Business, Economics and Public Policy
Working Papers

Number: 2011 - 6

Regional Distribution of Taiwanese Direct Investment in China: Recent Trends and Determinants

George S. Chen

School of Business, Economics and Public Policy
Faculty of the Professions,
University of New England,
2011

The Business, Economics and Public Policy Working Papers of the University of New England'sSchool of Business Economics and Public Policy, Armidale, Australia continues from the earlier series and comprisesthe following series:

- *Working Papers in Agricultural and Resource Economics*
  ISSN: 1442 1909
- *Working Papers in Econometrics and Applied Statistics*
  ISSN: 0157 0188
- *Working Papers in Economics*
  ISSN: 1442 2980
- *Working Papers in Economic History*
  ISSN: 1442 2999

The intended aim and scope of these Working Papersis to provide a forum of the publication of research in the School's key research themes:

- Business, Development and Sustainability;
- Economics; and
- Policy and Governance.

FOR COPIES PLEASE CONTACT:
School of Business, Economics and Public Policy
Faculty of the Professions
University of New England
Armidale NSW 2351
Tel: 02 6773 2432
Fax: 02 6773 3596
Email: beppwps@une.edu.au

AUTHOR CONTACT DETAILS:
George S. Chen, gchen2@une.edu.au
School of Business, Economics and Public Policy
Faculty of the Professions
University of New England
Armidale NSW 2351

Regional Distribution of Taiwanese Direct Investment in China: Recent Trends and Determinants

George S. Chen
gchen2@une.edu.au
Phone: (02) 6773 3595
School of Business, Economics and Public Policy
Faculty of the Professions
University of New England
Armidale NSW 2351

Tel: 02 6773 2432•Fax: 02 6773 3596
Email: beppwps@une.edu.au

Regional Distribution of Taiwanese Direct Investment in China: Recent Trends and Determinants

ABSTRACT

This paper seeks to explain uneven distribution of Taiwanese direct investment in China. Using firm-level data, we find that such a pattern can be attributed to different characteristics of key economic regions. Furthermore, we find evidence that the probability of a province being selected by a Taiwanese investor increases with the extent of industrial linkages and labour-market pooling. Importantly, we find evidence that the structure of the Retail and Service industry's location choice is markedly different to its Manufacturing counterpart.

Keywords China, Taiwanese investment, location choice

Subject classification codes F23, R12, R30

1. INTRODUCTION

Since its informal recognition in 1991, Taiwanese direct investment (TDI) in China has both deepened and widened. It has deepened in terms of reported cases and realized amount. According to the Ministry of Commerce (MOFCOM) in China, as of 2005, Taiwan was ranked as the fifth largest foreign investor in terms of realized amount. More impressively, in terms of approved projects, Taiwan was ranked as the second most active foreign investor in the same year, only second to Hong Kong[1].

TDI has widened in terms of its contribution to the Chinese economy. In 2003, MOFCOM reported that TDI accounted for 8 per cent of overall manufacturing output and 25 per cent of overall manufacturing output by foreign-owned enterprises in China. In the same year, it also reported that eight of top 100 exporting firms in China were affiliated with TDI–an achievement unmatched by other foreign investors (Zhu, 2005).

Undoubtedly, TDI plays a catalytic role in the Chinese economy. Taiwanese investors, like all other foreign investors, not only bring in much needed capital, but also managerial and technological know-how, to the local economy. Despite the relentless effort, not all local governments have been successful in this endeavour. In fact, this location tournament has led to the concentration of TDI in the coastal area. In this study, we seek to explain the causes of this development.

The search for uneven distribution of foreign direct investment (FDI) in China is not new. There already exists a burgeoning literature on its provincial determinants (see, e.g., Chen, 1996; Chen, 1997; Wei *et al.*, 1999; Wei and Liu, 2001; Zhang, 2001; Sun *et al.*, 2002). However, these studies have been criticized for neglecting factors pertinent to firms and industries (Cheng, 2007). Furthermore, with the exception of Li and Hu (2002), Lin and Png (2003), Fung *et al.*(2005) and Zhang (2005), a systematic inquiry into location determinants of TDI in China is still lacking to date. Therefore, this study is designed to broaden our understanding on the interplay between firm heterogeneity and provincial characteristics. Specifically, we seek to fill this gap by using the data on 2,131 Taiwanese greenfield investment projects in China for the period 1996-2005.

---

[1] Yang and Tu(2004) suggest that the true extent of TDI is likely to be greater if one takes into account the fact that many Taiwanese investors have established subsidiaries in Caribbean tax havens, such as the British Virgin Islands and the Cayman Islands, as vehicles for investing in China. This arrangement, however, means that information on the source country is often not reported.

This paper is structured as follows. Section 2 provides an analysis of regional distribution of TDI in China. Empirical models, hypotheses and variable selections for the study are presented in Section 3. Section 4 discusses estimated results, while the final section concludes.

2. REGIONAL DISTRIBUTION OF TDI

In this study, we assess regional distribution of TDI in China through the lens of the coefficient of variation (CV) and the Gini coefficient. CV is a relative measure of dispersion that is independent of the unit of measurement. It is calculated by dividing the standard deviation by the mean (Mansfield, 1994). In this study, a high CV is synonymous with a high degree of regional concentration of TDI.

The main problem for summary statistics such as CV is that it cannot identify the causes of dispersion. For example, it cannot differentiate whether the concentration of TDI stems from its unequal distribution within the coastal area or between the coastal and interior areas. In order to answer this question we need to rely on the Gini coefficient[2].

The Gini coefficient is a measurement of inequality commonly used in economics. It lies within the range $[0,1]$, with zero indicating complete equality and one indicating complete inequality. However, as Atkinson (1975) and Paglin (1975) point out, it tends to overestimate the extent of inequality, leading to erroneous conclusions. Mookherjee and Shorrocks (1982) suggest that this problem can be addressed by decomposing the coefficient into the within-group and between-group components[3.] This is a desirable property because we can infer causes of regional concentration of TDI from variations in these components.

In order to decompose the Gini coefficient into the within-region and between-region components, we divide China into different economic regions. Traditionally, most studies either divided China into the coastal and inland areas, or western highlands, midland floodplains and eastern seaboards (see, e.g., Chen, 1996; Broadman and Sun, 1997; Bao et

[2] This approach was also used by Tsui (1996) to study the impact of tertiary industry development on regional income inequality in China, by Yang (1999) to investigate the impact of economic reform on urban rural income inequality in Sichuan and Jiangsu, and by Huang *et al.*(2004) to examine regional inequality of economic development in China.

[3] See also Lambert and Aronson (1993) for the debate regarding the appropriateness of using decomposed Gini coefficients as a measure of inequality.

al., 2002). However, these groupings were, by and large, topology-based and neglected the fact that each region contained many heterogeneous provinces.

An alternative to the topology-based grouping is to follow the approach outlined in the Ninth Five-Year Plan proposed by the National People's Congress in 1996. It divided China into seven key economic regions; namely, the Greater Bohai, Yangtze River, South Coastal, Northeast, Midland, Southwest and Northwest regions[4]. We follow this approach in this study because it brings together provinces with similar characteristics and experience in economic reform[5].

Formally, the Gini coefficient for regional distribution of TDI in China can be written as follows:

$$G = \frac{1}{2n^2\mu}\sum_i\sum_j |y_i - y_j|, i \neq j \qquad (1)$$

where $n = 30$ is the number of provinces in China, $\mu = \sum_{i=1}^{30}(y_i/30)$ is the mean provincial TDI, and y_i and y_j represent the amount of TDI in the i^{th} and j^{th} province, respectively.

If we let N_k be the subset of provinces in the k^{th} economic region, with the number of regions given by n_k and its mean given by μ_k, we can decompose equation (1) into the within-region and between-region components as follows:

$$G = \sum_k \left(\frac{n_k}{n}\right)^2 \frac{\mu_k}{\mu} G^k + \frac{1}{2n^2\mu}\sum_k \sum_{i\in N_k}\sum_{j\in N_h} |y_i - y_j| \qquad (2)$$

Where G^k is the Gini coefficient for the k^{th} economic region. Following Mookherjee and Shorrocks (1982) and Huang et al. (2004), we define

$$\sum_{i\in N_k}\sum_{j\in N_h} |y_i - y_j| = n_k n_h |\mu_k - \mu_h|, h \neq k \qquad (3)$$

---

[4] The Greater Bohai region includes Beijing, Tianjin, Hebei, Shanxi, Neimenggu and Shandong. The Yangtze River region includes Shanghai, Jiangsu and Zhejiang. The South Coastal region includes Fujian and Guangdong. The Midland region includes Anhui, Jiangxi, Henan, Hibeiand Hunan. The Northeast region includes Liaoning, Jilin and Heilongjiang. The Northwest region includes Xizang, Shannxi, Gansu, Qinghai, Ningxaand Xinjiang. The Southwest region includes Guanxi, Sichuan, Guizhou, Yunnaand Hainan.

[5] In general, the South Coastal, Yangtze River and Greater Bohai regions were the first to experience economic reforms, followed by the Northeast and Midland regions, and finally the Southwest and Northwest regions.

Substituting equations (2) and (3) back into equation (1) and rearranging yields

$$G = \sum_k \nu_k^2 \lambda_k G^k + \frac{1}{2} \sum_k \sum_h \nu_k \nu_h |\lambda_k - \lambda_h| \qquad (4)$$

where$\nu_k = n_k/N$ is the proportion of provinces belonging to the k^{th} economic region and $\lambda_k = \mu_k/\mu$ is the mean TDI in the k^{th} economic region relative to the mean provincial TDI. Intuitively, the first and second items on the right-hand side of equation (4) represent the contribution of the within-region and between-region effects to the Gini coefficient, respectively.

The data used to calculate the CV and the Gini coefficient is compiled from Statistics on Approved Outward Investment by Year and Area and Statistics on Approved Indirect Mainland Investment by Year and Area, both published by the Ministry of Economic Affairs (MOEA) in Taiwan. We calculate two sets of the Gini coefficient; the first is the Gini (all) coefficient and the second is the Gini (selected) coefficient. The main difference between them is that the later excludes provinces with less than 1 per cent of the stock of TDI. This is done to avoid potentially biased results. Finally, we divide the sample period into three distinct periods; namely, the Boom (1991-1995), Cautious (1996-1999) and Adjustment (2000-2005) period.

2.1Recent trends

The Chinese government has made substantial changes to the Open Door policy following its promulgation in 1979. Table 1 shows that TDI started to gather momentum during the Boom period. In part, this can be attributed to the Taiwanese government introducing Regulations on Indirect Investment and Technology Co-operation with the Mainland Area in 1991 that removed some ambiguities surrounding TDI in China; and partly, to the Chinese government embracing cross-Strait economic exchanges at that time. Together, these changes bestowed confidence in Taiwanese investors about doing businesses in China.

Table 1 Regional distribution of Taiwanese investment and non- Taiwanese investment in China, by coefficients of variation, 1991- 2005

Period	Year	Amount (US$m)	TDI	Non-TDI
Boom	1991	143.10	3.00	2.43
	1992	217.80	2.60	2.02
	1993	2,886.30	2.15	1.68
	1994	886.50	2.05	1.70
Cautious	1995	1,036.90	1.85	1.70
	1996	1,207.20	2.11	1.70
	1997	4,322.80	2.39	1.63
	1998	2,083.80	2.50	1.68
	1999	1,262.30	2.60	1.85
Adjustment	2000	2,589.60	2.87	1.84
	2001	2,780.50	2.59	1.73
	2002	6,658.30	2.33	1.67
	2003	7,443.10	2.40	1.61
	2004	6,584.30	2.37	1.54
	2005	5,854.40	2.51	1.52

Source: Statistics on Taiwanese investment are compiled from *Statistics on Approved Outward Investment by Year & Area* and *Statistics on Approved Indirect Mainland Investment by Year & Area*, published by Industrial Development and Investment Commission, Ministry of Economic Affairs, Republic of China (various issues). Statistics on non-Taiwanese investors are compiled from *China Statistical Yearbook* (various issue) published by National Bureau of Statistics of China.

During the Cautious period, TDI grew substantially, with much of it stemming from the Chinese government abolishing the dual-track exchange rate regime in 1994 (Huang et al., 2004)[6]. This change led to a hefty depreciation of the Chinese currency, which effectively reduced the real costs of investing in China.

During the Adjustment period, TDI accelerated in terms of realized amount and reported cases. This surge coincided with the Taiwanese government substituting the No Haste Be Patient policy with the Active Opening Effective Management policy in 2000. This policy change was momentous in that it allowed, for the very first time, high-tech and capital-intensive industries to legally invest in China. Furthermore, following its accession to the World Trade Organization (WTO) in 2000, the Chinese government continued to liberate its domestic market, attracting market-seeking TDI in the process. By the end of 2002, China became the largest host country of Taiwanese overseas investment.

2.2 Increasing regional concentration

In terms of regional concentration, Table 1 shows that TDI was less concentrated during the Boom period, i.e., the CV decreased from 3.00 in 1991 to 2.05 in 1994. This trend can

---

[6] Huang *et al.*(2003) reported that the Chinese currency depreciated by an order of 46.5 per cent from 1993 to 1994.

be attributed to the emergence of TDI in newly established investment incentive zones (IIZs) across China.

However, TDI became more concentrated during the Cautious period, i.e., the CV increased from 1.85 in 1995 to 2.60 in 1999. In part, this was driven by the relocation of Taiwanese firms from Southeast Asia to China after the Asian Financial Crisis in 1997. Importantly, most of them chose to relocate in the coastal area due to its large market potential, better basic infrastructure, sound industrial linkages, low labour costs and proximity to the world market (Ohmae, 2002; Zhu, 2005).

The extent of regional concentration of TDI, though remained concentrated, reduced slightly during the Adjustment period, i.e., the CV decreased from 2.87 in 2000 to 2.51 in 2005. This could be related to the policy change in 2000 that saw many high-tech and capital-intensive investors flocking to the coastal area (Chen, 2008).

Regional concentration of TDI can also be seen from variations in Gini coefficients. As Table 2 shows, Gini (all) coefficients and Gini (selected) coefficients consistently exceeded 0.60 for the period 1991-2005. Specifically, they showed that TDI was less concentrated during the Boom period, i.e., Gini (all) coefficients fall within the range 0.82 to 0.75. However, they became more concentrated during the Cautious and Adjustment periods, i.e., Gini (all) coefficients fall within the range 0.69 to 0.83. This initially decreasing, increasing and then decreasing trend is consistent with our earlier findings for CVs.

Table 2 Regional distribution of Taiwanese direct investment and non- Taiwanese direct investment in China, by Gini coefficients, 1991- 2005

			TDI		Non-TDI
Period	Year	Amount (US$m)	Gini (All)	Gini (Selected)	Gini (All)
Boom	1991	143.10	0.82	0.80	0.76
	1992	217.80	0.67	0.63	0.73
	1993	2,886.30	0.73	0.64	0.67
	1994	886.50	0.75	0.65	0.67
Cautious	1995	1,036.90	0.69	0.60	0.67
	1996	1,207.20	0.69	0.63	0.67
	1997	4,322.80	0.77	0.68	0.65
	1998	2,083.80	0.80	0.73	0.67
	1999	1,262.30	0.79	0.76	0.69
Adjustment	2000	2,589.60	0.83	0.80	0.70
	2001	2,780.50	0.82	0.74	0.69
	2002	6,658.30	0.79	0.72	0.69
	2003	7,443.10	0.79	0.72	0.68
	2004	6,584.30	0.78	0.73	0.66
	2005	5,854.40	0.81	0.75	0.66

Note: After excluding provinces hosting less than 1 per cent of the overall Taiwanese investment in China, the Gini (selected) coefficient includes a total of 17 provinces, namely Beijing, Tianjin, Hebei, Shandong, Liaoning, Shanghai, Jiangsu, Zhejiang, Jiangxi, Henan, Hubei, Fujian, Guangdong, Guangxi, Hainan, and Sichuan (inclusive of Chongqing).
Source: Statistics on Taiwanese investment are compiled from *Statistics on Approved Outward Investment by Year & Area* and *Statistics on Approved Indirect Mainland Investment by Year & Area*, published by Industrial Development and Investment Commission, Ministry of Economic Affairs, Republic of China (various issues). Statistics on non-Taiwanese investors are compiled from *China Statistical Yearbook* (various issue) published by National Bureau of Statistics of China.

From the outset, this trend reflects the Open Door policy that favoured the coastal area. As Table 3 shows, in 2005, the coastal area, including the Yangtze River, South Coastal and Greater Bohai regions, accounted for approximately 94.5 per cent of the stock of TDI. By contrast, the interior area, including the Midland, Southwest, Northeast and Northwest regions, only accounted for approximately 5.5 per cent. Fung et al. (Fung et al., 2005) attributed the interior area's dismal performance to poor economic infrastructure and weak institutional environment.

Table 3 Stock of Taiwanese investment in China, by economic region, 2005

Economic Region	Province	Amount (US$m)	Share (%)
Yangtze River	Shanghai, Jiangsu, Zhejiang	23,846	51.9
South Coastal	Fujian, Guangdong	16,710	36.4
Greater Bohai	Beijing, Tianjin, Hebei, Shanxi, Neimenggu, Shandong	2,861	6.2
Midland	Anhui, Jiangxi, Henan, Hubei, Hunan	1,138	2.5
Southwest	Guangxi, Sichuan, Guizhou, Yunnan, Hainan	909	2.0
Northeast	Liaoning, Jilin, Heilongjiang	477	1.0
Northwest	Xizang, Shaanxi, Gansu, Qinghai, Ningxa, Xinjiang	15	0.0
Total		45,957	100.0

Note: Figures are deflated using the GDP deflator for Taiwan published by IMF World Economic Outlook. Bold letters indicate coastal regions. The classification of economic regions follows the Ninth Five-Year Plan released by the National People's Congress in 1995.
Source: See Table 1.

Finally, another stylized fact revealed in Tables 1 and 2 is that TDI, in general, was more concentrated compared to non-TDI from 1997 onward, i.e., Gini coefficients and CVs of TDI consistently exceeded those of non-TDI. Moreover, the increasing concentration of TDI during the Cautious and Adjustment periods was in strong contrast to a more dispersed distribution of FDI over the same period. This could suggest that the Western Development Plan introduced by the National People's Congress in 1996 might have had much more of an impact on non-Taiwanese investors.

2.3 Unequal inter- regional distribution

Although TDI was unequally distributed in China, it is difficult to extract information on the driving force behind it from summary statistics such as CVs and Gini coefficients. Furthermore, it is possible for these statistics to overestimate the extent of the inequality. In order to address these issues, we decompose Gini coefficients into the between-region and within-region effects. Table 4 shows that although the between-region effect declined from 1991 to 2005 it still explained between 76 and 93 per cent of variations in regional distribution of TDI.

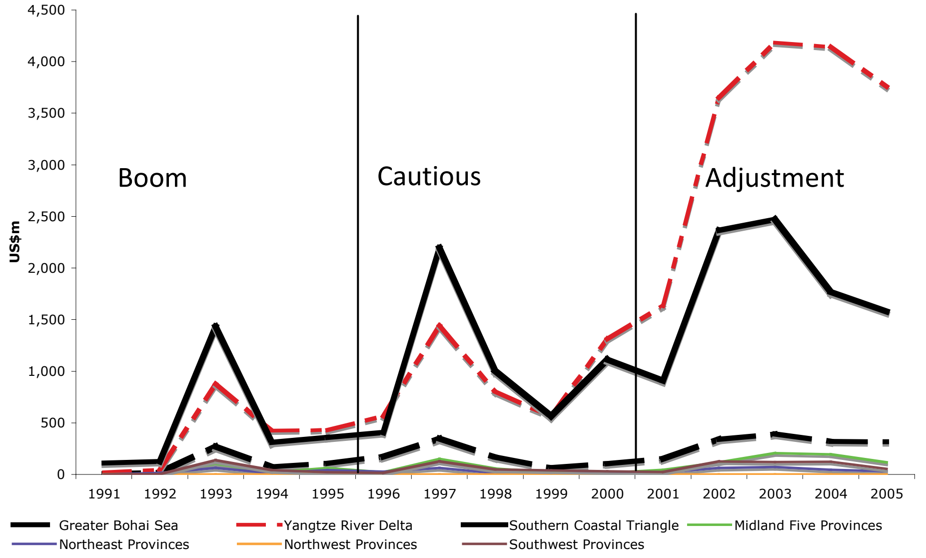
Table 4 Regional distribution of Taiwanese investment in China, by between- region and within- region effects

Period	Year	Gini (All)	Between-region (%)	Within-region (%)
Boom	1991	0.82	93.9	6.1
	1992	0.67	89.6	10.5
	1993	0.73	82.2	17.8
	1994	0.75	76.0	24.0
	1995	0.69	81.2	18.8
Cautious	1996	0.69	84.1	15.9
	1997	0.77	81.8	18.2
	1998	0.80	80.0	20.0
	1999	0.79	82.3	17.7
Adjustment	2000	0.83	81.9	18.1
	2001	0.82	79.3	20.7
	2002	0.79	81.0	19.0
	2003	0.79	79.7	20.3
	2004	0.78	83.3	16.7
	2005	0.81	82.7	17.3

Source: Author’s own calculation based on Table 1.

The diminution of the between-region effect can be attributed to significant changes in the distribution of TDI within the coastal area. Figure 1 shows that TDI was, initially, concentrated in the South Coastal region during Boom and Cautious periods. This was to be expected; for it was the first region opened to FDI and shared cultural ties and geographical proximity with Taiwan. However, by the end of Adjustment period, the Yangtze River region overtook it and became the largest host region of TDI. In part, its rise to prominence was related to the establishment of numerous IIZs in the region since 1992 (Kao, 2002).

Figure 1 Annual flow of Taiwanese investment to China, by economic region, 1991- 2005



Note: Figures are deflated using the GDP deflator for Taiwan published by IMF World Economic Outlook. The classification of economic regions followsThe Ninth Five-Year Plan released by the National People's Congress in 1995.
Source: See Table 1.

It is worth noting that although the Greater Bohai region only managed to attract a small amount of TDI relative to other coastal regions it still outperformed interior regions. One possible explanation could be that Taiwanese investors were not familiar with interior regions due to their relatively short history of economic reform. Furthermore, despite lucrative fiscal incentives and preferential treatment under the Western Development Plan, many Taiwanese investors were discouraged by poor basic infrastructure, weak industrial linkages and the lack of human capital in these regions.

2.4 Changing intra- regional distribution

The within-region effect is also responsible for variations in Gini coefficients. Table 4 shows that, from 1991 to 2005, it explained between 6 and 24 per cent of variations in regional concentration of TDI in China. Its small contribution is consistent with the fact that provinces included in the same economic region shared similar attributes.

Despite its small magnitude, the within-region effect has, nevertheless, increased in importance in recent years. Table 4 shows that it increased from 6 per cent at the beginning of the Boom period to 17 per cent by the end of the Adjustment period. This is best understood by examining Table 5. Specifically, it suggests that the rise to prominence of the Yangtze River region can be attributed to the exponential growth of TDI in Jiangsu and Shanghai, and to a lesser extent, Zhejiang. In fact, by the end of the Adjustment period, Jiangsu and Shanghai accounted for 45 per cent of the stock of TDI in China. Meanwhile, the sharp decline of TDI in Fujian and Guangdong within the Southern Coastal region further strengthened the within-region effect. Finally, the growing within-region effect can be attributed to reductions of TDI in Beijing, Tianjin, Hebei, Shandong and Neimenggu within the Greater Bohai region, as well as to little variations in TDI within the Midland, Northeast, Northwest and Southwest regions[7].

Table 5 Taiwanese investment in China, by region and province, 1991- 2005

	Boom (1991-1994)		Cautious (1995-1999)		Adjustment (2000-2005)		Total (1991-2005)	
	Amount (US$m)	Share (%)	Amount (US$m)	Share (%)	Amount (US$m)	Share (%)	Amount (US$m)	Share (%)
Greater Bohai	**376.5**	**9.1**	**862.7**	**8.7**	**1622.1**	**5.1**	**2861.3**	**6.2**
Beijing	103.8	2.5	207.4	2.1	514.3	1.6	825.5	1.8
Tianjin	102.5	2.5	317	3.2	516.5	1.6	936.0	2.0
Hebei	50.7	1.2	71.7	0.7	88.0	0.3	210.4	0.5
Shanxi	3.6	0.1	10.8	0.1	56.3	0.2	70.7	0.2
Neimenggu	2.3	0.1	9.5	0.1	0.0	0.0	11.8	0.0
Shandong	113.5	2.8	246.4	2.5	446.9	1.4	806.8	1.8
Yangtze River	**1368.3**	**33.2**	**3798.2**	**38.4**	**18679.9**	**58.8**	**23846.4**	**52.1**
Shanghai	555.3	13.5	1487.8	15.0	4819.1	15.2	6862.2	15.0
Jiangsu	625.1	15.2	1860.5	18.8	11358.2	35.7	13843.8	30.2
Zhejiang	188.0	4.6	450.0	4.6	2502.7	7.9	3140.7	6.9
South Coastal	**2047.2**	**49.7**	**4579.8**	**46.3**	**10234.5**	**32.2**	**16861.5**	**36.8**
Fujian	598.2	14.5	910.9	9.2	2259.3	7.1	3768.4	8.2
Guangdong	1382	33.6	3616.6	36.6	7943.3	25.0	12941.9	28.3
Midland	**136.3**	**3.3**	**309.8**	**3.1**	**691.5**	**2.2**	**1137.6**	**2.5**
Anhui	21.2	0.5	19.4	0.2	106.9	0.3	147.5	0.3
Jiangxi	20.6	0.5	65.9	0.7	177.0	0.6	263.5	0.6
Henan	22.1	0.5	15.0	0.2	58.1	0.2	95.2	0.2
Hubei	41.2	1.0	128.9	1.3	287.7	0.9	457.8	1.0
Hunan	31.3	0.8	80.6	0.8	61.8	0.2	173.7	0.4
Northeast	**87.4**	**2.1**	**150.9**	**1.5**	**238.7**	**0.8**	**477.0**	**1.0**
Liaoning	64.7	1.6	126.1	1.3	187.1	0.6	377.9	0.8
Jilin	11.3	0.3	7.3	0.1	27.7	0.1	46.3	0.1
Heilongjiang	11.4	0.3	17.5	0.2	23.9	0.1	52.8	0.1
Northwest	**0.0**	**0.0**	**15.1**	**0.2**	**0.0**	**0.0**	**15.1**	**0.0**
Tibet	0.0	0.0	15.1	0.2	0.0	0.0	15.1	0.0
Shannxi	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gansu	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Qinghai	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ningxa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Xinjiang	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Southwest	**100.4**	**2.4**	**171.4**	**1.7**	**324.1**	**1.0**	**595.9**	**1.3**
Guangxi	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sichuan	87.4	2.1	127.4	1.3	304.9	1.0	519.7	1.1
Guizhou	6.5	0.2	14.6	0.1	6.0	0.0	27.1	0.1
Yunnan	6.5	0.2	29.4	0.3	13.2	0.0	49.1	0.1
Hainan	67.0	1.6	52.3	0.5	32.0	0.1	151.3	0.3
Total	**4116.1**	**100**	**9888**	**100**	**31790.7**	**100**	**45794.8**	**100.0**

Source: See Table 1.

[7] In these four regions, only Jiangxi, Hubei, Liaoning and Sichuan showed signs of minor variations in TDI.

3. MODEL, HYPOTHESES AND VARIABLE SELECTIONS

Unlike other foreign investors, Taiwanese investors share cultural ties and geographical proximity with China. Despite this, they still undergo extensive search for optimal investment locations. In part, this is because China is a vast country with diverse economic capability across provinces. This makes investment location choice the first, and probably, the most important investment decision[8].

3.1 The model

To model Taiwanese investors' location choice in China, we first assume that they evaluate relevant attributes from a set of alternative provinces. According to McFadden (1974), if an information set describing the attributes of these provinces is available, the conditional logit model (CLM) can be applied to estimate the probability of a particularly province being selected by an investor. Furthermore, we assume that this investor seeks locations with the highest expected profit[9].

Formally, let i to represent a Taiwanese investor's location choice in China and P to denote the set of possible provinces that this investor can choose from. If the expected profit is a sole function of location attributes of the chosen province, we can express it as:

$$\pi_{ip} = A_0 X_{1p}^{\alpha_1} \cdots X_{mp}^{\alpha_m} e^{\sum_{k=m+1}^{n} \alpha_k D_{kp}} \varepsilon_{ip}^{M} \qquad (5)$$

where A_0, M and $\alpha_s \forall (s = 1, \cdots, n)$ are unknown constants, $X_{sp} \forall (s = 1, \cdots, m)$ are continuous exogenous variables at province p and $D_{sj} \forall (s = m+1, \cdots, n)$ are dummy variables at province p. Importantly, $\varepsilon_{ip}$is a random disturbance terms reflecting measurement and/or specification error, as well as a firm-specific effect (Carlton, 1983; Woodward, 1992).

If the objective of investor i is to maximize profit, then the probability that a particular province p will be chosen is:

$$\Pr(Y_i = p) = \Pr(\pi_{ip} > \pi_{iq}) \forall p \neq q \qquad (6)$$

Taking logs of equation (5) and dividing by M we obtain:

[8] Zhu (2005) and Ohame (2002) provide interesting case studies in which Taiwanese firms failed in China as a result of poor location choices.

[9] It is possible for some location choices made on grounds other than profit maximization. For example, it is not uncommon for such choices to be made for the purpose of industrial grouping or strategic alliance(Blonigen *et al.*, 2005a, b). These choices, at least in the short run, need not be consistent with our profit-maximization assumption.

$$\ln \pi_{ip}/M = \ln A_0/M + \sum_{k=1}^{m} \alpha_k \ln X_{kp}/M + \sum_{k=m+1}^{n} \alpha_k D_{kp}/M + \varepsilon_{ip} \quad (7)$$

Next, if we let $\beta_k \equiv \alpha_k/M$and $A_1 \equiv \ln A_0/M$, we can rewrite equation (7) as:

$$\ln \pi_{ip} = A_1 + \sum_{k=1}^{m} \beta_k \ln X_{kp} + \sum_{k=m+1}^{n} \beta_k D_{kp} + \varepsilon_{ip} \quad (8)$$

Following McFadden (1974), if ε_{ip} are independently distributed with an extreme-type-value 1 Weibull density functions, the probability of province p being chosen by all Taiwanese investors is given by:

$$\Pr(Y_i = p) = \frac{e^{\sum_{k=1}^{m} \beta_k \ln X_{kp} + \sum_{k=m+1}^{n} \beta_k D_{kp}}}{\sum_{p \in P} e^{\sum_{k=1}^{m} \beta_k \ln X_{kp} + \sum_{k=m+1}^{n} \beta_k D_{kp}}} \quad (9)$$

An assumption underlying this specification is that the odds of choosing one alternative relative to another remained unchanged if the number of choices is altered. This property, also referred to as the independence of irrelevant alternatives (IIA), though simplifies estimation processes; it can be a drawback whenever two or more choices are close substitutes.

In order to estimate equation (9), we require a data set containing information on Taiwanese investors' location choice in China. This information is regularly updated by the Taiwan Affairs Office of the State Council in China and the Investment Development and Industrial Commission (IDIC) in Taiwan. For this study, we examine only Taiwanese greenfield investors' location choices in China. This is because, unlike mergers and acquisitions in which investment locations are often pre-determined, these investors are free to invest anywhere in China[10]. Between these two potential sources of firm-level data, we select the IDIC dataset, on the basis that it includes genuine investors who are active in cross-Strait economic exchanges (Yang and Tu, 2004)[11].

[10] To some extent, this choice of unit of analysis helps to avoid the complication associated with non-profit-maximization strategic investment.

[11] In addition, we do not use the Chinese figures because they may contain many dubious investment projects financed by roundabout Chinese capital rather than capital originated from Taiwan (Pomfret, 1994).

The IDIC data for 1996 to 2005 were used to form the dependent variables in this study. The sample is comprised of 2,131 greenfield investment projects in China made by Taiwan's public listed companies[12]. Also, we exclude those investors who re-invested in, or withdrew their involvement from, China[13]. Each investment project forms a separate observation comprised of P province choices, with 1 being assigned to the chosen province and 0 otherwise. In the regressions, each observation is conditional on, firstly, attributes of the selected province, and secondly, attributes of all other provinces in the choice set. Table 6 shows that, for the period studied, Xinjiang, Xizang, Gansu, Yunnan, Qinghai and Ningxia received no TDI. Consequently, they are excluded from the choice set[14]. This also means that we need to interpret the dependent variable as the probability of a province being chosen from the 24 remaining provinces by Taiwanese investors[15].

[12] We investigate these companies' location choice not only because they feature prominently in the cross-Strait economic exchange, but also these investment projects' average size is substantially larger than those originated from small- and medium-sized Taiwanese enterprises. In addition, because investment projects with a contracted value under $US1 million do not need to be formally registered, they are omitted from this study.

[13] In other words, we only focus on these investors' initial location choice, not on their operation success or failure in subsequent periods.

[14] We exclude provinces received no TDI during the sample period from the choice set as they leave the odds undefined in the maximum likelihood technique (it would involve taking the natural log of a zero value).

[15] The 24 provinces include in the sample are Beijing, Tianjin, Hebei, Shanxi, Neimenggu, Liaoning, Jilin, Heilongjiang, Shanghai, Jiangsu, Zhejiang, Anhui. Fujian, Jiangxi, Shandong, Henan, Hubei, Hunan, Guangdong, Guangxi, Hainan, Sichuan, Guizhouand Shannxi. For consistency, we regard TDI in Chongqing as part of the investment in Sichuan.

Table 6 Location of Taiwanese greenfield investment in China, 1996- 2005, by province and industry

Province \ Industry	Chemical	Electrics and electronics	Food processing	Machinery	Metal	Transportation	Textiles	Retails and services	**Total**
YANGTZE	**153**	**577**	**28**	**43**	**110**	**46**	**65**	**85**	**1,10 7**
Shanghai	50	212	17	26	37	18	26	62	448
Jiangsu	7	14	0	2	5	2	1	2	33
Zhejiang	96	351	11	15	68	26	38	21	626
SOUTH COAST	**92**	**369**	**12**	**21**	**52**	**45**	**54**	**39**	**704**
Fujian	11	21	5	1	4	26	7	7	82
Guangdong	81	348	7	20	48	19	47	32	622
BOHAI	**26**	**76**	**18**	**8**	**13**	**8**	**14**	**21**	**184**
Beijing	5	34	8	6	6	4	8	13	84
Tianjin	12	21	9	1	2	2	2	6	55
Hebei	1	1	0	0	4	0	1	0	7
Shanxi	1	3	0	0	1	0	0	0	5
Neimenggu	0	1	0	0	0	0	0	0	1
Shandong	7	16	1	1	0	2	3	2	32
MIDLAND	**9**	**22**	**3**	**0**	**1**	**6**	**5**	**7**	**53**
Anhui	2	3	0	0	0	1	0	0	6
Jiangxi	0	4	1	0	0	1	2	0	8
Henan	1	1	1	0	0	0	1	1	5
Hubei	3	12	1	0	0	3	1	2	22
Hunan	3	2	0	0	1	1	1	4	12
SOUTHWEST	**3**	**15**	**1**	**3**	**4**	**7**	**1**	**13**	**47**
Guangxi	0	4	1	0	0	0	0	1	6
Sichuan	3	9	0	3	2	6	1	12	36
Guizhou	0	1	0	0	0	0	0	0	1
Hainan	0	1	0	0	2	1	0	0	4
Yunnan	0	0	0	0	0	0	0	0	0
NORTHEAST	**3**	**9**	**4**	**1**	**0**	**6**	**1**	**2**	**26**
Liaoning	2	7	4	0	0	1	1	2	17
Jilin	1	1	0	1	0	2	0	0	5
Heilongjiang	0	1	0	0	0	3	0	0	4
NORTHWEST	**2**	**3**	**0**	**0**	**2**	**0**	**0**	**3**	**10**
Shannxi	2	3	0	0	2	0	0	3	10
Gansu	0	0	0	0	0	0	0	0	0
Qinghai	0	0	0	0	0	0	0	0	0
Ningxia	0	0	0	0	0	0	0	0	0
Xinjiang	0	0	0	0	0	0	0	0	0
Xizang	0	0	0	0	0	0	0	0	0
Total	**288**	**1,07 1**	**66**	**76**	**182**	**118**	**14 0**	**170**	**2,13 1**

Source: Bold letters indicate economic regions classified under the Ninth Five-Year Plan released by the National People's Congress in 1995, The relevant statistics are compiled from various issues of *Statistics on Approved Indirect Mainland Investment, by year and area*, published by IDIC, Taiwan.

3.2 Hypotheses

From our discussion in Section 2, there are five potential factors causing uneven distribution of TDI in China. For ease of exposition, they can be broadly categorized as the effects of market access, industrial linkage, labour-market pooling, trade costs and monitoring costs.

3.2.1 Market access

Economic liberalization has resulted in China opening up its domestic market to foreign investors. This change has encouraged many Taiwanese investors to establish production facilities in large provinces predominantly for two reasons. Firstly, it enhances the prospects of realizing economies of scale and scope in production and transportation. Secondly, it increases the likelihood of tapping into massive local markets.

The most commonly used measurement of market access is the level of gross provincial product (GPP), on the basis that a higher level of GPP implies higher purchasing power of residents in the province (Belderbos and Carree, 2002; Zhou et al., 2002; Cheng and Stough, 2006; Kang and Lee, 2007). In contrast, some studies have suggested that population density may be a better indicator of market potential as it takes into account the potential of reaching new customers (Chang and Park, 2005). We consider these measures in this study and expect a positive sign. Therefore, we have:

> **Hypothesis 1**: The probability of a Chinese province being selected by a Taiwanese investor increases with market access, *ceteris paribus*.

3.2.2 Industrial linkages

The extent of industrial linkages affects the willingness of Taiwanese investors to invest in a province. This is because a strong industrial base enhances the ability to source inputs locally. It also increases the likelihood of becoming suppliers to local industrial networks.

Three potential measures of local industrial linkages are widely used in the literature. The first is based on the argument that the likelihood of a firm in becoming a supplier to other firms increases with the number of manufacturing firms in the province (Head and Ries, 1996; Zhou et al., 2002; Chang and Park, 2005; Wakasugi, 2005). The second is based on the premise that provinces with a higher number of manufacturing workers indicate better availability of specialized intermediate inputs (Head and Ries, 1996; Chang and Park, 2005; Cheng, 2007). The third is drawn from the network effect. Specifically, it suggests that the co-location of foreign investors from the same country, or national clusters, arises in the host country because networks established at home can be easily extended beyond national boundaries (Head and Ries, 1996; Chang and Park, 2005; Wakasugi, 2005; Cheng and Stough, 2006; Cheng, 2007). We consider these measures in this study and expect a positive sign. Therefore, we have:

> **Hypothesis 2**: The probability of a Chinese province being selected by a Taiwanese investor increases with industrial linkages, *ceteris paribus*.

3.2.3 Labour-market pooling

Traditionally, the majority of Taiwanese investors in China have originated from export-oriented, labour-intensive industries. For these investors, securing low-cost workers is critical to their international competitiveness. In recent years, however, capital-intensive and high-tech Taiwanese investors have increased their presence in China. For them, locating in provinces with an ample supply of qualified workers increases the probability of finding specialized workers.

In measuring the impact of labour-market pooling, average real wage rate is often used in the literature (Belderbos and Carree, 2002; Zhou et al., 2002; Wakasugi, 2005; Cheng and Stough, 2006; Kang and Lee, 2007). However, it may not be a good indicator due to its high correlation with labour quality. Instead, other studies circumvent this problem by using efficiency wage rate (Head and Ries, 1996; Belderbos and Carree, 2002). We adopt these measures in this study and expect a negative sign. Therefore, we have:

> **Hypothesis 3**: The probability of a Chinese province being selected by a Taiwanese investor increases with labour-market pooling, *ceteris paribus*.

3.2.4 Trade Costs

The level of trade costs is expected to feature prominently in Taiwanese investors' location choices in China. This is because it determines transportation costs of intermediate inputs and final goods, which account for a significant proportion of operational expenses. Any reductions in trade costs, in effect, increase the profitability of foreign subsidiaries.

In the literature, transportation density in a province is the most commonly used measurement (Zhou et al., 2002; Chang and Park, 2005; Wakasugi, 2005; Cheng and Stough, 2006; Cheng, 2007; Kang and Lee, 2007). Given the importance of exports to the Chinese economy, some studies have used the number of seaports and airports instead (Head and Ries, 1996; Belderbos and Carree, 2002). Both measures are considered in this study and we expect a positive sign on these variables. Therefore, we have:

> **Hypothesis 4**: The probability of a province being selected by a Taiwanese investor decreases with trade costs, *ceteris paribus*.

3.2.5 Monitoring Costs

By all accounts, the scale of operation for many Taiwanese investors tends to be relatively small compared to other foreign investors in China. Limited resources, particularly in terms of managerial capacity, force many managers to frequently travel between headquarter in Taiwan and its subsidiaries in China. As a consequence, monitoring costs play an important role for ensuring effective co-ordination of tasks within the organization.

A well-established telecommunication infrastructure is the most efficient way of reducing monitoring costs. As such, most studies have used telephone density as a proxy for monitoring costs (Head and Ries, 1996). Meanwhile, others have selected the provincial output of postal and telecommunication industries and the number of employees in these industries (Wei et al., 1999; Wei and Liu, 2001). In general, a higher provincial output of, and more local employees in, postal and telecommunication industries suggest a better communication infrastructure needed to reduce monitoring costs. We adopt these measures in the study and expect a positive sign. Therefore, we have:

> **Hypothesis 5**: The probability of a Chinese province being selected by a Taiwanese investor decreases with monitoring costs, *ceteris paribus*.

3.3 Variable selections

Based on the review of empirical literature we select 18 commonly used variables related to the five effects influencing the Taiwanese investors' location choice in China. Table 7 provides summary statistics of these variables.

Table 7 Summary statistics, by variables

Variables	Symbol	Mean	Std. Dev.	Min.	Max.	Source
Gross provincial product (RMB billion)	GPP	4.404	2.920	0.588	6.159	CSY
Gross provincial product per capita (RMB)	PGPP	3.665	3.044	0.271	4.440	CSY
Provincial population density (person/km^2)	POPD	1.455	0.259	0.402	2.554	CSY
Provincial manufacturing output (RMB billion)	MOUT	4.404	2.920	0.588	6.159	CSY
Number of manufacturing workers (10,000 people)	MWKER	6.078	4.829	0.357	6.893	CSY
Provincial number of manufacturing firms (count)	NMF	3.661	4.605	0.435	2.790	CSY
Cumulative FDI (RMB 10,000)	CFDI	9.762	8.802	0.498	10.909	CSY
Provincial number of foreign-invested enterprises(count)	NFDI	3.694	2.775	0.481	4.782	CSY
Provincial cumulative TDI (RMB10,000)	CTDI	5.512	3.320	0.818	7.510	IDIC
Provincial number of Taiwanese enterprises (count)	NTDI	3.694	2.775	0.481	4.782	IDIC
Provincial average real wage rate (RMB)	AWAGE	3.674	3.281	0.174	4.159	CSY
Provincial efficiency wage rate (RMB)	EWAGE	2.649	2.206	0.207	3.220	CSY
Provincial railway density (km/km^2)	RWAY	-1.867	-2.409	-1.161	0.301	CSY
Provincial highway density (km/km^2)	HWAY	4.644	3.589	0.337	5.224	CSY
Provincial combined railways and highways density(km/km^2)	WAY	-0.457	-1.367	0.121	0.263	CSY
Provincial telephone density (Telephone set per 1,000 people)	TELD	0.990	-0.042	0.406	1.772	CSY
Provincial postal and telecommunication output (RMB billion)	TOUT	3.255	1.848	0.600	4.963	CSY
Provincial number of postal and telecommunication workers(10,000 people)	TWKER	5.348	4.542	0.236	5.750	CSY

Note: These summary statistics are based on the logged value and since log 0 is undefined, 10-4 is used to replace the zero whenever it occurs in the dataset. The panel data comprises observations of 24 provinces across the period 1996-2005. We convert GPP, GPP per capita and provincial outputs of manufacturing and postal and telecommunication industries into 1990 prices using the GDP deflator for the relevant province. Similarly, the CPI for the relevant province is used to convert the provincial wage rates into 1990 prices. In order to obtain the respective densities, we adjust the population size, the total length of railways and highways and the number of telephone sets for landmass of the relevant province. In terms of the figures for cumulative FDI and Taiwanese investment in each province, we make 1996 our reference point and use the GDP deflator for the relevant province to deflate the stock of provincial FDI and Taiwanese investment since 1996. Finally, the numbers of foreign-invested and Taiwanese enterprises in the province are year-end figures. CSY denotes China Statistical Yearbook. IDIC denotes Statistics on Approved Indirect Mainland Investment by Year and Area published by Taiwan's Industrial Development and Investment Commission. Efficiency wage rate is the ratio of the average real wage rate to manufacturing output divided by the number of workers in the manufacturing industries.

Clearly, many of these variables are conceptually similar. As such, a process of data reduction is required. To achieve that end, we perform principal components analysis on these variables to generate a set of factors that has empirical coherence[16]. After seven iterations, we remove items that are highly loaded on more than one factor and end up with the five factors shown in Table 8. In this solution, factor retention is based on scree plots and eigenvalues. As shown, these five factors account for approximately 90 per cent of variations in the 18 selected variables. Conceptually, we name these factors market access, industrial linkages, labour-market pooling, trade costs and monitoring costs.

Table 8 Principal component analysis

Variable	Market Access (MA)	Trade Costs (TC)	Industrial Linkage (IL)	Labour-market pooling (LP)	Monitoring Costs (MC)
GPP	**0.841**	0.335	0.380	0.148	0.048
PGPP	**0.461**	0.194	0.805	-0.019	0.046
POPD	**0.885**	0.331	0.118	0.205	0.030
RWAY	0.848	**0.125**	0.135	0.105	-0.079
HWAY	-0.560	**0.477**	-0.101	0.480	0.291
WAY	0.817	**0.189**	0.241	0.365	0.013
MOUT	0.841	0.335	**0.380**	0.148	0.048
MWKER	0.284	0.908	**0.391**	0.151	-0.105
NMF	0.344	0.677	**0.272**	0.117	0.217
CFDI	0.583	0.550	**-0.077**	0.258	0.062
NFDI	0.594	0.578	**0.277**	0.239	0.014
CTDI	0.529	0.353	**0.200**	0.699	0.114
NTDI	0.444	0.258	**0.071**	0.808	0.152
AWAGE	0.159	-0.086	0.927	**-0.140**	0.047
EWAGE	0.012	-0.078	-0.064	**-0.102**	-0.979
TELD	0.230	-0.001	0.924	0.057	**0.099**
TOUT	0.835	0.307	0.407	0.158	**0.010**
TWKER	0.210	0.889	-0.102	0.182	**0.030**
Eigenvalue	6.297	3.659	3.285	1.854	1.168
Cumulative variance	34.986	55.314	73.566	83.865	90.355

Note: Varimax with Kaiser Normalisation. Rotation converged in seven iterations.We also use Quartimax rotation with Kaizer Normalisation. After five iterations, we reach the same qualitative conclusion as those shown in the table.

Specifically, market access (MA) is comprised of provincial market size via GPP, GPP per capita and population density. The length of railways, the length of highways, and the combined length of railways and highways, all adjusted for the province's landmass indicates provincial transportation network coverage, and hence, constitutes trade costs (TC). Industrial linkages (IL) include the number of manufacturing workers, the cumulative stock of FDI and TDI, and the number of registered projects affiliated with FDI and TDI. Average wage rate and efficiency wage enter the labour-market pooling (LP) effect. Telephone density, the output of postal and telecommunication industries, and the

[16] We use Varimax rotation with Kaiser Normalization for factor retention.

number of postal and telecommunication employees, are used to form the measure for monitoring costs (MC).

We also introduce the Open Door policy variables and regional dummies in the model. In terms of the Open Door policy variables, we include the Special Economic Zone (SEZ) and the Open Coastal City (OCC) in the model. For foreign investors, the long history of SEZs and OCCs in hosting FDI reduces the information costs associated with these locations (He, 2002). Given the small number of SEZs in China, we add one to the number of SEZ in the relevant province (Hong, 2009)[17]. Similarly, in order to avoid a value of zero in some provinces, we add one to the number of OCC in the relevant province[18]. These variables are included to capture the fact that not only Taiwanese investors are more familiar with the investment conditions in these locations, but also receive preferential treatment and tax concessions from local authorities (Tung, 2000).

In terms of regional dummies, we divide China into seven economic regions as identified in Section 2. Specifically, a value of one is assigned to the province belonging to the relevant region, and a value of zero otherwise. These dummy variables not only capture region-specific factors influencing Taiwanese investors' location choice, but also controls for potential violations of the IIA assumption in our CLM set up[19].

Finally, it is important to check for correlations among variables included in the model. In general, Table 9 shows that correlations between provincial attributes are quite low. Importantly, correlations between these provincial attributes and the Open Door policy variables are also low. This provides reassurances that policy variables do not substitute for measurement of provincial attributes.

---

[17]There are a total of four SEZs, including Zhuhai, Shantou and Shenzhen in Guangdong and Xiamen in Fujian.

[18]There are a total of fourteen OCCs, including Dalian, Qinhaungdao, Tianjin, Yantai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhangjiangand Beihai.

[19] For our conditional logit estimates to be meaningful, it must be the case that all industrial locations are equally substitutable in the same region. However, this is highly unlikely in China given its huge landmass and past policy. Specifically, the concentration of FDI in China's coastal provinces, in econometric terms, can lead to *'overdispersion, or a situation where the data exhibits variances larger than those permitted by the multinominal model'*, which casts doubts over the validity of our conditional logit estimates (Woodward *et al.*, 2006, p. 19). In order to control for this over-dispersion effect, most studies, including this one, use regional dummies to group together locations with similar attributes (see, e.g., Woodward, 1992; Coughlin and Segev, 2000; Cheng and Stough, 2006).

Table 9 Pearson pair- wise correlation coefficients

	1.	2.	3.	4.	5.	6.	7.
1. MA	1.00						
2. TC	-0.32	1.00					
3. IL	0.42	0.11	1.00				
4. LP	0.24	0.38	0.63	1.00			
5. MC	0.48	0.27	-0.29	-0.23	1.00		
6. SEZ	0.35	0.43	0.10	0.42	0.20	1.00	
7. OCC	0.58	0.31	0.13	0.45	0.21	0.34	1.00

4. EMPIRICAL RESULTS

Table 10 provides CLM estimates of Taiwanese investors' location choice in China. Column (1) estimates the proposed model without the policy variables and regional dummies. Columns (2)-(3) and Columns (4)-(5) investigate the effects of the Open Door policy and region-specific effects on the location choice, respectively.

Table 10 Conditional logit estimation results

	(1)	(2)	(3)	(4)	(5)
MA	1.18*	1.98***	1.67**	2.09***	1.46***
	(1.65)	(5.19)	(2.10)	(5.32)	(4.39)
IL	3.21***	2.98***	2.18***	1.97***	1.86***
	(5.43)	(3.42)	(3.88)	(2.84)	(3.90)
LP	-1.45	-1.05***	-2.29***	-1.64***	-1.99***
	(1.26)	(-3.08)	(-2.87)	(-2.58)	(-3.17)
TC	1.23	2.08**	0.32	1.03*	1.64**
	(0.84)	(1.99)	(0.44)	(1.79)	(2.01)
MC	0.87	0.65	1.54*	0.53	0.65*
	(1.03)	(0.95)	(1.71)	(0.65)	(1.81)
SEZ		1.55***	2.89***		
		(4.59)	(6.32)		
OCC		0.98***	1.66*		
		(3.07)	(1.69)		
YANGTZE			0.76	1.26***	
			(0.83)	(4.70)	
BOHAI			0.97	0.39***	
			(1.10)	(3.48)	
SOUTH			1.10	1.89***	
			(0.43)	(5.81)	
NORTHEAST					0.43***
					(2.94)
MINDLAND					-0.40***
					(-2.98)
NORTHWEST					-0.11***
					(-3.91)
SOUTHWEST					-0.20***
					(-2.61)
No. of choosers	2132	2132	2132	2132	2132
No. of choices	24	24	24	24	24
log-likelihood	-6453	-5401	-6004	-5213	-5065
Adjusted-ρ^2	0.106	0.299	0.224	0.326	0.302

Note: Bohai includes Beijing, Tianjin, Hebei, Shanxi, Neimenggu and Shandong. Yangtze includes Shanghai, Jiangsu and Zhejiang. South includes Fujian and Guangdong. Midland includes Anhui, Jiangxi, Henan, Hibei and Hunan. Northeast includes Liaoning, Jilin and Heilongjiang. Northwest includes Xizang, Shannxi, Gansu, Qinghai, Ningxa and Xinjiang. Southwest includes Guanxi, Sichuan, Guizhou, Yunna and Hainan.
Adjusted-ρ^2equals $1-[L(M)-k]/L(0)$, where $L(M)$ is the model log-likelihood value, k is the number of parameters and $L(0)$ is the log-likelihood value with all coefficients equal zero.
*, **, *** denote significance at the 10, 5 and 1 per cent levels. *t*-statistics are in parentheses.

4.1 Conditional Logit Estimates

In all specifications in Table 10, coefficients of MA, IL and LP have correct signs and are statistically significant at any conventional level. Furthermore, they suggest that the industrial linkage effect is, by far, the most important determinant of Taiwanese investors' location choice in China. Meanwhile, although coefficients on trade costs and monitoring costs have correct signs in all specifications, some of them are not statistically significant. These mixed findings, however, are consistent with our discussion in Section 2; namely, many Taiwanese investors flocked to China in order to gain access to mass virgin markets, local supply chains and low-cost workers. To these investors, trade costs and monitoring costs were not pressing concerns.

Table 10 also shows that Taiwanese investors responded positively to the Open Door policy as indicated by statistically significant coefficients of SEZ and OCC. In part, this can be attributed to the long history of economic reform in SEZs and OCCs. It is also consistent with other studies that discovered a similar pattern for other foreign investors in China (see, e.g., Qu and Green, 1997; Cheng and Kwan, 2000; Zhang, 2001; He, 2002).

An important observation from column (3) in Table 10 is that key coastal region dummies (YANGTZE, BOHAI and SOUTH) exert no material effects on the Taiwanese investors' location choice. In fact, taken columns (2) and (3) together, it suggests that uneven distribution of TDI can be due to the Open Door policy rather than any region-specific effect.

However, the aforementioned result needs to be interpreted with caution. This is because most SEZs and OCCs are located inside the Yangtze River, Greater Bohai and South Coastal regions. In order to truly assess the interplay between region-specific effects and Taiwanese investors' location choice, we run separate estimations in columns (4) and (5) that include only regional dummies. In column (4), it suggests that the South Coastal region is, by far, the most popular choice among Taiwanese investors. The importance of coastal region dummies is made more apparent in column (5) in which only MIDLAND, NORTHEAST, NORTHWEST and SOUTHWEST are included. Interestingly, it shows that the Midland, Northwest and Southwest regions have negative, statistically significant effects on Taiwanese investors' location choice[20]. In other words, these regions actually deter the

[20]We also perform the Hausman-McFadden (1984) test for the IIA assumption. We are unable to reject the null hypothesis that the IIA assumption holds and that the proposed specificationsare robust.

development of TDI. This result is consistent with our discussion in Section 2 that much of regional concentration of TDI in China can be attributed to the significant between-region effect.

Finally, we examine the overall goodness-of-fit of specifications in Table 10. To achieve that end, we assess the likelihood ratio index and the adjusted-ρ^2. However, it is worth noting that although there does not yet exist a preferred level of adjusted-ρ^2, the consensus is that if it takes a value within the range 0.2 and 0.4, then it is said to have a reasonable level of goodness-of-fit (Greene, 2000). From the table, with the exception of column (1), the adjusted-ρ^2 for all specifications fall within the specified range. Specifically, with a adjusted-ρ^2 value of 0.316, column (4) is the most preferred model for analyzing factors influencing Taiwanese investors' location choice in China.

4.2 Robustness Checks

To examine the robustness of the results obtained so far, we use column (4) in Table 10 as our baseline model and re-estimate it on sub-samples. Table 11 reports the estimated results for sub-samples. Specifically, column (1) excludes the Electrics and Electronics industry, on the basis that they account for more than 50 per cent of the investment reported in this study. By removing it from the sample, we can ascertain that the results obtained are not pertinent to that industry. Similarly, column (2) excludes the Retail and Service industry, as it is more concerned with market access than any other factors examined in this study. In order to validate this claim further, column (3) includes only the Retail and Service industry. Finally, column (4) excludes provinces with less than ten Taiwanese investment projects during the sample period. This is designed to remove the endowment effect; that is, firms may invest in a province in order to gain access to certain factors of production such as natural resources.

Table 11 Conditional logit estimation results: robustness test

	(1)	(2)	(3)	(4)
MA	1.10*	1.36***	2.20**	1.48***
	(1.71)	(4.30)	(2.04)	(2.87)
IL	2.87***	3.20***	1.34***	2.50***
	(4.47)	(5.19)	(3.40)	(3.74)
LP	-2.18***	-2.32***	-1.23	-2.48***
	(-3.78)	(-3.99)	(-0.88)	(-2.81)
TC	1.76*	1.80**	1.04	1.08
	(1.72)	(2.21)	(0.90)	(0.99)
MC	1.22	1.34	1.45	0.85
	(0.43)	(0.90)	(0.53)	(1.34)
YANGTZE	1.34***	1.03**	1.22	1.08***
	(4.93)	(2.03)	(1.33)	(3.29)
BOHAI	0.47***	0.98***	0.80	0.88***
	(3.48)	(2.78)	(1.54)	(3.20)
SOUTH	1.67***	1.44***	0.42	1.21***
	(5.30)	(4.03)	(1.03)	(3.01)
No. of choosers	1060	1961	170	2079
No. of choices	24	24	24	13
log-likelihood	-4583	-4331	-5491	-4389
Adjusted-ρ^2	0.331	0.344	0.138	0.350

Note: The dependent variable is a dummy variable, which equals one when the province is chosen. The baseline model is based on column (4) in Table 9. In column (1), the dependent variable excludes Electrics and Electronics. In column (2), the dependent variable excludes Retails and Services. In column (3), the dependent variable includes only Retails and Services. In column (4), the dependent variable excludes provinces received less than 10 Taiwanese investment during the sample period.
Bohai includes Beijing, Tianjin, Hebei, Shanxi, Neimenggu and Shandong. Yangtze includes Shanghai, Jiangsu and Zhejiang. South includes Fujian and Guangdong. Midland includes Anhui, Jiangxi, Henan, Hibei and Hunan. Northeast includes Liaoning, Jilin and Heilongjiang. Northwest includes Xizang, Shannxi, Gansu, Qinghai, Ningxa and Xinjiang. Southwest includes Guanxi, Sichuan, Guizhou, Yunna and Hainan.
Adjusted-ρ^2equals $1-[L(M)-k]/L(0)$, where $L(M)$ is the model log-likelihood value, k is the number of parameters and $L(0)$ is the log-likelihood value with all coefficients equal zero.
*, **, *** denote significance at the 10, 5 and 1 per cent levels. t-statistics are in parentheses.

Table 11 shows that the baseline model (column (4) in Table 10) fits the sub-samples relatively well. Specifically, with the exception of column (3), most estimated coefficients are statistically significant and have correct signs. Furthermore, the baseline model is robust in that the reported adjusted-ρ^2 for columns (1), (2) and (4) all fall within the desirable range. Among them, column (4) has highest goodness-of-fit. This result suggests that, since it excludes provinces with less than ten Taiwanese investment projects, the baseline model is a suitable candidate for explaining the location choice of an ordinary Taiwanese investor in China. Similarly, given the poor goodness-of-fit in column (3), it lends support to the view that the Retail and Service industry may follow a different structure of location choice.

Finally, the magnitude of estimated coefficients for the industrial linkage and labour-market pooling effects in columns (1), (2) and (3) are significantly larger than those reported for the full sample. This suggests that the increasing within-region effect of regional concentration of TDI may be attributed to the different extent of industrial linkages and labour-market pooling in provinces within a region. Furthermore, the importance of these effects coincides with the fact that most Taiwanese investors originated from export-orientated, manufacturing industries. To these investors, securing low-cost inputs and workers is crucial to their international competitiveness.

5. CONCLUSIONS AND DISCUSSIONS

We investigated regional distribution of TDI in China from 1991to 2005. Using measures of inequality, we found that TDI was unevenly distributed across key economic regions. We attributed it to the inherent differences across these regions. For example, due to historical accidents and sound economic infrastructure, coastal economic regions, such as the Greater Bohai, Yangtze River and South Coastal regions, managed to attract more TDI. However, we also found evidence that, even within the same economic region, the distribution of TDI is highly skewed.

In order to ascertain the driving forces behind regional concentration of TDI in China, we developed a model in which Taiwanese investors' location choice is jointly determined by firm heterogeneity and provincial characteristics. We found evidence that the Open Door policy had non-negligible impacts on these investors' location choice. Also, we found that the effects of industrial linkages and labour-market poling influenced the Manufacturing sector's location choice more than its Retail and Service counterpart. Importantly, we found evidence that, unlike other foreign investors, the effects of trade costs and monitoring costs were only of marginal consequences.

In sum, several policy implications can be drawn from this study. First, instead of engaging in location tournament, local government officials in China should seek to implement policies that foster the growth of industrial linkages and labour-market pooling. This is particularly important for provinces in interior provinces. As the new economic geography literature suggests, these effects can be self-reinforcing. If these concerns were addressed effectively, it can give rise to the agglomeration of TDI in the province over time. Second, as we have shown, the Retail and Service industry has a very different structure of location choice. This suggests that if the goal for provinces in coastal regions is to attract the high value-added Retail and Service industry, they will need to address issues such as market access. Last, but not the least, given the catalytic role of economic regions, officials in Beijing should strive to improve economic infrastructure not only at the province level, but also at a region-wide level.

1. References

Atkinson, A. B., 1975, *The Economics of Inequality*, Oxford: Oxford University Press.

Bao, Shuming, Gene Hsin Chang, Jeffrey D. Sachs and Wing Thye Woo, 2002, 'Geographic factors and China's regional development under market reforms, 1978-1998, China Economic Review,' Vol. 13, No. 1, pp. 89-111.

Belderbos, Rene and Martin Carree, 2002, 'The location of Japanese investment in China: Agglomeration effects, keiretsu, and firm heterogeneity, Journal of Japanese and International Economies,' Vol. 16, No. 2, pp. 194-211.

Blonigen, Bruce A., Christopher J. Ellis and Dietrich Fausten, 2005a, 'Industrial groupings and foreign direct investment, Journal of International Economics,' Vol. 65, No. 1, pp. 75-91.

Blonigen, Bruce A., Christopher J. Ellis and Dietrich Fausten, 2005b, 'Industrial groupings and strategic FDI, Japan and the World Economy,' Vol. 17, No. 2, pp. 125-150.

Broadman, Harry G. and Xiaolun Sun, 1997, 'The distribution of foreign direct investment in China, World Economy,' Vol. 20, No. 3, pp. 339-361.

Carlton, Dennis W., 1983, 'The location and employment choices of new firms: An econometric model with discrete and continuous endogenous variables, Review of Economics and Statistics,' Vol. 65, No. 3, pp. 440-449.

Chang, Sea-Jin and Sekeun Park, 2005, 'Types of firms generating network externalities and MNCs' co-location decisions, Strategic Management Journal,' Vol. 26, No. 7, pp. 595-615.

Chen, Chien-Hsun, 1996, 'Regional determinants of foreign direct investment in mainland China, Journal of Economic Studies,' Vol. 23, No. 2, pp. 18-30.

Chen, Chunlai, 1997, 'Provincial characteristics and foreign direct investment location decision within China,' *Chinese Economic Research Centre Working Paper* no. 97/16, The University of Adelaide.

Chen, George Shih-Ku, 2008, 'Agglomeration economies and the location of foreign direct investment: a study of the regional distribution of Taiwanese investment in China,' *Department of Economics* PhD Thesis, Monash University.

Cheng, Leonard K. and Yum K. Kwan, 2000, 'What are the determinants of the location of foreign direct investment? The Chinese experience, Journal of International Economics,' Vol. 51, No. 2, pp. 379-400.

Cheng, Shaoming, 2006, 'The role of labour cost in the location choices of Japanese investors in China, Papers in Regional Science,' Vol. 85, No. 1, pp. 121-138.

Cheng, Shaoming, 2007, 'Structure of firm location choices: an examination of Japanese greenfield investment in China, Asian Economic Journal,' Vol. 1, No. 21, pp. 47-73.

Cheng, Shaoming and Roger Stough, 2006, 'Location decisions of Japanese new manufacturing plants in China: a discrete-choice analysis, Annals of Regional Science,' Vol. 40, No. 2, pp. 369-387.

Coughlin, Cletus C. and Eran Segev, 2000, 'Location determinants of new foreign-owned manufacturing plants, Journal of Regional Science,' Vol. 40, No. 2, pp. 323-351.

Fung, K. C., Alicia Garcia-Herrero, Hitomi Iizaka and Alan Siu, 2005, 'Hard or soft? Institutional reforms and infrastructure spending as determinants of foreign direct investment in China, Japanese Economic Review,' Vol. 56, No. 4, pp. 408-416.

Greene, William H., 2000, *Econometric Analysis*, Upper Saddle River, NJ: Prentice Hall.

Hausman, Jerry and Daniel McFadden, 1984, 'Specification tests for the multinominal logit model, Econometrica,' Vol. 52, No. 5, pp. 1219-1240.

He, Canfei, 2002, 'Information costs, agglomeration economies and the location of foreign direct investment in China, Regional Studies,' Vol. 36, No. 9, pp. 1029-1029-1036.

Head, Keith and John Ries, 1996, 'Inter-city Competition for Foreign Investment: Static and Dynamic Effects of China's Incentive Areas, Journal of Urban Economics,' Vol. 40, No. 1, pp. 38-38-60.

Hong, Junjie, 2009, 'Firm heterogeneity and location choices: evidence from foreign manufacturing investments in China, Urban Studies,' Vol. 46, No. 10, pp. 2143-2157.

Huang, J.-T., Hsien-Chang Kuo and A.-P. Kao, 2003, 'The inequality of regional economic development in China between 1991 and 2001, Journal of Chinese Economic and Business Studies,' Vol. 1, No. pp. 273-285.

Huang, Jr-Tsung, An-Pang Kao and Tzu-Ying Yu, 2004, 'The unequal distribution of FDI among China's regions and industries (in Chinese), Research on Mainland China,' Vol. 47, No. 2, pp. 33-56.

Kang, S. J. and H. S. Lee, 2007, 'The determinants of location choice of South Korean FDI in China, Japan and the World Economy,' Vol. 19, No. 4, pp. 441-460.

Kao, Cheng, 2002, *Economic Reform in China and Cross-Strait Economic Relation (in Chinese translation)*, Taipei: Wunan.

Lambert, Peter J. and J. Richard Aronson, 1993, 'Inequality decomposition analysis and the Gini coefficient revisited, Economic Journal,' Vol. 103, No. 420, pp. 1221-1227.

Li, Yang and Jin-Li Hu, 2002, 'Technical efficiency and location choice of small and medium-sized enterprises, Small Business Economics,' Vol. 19, No. 1, pp. 1-12.

Lin, Chu-Chia S. and Ivan Png, 2003, 'Monitoring costs and the mode of international investment, Journal of Economic Geography,' Vol. 3, No. 3, pp. 261-274.

Mansfield, Edwin, 1994, *Statistics for Business and Economics: Methods and Application*, New York: W. W. Norton and Company.

McFadden, Daniel L., 1974, Conditional logit analysis of qualitative choice behavior, in *Frontiers in Econometrics*, ed., A. Zarembka, L. Lundqvist, F. Snickars and J. Weibull. New York: Academic Press.

Mookherjee, Dilip and Anthony F. Shorrocks, 1982, 'A decomposition analysis of the trend in UK income inequality, Economic Journal,' Vol. 92, No. 368, pp. 886-902.

Ohmae, K., 2002, *The China Impact (in Chinese)*, Taipei: CommonWealth Magazine.

Paglin, M., 1975, 'The Measurement and Trend of Inequality: A Basic Revision, American Economic Review,' Vol. 65, No. pp. 598-609.

Pomfret, Richard, 1994, 'Direct foreign investment in China,' Chinese Economic Research Centre Working Papers no. 94/9, The University of Adelaide.

Qu, Tao and Milford B. Green, 1997, *Chinese Foreign Direct Investment: A Subnational Perspective on Location*, Aldershot: Ashgate.

Sun, Qian , Wilson Tong and Qiao Yu, 2002, 'Determinants of foreign direct investment across China, Journal of International Money and Finance,' Vol. 21, No. 1, pp. 79-113.

Tsui, K. Y., 1996, 'Economic Reform and Interprovincial Inequalities in China, Journal of Development Economics ' Vol. 50, No. pp. 353-368.

Tung, Chun-Yun, 2000, 'China's Economic Leverage and Taiwan's Security Concerns With Respect to Cross-Strait Economic Relations,' *PhD Thesis, School of Advanced International Studies, Johns Hopkins University* Baltimore.

Wakasugi, R., 2005, 'The effects of Chinese regional conditions on the location choice of Japanese affiliates, Japanese Economic Review,' Vol. 56, No. 4, pp. 390-407.

Wei, Yingqi and Xiaming Liu, 2001, *Foreign Direct Investment in China: Determinants and Impact*, Cheltenham: Edward Elgar.

Wei, Yingqi, Xiaming Liu, David Parker and Kirit Vaidya, 1999, 'The regional distribution of foreign direct investment in China, Regional Studies,' Vol. 33, No. 9, pp. 857-857-867.

Woodward, Douglas, Octávio Figueiredo and Paulo Guimarães, 2006, 'Beyond the Silicon Valley: University R&D and high-technology location, Journal of Urban Economics,' Vol. 60, No. pp. 15-32.

Woodward, Douglas P., 1992, 'Locational Determinants of Japanese Manufacturing Start-Ups in the United States, Southern Economic Journal,' Vol. 58, No. 3, pp. 690-708.

Yang, D. T. , 1999, 'Urban-biased policies and rising income inequality in China, American Economic Review,' Vol. 89, No. pp. 306-310.

Yang, Ya-Hwei and Ying-Yi Tu, 2004, 'Analysis of Factors Influencing Taiwan's Unregistered Overseas Investment Behavior, Asian Economic Journal,' Vol. 18, No. 2, pp. 213-231.

Zhang, Kevin Honglin, 2001, 'What attracts foreign multinational corporations to China?, Contemporary Economic Policy,' Vol. 19, No. 3, pp. 336-346.

Zhang, Kevin Honglin, 2005, 'Why does so much FDI from Hong Kong and Taiwan go to Mainland China?, China Economic Review,' Vol. 16, No. 3, pp. 293-307.

Zhou, Changhui, Andrew Delios and Jing Yu Yang, 2002, 'Locational Determinants of Japanese Foreign Direct Investment in China, Asia Pacific Journal of Management,' Vol. 19, No. 1, pp. 63-86.

Zhu, Yan, 2005, *Taiwan-Invested Enterprises in China (in Chinese)*, Tokyo: Toyo Keizai Inc.