Development Zones in China: Are STIPs a Substitute for or a Complement to ETDZs?

Liu, Bih Jane and Yu-Yin Wu

Abstract

This paper examines the relationships between two types of development zones in China, namely, the Economic Technological Development Zones (ETDZs) and Science and Technology Industrial Parks (STIPs), during the period 2001 to 2005. After controlling for regional characteristics, the results show that an ETDZ with a STIP located in the same region (city) attracts significantly more foreign direct investment (FDI), an indication of a complementary relationship between ETDZs and STIPs. This complementary relationship is reinforced by the fact that more exports, sales, or employment on the part of STIPs induces greater FDI to the ETDZs within the same region. However, the spillovers fall unevenly across regions. The ETDZs in the coastal regions benefit more from the presence of STIPs than those in the inland regions, which may lead to greater regional development disparities in China.

Keywords: FDI, Economic Zones, Regional Development, China
JEL Classification: F21, O16, R11

Liu, Bih Jane, Department of Economics, National Taiwan University, No. 21, Hsu-Chow Rd., Taipei City 10055, Taiwan, R.O.C. and Chung-Hua Institution for Economic Research, No. 75, Chang-Hsing St., Da-an Dist., Taipei City 10672, Taiwan, R.O.C. Tel: 886-2-2735-6006 ext.306, E-mail: bjliu@ntu.edu.tw. Yu-Yin Wu, Chung-Hua Institution for Economic Research, No. 75, Chang-Hsing St., Da-an Dist., Taipei City 10672, Taiwan, R.O.C. Tel: 886-2-2735-6006 ext.335, E-mail: yuyinwu@cier.edu.tw.
Received 2 September 2009; revised 18 November 2009; accepted 29 September 2010.

1. Introduction

Since China's adoption of its open door policy in 1978, a variety of development zones, such as Economic Technological Development Zones (ETDZs) and Science and Technology Industrial Parks (STIPs) have been established. The purpose of these development zones is to attract foreign direct investment (FDI) to promote domestic technology, earn foreign exchange, and most of all, to accelerate economic growth. ETDZs and STIPs were established after the successful experience of Special Economic Zones (SEZs), which were concentrated in Guangdong and Fujian, two southeastern provinces. The establishment of ETDZs was headed by the Ministry of Commerce in 1984 to attract FDI, and these have gradually transformed their industry structures from labor intensive to high-tech industries. On the other hand, STIPs were launched in 1988 and were governed by Ministry of Science and Technology. Notably, these aimed originally and specifically at fostering the development of high-tech industries and the promotion of indigenous firms. By the end of 2008, there were 54 ETDZs and 54 STIPs located in cities from the eastern to western provinces, 30 of which host both types of development zones.[1]

Although governed by different authorities, the different types of development zones within a given city are often designed to serve the same purpose: to facilitate technological development and accelerate regional economic growth. Therefore, one development zone may be affected by another located in the same region. While different development zones may compete for the same sources of inward FDI,

[1] Appendix 1 lists the number of ETDZs with and without STIPs.

the presence of multiple types of development zones, each with somewhat different features, may also foster spillover effects through labor movement, backward linkage and supply chains, etc. Therefore, it is not clear whether different types of development zones substitute for, or are complementary to each other.

The FDI spillovers associated with development zones in the same city (intra-zone spillovers) have been studied extensively. However, the dynamics of those that originate from the coexistence of different types of development zones (i.e., inter-zone spillovers) is a topic that has been ignored in the literature. By considering the two types of development zones in a single city in China; i.e., ETDZs and STIPs, we examine whether inter-zone spillovers are positive or negative. As spillovers can run both ways, ideally, two-way spillovers should be the focus of the study. However, since more complete data are available for ETDZs than for STIPs, [2] in this paper, we will focus only on the one-way spillovers that run from STIPs to ETDZs. Whether the policy that targets the promotion of high-tech and indigenous firms for STIPs throughout the entire development period will produce strong and positive spillovers to ETDZs in attracting FDI is an issue that deserves further study. Questions regarding whether the spillovers from STIPs augment or diminish regional disparity will also be examined.

Section 2 profiles the background of the establishment of ETDZs and STIPs. Section 3 reviews the literature on spillovers within a given development zone; i.e., intra-zone spillovers. Here, we argue that while intra-zone spillovers are the main focus of the literature, inter-zone spillovers, which arise when other development zones coexist in the surrounding area, may also be crucial in fostering the development of

---

2 For example, FDI data for STIPs are not available by region.

an economic zone. The reasons why inter-zone spillovers occur will be discussed. In Section 4, we focus on the location choice of FDI, taking into account the inter-zone spillovers and the endogeneity of the production scale of ETDZs. A detailed discussion regarding regression results is provided in section 5. The last section summarizes the findings and the attendant policy implications.

2. The Development of ETDZs and STIPs

2.1 The Development of ETDZs

With the introduction of China's open door policy at the end of the 1970s, four SEZs (including Shenzhen, Zhuhai, Shanto, and Xiamen) were created. These zones benefited from preferential policies, such as tax concessions and tariff exemptions on imported materials, which were granted to attract FDI. Because of the successful experience of SEZs and the optimism expressed by Deng Xiaoping on his first southern tour in 1984, the Chinese government decided to extend the open door policy to more cities in China by establishing ETDZs.

The development of ETDZs can be divided into three stages (Hu, 2005). The first of these (1984–1991) was the exploratory stage, in which strong resistance to capitalist ideology was prevalent. In all, 14 ETDZs were established in the coastal areas; most of which were located in remote rural areas in order to maintain distance between Chinese citizens and foreign investors (Wong and Tang, 2005). The second stage (1992–1996) was a period of rapid development, which was spurred by the enthusiasm Deng Xiaoping displayed during his second southern tour in 1992. It was also the period during which ETDZs were gradually extended to China's central and western regions. Notably, 18 new ETDZs were added during that period. The third stage took place from 1997 to the present and marked the period of stable development. Another 17 ETDZs were approved in the central and western regions as well. In addition, there were five national development zones in which investors enjoyed the same preferential policies as those offered in the ETDZs. This increased the number of ETDZs to 54. [3]

While the ETDZs used less than 0.009% of China's territory, [4] their attractiveness to foreign investors appears to have intensified over time, especially from 2001 to 2003, when China entered the World Trade Organization and later approved 17 additional ETDZs. As a result, the realized FDI inflows and international trade more than doubled and tripled between 2002 and 2003, respectively (see Table 1). While FDI inflows to ETDZs slowed somewhat during 2004 and 2005, international trade continued to increase. By 2005, ETDZs' FDI inflows and trade had accounted for 21.6% and 15.84% of China's total FDI and trade, respectively.

We divide the development zones into three groups according to geographic location: East, Center, and West. The coastal region (East), which was opened to the outside world earlier than other parts of China, is further divided into four subregions, namely, Bohai Economic Circle, Yangtze River Delta, Pearl River Delta, and other ETDZs. [5]

The output shares of the different regions in the ETDZs and for foreign investors from 2001 to 2005 are displayed in Table 2a. [6] This shows that the economic development of the ETDZs was skewed heavily toward the coastal region. The Bohai Economic Circle and the

[3] See Appendix 2 for a list of the ETDZs established during the different stages.
[4] In 2005, the ratio was 0.0088%.
[5] See Appendix 3 for a list of the ETDZs by region and subregion.
[6] Unfortunately, data for 2004 are unavailable.

Table 1 Economic Indicator of 54 ETDZs: 2001-2005

	ETDZs (US billion)					ETDZs Shares (%)				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Trade	38.195	53.633	167.763	166.208	225.235	7.49	8.64	19.71	14.40	15.84
Export	19.829	27.535	80.859	80.304	113.797	7.45	8.46	18.45	13.54	14.93
Import	18.366	26.098	86.904	85.904	111.438	7.54	8.84	21.05	15.31	16.88
Realized Inward FDI	6.180	7.737	15.769	13.607	13.023	12.44	14.06	28.09	21.24	21.60

Date sources: Statistical Yearbook of ETDZ in China 2002-2006; authors' calculation.

Table 2 Statistics for ETDZs

(2a) Output Shares of ETDZs and Foreign Investors by Region

Unit: %

	Output Share				Output Share of Foreign Investors			
	2001	2002	2003	2005	2001	2002	2003	2005
Total	100.00	100.00	100.00	100.00	72.87	73.95	75.16	78.34
East	80.36	79.44	82.35	83.66	80.73	80.19	80.71	83.79
Bohai	41.48	37.86	29.02	28.96	82.33	81.42	76.79	82.29
Yangtze	22.77	26.40	37.93	38.71	76.43	77.10	84.34	85.49
Pearl	8.46	8.23	7.79	8.69	92.81	90.87	88.58	92.88
others	7.66	6.95	7.61	7.29	71.52	72.52	69.52	68.93
Center	14.51	14.89	12.32	11.68	41.59	54.11	53.67	55.52
West	5.13	5.67	5.32	4.66	37.47	38.70	38.97	36.85

Data sources: Statistical Yearbook of ETDZs in China 2002-2006; authors' calculation.

(2b) FDI Inflows by Region

	FDI Inflows (US 100 million)					Geographical Distribution Share of Cumulated FDI (%)				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Total	61.80	77.37	103.29	136.07	130.23	100.00	100.00	100.00	100.00	100.00
East	54.48	67.33	85.27	114.30	109.26	90.31	89.90	88.86	88.10	87.35
Bohai	31.58	35.58	30.87	43.09	41.65	34.78	36.16	35.27	34.71	34.49
Yangtze	12.79	19.37	35.85	49.83	46.73	35.29	34.02	34.12	34.51	34.11
Pearl	6.89	9.17	11.89	12.66	14.78	9.47	9.76	10.01	9.90	9.71
others	3.22	3.21	6.66	8.72	6.10	10.77	9.95	9.45	8.97	9.04
Center	5.40	8.13	15.48	18.37	15.43	7.24	7.64	8.69	9.44	9.96
West	1.93	1.93	2.54	3.39	5.53	2.45	2.46	2.46	2.46	2.69

Data sources: Statistical Yearbook of ETDZs in China 2002-2006; authors' calculation.

Yangtze River Delta, the two largest development zones with 22 ETDZs within them, accounted for about 65% of the overall output in ETDZs. The output share in Center and West regions, on the other hand, was less than 20%, even though there were as many ETDZs (22) as in the subregions of Bohai Economic Circle and Yangtze River Delta. The output contribution of foreign investors varied significantly across different regions. FDI played a much more significant role in the Pearl River Delta than in other regions, where the output share of FDI exceeded 90% from 2001 to 2005, except during 2003. On the contrary, the output share of FDI in the West was less than 40%, implying that the indigenous firms primarily shaped the production of ETDZs in western China.

As shown in Table 2b, the coastal regions that have larger output shares were also those that attracted more FDI; in contrast, the inland regions (Center and West) with lower output shares tended to invite less FDI. This implies that the scale of ETDZs, which may be a good indicator of investment environment and linkage effects, may be an important factor in determining FDI inflows. Table 2b shows further that the FDI shares for the central and western regions increased while it decreased in the eastern region, thus suggesting a declining geographical dispersion of FDI across the ETDZs over time.

The discussions above demonstrate that the center-periphery regional growth structure, which was observed in many studies (e.g., Naughton, 1999; Chen and Fleisher, 1996; Luo, 2005), remains apparent during the first half of the 2000s. Many argue that FDI inflows may be the element that causes this biased growth structure, and this appears to be supported by the statistics in Table 2. But what leads to the “snowball” effect of FDI inflow remains a question that deserves further exploration.

One may note that ETDZs were headed by Ministry of Commerce to carry out the open policies in cities and were created originally to attract small and medium-sized firms in labor intensive industries during the first stage of development. Along with the acceleration of FDI and the shift in policy aims, ETDZs began to redirect their industrial structures toward high-tech industries. By 2005, ETDZs had already attracted more than 3,200 high-tech enterprises. The industrial output of high-tech enterprises was 1,086.1 billion RMB, which accounted for 46.46% of the industrial output of all ETDZs.

2.2 The Development of STIPs

Different from ETDZs that shifted their industrial structures gradually towards high-tech industries, STIPs were established originally with the aim of engaging in scientific development and exploring a unique Chinese route towards new industrialization.

The development of STIPs can also be divided into three stages. The first stage, which ran from 1986 to 1988, was the incubation stage during which the idea of facilitating high-tech development in China was formed and proposed in 1986. The State of Council approved the Torch Program officially in 1988. The primary mission of the program was to promote the commercialization, industrialization, and internationalization of new and high technology research results in accordance with the laws of the market economy. The STIPs, along with Technology Business Incubators and the Innovation Fund for Tech-based Small and Medium Enterprises (SMEs) were established to implement the program.

The second – exploratory – stage took place from 1988 to 1991. During that time, various incentives and preferential policies, such as exemptions on income tax and export tariffs were offered. By 1991, 27

STIPs, including the first one in Beijing, had been established. However, unlike the ETDZ establishment during the same period that skewed toward the coastal region, STIPs were distributed quite evenly across the country, with 11 out of 27 established in the central and western regions in the second stage.

Beginning in 1992, these STIPs entered the stage of high growth and development. Another 25 national STIPs were approved in 1992; most of which were located in the inland regions. By 2008, the total number of STIPs had reached 54 (Appendix 5). Almost every province and autonomous region except Tibet and Qinghai has a STIP, thus demonstrating the Chinese government's resolve in fostering scientific development throughout China. Science and technology (S&T) enterprise incubators were used as a key approach in STIPs to promote indigenous firms' capability of engaging in independent R&D, upgrading technologies, and commercializing product innovations.

In addition to differences in the geographical distribution, ETDZs and STIPs are distinct in three aspects. First, in terms of development mode, only high-tech industries are welcomed in STIPs, while both high-tech and low-tech industries are indeed allowed to be established in ETDZs. This can be observed by the fact that all industries in STIPs are high-tech but the proportion of industrial output generated by high-tech industries is only 46.46% in ETDZs. Second, in terms of policy targets, while open-door policies, similar to those in ETDZs in which tax and land policies favored foreign investors, [7] were also adopted by

[7] In fact, the preferential treatments are the same for firms in both STIPs and ETDZs (Appendix 5).

STIPs to facilitate technology transfer and spillovers from FDI, [8] STIPs also aimed at promoting indigenous firms. As a result, the output share of foreign investors was much smaller in the STIPs than in the ETDZs; e.g., 49.37% and 78.34%, respectively, in 2005. Third, from the perspective of policy implementation, STIPs is more stringent than ETDZs. Firms in STIPs are scrutinized every 5 years to see if they still meet the high-tech requirements and are allowed to enjoy the preferential treatments continuously. [9] The preferential treatments, on the other hand, are granted once firms are permitted to invest in ETDZs.

Table 3 illustrates the rather fast growth rate of STIPs from 2001 to 2005. The output in 2005 was triple the figure in 2001, which is more than a 32% annual compound growth rate. Despite being distributed more evenly across regions than the ETDZs, the output share of STIPs in the East was about 70% of the total output, which is also biased toward the coastal region. The export share skewed even more heavily toward the coastal region than the output share, implying that the coastal region is more export oriented than the inland regions. Similar to the ETDZs, the Bohai Economic Circle and the Yangtze River Delta are the two largest high-tech zones. Notably, their output

[8] The Shanghai Zhangjiang Hi-tech Park, for example, successfully attracted several foreign automobile manufacturers, including Visteon and Thompson-Ramo-Wooldridge (TRW) from U.S., Faurecia from France, Trelleborg from Sweden, and Calsonic Kansei (CKE) from Japan, to establish R&D centers in the zone. See the report on "National Hi-tech Industrial Zone—A Vigorous Drive to the Enterprises Growing Capabilities of Independent Innovation" (http://www.most.gov.cn).

[9] To qualify for designation as a "high-tech enterprise," several conditions must be met. For example, a firm must be knowledge and technology intensive; the share of employees who received at least a bachelor's degree must exceed 30%; the proportion of technical personnel engaged in research and development activities must be greater than 10% of total employees; the share of R&D expenditures must represent more than 3% of total sales; finally, the sales share of high-tech commodities must exceed 50% (GuoKeFaHuo, 2008).

Table 3 Statistics for STIPs

(3a) Output Value and Share by STIP Region

	Output Value (100 million RMB)					Output Share by Region (%)				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Total	180.71	244.10	325.61	427.15	552.41	100.00	100.00	100.00	100.00	100.00
East	247.59	325.86	437.56	578.71	751.98	69.80	68.01	68.46	69.02	69.35
Bohai	237.78	309.77	379.88	480.40	627.06	29.79	28.73	26.41	25.46	25.70
Yangtze	383.68	465.67	664.73	935.45	1267.69	24.04	21.60	23.11	24.79	25.98
Pearl	213.42	307.16	438.18	570.34	701.80	13.37	14.25	15.23	15.12	14.38
Others	82.97	148.01	212.72	275.23	320.59	2.60	3.43	3.70	3.65	3.28
Center	138.09	196.47	253.69	333.74	424.46	18.74	19.74	19.11	19.16	18.85
West	84.42	121.91	165.03	205.78	265.86	11.46	12.25	12.43	11.82	11.80

Data sources: China Statistical Yearbook on Science and Technology; authors' calculation.

(3b) Export Value and Share by STIP Region

	Export Value (10 thousand Dollars)					Export Share by Region (%)				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Total	45521.41	62117.11	96258.36	155437.20	210651.60	100.00	100.00	100.00	100.00	100.00
East	80921.79	109339.10	172522.00	285480.50	384843.30	90.56	89.67	91.30	93.56	93.07
Bohai	49533.77	61685.33	74914.33	112425.80	164863.90	24.64	22.48	17.62	16.38	17.72
Yangtze	140317.90	171859.80	298060.20	609845.70	857025.50	34.90	31.32	35.05	44.42	46.06
Pearl	101638.00	158000.70	273312.50	382854.00	465177.00	25.28	28.80	32.14	27.88	25.00
Others	46249.30	77589.33	110295.70	134222.30	159729.00	5.75	7.07	6.49	4.89	4.29
Center	10176.63	12387.08	16435.77	21156.15	24549.31	5.48	4.89	4.19	3.34	2.86
West	7342.32	13770.77	17687.15	19628.31	34971.31	3.96	5.44	4.51	3.10	4.07

Data sources: China Statistical Yearbook on Science and Technology; authors' calculation.

and export shares account for about 50% and 60% of the output and exports for the STIPs as a whole.

There are 30 cities in China that host both ETDZ and STIP development zones. As shown in Appendix 3, while only 14 out of 32 ETDZs in the coastal region host both zones, almost every ETDZ in the central region and 8 out of 12 ETDZs in the western region set up both development zones in the same city. This implies that the inland regions tend to host both types of development zones.

The discussions above show that ETDZs and STIPs are characterized by somewhat different features and are governed by different authorities. They in fact operated independently as two separate systems, even though they adopt similar preferential measures toward FDI. A natural question to ask is how these two co-located development zones affect each other in attracting FDI inflows. According to Taiwanese firms upon interview, vicious competition between different development zones does exist, as a firm can always bargain over informal preferential treatments with the management committees of two development zones, when deciding to invest in a region which hosts both ETDZ and STIP. Vicious competition is reinforced by the fact that the career promotion of local governors depends crucially upon the economic development of the region. On the other hand, positive inter-zone spillovers may occur because of geographical proximity. As two opposite forces are at work, it is interesting to see which force dominates. Will one type of development zone complement or substitute for the other? In other words, does the presence of one type of development zone generate positive or negative spillovers to the other? Do spillovers vary across different regions so as to reduce regional disparity in China?

3. Spillover Effects

In the spillover literature, the way inward FDI affects the host economy has been studied intensively and extensively. The empirical results of FDI spillover studies, however, are rather mixed. Some find evidence that FDI enhances the productivity (e.g., Caves, 1974; Liu and Yoon, 2000; Zhu and Tan, 2000), sales (Wang and Yu, 2007), and export diversification (Banga, 2006) of domestic firms. Other research shows negligible (Hale and Long, 2007) or inconclusive effects in these areas (Haddad and Harrison, 1993; Buckley et al., 2007). More recent studies even report negative spillovers relative to the performance of domestic firms, a phenomenon generally ascribed to the existence of a "market stealing effect" (Aitken and Harrison, 1999; Konings, 2000; Buckley et al., 2002).

A number of studies have sought to offer some explanations about why mixed results on FDI spillovers occur. For example, Gorg and Strobl (2005) and Lipsey and Sjoholm (2005) show, respectively, that mixed results are a reflection of different firm and country characteristics in the dataset and different estimation techniques. Here, industry characteristics may matter. In the case of China, while most Chinese scholars lend their strong support to positive spillovers (Ran et al., 2007), Branstetter and Feenstra (2002) point to the potential loss that may be incurred by the state-owned industry as a result of FDI inflow. The extent of regional development also determines the extent of spillovers. The relatively developed regions are shown to benefit from FDI inflow at the cost of the "backward" regions (Ran et al., 2007). Gorg and Strobl (2005), on the other hand, find that the complex channels (e.g., labor mobility) through which spillovers occur may lead to mixed results. The owner or chairman of a domestic firm with some working experience with foreign firms is shown to be an effective catalyst for the improvement of a firm's performance. International FDI ownership is another possible reason for such mixed results. Buckley et al. (2007) showed in a case study on China that FDI from overseas Chinese, notably from Hong Kong, Macau, and Taiwan (HMT), generates significant spillovers. However, the spillover effect is of a curvilinear functional form: it is positive when the penetration of HMT firms increases, but becomes negative when the penetration of HMT firms exceeds a certain level. The nonlinear nature of the spillover effect is reconfirmed by Wang and Yu (2007).

The studies mentioned above, however, do not look at another type of spillovers that stem from the coexistence of other development zones in the same region. As mentioned earlier, out of 54 ETDZs, 30 have STIPs in the same city. According to the agglomeration theory, geographical proximity not only allows intra-zone but also inter-zone spillovers to occur. Intra-zone spillovers arise when firms cluster in the same zone, which leads to exploitation of scale economies, access to specialized local inputs, pooling of labor markets, creation of linkages, and dissemination of information (Marshall, 1920; Amin, 1993; Jaffe et al., 1993; Boudier-Bensebaa, 2005).

Inter-zone spillovers, on the other hand, have been largely ignored in the literature. Inter-zone spillovers arise when different development zones cluster in a neighboring region for reasons similar to those trigger intra-zone spillover. The economic growth created within STIPs might then spread to ETDZs in the surrounding region because of the forward and backward linkages, labor movement, the diffusion of knowledge, etc. This positive impact is often referred to as the "spatial radiation effect" in the regional spillover literature. Negative externalities may exist because STIPs near ETDZs compete for limited resources, such as capital, land, and skilled labor, as often criticized by some experts and politicians. Negative externalities may also occur because the presence of STIPs increases output market competition, which lowers the profit of ETDZs and decreases FDI inflows as well. In some cases, the spillovers may be rather limited as different economic zones have different industrial and technological profiles and thus adopt different development strategies, which tend to attract different types of FDI. According to a case study of Wuhan in central China (Heiduk and Pohl, 2001), ETDZs are established to attract firms and technologies that are appropriate for Chinese markets. On the other hand, STIPs aim to use and develop globalized technologies. In such a case, the negative spillovers may be negligible.

Table 4 provides some economic statistics regarding the two types of ETDZs; i.e., with and without STIPs in the same city. This shows that ETDZs collocated with STIPs were larger in terms of mean value of GDP, output, exports, and FDI, but smaller in export ratio, as compared to those without STIPs. But the gap in FDI inflows between the two types of ETDZs tended to shrink over time, as did value added. This may be due to the fact that most ETDZs without STIPs present in the same city tend to be located in the fast growing coastal region.

The discussions above demonstrate that the presence of STIPs may constitute another source of spillovers, giving rise to mixed spillover effect. However, empirical work in this area is scarce.

4. Empirical Models

We assume that FDI inflows (*FDI*) to ETDZ i at time t depend on intra- and inter-zone spillovers (*SPILL*) and other control variables (X). Here, we consider both intra-zone and inter-zone spillovers. As mentioned

Table 4 Economic Indicators of ETDZs with and without STIPs

Unit: US100 million

	with STIPs		without STIPs	
	Mean	Std.	Mean	Std.
2001				
GDP	7.39	2.04	5.00	0.84
Output	18.38	5.41	12.31	2.22
Export	4.68	2.21	3.90	1.03
Import	4.69	2.09	2.84	0.75
FDI	1.80	0.85	0.79	0.23
Cumulated FDI	11.59	4.37	6.45	1.55
Export ratio (%)	19.90	4.76	25.93	3.88
Productivity (10 thousand RMB/employer)	12.70	1.64	12.07	1.58
2002				
GDP	9.61	2.11	5.97	1.23
Output	24.21	5.45	16.05	3.67
Export	6.44	2.47	5.56	1.97
Import	6.65	2.63	4.52	1.73
FDI	2.22	0.77	0.98	0.33
Cumulated FDI	13.19	4.30	7.31	1.87
Export ratio (%)	20.62	4.45	26.24	3.77
Productivity (10 thousand RMB/employer)	15.71	2.30	12.40	1.38
2003				
GDP	13.03	2.68	9.37	2.02
Output	32.80	6.68	26.00	6.78
Export	9.57	3.16	8.97	3.10
Import	10.75	3.69	8.80	2.90
FDI	2.51	0.50	1.23	0.32
Cumulated FDI	16.83	4.42	9.04	2.19
Export ratio (%)	20.36	3.58	27.52	3.98
Productivity (10 thousand RMB/employer)	16.76	2.07	16.62	2.15
2005				
GDP	21.15	4.09	16.23	3.49
Output	61.07	12.62	46.43	11.36
Export	22.60	7.94	20.90	7.89
Import	23.46	8.23	18.67	6.35
FDI	3.00	0.67	1.83	0.42
Cumulated FDI	23.36	5.65	12.43	2.86
Export ratio (%)	23.56	4.15	37.52	6.55
Productivity (10 thousand RMB/employer)	17.95	1.93	19.74	2.31

Data sources: China Statistical Yearbook on Science and Technology; authors' calculation.

previously, intra-zone spillovers arise when firms cluster in the same zone. Since the agglomeration of foreign investors in a development zone is an indication of having a friendly investment environment, large forward or backward linkage effects (Blaise, 2005; Bronzini, 2007; Cheng, 2006; Kang and Lee, 2007; Wakasugi, 2005), it will lower searching and linkage costs for new foreign investment. Furthermore, as foreign firms tend to have higher productivity than domestic firms (Hale and Long, 2007), the agglomeration of foreign firms in a development zone would imply a faster dissemination of information in relation to innovations (Amin, 1993; Jaffe et al., 1993; Boudier-Bensebaa, 2005), which attracts FDI inflows. Therefore, we expect a positive relationship between FDI inflows and the agglomeration of FDI, in which the latter is measured by the ratio of foreign firms to domestic firms (*AGGLO1*) or the number of foreign investors (*AGGLO2*) in the ETDZ.

Regarding the inter-zone spillovers, we use a STIP dummy to capture this effect. If the presence of a STIP attracts more FDI into a nearby ETDZ, then the positive effect will be observed. However, if a STIP plays a competing role by pulling FDI out of the ETDZ, the opposite case would be apparent. Moreover, STIPs with different performance (measured in terms of exports) and scale (sales or employment) may produce a different extent of spillover effects on the FDI inflows to a ETDZ. Therefore, we add *EX_STIP*, *SALE_STIP* and *L_STIP* in the regression to show these aspects of spillovers from STIPs. The complementary relationship between STIPs and ETDZs will be observed if the sign of a STIP related variable is positive; on the other hand, the substitution relationship will be detected when the sign is negative.

Following the literature on the FDI location choice, the controlled variables *X* we consider here include variables that reflect the scale, labor market conditions, market size, and investment environment such as infrastructure in an ETDZ.

(1) Scale of ETDZ (*SCALE*): A larger development zone accommodates a thicker market and hence easier business-to-business matching. Therefore, FDI tends to be attracted to a larger development zone, as it provides more opportunities for industries and firms to develop as a result of external economies of scale (Chen, 1997; Cassidy and Andreosso-O'Callaghan, 2006). On the other hand, the already large scale of the ETDZ may mean matured development and hence high costs for labor and land. The sign of *SCALE* will depend on the two opposite effects. We use value added as a measure of an ETDZ's scale.

(2) Labor market conditions: According to the traditional trade theory, FDI tends to cluster in a region with resourceful endowments, among which abundant labor is one of the most attractive factors to foreign investors. The empirical results, however, are rather mixed. Blaise (2005), Buettner and Ruf (2007), Cheng and Kwan (2000), Coughlin and Segev (2000b), Cheng (2006), and Kang and Lee (2007) support the argument that high labor cost is a deterrent to FDI inflows. Zhao and Zhu (2000) and Boudier-Bensebaa (2005), on the other hand, show the opposite result. Broadman and Sun (1997), Chen (1996), Gao (2005), and Head and Ries (1996) observe an insignificant relationship between FDI inflows and wage rate. One reason that causes conflict among the results is that while wage rate reflects the abundance of labor, it also indicates the extent of labor productivity. An index of effective wage rate, where labor cost is adjusted for labor productivity, is therefore used as a measure of labor cost. However, the empirical effect of wages on FDI inflow is ambiguous (Cassidy and Andreosso-O'Callaghan, 2006; Chen, 1997; Coughlin and Segev, 2000a; Boudier-Bensebaa, 2005).

Following Blaise (2005), Buettner and Ruf (2007), Cheng (2006), Kang and Lee (2007) and Wakasugi (2005), we use *WAGE_ p* as a measurement of labor cost. Here, we expect the sign to be negative.

(3) Demand conditions: The theoretical model predicts that larger host markets tend to trigger foreign firms to choose FDI over exports; hence, more FDI will be observed (Markusen and Venables, 1999). Such predictions have been supported by many studies; e.g., Blonigen (2005), He (2001), He (2006) and Moosa and Cardak (2006). As *GDP_ p* is a good measure of the market size (Chen, 1997; Cassidy and Andreosso-O'Callaghan, 2006), we use the GDP of the province in which an ETDZ is located to capture the market size effect. We expect a positive relationship between *GDP_ p* and FDI.

(4) Infrastructure: For operational efficiency, infrastructure may be a decisive factor for investors. A developed infrastructure facilitates transportation and communication, which allows foreign investors to lower the setup cost for new local establishment in the host country, and gain easier access to the market, either domestic or international. Transportation infrastructures include highways, railways, and waterways. Among them, the extant empirical results on the effect of railways on FDI are rather stable, while the effects of other infrastructures are not consistent. Inland waterways, for example, are found to have a positive effect on Japanese FDI in China (Cassidy and Andreosso-O'Callaghan, 2006), but a negative effect on Korean FDI (Kang and Lee, 2007). We therefore use (*RAILWAY_ p*) as a measure of infrastructures and expect the sign to be positive.

Based on the above discussion, we can write the FDI equation as follows:

$$FDI_{it}=\alpha_0+\alpha_1 SPILL_{it}+\alpha_2 SCALE_{it}+\alpha_3 WAGE\_p_{it}+\alpha_4 GDP\_p_{it} + \alpha_5 RAILWAY\_p_{it}+\mu_{it}\ , \tag{1}$$

where α_1 measures the extent of spillovers; α_2 measures the scale effect of ETDZs; α_3, α_4, and α_5 capture the effects of labor cost, demand, and infrastructure.

Since the simultaneity problem may exist between *FDI* and *SCALE*, causing the OLS estimates of equation (1) to be biased and inconsistent. To solve for the endogeneity problem involved, an instrumental variable (IV) method is needed to obtain unbiased and consistent parameter estimates.[10] We assume that the scale of an ETDZ *i* at time *t* is a function of not only *SPILL* and other control variables, but also the instrument variable (*IV*):

$$\begin{aligned} SCALE_{it} = \alpha_0 + \alpha_1 SPILL_{it} + \alpha_2 Wage\_p_{it} + \alpha_3 GDP\_p_{it} \\ + \alpha_4 RAILWAY\_p_{it} + \alpha_5 IV + \varepsilon_{it} \, , \end{aligned} \tag{2}$$

where ε is a white noise error term.

We adopt a generalized two-stage least square regression (2SLS), with the first stage running *SCALE* on all other predetermined variables in the system as well as *IV* (i.e., equation (2)) and the second stage running equation (1) by using the predicted value of *SCALE* from stage 1 as an independent variable. To serve as an instrument variable, the following two conditions must meet; namely, *IV* is uncorrelated with μ in equation (1) but is a significant explanatory variable for *SCALE* when other exogenous variables (*SPILL* and *X*) are controlled for.

Alternatively, generalized method of moments (GMM) can be used to solve for the simultaneity problem. Since both 2SLS and GMM generate consistent estimators, we adopt both methods for empirical test and robust checking.

---

[10] The lag values of all independent variables except y are used to avoid other endogeneity problems.

5. Regression Results

Data related to ETDZs are drawn from the Yearbook of China Development Zones 2001 to 2005 except 2004, while the data on STIP-related variables are obtained from the China Statistical Yearbook on Science and Technology for the same period. Moreover, province-related variables, such as average wage, *GDP*, and infrastructures, are adopted from the China Statistical Yearbook as well. The statistics and definitions of all variables are displayed in Table 5.

Since ETDZs with relatively higher labor productivity tend to have a larger value added, we use *REPROD* as the *IV* for *SCALE*. For all of the regressions reported, *REPROD* satisfies the two conditions to be valid as an instrument variable; that is, *REPROD* is uncorrelated with μ but is a significant explanatory variable for *SCALE*. [11]

The results of the generalized two-stage panel regression with *REPROD* for the equation(1) are presented in Table 6. Specification 1 serves as the benchmark. Except scale and labor cost, all of the estimated effects are significant and carry expected signs. This shows significant intra-spillovers (the agglomeration effect from foreign firms) and inter-spillovers (spillovers from STIPs). [12] The positive agglomeration effect

---

[11] One may note that the two conditions are valid for all the regressions reported in Table 6 and Table 7. The correlations between *REPROR* and μ for all the specifications in Table 6 and Table 7 are -0.0013, 0.0104, -0.0071, -0.0556 and 0.0201, respectively.

[12] Alternatively, we use FDI as a proportion of total fixed capital or the ratio of the number of foreign investors relative to the total number of firms as a measure of agglomeration. However, the results are not significant. One may note that since firm-level data are not available, we use city-level data instead. As a result, we are unable to distinguish selection effects from the agglomeration economies. The interesting questions such as "whether highly productive firms will choose to agglomerate, or it is more likely that these firms are foreign firms" therefore cannot be discussed here. But they deserve further research if more detailed firm-level data are available in the future.

Table 5 Variables Definition and Statistics

Variables	Definition	Mean	Std.
SCALE (10 billion RMB)	Value added of ETDZ	0.86	1.03
STIP	"= 1" if STIP is present, "= 0" otherwise	0.56	0.50
EX_STIP (100 million USD)	Export value of STIP in the city at which the ETDZ is located	4.66	11.66
SALES_STIP (10 billion RMB)	Sales of STIP in the city at which the ETDZ is located	1.58	3.13
L_STIP (10 thousand)	Employment of STIP in the city at which the ETDZ is located	4.45	7.18
AGGLO1	No. of foreign investors/No. of domestic firms	3.78	9.21
AGGLO2 (100 firms)	No. of foreign investors	251.66	380.24
AGGLO_EX (100 million USD)	Total export value of ETDZ and STIP in the same city	13.50	26.39
AGGLO_L (10 thousand)	Total employment of ETDZ and STIP in the same city	23.52	12.46
WAGE_p (100 RMB)	Average wage of the province at which the ETDZ is located	145.23	53.18
GDP_p (10 billion RMB)	GDP of the province at which the ETDZ is located	60.68	42.25
GDPGR_p	The average GDP growth rate of the province at which the ETDZ is located for previous 5 years	0.08	0.02
GDPGRStd_p	The standard deviation of GDP growth rate of the province at which the ETDZ is located for previous 5 years	0.03	0.02
RAILWAY_p (km / 10 thousand hectares)	Railway density of the province at which the ETDZ is located	1.62	1.21
REPROD	Productivity of STIP in the city at which the ETDZ is located / productivity of ETDZ	2.13	3.87
BUDGET (10 thouand RMB/person)	Fiscal revenue / No. of employees in each ETDZ	1.36	1.47
East	"=1" if ETDZ in eastern China, "=0" otherwise	0.59	0.49
Center	"=1" if ETDZ in central China, "=0" otherwise	0.17	0.37
West	"=1" if ETDZ in western China, "=0" otherwise	0.24	0.43

Data sources: Statistical Yearbook of ETDZ in China 2002-2006; China Statistical Yearbook 2002-2006; China Statistical Yearbook on STIP 2002-2006; authors' calculation.

Table 6　Panel Regression Result for the Equation(1)
–Instrument Variables and Two-stage Least Squares

	Specification 1		Specification 2		Specification 3		Specification 4		Specification 5	
	Coef.	(Std.)	Coef.	(Std.).	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)
SCALE	1.053	(0.767)	1.080	(0.734)	1.033	(0.869)	0.520	(1.022)	1.101*	(0.695)
AGGLO1	0.075**	(0.033)	0.068**	(0.032)	0.076**	(0.033)	0.114**	(0.049)	0.072**	(0.032)
*AGGLO1*center*			-0.060	(0.127)						
*AGGLO1*west*			0.181	(0.485)						
STIP	1.131***	(0.468)	1.769	(0.613)					1.440**	(0.631)
*STIP*center*			-0.893***	(0.708)					-3.234**	(1.617)
*STIP*west*			-1.624**	(0.791)					-1.532	(1.080)
EX_STIP					0.153***	(0.046)				
*EX_STIP*center*					0.272	(0.265)				
*EX_STIP*west*					-0.231	(0.337)				
SALES_STIP							0.416***	(0.119)		
*SALES_STIP*center*							0.020	(0.208)		
*SALES_STIP*west*							-0.467	(0.289)		
L_STIP									0.065*	(0.037)
*L_STIP*center*									0.286	(0.181)
*L_STIP*west*									-0.053	(0.100)
WAGE_p	0.002	(0.006)	0.0005	(0.006)						
GDP_p	0.019***	(0.006)	0.014**	(0.007)	0.011*	(0.006)	0.016**	(0.007)	0.013**	(0.006)
RAILWAY_p	0.467**	(0.235)	0.326	(0.231)						
CONSTANT	-1.681*	(0.882)	-0.949	(0.918)	-0.136	(0.444)	-0.177	(0.459)	-0.363	(0.509)
Summary statistics										
Observations	129		129		129		129		129	
R^2	0.60		0.62		0.66		0.56		0.64	

Data sources: Statistical Yearbook of ETDZ in China 2002-2006; China Statistical Yearbook 2002-2006; China Statistical Yearbook on STIP 2002-2006; authors' calculation.

Notes: 1. Standard deviation is in parenthesis.
2. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 7 Panel Regression Result for the Equation(2)
–Instrument Variables and Two-stage Least Squares

	Specification 1		Specification 2		Specification 3		Specification 4		Specification 5	
	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)
AGGLO1	3.446***	(0.656)	3.176***	(0.680)	3.177***	(0.630)	4.460***	(0.676)	3.593***	(0.663)
*AGGLO1*center*			-0.937	(3.959)						
*AGGLO1*west*			-0.737	(15.201)						
STIP	65.369***	(14.312)	86.861***	(17.302)					89.697***	(20.436)
*STIP*center*			-41.058*	(21.563)					-152.258***	(46.132)
*STIP*west*			-39.673*	(22.872)					-63.701**	(31.436)
EX_STIP					4.948***	(0.869)				
*EX_STIP*center*					10.518	(8.260)				
*EX_STIP*west*					1.833	(11.137)				
SALES_STIP							9.670***	(2.640)		
*SALES_STIP*center*							2.220	(6.740)		
*SALES_STIP*west*							-4.120	(9.160)		
L_STIP									0.590	(1.201)
*L_STIP*center*									11.624**	(5.610)
*L_STIP*west*									-0.125	(3.327)
WAGE_p	0.524***	(0.161)	0.456***	(0.167)						
GDP_p	0.453***	(0.165)	0.293	(0.196)	0.393**	(0.176)	0.456***	(0.171)	0.373**	(0.182)
RAILWAY_p	14.574**	(5.698)	11.128*	(6.293)						
REPROD	-6.877***	(1.644)	-7.250***	(1.668)	-5.524***	(1.583)	-4.679***	(1.560)	-7.602***	(1.761)
CONSTANT	-79.017***	(22.201)	-52.163**	(26.599)	32.210**	(13.846)	26.521*	(13.702)	22.898	(15.659)

Data sources: Statistical Yearbook of ETDZ in China 2002-2006; China Statistical Yearbook 2002-2006; China Statistical Yearbook on STIP 2002-2006; authors' calculation.

Notes: 1. Standard deviation is in parenthesis.
2. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

means that when controlling for other variables, having relatively more foreign firms in the ETDZs tends to attract more FDI, which helps clarify why the coastal region continues to attract the lion's share of FDI. The positive spillovers from STIPs demonstrate that STIPs are complements of ETDZs in attracting FDI. Labor cost *WAGE_p* is insignificant in determining FDI location in China. Market size and infrastructures, as measured respectively by provincial *GDP* and railway density, have expected positive signs and are significant, thus showing that demand conditions and infrastructures matter in the determination of FDI inflows.

In order to obtain the detail needed to see if the externalities of STIPs vary across regions, we add the cross term of STIP dummy with the *Center* and *West* dummies in Specification (2). The result shows that while STIPs' externalities were generally positive, they fell favorably toward the coastal region. The spillovers received by the western region, albeit positive, are significantly lower than those received by the coastal region. Those received by the central region, however, did not deviate significantly from the coastal region. This suggests that STIPs play a complementary role in attracting FDI inflows to ETDZs, which strengthens the center-periphery regional structure and leads to a growing regional disparity as observed in many studies (Luo, 2005; Ran et al., 2007).

In Specifications 3, we use STIP exports as a measure of externalities from STIPs. The result shows that the larger exports a STIP is undertaking, the larger FDI inflows to the ETDZ located in the same city. [13] Although the marginal spillover effect does not vary by region, the positive spillovers from STIPs also imply the growing regional disparity in FDI inflows, given that the average exports of an ETDZ located in the coastal region are much larger than those in the central or western regions. If, instead, the sales of STIPs or the number of workers employed by STIPs is used to reflect STIP spillover (Specifications 4 and 5), it shows that STIPs are still a complement of ETDZs in attracting capital inflows.

The empirical results for the scale regression (i.e., the first-stage equation, equation (2)) are displayed in Table 7. As expected, the spillovers on the scale of the ETDZs stemming from the presence of

---

[13] Compared to IV estimates, where spillover from *EX_STIP* is positive and significant, the OLS estimate for the spillover from *EX_STIP* is negative and insignificant. This suggests that without solving for the endogeneity problem, we may arrive at the wrong conclusions with respect to the externalities.

STIPs are positive for all the regions (Specifications 1 and 2). However, the extent of spillovers differs across regions: the spillovers to the central and western regions are significantly lower than those to the coastal region. The effects of FDI agglomeration, market size, and railway density are all positive and significant, illustrating that the relatively greater number of foreign firms, the larger market, and the better infrastructures of an ETDZ lead to a larger scale of ETDZ. Labor cost *WAGE_p* has a significantly positive effect on *SCALE*, which is in line with Zhao and Zhu (2000) and Boudier-Bensebaa (2005). This somewhat counterintuitive result implies that *WAGE* captures both the effects of labor abundance and labor productivity.[14] Since the employment situation, average exports, and sales of STIPs, the extent of foreign agglomeration in ETDZs, and the provincial GDP are all greater in the coastal region than in other regions, the results described above also show that regional disparity in terms of the scale of ETDZs has been growing as a result of the presence of STIPs.

To see whether the 2SLS results are robust, we use the GMM model for robust checking.[15] Table 8 and Table 9 shows that the GMM

---

14 The labor productivity has positive explanatory power on average wage at a 1% significance level. Since effective wage, which is the wage relative to labor productivity, is highly correlated with the instrument variable *REPORD*, using effective wage in the scale regression will produce biased estimates. Therefore, we will not use effective wage as an explanatory variable as has been done in some studies (Blaise, 2005; Buettner and Ruf, 2007; Cheng, 2006; Kang and Lee, 2007; Wakasugi, 2005).

15 The instrument variables adopted in the first stage for the GMM models are listed in Appendix 7. One may note that since the number of instrument variables ($J=1$) is equal to the number of endogenous variables ($K=1$), we have exact identification here (Hayashi, 2000). This implies that we don't have to perform the overidentification test to make sure that the instrument used is independent of the unobservable error process. The regression result from the Stata reports also shows that Hansen J statistic is zero for every specification (Table 8), implying that the orthogonality condition is satisfied.

Table 8 Panel Regression Result for Equation(1)
–Instrument Variables and GMM

	Specification 1		Specification 2		Specification 3		Specification 4		Specification 5	
	Coef.	(Std.)	Coef.	(Std.).	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)
SCALE	-1.831	(1.901)	-2.463	(2.342)	-1.387	(2.255)	-3.846	(3.271)	-3.858	(3.093)
AGGLO2	0.838**	(0.374)	0.969**	(0.480)	0.737*	(0.463)	1.253*	(0.660)	1.213**	(0.616)
*AGGLO2*center*			0.235	(0.604)						
*AGGLO2*west*			-0.450**	(0.203)						
STIP	1.164***	(0.390)	1.491***	(0.551)					0.897	(0.815)
*STIP*center*			0.240	(1.162)					-5.019**	(1.99)
*STIP*west*			-1.080*	(0.566)					-1.582*	(0.855)
EX_STIP					0.138***	(0.043)				
*EX_STIP*center*					0.759*	(0.424)				
*EX_STIP*west*					-0.228	(0.174)				
SALES_STIP							0.356***	(0.136)		
*SALES_STIP*center*							0.778	(0.565)		
*SALES_STIP*west*							-0.225	(0.250)		
L_STIP									0.071*	(0.037)
*L_STIP*center*									0.721**	(0.343)
*L_STIP*west*									-0.002	(0.068)
WAGE_p	0.006	(0.007)	0.011	(0.011)						
GDP_p	0.013*	(0.008)	0.007	(0.008)	0.009	(0.006)	0.015**	(0.007)	0.013*	(0.008)
RAILWAY_p	0.179	(0.213)	-0.017	(0.230)						
CONSTANT	-1.303**	(0.633)	-1.185	(0.900)	0.047	(0.455)	0.051	(0.511)	0.383	(0.932)
Summary statistics										
Observations	140		140		140		140		140	
R^2	0.42		0.36		0.56		0.20		0.17	
Hansen J statistic	0.00		0.00		0.00		0.00		0.00	

Data sources: Statistical Yearbook of ETDZ in China 2002-2006; China Statistical Yearbook 2002-2006; China Statistical Yearbook on STIP 2002-2006; authors' calculation.

Notes: 1. Standard deviation is in parenthesis.

2. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Table 9 Panel Regression Result for the Equation(2)
–Instrument Variables and GMM

	Specification 1		Specification 2		Specification 3		Specification 4		Specification 5	
	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)
AGGLO2	17.948***	(1.466)	18.646***	(1.586)	18.409***	(1.526)	19.058***	(1.491)	18.409***	(1.652)
*AGGLO2*center*			1.755	(8.749)						
*AGGLO2*west*			-6.469**	(2.669)						
STIP	26.899***	(7.154)	21.535*	(11.810)					12.956	(14.656)
*STIP*center*			16.318	(17.407)					-63.723***	(22.675)
*STIP*west*			-2.094	(10.643)					-15.723	(11.496)
EX_STIP					1.342**	(0.562)				
*EX_STIP*center*					16.186***	(4.126)				
*EX_STIP*west*					1.123	(3.206)				
SALES_STIP							2.170	(1.510)		
*SALES_STIP*center*							12.400***	(3.220)		
*SALES_STIP*west*							2.560	(2.170)		
L_STIP									0.185	(0.420)
*L_STIP*center*									9.501**	(2.935)
*L_STIP*west*									0.844	(0.708)
WAGE_p	0.330***	(0.118)	0.375***	(0.128)						
GDP_p	0.008	(0.114)	-0.037	(0.112)	0.081	(0.093)	0.123	(0.093)	0.088	(0.111)
RAILWAY_p	-1.233	(3.344)	-3.244	(3.185)						
REPROD	-2.675***	(0.727)	-2.242***	(0.786)	-1.940***	(0.548)	-1.603***	(0.496)	-1.864**	(0.741)
CONSTANT	-25.087*	(13.078)	-26.912*	(15.206)	15.949***	(5.389)	12.127**	(5.437)	17.070**	(7.665)

Data sources: Statistical Yearbook of ETDZ in China 2002-2006; China Statistical Yearbook 2002-2006; China Statistical Yearbook on STIP 2002-2006; authors' calculation.

Notes: 1. Standard deviation is in parenthesis.
2. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

results are qualitatively the same as those obtained from 2SLS model, with some of them are more significant while others are less significant than those obtained from the 2SLS models. [16]

Some factors that were discussed in the literature will also be studied here for sensitivity analysis. In China, economic reform has resulted in considerable power and fiscal decentralization, which gives local governments not only significant autonomy over their economies but also hard budget constraints (He, 2006). To see whether hard budget constraints (*BUDGET*) has significant impact on the local government's effort in luring FDI, we add *BUDGET* in Specification 1 in Table 10. [17] The result turns out to be insignificant, suggesting that hard budget constraints do not seem to play a key role in influencing FDI inflows to ETDZs.

Moreover, a local government's track record may play an important role in attracting FDI inflows (Fan et al., 2009). A province that has experienced more impressive economic growth in the past is likely to attract more FDI inflows than other provinces. This is because a rapid economic growth rate can be an indicative of both profitable investment opportunities and a local government capable to foster, or at least not impede their exploitation. The provincial GDP growth rate

---

16 Sine *AGGLO1* used in the 2SLS model is not significant in the GMM model, we use *AGGLO2* in Table 8 and Table 9.

17 According to He (2006), hard budget constraints can be a double-edged sword relative to FDI inflows. On the one hand, it may induce a local government to provide a favorable investment environment to attract FDI in the hope of fostering economic development and increasing tax revenue. On the other hand, a local government may rely heavily on extra- and off-budgetary revenue to finance its expenditures, which results in inefficiency and corruption (Walder, 1995) and therefore deters FDI inflows. Whether or not hard budget constraints will increase FDI therefore depends upon the two forces. The fact that the two opposite effects cancel each other may be the reason for the insignificant impact of *BUDGET*.

Table 10 Robust Checking for Equation(1)
–Instrument Variables and GMM

	Specification 1		Specification 2		Specification 3		Specification 4	
	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)	Coef.	(Std.)
SCALE	-3.085	(2.689)	-1.051*	(0.637)	0.438	(0.695)	1.046	(0.649)
AGGLO1			0.075	(0.062)	0.052	(0.061)	0.073	(0.061)
AGGLO2	1.082**	(0.533)						
AGGLO_EX					0.095***	(0.039)		
AGGLO_L							0.038*	(0.020)
STIP	1.543***	(0.579)	1.439***	(0.482)	0.976**	(0.495)	1.636***	(0.458)
*STIP*center*	0.681	(1.271)	-2.999***	(1.022)	-2.789***	(1.050)	-1.029**	(0.503)
*STIP*west*	-1.422**	(0.660)	-1.413***	(0.577)	-1.150**	(0.551)	-1.681***	(0.444)
L_STIP			0.065*	(0.038)	-0.026	(0.042)		
*L_STIP*center*			0.282**	(0.145)	0.397***	(0.161)		
*L_STIP*west*			-0.060	(0.044)	0.049	(0.054)		
WAGE_p	0.009	(0.012)						
GDP_p	0.008	(0.009)	0.013*	(0.007)	0.009	(0.006)	0.014**	(0.006)
GDPGR_p			2.173	(10.428)				
GDPStd_p			-13.301	(8.619)				
RAILWAY_p	-0.024	(0.019)						
BUDGET	0.025	(0.129)						
CONSTANT	-0.375	(1.376)	-0.115	(0.832)	-0.233	(0.423)	-1.104**	(0.484)
Summary statistics								
Observations	139		129		129		129	
R^2	0.27		0.63		0.69		0.62	
Hansen J statistic	0.00		0.00		0.00		0.00	

Data sources: Statistical Yearbook of ETDZ in China 2002-2006; China Statistical Yearbook 2002-2006; China Statistical Yearbook on STIP 2002-2006; authors' calculation.

Notes: 1. Standard deviation is in parenthesis.

2. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

averaging over the last 5 years *GDPGR_p* and the corresponding standard deviation *GDPStd_p* are used as a proxy for the local government's track record and the stability of provincial growth. However, Specification 2 in Table 10 shows that the results are not statistically significant in affecting FDI inflows.

One may argue that agglomeration can arise from geographical proximity if ETDZ and STIP co-locate in the same region; two zones should thus be viewed as a cluster when examining agglomeration. We use the sum of exports (employment) of both zones as a proxy for this type of agglomeration in Specification 3 (Specification 4) of Table 10. The results show that the agglomeration effects stemming from total exports of the two zones *AGGLO_EX* significantly attract more FDI flows into the ETDZs. Similarly, the agglomeration due to labor pooling in two zones *AGGLO_L* also increases FDI.

To sum up, the conclusion that STIPs are a complement to ETDZs remains robust even when different explanatory variables are used or added.

6. Concluding Remarks

In this paper, we use China as a case to study whether STIPs are complements of or substitutes for ETDZs. Intuitively, if different types of development zones are competing among themselves, especially when there is insufficient policy coordination, then different types of development zones being established in the same area are not necessarily better for the regional growth. Here, however, that intuition is not supported. We show that when other variables are controlled for, inter-zone spillovers do exist and are positive for all ETDZs; that is, the presence of STIP (either measured by STIP dummy, exports, sales, or employment of STIPs) significantly increases FDI inflows and the production scale of nearby ETDZs. This suggests that STIPs are a complement to, but not a substitute for ETDZs.

However, these spillover effects fall unevenly across regions. The ETDZs in the coastal region receive larger spillovers than those in the inland regions (especially the western region). In turn, this leads to rapid growth in the coastal region and relative stagnation in the inland region, which configures the center-periphery regional growth structure as shown in many studies (e.g., Naughton, 1999; Luo, 2005). This implies that the presence of other types of development zones, in addition to the open door policy and hukou system (e.g., Cai et al., 2002), also contributes to the regional disparity in China.

In addition, the positive externality due to FDI agglomeration and the effects of infrastructures and market size all tend to magnify FDI inflows to ETDZs in the coastal region more so than in the central and western regions. These results confirm the virtuous circle often mentioned in studies of regional development (Luo, 2005), which makes the center-periphery regional growth structure an even more serious issue.

Based on concerns about efficiency, some discussions have taken place about increasing the coordination between STIPs and ETDZs located in the same city. As discussed in this paper that there is no substitution or crowding out effect associated with the presence of a STIP within the city that an ETDZ is located at, the effort may not be as effective as it appears. On the contrary, the existence of other development zones may actually force ETDZ governments to improve the investment environment and increase efficiency, which tends to increase output and attract more FDI. Moreover, improving the coordination between STIPs and ETDZs may not be able to solve the problem of regional disparity; thus, some policy measures targeted specifically at mitigating regional disparity are called for.

This case could also be a lesson for other countries. Because China's impressive economic growth was boosted further by establishing development zones to attract FDI, similar economic zones have been established in a wide range of nations, including Brazil, India, Iran, Jordan, Kazakhstan, Pakistan, the Philippines, Poland, Russia, and Ukraine. For those governments, aside from creating preferential policies in the zones to attract FDI, efforts made to reduce the regional disparity associated with the establishment of such development zones would also be important.

Appendix 1 Number of ETDZs Establishments by Subregion and the Presence of STIPs

	with STIP	without STIP
Total	**30**	**24**
East	14	18
Bohai	6	3
Yangtze	3	11
Pearl	3	1
Others	2	3
Center	8	1
West	8	5

Data source: Authors' calculation.

Appendix 2 ETDZ Establishments by Stage of Development

The First Stage: 1984–1991 16 ETDZs	Dalian	Guangzhou
	Qinhuangdao	Zhanjiang
	Tianjin	Fuzhou
	Yantai	Shanghai Minhang
	Qingdao	Shanghai Hongkiao
	Lianyungang	Shanghai Caohejing
	Nantong	Xiamen*
	Ningbo	Shanghai Jinqiao Export Processing Zone*
The Second Stage: 1992–1996 21 new ETDZs	Yingkou	Nansha
	Weihai	Huizhou
	Kunshan	Dongshan
	Wenzhou	Ningbo Daxie Development Zone*
	Changchun	Wuhan
	Beijing	Wuhu
	Shenyang	Rongqiao in Fuqing City Dongshan
	Xiaoshan	Harbin
	Hangzhou	Hainan Yangpu Economic Development Zone*
	Chongqing	Suzhou*
	Urumqi	
The Third Stage: 2000~present 2000 11 new ETDZs	Chengdu	Shihezi
	Xian	Hefei
	Kunming	Zhengzhou
	Guiyang	Changsha
	Xining	Nanchang
	Huhehaote	
2001 4 new ETDZs	Nanning	
	Yinchuan	
	Lasa	
	Taiyuan	
2002 2 new ETDZs	Nanjing	
	Lanzhou	

Note: * denotes the development zone which enjoys the same preferential policies with ETDZs.

Appendix 3 ETDZ Establishments by Subregion and the Presence of STIPs

Region	Province / City	ETDZs with STIPs in the Same City	ETDZs without STIPs
East			
Bohai Economic Circle	Tianjin	Tianjin	
	Beijing	Beijing	
	Liaoning	Dalian Shenyang	Yingkou
	Shandong	Qingdao Weihai	Yantai
	Hebei		Qinhuangdao
Yangtze River Delta	Shanghai		Shanghai Minhang Shanghai Caohejing Shanghai Hongkiao Shanghai Jinqiao Export Processing Zone
	Jiangsu	Nanjing Suzhou	Kunshan Nantong Lianyungang
	Zhejiang	Hangzhou	Wenzhou* Xiaoshan Ningbo Ningbo Daxie Development Zone
Pearl River Delta	Guangdong	Guangzhou Nansha of Guangzhou Huizhou	Zhanjiang*
Other ETDZs in East region	Fujian	Fuzhou Xiamen	Rongqiao in Fuqing city Dongshan
	Hainan		Hainan Yangpu Economic Development Zone
West	Chongqing	Chongqing	
	Shaanxi	Xian	
	Neimongol		Huhehaote
	Guangxi	Nanning	
	Ningxia		Yinchuan
	Tibet		Lasa
	Xinjiang	Urumqi	Shihezi

Appendix 3 ETDZ Establishments by Subregion and the Presence of STIPs (continued)

	Gansu	Lanzhou	
	Guizhou	Guiyang	
	Qinghai		Xining
	Sichuan	Chengdu	
	Yunnan	Kunming	
Center	Anhui	Hefei	Wuhu
	Heilongjiang	Harbin	
	Jilin	Changchun	
	Henan	Zhengzhou	
	Hubei	Wuhan	
	Hunan	Changsha	
	Jiangxi	Nanchang	
	Shanxi	Taiyuan	

Note: * ETDZ is grouped in Other ETDZs in East region.

Appendix 4 STIP Establishments

The high-tech industries identified by Commission of Science and Technology were micro electron science and electronic information technology, space science and aerospace technology, light drop science and light integration of machinery technology, life sciences and bio-engineering technology, materials science and new material technology, energy science and new energy, high efficiency technology, ecological science and environmental protection technology, geosciences and oceanographic engineering technology, basic material science and radiation technology, medico pharmaceutical science and bio-medical engineering, and new technologies that can applied to traditional industries, etc.

There are 54 STIPs, which include Beijing, Donghu in Wuhan, Nanjing, Nanhu in Shenyang, Tianjin, Xian, Chengdu, Weihai, Zhongshan, Shanghai Zhangjiang, Harbin, Changsha, Fuzhou, Guangzhou, Hefei, Chongqing, Hangzhou, Guilin, Zhengzhou, Lanzhou, Shijiazhuang, Jinan, Dalian, Shenzhen, Xiaman, Wuxi, Suzhou, Changzhou, Foshan, Huizhou, Zhuhai, Qingdao, Weifang, Kunming, Guiyang, Taiyuan, Nanning, Baotou, Xiangfan, Zhuzhou, Luoyang, Baoji, Jilin, Mianyang, Baoding, Anshan, Zibo in Shandong, Nanchang, Urumqi, Daqing, Changchun, Haikou, Yangling and Ningbo.

Appendix 5 Preferential Treatment of Development Zones

<table>
<tr><th colspan="2" rowspan="2">Policies</th><th rowspan="2">National tax rate</th><th rowspan="2">Special Economic Zones</th><th colspan="2">National Development Zones</th></tr>
<tr><th>ETDZ</th><th>STIP</th></tr>
<tr><td rowspan="6">Corporate income tax rate</td><td>Production enterprises</td><td>30%</td><td>15%</td><td>15%</td><td>–</td></tr>
<tr><td>High-tech enterprises</td><td>30%</td><td>15%</td><td>–</td><td>15%</td></tr>
<tr><td>Non-production enterprises</td><td>30%</td><td>15%</td><td>30%</td><td>30%</td></tr>
<tr><td>Exporters (export ratio is no less than 70%)</td><td>15%</td><td>10%</td><td>10%</td><td>10%</td></tr>
<tr><td>Financial institute (Investing more than 10 million US dollars or operating for more than 10 years)</td><td>30%</td><td>15%</td><td colspan="2">15%</td></tr>
<tr><td>Energy resources, transportation, port project or other projects encouraged by government.</td><td colspan="4">15%</td></tr>
<tr><td colspan="6">Other National Preferential Treatment</td></tr>
<tr><td rowspan="2">Rebate for reinvestment</td><td colspan="5">1. Rebate 40% of paid income tax to those foreign investors who reinvest the received profit in the enterprises or constructing a new FDI company and the original enterprises has operated for 5 years at least.</td></tr>
<tr><td colspan="5">2. Rebate 100% if the foreign investors reinvest in high-tech enterprises or exporter.</td></tr>
<tr><td rowspan="3">Tariff</td><td rowspan="2">Import equipment</td><td colspan="4">1. Duty-Free for pure exporters. Tariff would be collected when the equipments were imported, then rebated over 5 years after the products were totally exported.</td></tr>
<tr><td colspan="4">2. Duty-Free for foreign investors who transfer their technology.</td></tr>
<tr><td>Export product</td><td colspan="4">Duty-Free, except the products those were restricted to export.</td></tr>
</table>

Appendix 6 Correlation Matrix of Independent Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1 EX_STIP	1.00												
2 SALES_STIP	0.67	1.00											
3 L_STIP	0.56	0.88	1.00										
4 AGGLO1	0.23	0.13	0.17	1.00									
5 AGGLO2	0.43	0.25	0.23	0.67	1.00								
6 AGGLO_EX	0.81	0.48	0.40	0.45	0.78	1.00							
7 AGGLO_L	0.42	0.71	0.77	0.22	0.27	0.42	1.00						
8 WAGE_ p	0.17	0.13	0.03	0.12	0.18	0.34	0.43	1.00					
9 GDP_ p	0.28	0.03	-0.11	0.07	0.26	0.31	-0.02	0.34	1.00				
10 GDPGR_ p	0.20	0.12	0.04	0.15	0.25	0.34	0.20	0.67	0.34	1.00			
11 GDPStd_ p	-0.12	-0.11	-0.05	-0.05	-0.19	-0.13	-0.11	-0.13	-0.14	0.07	1.00		
12 RAILWAY_ p	0.27	0.51	0.57	0.36	0.42	0.38	0.81	0.37	0.02	0.19	-0.17	1.00	
13 BUDGET	0.19	0.22	0.17	0.19	0.20	0.22	0.40	0.35	0.09	0.20	-0.02	0.29	1.00

Data source: Authors' calculation.

Appendix 7 Instrument Variables Adopted in the First Stage of GMM Model

(a) Specifications in Table 8 and Table 9

Specification	Instruments
1	*AGGLO2, STIP, WAGE_p, GDP_p, RAILWAY_p, REPROD*
2	*AGGLO2, AGGLO2*center, AGGLO2*west, STIP, STIP*center, STIP*west, WAGE_p, GDP_p, RAILWAY_p, REPROD*
3	*AGGLO2, EX_STIP, EX_STIP*center, EX_STIP*west, GDP_p, REPROD*
4	*AGGLO2, SALES_STIP, SALES_STIP*center, SALES_STIP*west, GDP_p, REPROD*
5	*AGGLO2, STIP, STIP*center, STIP*west, L_STIP, L_STIP*center, L_STIP*west, GDP_p, REPROD*

(b) Specifications in Table 10

Specification	Instruments
1	*AGGLO2, STIP, STIP*center, STIP*west, WAGE_p, GDP_p, RAILWAY_p, BUDGET, REPROD*
2	*AGGLO1, STIP, STIP*center, STIP*west, L_STIP, L_STIP*center, L_STIP*west, GDP_p, GDPGR_p, GDPStd_p, REPROD*
3	*AGGLO1, AGGLO_EX, STIP, STIP*center, STIP*west, L_STIP, L_STIP*center, L_STIP*west, GDP_p, REPROD*
4	*AGGLO1, AGGLO_L, STIP, STIP*center, STIP*west, GDP_p, REPROD*

References

Aitken, B. J. and A. E. Harrison (1999), "Do Domestic Firms Benefit from Direct Foreign Investment? Evidence from Venezuela," *The American Economic Review*, 89:3, 605-618.

Amin, I. K. (1993) "Jump Diffusion Option Valuation in Discrete Time," *The Journal of Finance*, 48:5, 1833-1863.

Banga, R. (2006), "The Export-Diversifying Impact of Japanese and US Foreign Direct Investments in the Indian Manufacturing Sector," *Journal of International Business Studies*, 37:4, 558-568.

Blaise, S. (2005), "On the Link between Japanese ODA and FDI in China: A Microeconomic Evaluation Using Conditional Logit Analysis," *Applied Economics*, 37:1, 51-55.

Blonigen, B. A. (2005), "A Review of the Empirical Literature on FDI Determinants," *Atlantic Economic Journal*, 33:4, 383-403.

Boudier-Bensebaa, F. (2005), "Agglomeration Economies and Location Choice: Foreign Direct Investment in Hungary," *Economics of Transition*, 13:4, 605-628.

Branstetter, L. G. and R. C. Feenstra (2002), "Trade and Foreign Direct Investment in China: A Political Economy Approach," *Journal of International Economics*, 58:2, 335-358.

Broadman, H. G. and X. Sun (1997), "The Distribution of Foreign Direct Investment in China," *World Economy*, 20:3, 339-361.

Bronzini, R. (2007), "FDI Inflows, Agglomeration and Host Country Firms' Size: Evidence from Italy," *Regional Studies*, 41:7, 963-978.

Buckley, P. J., J. Clegg and C. Wang (2002), "The Impact of Inward FDI on the Performance of Chinese Manufacturing Firms," *Journal of International Business Studies*, 33:4, 637-655.

Buckley, P. J., J. Clegg and C. Wang (2007), “Is the Relationship between Inward FDI and Spillover Effects Linear? An Empirical Examination of the Case of China,” *Journal of International Business Studies,* 38:3, 447-459.

Buettner, T. and M. Ruf (2007), “Tax Incentives and the Location of FDI: Evidence from a Panel of German Multinationals,” *International Tax and Public Finance*, 14:2, 151-164.

Cai, F., D. Wang, and Y. Du (2002), “Regional Disparity and Economic Growth in China: The Impact of Labor Market Distortions,” *China Economic Review*, 13:2, 197-212.

Cassidy, J. F. and B. Andreosso-O'Callaghan (2006), “Spatial Determinants of Japanese FDI in China,” *Japan and the World Economy,* 18:4, 512-527.

Caves, R. E. (1974), “Multinational Firms, Competition, and Productivity in Host-Country Markets,” *Economica*, 41:162, 176-193.

Chen, C. (1996), “Regional Determinants of Foreign Direct Investment in Mainland China,” *Journal of Economic Studies*, 23, 18-30.

Chen, C. (1997), “Provincial Characteristics and Foreign Direct Investment Location Decision in China,” University of Adelaide, Chinese Economic Research Unit Working Paper No. 97/16.

Chen, J. and B. M. Fleisher (1996), “Regional Income Inequality and Economic Growth in China,” *Journal of Comparative Economics*, 22:2, 141-164.

Cheng, L. K. and Y. K. Kwan (2000), “What Are the Determinants of the Location of Foreign Direct Investment? The Chinese Experience,” *Journal of International Economics*, 51:2, 379-400.

Cheng, S. (2006) “The Role of Labour Cost in the Location Choices of Japanese Investors in China,” *Papers in Regional Science*, 85:1, 121-138.

Coughlin, C. C. and E. Segev (2000a), "Location Determinants of New Foreign-Owned Manufacturing Plants," *Journal of Regional Science,* 40:2, 323-351.

Coughlin, C. C. and E. Segev (2000b), "Foreign Direct Investment in China: A Spatial Econometric Study," *World Economy*, 23:1, 1-23.

Fan, J. P. H., R. Morck, L. C. Xu and B. Yeung (2009), "Institutions and Foreign Direct Investment: China versus the Rest of the World," *World Development*, 37:4, 852-865.

Gao, T. (2005), "Labor Quality and the Location of Foreign Direct Investment: Evidence from China," *China Economic Review*, 16:3, 274-292.

Gorg, H. and E. Strobl (2005), "Spillovers from Foreign Firms through Worker Mobility: An Empirical Investigation," *Scandinavian Journal of Economics*, 107:4, 693-709.

Haddad, M. and A. Harrison (1993), "Are There Positive Spillovers from Direct Foreign Investment? Evidence from Panel Data for Morocco," *Journal of Development Economics*, 42:1, 51-74.

Hale, G. and C. X. Long (2007), "Are There Productivity Spillovers from Foreign Direct Investment in China?" Federal Reserve Bank of San Francisco Working Paper series.

Hayashi, F. (2000), "Single-Equation GMM", in *Econometrics*, New Jersey: Princeton University Press.

He, C. (2001), "Locational Choices and Export Decisions of Foreign Manufacturing Enterprises in China," Unpublished Doctoral Dissertation, Arizona State University, USA.

He, C. (2006), "Regional Decentralisation and Location of Foreign Direct Investment in China," *Post-Communist Economies*, 18:1, 33-50.

Head, K. and J. Ries (1996), "Inter-City Competition for Foreign

Investment: Static and Dynamic Effects of China's Incentive Areas," *Journal of Urban Economics*, 40:1, 38-60.

Heiduk, G. and N. Pohl (2001), "Empirical Evidence from Wuhan's State-Level Economic Development Zones," *Journal of Asia Pacific Economy*, 6:2, 244-260.

Hu, X. (2005), "A Study of Sustainable Development of China's State-Level Economic and Technological Development Zones," *China & World Economy*, 13:3, 92-106.

Jaffe, A. B., M. Trajtenberg and R. Henderson (1993), "Geographic Localization of Knowledge Spillovers as Evidenced by Patent Citations," *Quarterly Journal of Economics*, 108:3, 577-598.

Kang, S. J. and H. S. Lee (2007), "The Determinants of Location Choice of South Korean FDI in China," *Japan and the World Economy*, 19:4, 441-460.

Konings, J. (2000), "The Effects of Direct Foreign Investment on Domestic Firms: Evidence from Firm Level Panel Data in Emerging Economies," CEPR Discussion Papers No.2586.

Lipsey, R. E. and F. Sjoholm (2005), "The Impact of Inward FDI on Host Countries: Why Such Different Answers?" in *Does Foreign Direct Investment Promote Development*? ed., T. H. Moran, E. M. Graham and M. Blomstrom, 23-44, NW, Washington, DC: Institute for International Economics.

Liu, B. Y. and B. J. Yoon (2000), "China's Economic Reform and Regional Productivity Differentials," *Journal of Economic Development*, 25:2, 23-41.

Luo, X. (2005), "Growth Spillover Effects and Regional Development Patterns: The Case of Chinese Provinces," The World Bank Policy Research Working Paper No.3652.

Markusen, J. R. and A. J. Venables (1999), "Foreign Direct Investment as a Catalyst for Industrial Development," *European Economic Review*, 43:2, 335-356.

Marshall, A. (1920), *Principles of Economics*, *8th edition*, London: MacMillan.

Moosa, I. A. and B. A. Cardak (2006), "The Determinants of Foreign Direct Investment: An Extreme Bounds Analysis," *Journal of Multinational Financial Management*, 16:2, 199-211.

Naughton, B. (1999), "China: Domestic Restructuring and a New Role in Asia," in *The Politics of the Asian Economic Crisis*, ed., T. J. Pempel, 203-223, Cornell Studies in Political Economy, Ithaca and London: Cornell University Press.

Ran, J., J. P. Voon and L. Guangzhong (2007), "How Does FDI Affect China? Evidence from Industries and Provinces," *Journal of Comparative Economics*, 35:4, 774-799.

Wakasugi, R. (2005), "The Effects of Chinese Regional Conditions on the Location Choice of Japanese Affiliates," *The Japanese Economic Review*, 56:4, 390-407.

Walder, A. G. (1995), "Local Governments as Industrial Firms: An Organizational Analysis of China's Transitional Economy," *The American Journal of Sociology*, 101:2, 263-301.

Wang, J. and L. Yu (2007), "Do Spillover Benefits Grow with Rising Foreign Direct Investment? An Empirical Examination of the Case of China," *Applied Economics*, 39:1-3, 397-405.

Wong, S. W. and B. S. Tang (2005), "Challenges to the Sustainability of 'Development Zones': A Case Study of Guangzhou Development District, China," *Cities,* 22:4, 303-316.

Zhao, H. and G. Zhu (2000), "Location Factors and Country-of Origin Differences: An Empirical Analysis of FDI in China," *Multinational Business Review*, 8:1, 60-73.

Zhu, G. and K. Tan (2000), “Foreign Direct Investment and Labor Productivity: New Evidence from China as the Host,” *Thunderbird International Business Review*, 42:5, 507-528.

中國開發區：高新技術產業園區對經濟技術開發區具互補性或是替代性之研究

劉碧珍、吳玉瑩*

摘　要

本文利用 2001 年至 2005 年中國國家級高新技術產業園區對於經濟技術開發區吸引外人直接投資（foreign direct investment, FDI）的影響。迴歸結果顯示，在控制區域特性後，中國國家級高新技術產業園區對於同城市內的經濟技術開發區外資流入具有正向影響，顯示高新區對於同城市內的經濟技術開發區具互補性。其互補性亦表現於高新區的出口額、銷售額以及就業情況，亦即，當高新技術產業園區的出口、銷售或者就業增加時，同城市的經濟技術開發區外資流入亦會增加。然而，高新區對於經濟技術開發區的互補效果在東部地區顯著大於西部效果，此種發展型態恐將對區域發展已不均的中國產生不利的影響。

關鍵詞：外人直接投資、開發區、區域發展、中國
JEL 分類代號：F21, O16, R11

* 兩位作者分別為聯繫作者：劉碧珍，國立台灣大學經濟系教授，台北市徐州路 21 號，中華經濟研究院 WTO 中心，台北市長興街 75 號，電話：02-2735-6006 轉 306，E-mail: bjliu@ntu.edu.tw。吳玉瑩，中華經濟研究院 WTO 中心，台北市長興街 75 號，電話：02-27356006 轉 335，E-mail: yuyinwu@cier.edu.tw。作者非常感謝兩位匿名評審與編輯委員的寶貴意見使本文增色不少，惟文中若有任何錯誤乃由作者完全負責。
投稿日期：民國 98 年 9 月 2 日；修訂日期：民國 98 年 11 月 18 日；
接受日期：民國 99 年 9 月 29 日。