour cost increases, this may significantly cause foreign investors to move to other provinces. As a result, market size at the provincial level is more elastic than that at the national level.

The level of innovation activities in China at the sectoral level has a positive effect on the stock of inward investment. The factor representing innovation in the Guangdong province is correctly signed, although its coefficient is not statistically significant. The coefficient of innovation activities at the sectoral level is about 0.66 in China and only about 0.08 in the Guangdong province, indicating that a 1% increase in investment in innovation of China would lead to an increase in the stock of FDI by 0.66% for the nation but with almost no effect in the Guangdong province. This phenomenon might suggest that foreign investors only consider overall innovation activities of the nation, but do not consider the innovation level of an individual province.

The effect of ownership by SOEs in terms of employment in China and the Guangdong province is negative and statistically significant. The coefficient of ownership by SOEs at the sectoral level is about -5.36 in China and -1.96 in the Guangdong province. As the level of ownership by SOEs is a proxy of the degree of economic reform, higher level of ownership by SOEs suggests that market freedom and competitiveness are not highly efficient and may be expected to reduce FDI. Moreover, the elasticity of ownership by SOEs in China is greater than in the Guangdong province. This can be explained by the fact that ownership of resources are highly controlled by the central government, but not by provincial governments.

Table 3 Regression results on inward FDI in China & the Guangdong province

Variables	China	P-values	Guangdong (province)	P-values
Constant	29.4346 (8.8826)	0.0000	29.0803 (6.9597)	0.0000
LGDP	0.3355 (2.1698)	0.0335	0.4545 (2.0694)	0.0438
LWR	-0.9868 (-2.4914)	0.0151	-1.1803 (-2.7117)	0.0092
LIL	0.6628 (6.9581)	0.0000	0.0773 (0.5599)	0.5781
LOE	-5.3647 (-5.8269)	0.0000	-1.9645 (-2.9691)	0.0046
R ²	0.6296		0.5978	
Adjusted R ²	0.6081		0.5650	
Total Panel Observation	74		54	
Degree of Freedom	69		49	
F-statistic	29.3213	0.0000	18.2098	0.0000

Note: The t-statistics are given in parentheses

Table 4 Elasticity of Variable at Sectoral Level

Variables	China	Guangdong (province)
Δ 1% in GDP	Δ 0.34%	Δ 0.45%
Δ 1% (+) in WR	Δ 0.99%	Δ 1.18%(-)
Δ 1% in IL	Δ 0.66%	Δ 0.08%
Δ 1% in OE	Δ 5.36%	Δ 1.96%(-)

7. Conclusion

The substantial amount of foreign direct investment from all over the world into China had played an enormously important role in the growth of the Chinese economy. This paper has attempted to address the determinants of FDI at the sectoral level in China and in the Guangdong province. After reviewing foreign investment policies and the facts and previous literature about China's inward FDI, empirical analysis has been implemented to determine the factors that influence the magnitude of FDI across sectors, based on pooled data of 13 sectors for China and 9 sectors for the Guangdong province from 1997 to 2002. The inward FDI of China and the Guangdong province is established as a function of the domestic market size (GDP), the labour wage, innovation activities, and degree of economic reform. The results reveal that the large market size encourages inward foreign investments in both China and the Guangdong province. This is consistent with the widely accepted belief that growing market size creates an incentive for foreign investors to gain market access. However, the labour cost and state ownership level seem to have a negative effect, which shows that higher labour costs and higher degree of ownership by SOE might be a reason to deter the inflow of FDI at sectoral levels in both China and the Guangdong province. This might suggest that foreign investors only consider the innovation activities of the whole nation, but do not consider the innovation level of an individual province.

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