

Foreign Direct Investment, Regional Geographical and Market Conditions, and Regional Development: A Panel Study on China*

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Abstract: *This paper uses regional panel data to investigate the mechanism of how FDI has contributed to China's regional development through quantifying regional marketization level. It is found that FDI inflow generates a demonstration effect in identifying regional market conditions for investment in fixed assets and hence affects industrial location. In addition, its effects on regional export and regional income growth varied across east, central and west China since the second half of the 1990s, depending on FDI-orientation in different regions. In east China, geographical advantage in export attracts FDI inflow and FDI promotes export. In addition, rise of FDI-GDP ratio increases regional share in industrial value added in east China. These effects contribute positively to regional income growth in east China although there is a direct crowding out effect between FDI and domestic investment (as input) in growth. In contrast, the negative impact of FDI inflow in central China on regional export orientation weakens its contribution to regional income growth. Furthermore, contribution of improvement of market mechanism to regional development is evidenced in attracting FDI, in promoting export and directly contributing to regional income growth.*

Key Words: Export-oriented FDI and import substitute FDI, marketization, industrial location, and regional growth

JEL Classification: F23, O53, P52, R11

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Introduction

Since China began economic reform in the late 1978, its economy has gradually opened up to the rest of the world with increasing foreign direct investment (FDI hereafter) inflow and international trade. Its accession to the World Trade Organization (WTO hereafter) in 2001 made it more closely integrated into the world economy. A high average annual GDP growth rate of 9.6 per cent from 1978 to 2001 and gradual improvement of its market mechanisms attract world-wide attention with emerging investment opportunities and a huge market size. On the one hand, China is becoming the largest FDI recipient country. Many multi-national enterprises (MNEs hereafter) have been shifting their production base to China due to the low wages and good investment environment there. Chinese firms have significantly improved their product quality after being exposed to international competition for more than 20 years. On the other hand, accession to the WTO lifted China's international trade to 509.76 billion US dollars in 2001 and 620.8 billion US dollars in 2002. Although the general growth picture is viewed as rosy, China's perspectives for domestic industry are of great uncertainty as increasingly rigorous international competition has brought about the mixture of challenges and opportunities. While future gains and losses are difficult to gauge, this paper uses China's regional panel data to investigate the mechanism of how FDI may have contributed to regional development¹.

In the trend of economic globalization, the role of FDI in promoting economic development has been widely studied. Studies such as Athukorala and Menon (1995), Zhang and Song (2001), Zhang and Fellingham (2001) and Liu et al. (2001) find that FDI promotes the manufactured exports of recipient countries. Although there is no consensus regarding the relationship between FDI and GDP growth², to attract FDI as a strategy of development has become a trend among developing countries following the development

¹ Data in this section are from *SSBa* (2001) and *SSBc* (2003).

² While many studies find that FDI is growth-enhancing due to promoting export or pure technology transfer effect (Campos and Kinoshita, 2002), Chakraborty and Basu (2002), for example, find that increase in Indian GDP is not Granger caused by increase in FDI. The causality between Indian GDP and FDI runs more from GDP to FDI. Yet, Balasubramanyam et al. (1996), drawing upon theoretical work of Bhagwati, argue that import-substitution FDI would lead to misallocation of resources and encourages X-inefficiency in countries of bad trade regime and distortions in factor and product markets.

of newly industrialized countries in the 1960s and 1970s. Athukorala and Chand (2000) and Balasubramanyam et al. (1996) provide some evidence that the growth-enhancing effect of FDI would be significant and strong in countries with open trade policies and better trade regimes with export-promoting FDI. While many developing countries are competing for FDI inflow, recent studies attempt to identify conditions which would lead to more beneficial utilization of FDI. For example, Narula and Dunning (2000) point out that the increased competition for FDI is more for the “right” kind of investment and less developed countries increasingly need to provide unique, non-replicable created assets to maintain a successful FDI-assisted development strategy. De-Mello (1999) finds that the extent to which FDI is growth-enhancing depends on the degree of complementarity or substitution between FDI and domestic investment. Furthermore, Zhang (2001a) reports that the extent to which FDI is growth-enhancing appears to depend on country-specific characteristics.

When a formerly central planned economy transforms to market-oriented one with an increasingly open trade regime and a gradually improving environment for FDI, FDI would promote regional development through many channels. First, as the above literature indicates, FDI may promote export of manufactured products if the FDI can enable recipient region to exert its comparative advantage. Second, it may generate a technology spillover effect and raise productivity. Third, it may create a demonstration effect through a closer observation in market conditions and better management knowledge. The first and the second effects are analysed in many quantitative studies. However, so far the third factor has not attracted due attention in the existing literature for the development of transitional economies, neither has it empirically tested. In transitional economies, the imperfection of a gradually established market mechanism is a common feature. Therefore, to investigate this demonstration effect of FDI on the development of receipt region has strong theoretical implication in general, and policy implications to transitional economies in particular.

In the first decade(s) of economic transition, private entities can be small component of a transitional economy. Due to poorly defined ownership rights in state-owned enterprises

(SOEs hereafter), managers of enterprises may not have sufficient incentive to closely observe market conditions and distinguish different investment opportunities for profit maximization. Even when managers want to pursue better enterprise performance, it is more likely that they may not be able to do so due to insufficient knowledge of how the market mechanism functions, as there is a learning process of the market mechanism in transitional economies (Goodhue, et. al., 1997). In contrast, investors, especially market ones, from developed market economies are more capable of observing market conditions and distinguishing different investment opportunities although they need to learn how to conduct businesses in a new cultural environment. Allocating capital to more valuable uses, foreign investors would generate a demonstration effect for domestic enterprises when higher return to FDI is observed³. FDI thus increase efficiency through signalling correct investment directions. While Bhagwati would think import-substitute FDI may serve purely as a measure for redistributing income toward newcomers when there were distortions in factor and product markets in developing countries, the above-mentioned demonstration effect can be beneficial to recipient regions if domestic enterprises can learn fast and the market mechanism is improving in the transitional economy.

Since special economic zones with encouraging preferential policies for foreign investment were set up in south-east China, FDI inflow has been keeping pace with China's economic development. When Chinese per capita GDP was between 400-500 yuan in the earlier 1980s, average annual utilization of FDI was around 1.936 billion US dollars (1979-1983). The main source countries and regions were Hong Kong, US and Japan, while Guangdong, Fujian, Shanghai and Beijing were the major recipient regions. The total value of import and export was 38.14 billion US dollars with a 19.0 billion US dollar trade deficit in 1980. After more than two-decades of economic development, China's per capita GDP reached 9,101 yuan in 2003. Correspondingly, actual utilization of FDI rose to 53.505 billion US dollars in 2003. The source countries now include almost all open economies. And almost every Chinese province has foreign invested

³ In China, redundant investments and extremely low marginal profits in many manufacturing industries indicate that acumen in judging investment direction and location can be one of the most desired assets in China's economic development.

projects. The total value of international trade reached around 851 billion US dollars in 2003 with a 25.5 billion US dollars trade surplus.⁴

The development benefits of FDI inflow to China have been widely reported. Zhang and Song (2001) found that FDI to China up to 1997 promoted export. Li, Liu and Parker (2001) confirm that there is a technology spillover effect from FDI. However, due to quite differentiated regional development policies in the first two decades of economic reform, uneven regional development are observed across east, central and west China. Wen (2004) reports relocation of Chinese industries from inland to east China with a significant industrial agglomeration into several east coastal regions including Guangdong and Jiangsu provinces. Different geographical conditions and differentiated policies in regional transition and development formed diverse regional market conditions and brought about uneven development paces. In turn, different per capita income indicates varying regional market sizes and diversified scope for further economic growth and, hence, different investment opportunities. Although Zhang (2001b) reports that FDI promoted income growth in China with a varying effect across regions, according to my best knowledge, so far no study examines formerly-mentioned demonstration effect through quantifying regional marketization level. This study investigates the effect, which helps to disclose the mechanisms of how FDI has promoted regional income growth in China's economic transition.

The paper is organized as follows. Section 2 provides a brief summary of China's regional discrepancies in economic geography, development of market institutions, utilization of FDI, and GDP components. The relationship between regional marketization level, FDI and industrial development is examined in Section 3. Section 4 investigates the effect of FDI on regional export and income growth. Concluding remarks follow in Section 5.

⁴ Data in this paragraph are from *SSBa* 1998 and 2004.

2 Regional Differences in Economic Geography, Development of Market Institutions, Utilization of FDI and GDP Components

Being the third largest country in the world, China has considerably geographical variations from east to west and south to north. Along the South China sea, the East China sea, the Yellow Sea, and the Bo Sea, east China has approximately 14,500 km of coastline, with ports and harbors for sea transportation to many developed western economies.⁵ Its geographical proximity to duty-free Hong Kong provided special export channel in the earlier years of economic reform. East China is adjacent to Laos, Vietnam, and North Korea. It is also close to one of the world largest economies – Japan, as well as two of the newly industrialized economies – Taiwan and South Korea. In comparison, West China is bordered by many developing and underdeveloped economies, including Russia⁶, Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, Pakistan, India, Nepal, Bhutan, and Burma. East China is of plains, deltas and hills while west China has high plateaus, mountains and deserts. These geographical conditions may have caused Chinese government to adopt the strategy of giving development priority to east China in the hope that later on, east China can generate radiant impact on central and west regions. In turn, the differentiated regional development policies have contributed to a varying regional economic picture.

Before the economic reform, due to industrial distribution along the east coastal belt before 1949 and inland development policies from 1953 to 1978, many 2-digit manufacturing industries were distributed in Hubei, Henan, Sichuan, Shannxi and Heilongjiang provinces in addition to the following eastern regions – Shanghai, Jiangsu, Liaoning, Shandong, and Beijing. From 1953 to 1978, location of industrial firms was not from economic concerns. Instead, it was guided by security concerns. Locating firms in inland China, especially in mountainous regions, was at a cost of efficiency loss because of the poor transportation conditions in western China at that time. However, the

⁵ There are ports or harbors in Dalian, Fuzhou, Guangzhou, Haikou, Huangpu, Lianyungang, Nanjing, Nantong, Ningbo, Qingdao, Qinghuangdao, Shanghai, Shantou, Shenzhen, Tianjing, Wenzhou, Xiamen, Xingang, Yantai and Zhanjiang.

⁶ Russia is mainly adjacent to North-east China but somewhat to North-west China as well.

differentiated regional development policies adopted by the central government from 1978 to 2000 created the best investment environment in east coastal China. In east China, approval processes for new investment projects as well as import and export rights were easier and faster than the other regions making the transaction costs lower. Preferential policies adopted for special economic zones and open cities in the region attracted both major foreign investment and domestic investment (as much FDI flew into China in enterprise forms of joint ventures). Close proximity to ports and better infrastructure⁷ promoted many manufacturing industries to relocate towards east coastal regions. By 1995, the agglomeration of many foot-loose industries in several east coastal regions, including Guangdong, Jiangsu, Shanghai, Shandong and Zhejiang, was observed and reported in Wen (2004). In this industrial relocation process, foreign invested enterprises and development of TVEs especially in east coastal regions, played a very important role.

According to China's statistics, since economic reform, most of FDI inflows into China have gone to the industrial sector in the east coastal regions. More than 85 per cent of annual FDI has been invested in east coastal regions. Four provinces – Guangdong, Jiangsu, Shanghai and Zhejiang – have been receiving more than half of China's FDI inflow. In 2000, the central government advocated development of west China and provided a set of preferential policies to attract FDI to west China. Even though, east China still received 86 per cent of China's actual utilization of FDI in 2001 while central and west China had only 8.75 per cent and 4.1 per cent, respectively with Guangxi (formerly geographically classified as east region) and Inner Mongolia (formerly classified as Central region) were counted as west regions (enjoying west China development policies).⁸ The increase in share of FDI inflow from 1999 to 2001 in western regions was less than .02. Due to the clearer property rights of foreign capital, foreign investors care more about the return to capital. The clear objective of making

⁷ The better infrastructure includes a higher urbanization rate and better transportation systems, etc. See Wen, 2002b for details.

⁸ There is some amount of FDI not classified into regions so that the sum of the percentage of three regions is slightly less than 1.

profits drives foreign investors to closely observe regional market conditions when choosing where to invest.⁹

Since China opened up its economy in 1979,¹⁰ FDI inflow into China experienced three stages with major development of China's market and relevant institutions. From 1980 to 1983 China's SOE reforms were focused on transforming SOEs from administrative units to independent economic identities while a market was gradually establishing for trade of agricultural products and small consumption products. Foreign investors then cautiously entered and invested into some big and well-performed SOEs in the form of joint ventures. Major recipient areas were mainly the four special economic zones and the fourteen coastal open cities. Investing into these SOEs, foreign investors may have lowered their investment risk. The returns to their investment would also be guaranteed under official protection¹¹. Meanwhile in addition to capital investment, Chinese government expected that the form of joint ventures could enable Chinese enterprises to benefit more from the advanced technologies which FDI would bring in.

In 1984, dual track was introduced into the SOEs' reform allowing them to trade their produces beyond state planning in the market at prices within a 20 per cent variation around the planned prices. The prices of small consumption commodities were determined by the market, and the prices of some light industrial products were adjusted according to market demand. More importantly, the Central Governmental Decision on the Reform of the Economic System, passed in October 1984 at the third plenary session of the twelfth congress of the Chinese Communist Party, initiated the establishment and development of a market for intermediate goods. Then enterprises registered with foreign funding increased from 616 in 1983 to 1999 in 1984 and registered investment from

⁹ Figures in this paragraph are calculated from data in *SSBa*, various years.

¹⁰ In July 1979, China's state council approved establishment of four special economic zones including Shenzhen, Zhuhai, Shantou and Xiamen. In special economic zones, preferential policies were introduced to encourage foreign investment, including income tax exemptions in the first three years of some businesses and granting exporting firms the right to import intermediate inputs duty free. Fourteen coastal cities (Dalian, Qinghuangdao, Tianjing, Yantai, Qingdao, Lianyungang, Nantong, Shanghai, Ningbo, Wenzhou, Fuzhou, Guangzhou, Zhanjiang, and Beihai) were also opened up to foreign investment. Later on, more open cities and regions were approved, and gradually extended to central and western China.

¹¹ The support can be through bank loans and needn't be direct intervention.

foreign partners in these enterprises increased from 895.89 million US dollars in 1983 to 2071.09 million US dollars in 1984, correspondingly, according to *SSBb*. In the second stage of FDI inflow from 1984 to 1992, SOEs' reform was towards more autonomy in enterprise decision-making. Various kinds of contracts with stronger incentive schemes were introduced for managers of SOEs and workers were shifted to contract-bases. Most state banks were also restructured. With more market trading based on improvement of the final goods market and the establishment of markets for more intermediate goods, joint ventures and pure foreign enterprises grew steadily with development of domestic collective enterprises and individual businesses. FDI then spread to more east coastal provinces and central regions, with Jiangsu, Shandong, Shanghai, Hainan and Liaoning becoming major FDI recipient regions in addition to Guangdong and Fujian provinces.

Since 1992, when the “dual track” was merged into market prices and most intermediate goods opened to market competition, China's market mechanism has been systematically improving across all regions. Reform of the housing system towards a semi-commercial system was executed nationwide. Two stock exchange markets were also established in 1992 in Shanghai and Shenzhen, respectively. Both the housing reform and the floating of companies provided new channels for foreign investment. After Deng, Xiaoping's southern tour, the fourteenth congress of the Chinese Communist Party, held in October 1992, officially declared that the aim of China's economic reform was to establish a socialist market system. Several economic laws were under discussion at that time and were later legislated in 1993. Systematic development of the market mechanism, legal protection for foreign businesses and economic contracts, and new investment channels drew a huge wave of FDI into China. As a result, in 1993, the number of registered enterprises with foreign funding and the total investment from foreign partners in these enterprises rose from 84,371 units and 68.665 billion US dollars in 1992 to 167,507 units and 150.182 billion US dollars, respectively¹². The nation-wide firm change towards a market system raised the expectation of market improvements in central and western regions. In fact, from 1992 to 1993, the eastern share in total FDI utilization decreased

¹² These figures are from *SSBb*.

from .913 to .874 while the shares of central and western regions increased from .0681 and .0189 to .0888 and .0375 respectively¹³.

However, due to different initial timing in opening up and time lags in adopting multi-direction market reforms, differences in people's viewpoints of conducting businesses, differences in the regional marketization level, and subsequent differences in regional GDP level and its structure could be observed in the 1990s. In east China, there was less government intervention in business decisions, faster development of non-state owned economic entities, a more sophisticated market system with better integration of developed product markets, factor markets, intermediary markets, as well as a relatively more efficient legal system than in the central and western regions. In comparison, west China lagged behind in developing market institutions. Due to closer impact from eastern regions, central China was between eastern and western regions in development of market institutions. With earlier exposure to international competition, businessmen in east China have stronger economic sense and pay more attention to enterprises' operational efficiency. As a consequence of stronger market competition, better geographical location and advanced market institutions, east China exhibited a much higher development level (than central and west China) shown in both per capita GDP and its components. According to *SSBa*, in 1999, the per capita GDP of east, central and west China was 12,330, 5,551, and 4,384 yuan, respectively. East China had a lower primary industry share but a higher tertiary industry share than central and west China. With the highest secondary industry share across regions and much larger regional GDP, east China then produced 61.6 per cent of national industrial GDP. The regional income differences imply different market size for investment. However, due to different strengths of industrial competition across regions and existing regional barriers to trade, regional investment opportunities for foreigners are not only determined by regional market size and export potential, but also by the market structure of different industries in different regions, policy variations regarding permission for foreign entries across

¹³ Calculated from data in *SSBa*. Note that the increase in the western share due to reform firmly towards a market system is not less than the changes due to preferential policies made under the *West China Development* strategy. In addition, the incremental FDI from 1992 to 1993 in western regions is partly from the FDI shift from eastern to western regions but the incremental FDI from 1999 to 2000 would be the FDI shift from both central and eastern regions to the western regions.

industries and regions, the technology differentials between foreign and domestic sectors and regional preferential policies for foreign funded enterprises.

With the existing differences in regional openness and industrial agglomeration in east coastal regions, industrial competition is far more severe in east China than in central and west China. In 1995, when many manufacturing industries reported excess production capacity, price game was common and marginal profits in many industries were squeezed such that many loss-making SOEs and ill-performing enterprises were driven out of businesses in subsequent years. Industries were experiencing both faster exit and entry rates for structural adjustments. Foreign funded enterprises were playing major roles in many manufacturing industries including the electronics and telecommunication equipment industry, the instruments, meters, and office-machinery industry, the cultural, educational and sports-goods industry, the leather, furs, down and related products industry, the garments and other fiber products industry as well as the automobile industry. Since then, while foreign funded enterprises have stronger incentive to use more advanced technologies in order to sustain market shares, more foreign investors were observing and preparing to enter the large domestic market in central and western regions. Consequently, share in total FDI inflow of the Yangtze triangle area, including Jiangsu, Shanghai and Zhejiang has been steadily increasing, as the Yangtze triangle is transportation pivotal for both domestic passengers and commodities and has the best access to the domestic market. *West China Development* policies initiated in 2000 could further strengthen this trend. This changing trend may significantly affect industrial locations in the coming years and regional economic development.

3 Marketization, FDI and Industrial Development

An empirical analysis of the relationship between regional marketization level, FDI and regional industrial development will be undertaken in this section. Since 2001, the National Economic Research Institute, China Reform Foundation has compiled a set of NERI indices of marketization of China's provinces. The indices reflect regional marketization and other institutional changes for more efficient market functioning,

represented by level of the development of product market, development of factor market, development of the non-state sector, autonomy in making economic decisions and development of intermediates and the legal system. For example, the report published in 2001 presents the picture of regional development of market institutions given in Table 1 in appendix 1.

From Table 1, it can be seen that in terms of all the indices given in the table east China had a much higher marketization level than central and west China in 1999 and 2000. However, different indices present different pictures regarding the relative marketization level of the central China. The development level of the product market in central China was closer to the level of east China than to west China. And development of the non-state sector in central China lay in the middle of the development levels of east and west China. However, central China was not too far ahead of west China in terms of reduction in government intervention, development of a factor market and development of intermediaries and efficiency improvement in their legal system.

As development of product markets directly affects the value of market transaction and the index is more accurately constructed in my opinion, I extend and construct the index for each year since 1995 according to the NERI 's approach and use it to investigate how it could affect regional investment. In examining the actual utilization of foreign direct investment at provincial level and regional investment in fixed assets from 1995 to 2001, it is found that both have positive correlation with regional marketization scores (the correlation coefficients are between 0.3 and 0.4). However, when regional FDI and investment in fixed assets of per yuan GDP are examined, the regional FDI-GDP ratio shows a higher correlation (0.25) with regional marketization level than total investment rate (in fixed assets), which is lower than 0.1. This can be interpreted in two ways: first, given market conditions, FDI was more likely to go to regions with a higher GDP level (a larger market size); second, while both returns to FDI and investment in fixed assets were lower in regions with more advanced market institutions from 1995 to 2001, the return to FDI might be higher than the return to investment in fixed assets, *Ceteris Paribus*.

When the determinants of FDI-GDP ratio and the ratio of investment in fixed assets to GDP were examined, following Regression 1 and 2 are established. While all the variables are highly significant in the OLS estimates, regression 1 suggests that regional FDI-GDP ratio can be largely explained by regional export-GDP ratio, regional marketization level, regional per capita GDP, and the cross-effect of per capita GDP and marketization level of the past year.¹⁴ The higher the regional export-GDP ratio of the past year, the higher the FDI-GDP ratio; the higher the regional marketization level of the past year, the higher the FDI-GDP ratio; the higher the per capita GDP of the past year, the higher the FDI-GDP ratio, and the effect was stronger in central and west China than in east China. The cross effect of per capita GDP and marketization level was negative, indicating that in regions with higher development level, an increase in marketization level would be accompanied with a higher market competition level, which discourage further rise of FDI-GDP ratio.

(Place Regression 1 here).

In addition to the above variables, Regression 1 also shows there were both a systematic constant shift across east coastal and west China, and some idiosyncratic regional shifts within east China. While east China had higher FDI-GDP intercept than central and west China, west China had a lower intercept than central China before 1999 but a higher intercept than central China after 1999. In east China, the FDI-GDP ratio of Tianjing, Hainan, Fujian, Shanghai, and Jiangsu is higher than other regions, *Ceteris Paribus*. Zhejiang had a lower intercept than the other east regions while Shaanxi had a higher intercept than the other western regions, indicating the distinctive scope for raising FDI-GDP ratios of these two regions. The last six rows of the table give out the number of observations, the R-squared, the adjusted R-squared, the joint significance F-test and log likelihood ratio as well as Durbin-Watson test result.

Regression 2 investigates factors affecting the regional ratio of investment in fixed assets to GDP. It is found that regional investment rate (in fixed assets) is positively correlated

¹⁴ In addition to the marketization index constructed from the proportion of products whose prices are determined by the market, regional FDI (actual utilization of FDI), regional export value and regional per capita GDP are from *SSBa*.

to the investment rate of the past year and increment of FDI-GDP ratio but negatively related to per capita GDP of the past year of the region. The larger the extent of increase in FDI-GDP ratio, the higher the regional investment rate (in fixed assets). The higher the investment rate of the past year, the higher the current investment rate. However, a lower regional per capita GDP level of the past year would be more helpful to a larger increase in the ratio of investment in fixed assets to GDP, *Ceteris Paribus*. In addition, the Asian Financial Crisis in 1997 had a negative impact on investment rate in fixed assets. As current FDI-GDP ratio is endogenous, an instrumental variable approach is used to estimate the equation. The current FDI-GDP ratio is estimated from regression 1.

(Place Regression 2 here).

From these two regressions, it can be seen that improvement of market institutions and stronger export orientation are helpful in raising regional FDI-GDP ratio. Increase in the FDI-GDP ratio can promote increase in the regional investment rate in fixed assets, which would be beneficial to regional industrial development. However, the effects of regional per capita GDP on FDI-GDP ratio and on the ratio of investment in fixed assets to GDP are different. The former is positive while both the direct and total effect of the latter is negative, although the total effect is much weaker than the direct effect. This means that while increment in FDI-GDP ratio was larger in regions with a higher per capita GDP, investment rate in fixed assets would be larger in regions with a lower per capita GDP, indicating that foreign investors paid more attention to regional purchasing power when choosing where to invest.

In countries with a large population and labor force like China, fixed capital and investment are crucial to industrial development, so the possible contribution of FDI inflow to regional industrial development is investigated in regression 3. With a high significance of 0.0001 of most variables and an adjusted R-squared of 0.971, regression 3 indicates that regional share in national industrial value added was determined by regional investment in fixed assets, per capita GDP level of the past year and the negative cross-effect of FDI and per capita GDP of the past year. Regional GDP, marketization

level and FDI inflow of the past year are used as instruments in endogenizing current investment in fixed assets in regression 3. All the instrumental variables are significantly (at 0.01 level) positive and together give an adjusted R-squared of 0.911. In regression 3, the positive investment effect was weaker in 2000 and 2001. The positive effect of per capita GDP of the past year indicates the positive correlation between regional industrial development level and regional development level. Because the effect of FDI inflow is weakly positive in OLS estimation but insignificantly (at 0.10 level) negative after endogenized via instrumental variable approaches, it is not shown in the final result of regression 3. The negative cross-effect between FDI and per capita GDP of the past year implies that the positive effect of increase in FDI on regional share in national industrial value added was weaker in regions with higher per capita GDP than in regions with lower per capita GDP since the late 1990s, *Ceteris Paribus*. In the regression, there is a weak positive cross-effect among investment in fixed assets, utilization of FDI and the per capita income of the past year at 0.05 significance level. This weak effect indicates that if FDI was complementary to investment in fixed assets, then the complementary investments increased regional significance in national industry in regions with high per capita GDP. Furthermore, there was a negative constant shift each year from 1996.¹⁵

(Place Regression 3 here).

The empirical results presented in this section confirm the observed movement of FDI discussed in the last section: more FDI flew into Chinese regions with high marketization level, high potential export opportunities and high development level (or say high income level) although the cross-effect of regional marketization level and per capita GDP is negative in making FDI inflow grow faster than regional GDP.¹⁶ It also confirms that it is the market orientation (shown by regional marketization level) and economic openness

¹⁵ As both regional investment in fixed assets and regional FDI are considered as endogenous, regional GDP level of the past year, marketization level of the past year, and fdi of the past year are used as instruments to estimate the current regional investment in fixed assets while export of the past year, regional gdp of the past year, east coastal region dummies are used as instruments to estimate current fdi level.

¹⁶ Or say “although the cross-effect of regional marketization level and income level is negative on FDI-GDP ratio”.

that provide a region with more development opportunities. A higher marketization level and more regional export opportunities attract FDI and investment in fixed assets into the region, which indirectly or directly promotes regional industrial development. It is worth noting that the effect of FDI on regional share in industrial value added is mostly indirect, which is through its regional location to generate a demonstration effect to regional investment in fixed assets while there is a very weak direct effect when it was complementary to investment in fixed assets.¹⁷

As the existing literature shows that FDI promoted China's export of manufacturing products and regional income growth, a formal growth model will be adopted in the next section to investigate the determinants of China's regional income growth.

4 FDI, Export, Industrial Development and Regional Income Growth

Zhang and Song (2000) reveal that from 1986 to 1997, the increase in China's regional FDI inflow resulted in increase in regional exports. Liu et al. (2001) find that the relationship between regional FDI inflow and regional export are bi-directional. In other words, east China, which has geographical advantages in export, attracts FDI inflow into the region. FDI inflow into the region increases its export. A regression of China's regional trade orientation (measured by the ratio of regional export value to regional GDP¹⁸) on regional FDI-GDP ratio, regional marketization level and regional dummies is shown in regression 4. Regional panel data from 1995 to 2001 is used for the regression. The regression clearly shows that regional export orientation is mainly determined by FDI-GDP ratio and the regional marketization level of the past year. While improvement of market mechanism was beneficial to raise regional export-GDP ratio nationwide, the effect of FDI-GDP ratio on regional export orientation varied across east, central and west China. In east China, a higher regional FDI-GDP ratio led to stronger export orientation. However, in central China, the effect of FDI-GDP ratio on the export-GDP

¹⁷ Note that this study is based on regional panel data from 1995 to 2001. The picture showing here can be different from a one in 1980s.

¹⁸ The regional export value is given by China's foreign trade managing units by region. The data are from *SSBa*.

ratio was significantly negative, indicating major FDI inflow into central China may have been targeting at the domestic market. In west China, the effect of FDI-GDP ratio on export-GDP ratio was not significant even at the 0.10 level.¹⁹

(Place Regression 4 here).

In addition, export-orientation of major east coastal regions, including Guangdong, Beijing, Shanghai, Tianjin, Zhejiang, Fujian, and Jiangsu, was higher than the other regions *Ceteris Paribus* as the constants of these regions were bigger. After two decades of open economic transition and development, these east costal regions are highly export-oriented.

As market condition, industrial development, and regional income still varied to a large extent across regions from 1995 to 2001, a closer examination on the determinants of growth rate of regional export leads to the following regression 5. Regression 5 is estimated via an instrumental variable approach. Current regional FDI-GDP ratio is estimated from regression 1 and current regional share in industrial value added is estimated from regression 3. Regional export of the past year and regional GDP last year as well as region dummies and time dummies are used as instruments to endogenize the level of current regional FDI inflow.

(Place Regression 5 here).

There are several observations from regression 5. First, regional growth rate of export was positively related to regional marketization level of the past year from 1999 to 2001. Second, an increase in regional share in industrial value-added promoted regional export growth in east China. Third, a higher per capita GDP of the past year was helpful to export growth while the growth rate of export would be smaller in regions with a higher export level of the past year, *ceteris paribus*. Fourth, an increase in FDI-GDP ratio in east coastal regions did promote regional export growth. In addition, the effect would be further strengthened through the increase in regional share in industrial value added.

¹⁹ It is dropped in the final result. This insignificance would be due to insufficient FDI inflow to west China so far.

Fifth, similar to the regression on export-GDP ratio, in central China, the effect of FDI-GDP ratio on export growth was negative, due to the fact that major FDI inflow into the central regions have been targeting domestic market. As yet, FDI-GDP ratio had no significant effect on the growth rate of export in west China. Sixth, due to the well-functioning market mechanism in east China, increase in FDI-GDP ratio in the region without increasing regional industrial share when the market mechanism further perfected may slow down export growth as the cross-effect of FDI-GDP ratio and increase in marketization level was negative in east China. Seventh, there were constant shifts across regions in the regression, with the highest constant for central China and a medium constant for west China except in 1996. Eighth, effects for the accession to the WTO in 2000 shifted the constant up. Although the Asian financial crisis started in 1997, China experienced a positive constant shift in export growth, which might be due to China's stronger competitiveness in exports and for attracting FDI in the worsening Asian economic environment. In addition, Xinjiang seemed to be doing well in lifting exports from 1997 to 1999.

As the effect of FDI on exports and raising regional share in industrial value added varies across regions, the mechanism of how FDI promotes regional income growth is not straight forward, especially in central and west China. Therefore, the growth model used in Balasubramanyam et al. (1996) is extended to a transitional-economy case to show how China's regional GDP growth is determined by different factors. In Balasubramanyam et al. (1996), output is assumed to be a function of labor input, capital stock, stock of FDI and export so that in log form, the following equation can be derived approximately for estimating the determinants of the growth rate of GDP from Cobb-Douglas production function.

$$y = \alpha + \beta l + \gamma \left(\frac{I}{Y} \right) + \psi \left(\frac{FDI}{Y} \right) + \phi x \quad (1)$$

In (1), y and l are the growth rates of output and growth rate of labor input. As it is difficult to get accurate data on the growth rate of fixed asset stock and the growth rate of FDI stock, $\frac{I}{Y}$ and $\frac{FDI}{Y}$ is used as their proxies. x is the growth rate of export. Regional panel data from 1995 to 2001 shows that the correlation coefficient between the

growth rate of export and the growth rate of GDP is only 0.018, indicating no strong correlation between the two variables. Meanwhile, according to the studies in former sections, improvement in the market mechanism in the transitional economy would bring more investment and subsequent increase in the regional share in industrial value added while regional industrial development would pull up the regional income growth. Therefore, in addition to the variables considered in (1), regional marketization level, regional share in industrial value added, potential cross effects between I/Y and FDI/Y , regional initial development level and change in export-GDP ratio are also considered as potential factors affecting regional GDP growth, shown in the following (2).

$$y = \alpha + \beta I + \gamma \left(\frac{I}{Y}\right) + \psi \left(\frac{FDI}{Y}\right) + \eta \left(\frac{I}{Y}\right) \cdot \left(\frac{FDI}{Y}\right) + \phi_1 x + \phi_2 \cdot \Delta \left(\frac{EX}{GDP}\right) + \lambda_1 RML + \lambda_2 \left(\frac{RIVA}{IVA}\right) + \lambda_3 RDL_{-1} + \lambda_4 \cdot \left(\frac{FDI}{Y}\right) \cdot RDL_{-1} \quad (2)$$

where RML , $\left(\frac{RIVA}{IVA}\right)$, RDL_{-1} are regional marketization level, regional share in industrial value added and regional per capita income of the past year, respectively. Because panel data from 1996 to 2001 are used for estimating the growth function, structural changes along time and spatial dimensions are considered. The regression result is reported in Regression 6.

(Place Regression 6 here).

Similar to regression 5, an instrumental variable approach is used to estimate regression 6. Current ratio of investment in fixed assets to GDP is estimated from regression 2. Current FDI-GDP ratio is estimated from regression 1 and current regional share in industrial value added is estimated from regression 3. Export-GDP ratio is estimated from regression 4. As both growth rate of employment (due to redundant labor force) and growth rate of export are insignificant even at the 0.10 level, they are deleted from the stepwise regression process and do not appear in the final regression. All the variables included in the final result of regression 6 are highly significant. While five variables are significant at 0.05 level and one significant at 0.10 level, all the rest are significant at 0.01 level. In addition, the following observations can be drawn from regression (6).

First, capital input significantly contributed to output as shown in the regression that the ratio of investment in fixed assets to GDP is significantly positive except in 1997 east China. This positive effect was even stronger in 1997 central China. Second, regional GDP growth rate is significantly and positively related to regional FDI-GDP ratio. Third, the cross-effect between investment rate in fixed asset and FDI-GDP ratio is significantly negative, indicating that there was a crowding out effect between domestic and foreign investment as input factors in promoting regional GDP growth. Fourth, increasing regional share in industrial value added could increase regional income growth. Fifth, the higher be the regional development level (per capita GDP of the past year), the faster be the regional income growth. This can be partly because of larger regional demand in higher per capita GDP regions and partly because regions with higher per capita income may have recovered faster from the impact of the Asian financial crisis and were quicker in grasping new development opportunities provided by China's accession to the WTO. In addition, given the global economic environment and a large lift of FDI into eastern China in 1997²⁰, east coastal regions with higher per capita income did well in maintaining a fast economic growth. Sixth, increment in FDI-GDP ratio and per capita GDP of the past year generated a positive cross-effect on regional GDP growth. In other words, given per capita GDP level, the larger the extent of the increment in FDI-GDP ratio, the faster the regional GDP growth; given the extent of the increment in FDI-GDP ratio, the higher the regional per capita GDP, the faster the regional GDP growth. Seventh, as mentioned earlier, the correlation coefficient between growth rate of export and growth rate of GDP is only 0.018, indicating that faster growth of export itself may not promote GDP growth. However, increase in export-GDP ratio can promote regional income growth. In other words, growth of export has to reach such a level which increases regional export-orientation that it will promote regional income growth²¹. Eighth, further development of market mechanisms in west China can directly contribute to income growth in addition to indirect effects from raising investment and raising

²⁰ The large increase in FDI into eastern China in 1997 can be a major reason of causing the marginal contribution of the investment rate to regional GDP growth rate to be negative in eastern regions.

²¹ It's equivalent to say that the growth rate of export has to be higher than regional income growth rate for export to promote further income growth.

regional share in industrial value added. Ninth, the constant shifted across regions and across time as shown in first eight rows in regression 6. Last, there are regional constant shifts during different years, such as a negative shift for Guangdong province and a positive shift for Shandong provinces during the whole period. This indicates that different regions have different total factor productivity fixing factors considered above, *Ceteris Paribus*.

Concluding Remarks

The above two sections use a recursive system of equations²² to disclose the mechanism of how FDI has promoted regional income growth in China's economic transition. After a quarter of a century of fast economic growth and uneven regional economic development, both sustainable growth and regional income inequality are major concerns in China's economy. In China, there are high expectations of attracting additional FDI inflow for both further economic growth and reduction in regional income disparity. It is worth noting that results in this paper shows that while FDI inflow generated a demonstration effect in identifying market conditions for investment in fixed assets and hence affected industrial location, its effect on regional export and regional income growth has varied across east, central and west China since the second half of the 1990s.

In east China, geographical advantages in export attracted FDI and FDI inflow promoted export. Rise of regional FDI-GDP ratio also increased regional share in industrial value added in east China. All these effects contributed positively to regional income growth in east China although there was a crowding out effect in FDI and domestic investment. In central China, the picture was different. Major FDI inflow seemed to be targeting the domestic market, hence an increase in FDI-GDP ratio in central regions did not increase their export-orientation. Instead, it generated a negative effect on the export-orientation of central regions. While FDI inflow into central regions contributed to regional income

²² Note that Regressions 1 to 6 form a recursive system of equations so that the paper can expose the mechanism equation by equation. The adopted exposure sequence is to emphasize the effect of regional market development and the signal effect of foreign direct investment although the growth model used in regression 6 is the top level result.

growth through its market demonstration and direct investment effects, its negative impact on regional export orientation weakened its contribution to regional income growth in central China. As there had no substantial FDI inflow into west China yet, the effect of FDI inflow there is hard to gauge. Although FDI can contribute positively to regional income growth through direct investment and indirect demonstration effects, effect of FDI inflow on raising regional export orientation is very likely to be negative,²³ as west regions may not have geographical advantage in export and the market condition is yet to improve for attracting FDI with advanced technology.²⁴ If the negative effect is strong, FDI may not contribute significantly to regional income growth. However, as complementary FDI and investment in fixed assets were encouraged by economic development for regional industrial development, if FDI with unique characteristics (which domestic investment wouldn't generate) inflow into the region, such as unique technology or export channels, can substantially promote exports to adjacent countries such as Russia, Mongolia, Kazakhstan, Kyrgyzstan, Tajikistan, Afghanistan, Pakistan, India, Nepal, Bhutan, and Burma, the story would be different although current social instability in many of these countries may undermine this perspective.

More importantly, the contribution of improvement in market mechanism to regional development is evidenced in attracting FDI, in indirectly contributing to regional industrial development, in promoting export as well as directly contributing to regional income growth. Therefore, further development of regional market mechanisms will be the most efficient approach to regional development, especially in central and west China. Foreign investments in infrastructure which could assist the improvement in market institutions would help as well. Noting that FDI has a demonstration effect to investment in fixed assets and there is a crowding out effect between FDI and domestic investment, increasing the efficiency of domestic investment is also very important for fast regional income growth. However, to improve the efficiency of domestic investment

²³ Note this does not contradict to the fact that marginal return to FDI in some western regions can be higher than in many eastern regions so that more FDI may flow into western China naturally following higher marginal returns in near future.

²⁴ A very important difference between export-oriented and import-substitute FDI would be the embedded technology. Export-oriented FDI is more likely to be of more advanced technology due to high international competition in the product market while import-substitute FDI may bring in less advanced technology.

does not seem to be an easy task. It requires stronger concern over efficiency based on changes in ownership composition in the economy. It also demands institutional reforms including further reforms in the banking sector and financial market, which can lead to more efficient allocation of resources across industries, regions, and different economic entities. It further calls for more investment knowledge, management knowledge, R&D and knowledge about the international market. With increased gradual perfection of market mechanism in east China and increasing industrial competition in the region, more FDI is naturally flowing into central China and may increasingly flow to west China with the improving regional market conditions. However, so far, the contribution of FDI inflow into central and west regions to regional income growth is not comparable to what has happened in east China during the past two decades. Therefore, to seek the “right kind” of FDI inflow is important for enhancing regional development in central and west China.

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Appendix

Table 1 Regional Changes in Institution and Marketization Levels

Index representing	1999	2000	Change
1. Reduction of Government Intervention			
Nationwide	6.11	6.05	-0.06
Eastern Region	7.08	7.11	0.03
Middle Region	5.59	5.47	-0.11
Western Region	5.52	5.40	-0.12
2. Development of Non-state Owned Enterprises			
Nationwide	4.80	5.34	0.54
Eastern Region	6.91	7.58	0.67
Middle Region	4.41	4.65	0.25
Western Region	2.99	3.60	0.61
3. Development of Product Market			
Nationwide	7.23	7.44	0.21
Eastern Region	7.94	8.16	0.22
Middle Region	7.70	7.88	0.17
Western Region	6.16	6.39	0.22
4. Development of Factor Market			
Nationwide	3.43	3.60	0.17
Eastern Region	5.41	5.66	0.25
Middle Region	2.41	2.59	0.17
Western Region	2.18	2.29	0.11
5. Development of Intermediaries and Efficiency Improvement of Legal System			
Nationwide	5.01	5.26	0.25
Eastern Region	6.13	6.43	0.30
Middle Region	4.72	4.92	0.20
Western Region	4.10	4.34	0.24

Note: This table is translated from table 3 of NERI (2001). Construction approach of these indices is provided in the NERI report.

Regression 1 Dependent Variable: FDI-GDP ratio

Explanatory variables	Coefficient	t-statistic	p-value
Constant	-0.003265	-4.208856	0.0000
Constant shift in year 1999-2001	-0.001531	-5.898219	0.0000
Export_GDP ratio of the past year	0.133944	18.77374	0.0000
Marketization level of the past year	0.000656	6.900986	0.0000
Per capita GDP of the past year in east China	0.005958	4.317418	0.0000
Per capita GDP of the past year in central and west China	0.007681	5.927799	0.0000
Cross-effect of per capita GDP of the past year and marketization level of the past year	-0.000917	-6.552779	0.0000
Jiangsu dummy	0.003565	6.830051	0.0000
Fujian dummy	0.006336	12.10839	0.0000
Shanghai dummy	0.004068	4.306651	0.0000
Tianjing dummy	0.007093	12.26564	0.0000
Zhejiang dummy	-0.001379	-2.553156	0.0116
Hainan dummy	0.007801	13.68913	0.0000
East costal region dummy	0.001745	2.326918	0.0212
Western region dummy in year 1996-98	-0.001071	-3.693832	0.0003
Western region dummy in year 1999-2001	0.000805	2.086195	0.0386
Shaanxi dummy	0.001923	3.776754	0.0002
No. of observations	174		
R-squared	0.942651		
Adjusted R-squared	0.936806		
F-statistic (joint test on regressors excluding constant)	161.288		
Log likelihood Ratio	497.3953		
Durbin-Watson Test	1.976		

Regression 2 Dependent Variable: Ratio of Total Investment in Fixed Assets to GDP

Explanatory variables	Coefficient	t-statistic	p-value
Constant	0.029744	3.671888	0.0003
Investment rate in fixed assets of the past year	0.995472	36.49847	0.0000
Increment of FDI-GDP ratio	3.137566	1.905378	0.0584
Pre capita GDP of the last year	-0.025851	-4.814102	0.0000
Year 1997 dummy	-0.022371	-4.047490	0.0001
No. of observations	172		
R-squared	0.908952		
Adjusted R-squared	0.906771		
F-statistic (joint test on regressors excluding constant)	416.8002		
Log likelihood Ratio	412.1757		
Durbin-Watson Test	1.555		

Regression 3 Dependent Variable: Regional Share in Industrial Value Added

Explanatory variables	Coefficient	t-statistic	p-value
Constant	-0.001009	-0.779998	0.4365
Year 2001 dummy	-0.012584	-6.575199	0.0000
Year 2000 dummy	-0.012475	-6.515545	0.0000
Year 1999 dummy	-0.016314	-11.87452	0.0000
Year 1998 dummy	-0.012266	-9.282126	0.0000
Year 1997 dummy	-0.007056	-5.458353	0.0000
Total investment in fixed assets	4.68E-05	50.95152	0.0000
Shift of investment effect in 2001	-9.23E-06	-6.652777	0.0000
Shift of investment effect in 2000	-6.06E-06	-4.234758	0.0000
Per capita GDP of the past year	0.009514	4.399195	0.0000
Cross-effect of FDI and past year's per capita GDP	-3.26E-08	-4.026376	0.0001
Cross-effect of I, FDI, and past year's per capita GDP	5.25E-12	2.032573	0.0437
No. of observations	172		
R-squared	0.972866		
Adjusted R-squared	0.971000		
F-statistic (joint test on regressors excluding constant)	521.5100		
Log likelihood Ratio	620.3970		
Durbin-Watson Test	1.520		

Regression 4 Dependent Variable: Export-GDP Ratio

Explanatory variables	Coefficient	t-statistic	p-value
constant	0.005174	5.296024	0.0000
FDI-GDP ratio of the past year for east China	0.632729	5.779178	0.0000
FDI-GDP ratio of the past year for central China	-1.153768	-3.143383	0.0020
Regional marketization level of the past year	0.010860	5.635203	0.0000
Guangdong dummy	0.014488	6.548604	0.0000
Beijing dummy	0.033688	16.75761	0.0000
Shanghai dummy	0.034945	18.07320	0.0000
Tianjin dummy	0.028241	12.28278	0.0000
Zhejiang dummy	0.075511	32.18840	0.0000
Fujian dummy	0.015097	8.307682	0.0000
Jiangsu dummy	0.000388	2.722022	0.0072
No. of observations	174		
R-squared	0.959081		
Adjusted R-squared	0.956571		
F-statistic (joint test on regressors excluding constant)	382.0503		
Log likelihood Ratio	556.1330		
Durbin-Watson Test	1.815		

Regression 5 Dependent Variable: Regional Growth Rate of Export

Explanatory variables	Coefficient	t-statistic	p-value
Constant	-0.007896	-0.046115	0.9633
Log value of past years' export	-0.023469	-1.626537	0.1060
Region share in industrial value added for east China	3.175961	6.128717	0.0000
Cross-effect of increase in regional share in industrial value added and improvement of regional market mechanism	2.854703	3.100520	0.0023
Regional marketization level of the past year for year 1999-2001	0.007923	3.421826	0.0008
Per capita gdp of the past year	0.084920	3.369850	0.0010
fdi-gdp ratio for east China	13.05950	3.851560	0.0002
fdi-gdp ratio for central China	-67.39401	-3.379995	0.0009
Cross-effect of the level of FDI inflow and export-GDP ratio of the past year	-2.09E-06	-3.584548	0.0005
Cross-effect of fdi-gdp ratio and increase in marketization level for east China	-1.687637	-2.300625	0.0228
Central China dummy	0.308002	5.878061	0.0000
West China dummy	0.191683	4.327249	0.0000
Year 2000 dummy	0.239633	11.69982	0.0000
Year 1997 dummy for east China	0.184564	5.868473	0.0000
Year 1997 dummy for central and west China	0.219301	8.123680	0.0000
Year 1996 dummy for west China	-0.135285	-3.707779	0.0003
Year 1997, 1998 and 1999 dummy for Xinjiang province	0.276032	5.104519	0.0000
No. of observations	162		
R-squared	0.752382		
Adjusted R-squared	0.725059		
F-statistic (joint test on regressors excluding constant)	27.53622		
Log likelihood Ratio	226.1306		
Durbin-Watson Test	1.865		

Regression 6 Dependent Variable: Growth Rate of Regional GDP

Explanatory variables	Coefficient	t-statistic	p-value
Constant for east China	9.372715	11.29159	0.0000
Constant for central China	8.085079	8.493544	0.0000
Constant for west China	9.674201	14.67827	0.0000
Year 2001 dummy	-4.410836	-11.87972	0.0000
Year 2000 dummy	-4.380420	-11.80328	0.0000
Year 1999 dummy	-4.936243	-13.37679	0.0000
Year 1998 dummy	-4.101423	-11.33910	0.0000
Year 1997 dummy	-2.973644	-6.179479	0.0000
Constant shift in 1996 for east China	-1.688432	-3.642097	0.0004
Constant shift in 1996 for west China	-1.759120	-3.273895	0.0013
Investment rate in fixed assets	8.471358	4.397700	0.0000
Shift of the effect of investment rate in year 1997 for east China	-15.26124	-4.801143	0.0000
Shift of the effect of investment rate in year 1997 for central China	4.238731	2.264103	0.0251
FDI-GDP ratio	461.4532	5.166650	0.0000
Cross-effect of FDI-GDP ratio and investment rate in fixed assets	-1008.232	-4.433516	0.0000
Regional share in industrial value-added	10.49195	2.399077	0.0177
Per capita GDP of the past year	0.721788	2.718881	0.0074
Shift of the effect of per capita GDP of the past year in 1997 for east China	5.014624	4.508018	0.0000
Cross-effect of increment in FDI-GDP ratio and per capita GDP of the past year	88.64134	1.781495	0.0769
Increase in export-GDP ratio	82.04594	4.177816	0.0001
Effect of marketization level for west China	0.139582	2.379375	0.0187
Guangdong dummy	-1.311314	-2.422152	0.0167
Shandong dummy	1.093167	2.459147	0.0151
No. of observations	167		
R-squared	0.767024		
Adjusted R-squared	0.731430		
F-statistic (joint test on regressors excluding constant of year 1996)	872.1594		
Log likelihood Ratio	810.5367		
Durbin-Watson Test	2.036		