The Impact of Foreign Direct Investments on Economic Growth in China during the Era 1979-2009

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Abstract

The attraction of foreign direct investments (FDI) is one of the most important strategies for developing countries to enhance capital formation in order to generate a higher GDP growth rate. China as an emerging country has attracted significant amounts of FDI in the last three decades accompanied by a tremendous growth in GDP.
The impact of the Chinese FDI promotion on its economic performance and on the development of the rural and coastal provinces make up the main issues of this paper. An attempt to quantify the determinants of the GDP growth rate completes the here presented work. Different approaches were accomplished to point up the relationship between FDI and GDP. Analyses were made with panel data based on a regression model including values for all Chinese provinces in the time period of 1985-2005.
Even though theory suggests positive effects of FDI inflows on economic growth the accomplished empirical assessment however finds no positive but a slightly negative and highly significant relationship between the two components. Nevertheless this paper concludes that FDIs are supposed to have contributed essentially to the GDP growth in China through various channels.

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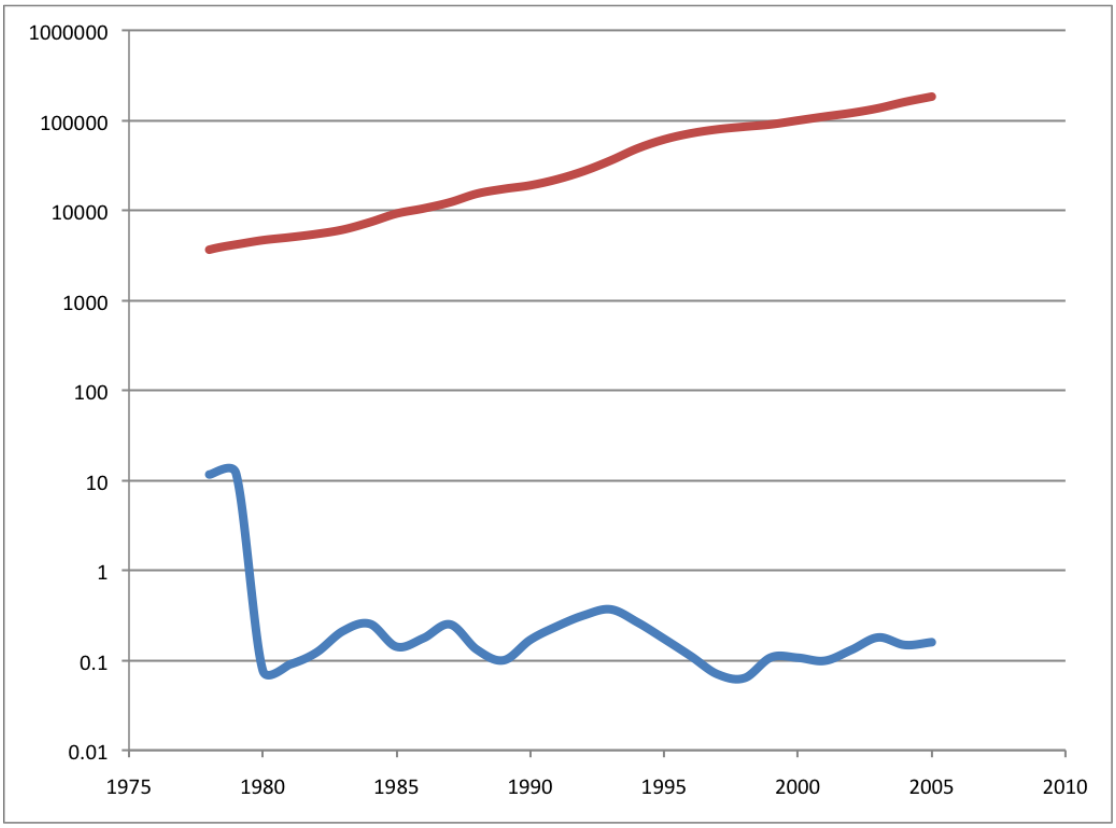
1. Introduction

After adopting the Open Door Policies in 1978 China experienced a tremendous growth of gross domestic product (GDP) which rose from 364.5 billion RMB yuan in 1978 to 24'953 billion in 2007 (figure 1). This corresponds to an average annual growth rate of about 9.5%. The corresponding value for the rest of the world was on contrary about 3% (Zhang, 2006a).

Figure 1: China's GDP 1978-2005 in 100 Mio RMB and GDP Growth Rate, log scale

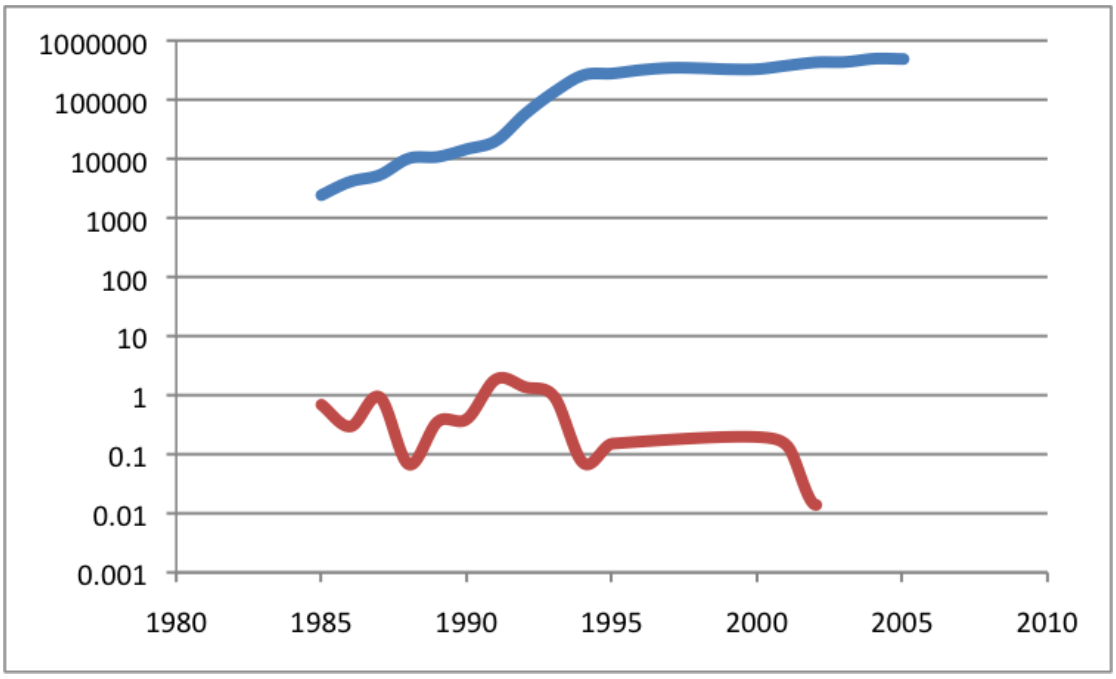


Source: China Statistical Yearbook, various years.

The enormous growth in GDP is mainly related to the adoption of radical initiatives encouraging inward foreign direct investments (FDI). Like most of the developing countries China sees the attraction of FDI as an important element for the economic development. Due to tax incentives and various privileges for foreign investors within the limits of the Open Door Policies China could enhance FDI from 0.5 billion US$ in 1978 to 50 billion US$ in 2007 (figure 2) what makes it by far the largest FDI recipient in the developing world and the second largest worldwide following the United States (Ren and Pentecost, 2007).

The effects of the opening were not a long time coming and China emerged as the most

Figure 2: FDI Inflows into China 1985-2005 in 10'000 US$ and FDI Growth Rate, log scale



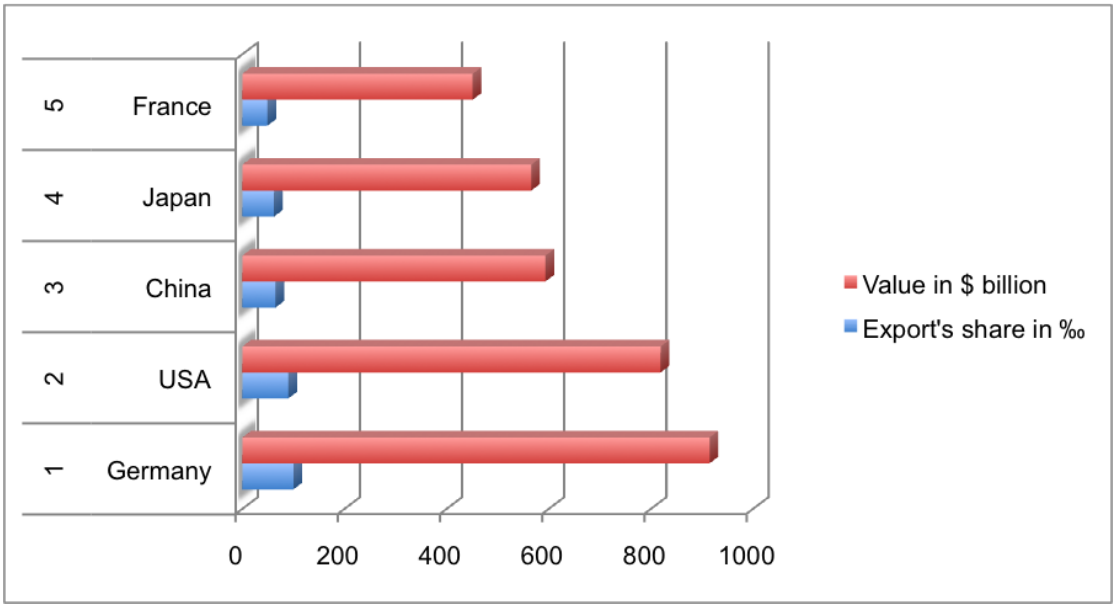
Source: China Statistical Yearbook, various years.

dynamic trading nation in the world for three decades since 1978. While China's exports and imports accounted for scarcely 10% of its GDP in 1978 they amount to 75% of its GDP today (Zhang, 2006a). China's share of world's exports in 1978 was only 0.6% with an absolute value of 7.6 billion US$ what made it only ranked as thirty-second largest exporting country worldwide. By 2004 however China had become the third largest exporting nation after the United States and Germany with a share of 6.5% and a nominal value of 595 billion US$ (figure 3).

The evidence of this export expansion is clearly visible as products with the *Made in China* label are present in every store. Doubtlessly China has become one of the most important exporting nations in the world.

As the emergence of China to one of the main global players in world economy was one of the most interesting economic developments in the last century, there is plenty of literature trying to explain the growth process in more detail. Even though there is a huge number of research papers that investigate the impact of FDI on the economic development in China the empirical work is rather limited mainly because of the missing data or the difficulties to obtain the relevant data. Especially the data for less developed provinces are not available or incomplete for a longer time period. Former research papers like Fung et al. (2002), Wei

Figure 3: Export Value in billion US $ and Share of the five largest Exporting Nations in 2004



Source: Zhang, 2006a.

(1993) or the OECD (2000) contribute the development of FDI mainly to the effects of the Open Door Policies. This paper will associate with this theory.

The aim of this paper is to reveal the impact of FDI on economic growth in the different Chinese provinces. Depending on the applied policies, the geographical location and other factors like infrastructure and the level of human capital, FDI inflows were or are still distributed very unevenly in the different provinces what leads to different economic performances of the provinces.

The empirical growth model of this paper is mainly based on the model used by Shang-Jin Wei (1993). It expresses the GDP growth rate of a certain province depending on the productivity parameter of the whole country, the FDI inflows, the exports, the initial size of the economy in 1978, the human capital and the population growth of the province:

$$g_{province} = g_{A_{China}} + \beta_1 FDI_{province} + \beta_2 Exp_{province} + \beta_3 Y_{province_{1978}} + \beta_4 H_{province} + \alpha g_{pop_{province}} + e_{province} \quad (1)$$

As the paper by Wei (1993) uses absolute values of all the included variables a second method like the one presented by Barro and Sala-i-Martin (2004) is inquired that uses only per capita

data to diversify the empirical analysis and to improve the results. As for time restrictions the previously illustrated regression will be retained but the variables will be transformed into per capita terms. This work will therefore include regressions based on absolute numbers as well as on per capita values. In addition an interaction term will be included measuring the interdependency between FDI and human capital (based on Bornsztein et al., 1998).

The formal aspects of this thesis are primarily based on the papers by the OECD (2000), by Zhang (2006), the IMF (2003), Fung et al. (2002) and others. The data however are taken from the Chinese Statistical Yearbook and the website of the Ministry of Commerce, China (www.mofcom.gov.cn).

The rest of the paper is organized as follows: Section 2 gives an overview over China's historical evolution regarding the Open Door Policies and the resulting changes in FDI inflows. The paper points out the development of the tax system and other incentives for investors and the gradual opening of the country. The different legal changes regarding FDI will be exposed and the Open Door Policies in the different provinces will be explained. The development from the first four Special Economic Zones (SEZ), the 14 coastal cities and finally the opening of the whole country will be demonstrated. In addition various aspects of FDI will be shown theoretically. The main determinants of FDI inflows as well as the positive and negative impacts of FDI on the country will be exposed.

In section 3 the data will be discussed. The origin and the reliability of the data will be briefly reviewed, time restrictions of the datawork will be made and the model used in the paper will be explained properly.

The following section 4 includes the datawork with the discussion about various regressions, regression results and interpretations.

Section 5 concludes the work, provides a summary of the main results and attempts to give a short forecast for the expected future development of the Chinese economy including limitations and future research possibilities.

2. China's Open Door Policies and its Development

2.1. Historical Overview 1978-2005

In 1978 Deng Xiaoping announced an opening of the People's Republic of China after decades of political isolation. From 1978 on there are three periods according to the OECD (2000) that can be distinguished with regard to changes in policy directions (table 1). Ren and Pentecost (2007) support this theory.

Table 1: Open Door Policy in Three Periods

Period	Legal Changes	Policy Directions
1979-1983	In 1979 the *Law on Joint Ventures Using Chinese and Foreign Investment* provides a basic framework and (mainly tax) incentives for foreign investors. The first four Special Economic Zones (SEZs) were established in 1980.	FDI inflows were granted a legal status in China but still they were limited and highly concentrated in the SEZs due to the special incentives policies and the poor infrastructure of the other provinces. Wholly foreign-owned enterprises were forbidden.
1984-1991	In 1986 the existence of wholly foreign-owned enterprises was allowed in the four SEZs and further incentives for firms using advanced technology were set up. In 1990 the first two Free Trade Areas as well as so-called High Technology Development Zones were established.	Inspired by the economic success of the first four SEZs the Hainan Island and fourteen other coastal cities were opened and FDI inflows started to take off. FDI inflows spread along the coast side and let to a very uneven distribution of FDI and wealth in the whole country.
1992-2005	The implementation of a nation-wide opening to favour the so far neglected regions in the western part of the country was pursued and the accession to the World Trade Organisation (WTO) in 2001 escalated economic performance.	FDI inflows accelerated due to substantial commitments in the range of intellectual property rights and market access. In addition further geographic restrictions were abolished.

Source: OECD (2000), Ren and Pentecost (2007).

Before 1978 China pursued an autarkic policy. With exports of just 7.6 billion US$ in 1978 China was an isolated economy and hardly involved in world business. FDIs were highly restricted before 1978 and amounted to only 0.5 billion US$ in 1979. Since then the government liberalized the FDI market gradually by generating a legal framework for the attraction of FDI. After adopting the Open Door Policies China experienced a boom of FDI in- and export-outflows with an export value of 1'442.8 billion US$ in 2008 (www.mofcom.gov.cn).

The establishment of the first four economic zones in 1980 was one of the most important steps towards an opening of the country. In the SEZs the investment-decisions were made outside the state plan and allowed therefore a market-driven environment. The early reform, or better the establishment of the SEZs, consisted actually of experiments which allowed the regime to first assess the results before extending the new policies to other parts of the country. The SEZs consisted of the cities Shenzhen, Zhuhai and Shantou in Guangdong province and Xiamen in Fujian province. These cities were not chosen arbitrarily. They were chosen with the clear intention to attract investment from oversea Chinese in Hong Kong, Macao or Taiwan. All three of them are largely populated by Chinese people what makes the communication a lot easier and facilitates business due to the same cultural background. As it was thought that a huge country like China could not grow in all its regions simultaneously a trickle-down strategy has been developed that first strengthened a few coastal cities and then step by step the other regions. There are two reasons for the choice of these cities as SEZs. The size of the cities is the first reason to consider: Even though the cities were not small at all they were not the biggest and important ones for the former Chinese economy either. The reason for that lies in the fear of a failure of the reforms. Still they became huge and influential cities today with the most important industries. The second and much more important reason is their geographical location. As will be explained in more detail later the main share of FDI came from Asian countries as Hong Kong or Taiwan. It can be seen in figure 5 in the appendix that Shenzhen shares a border with Hong Kong, Zhuhai is next to Macao and Xiamen is near Taiwan. It doesn't come as a surprise that Hong Kong is with about 50% the main supplier of FDI.

Encouraged by the economic success of the SEZs the government announced in 1984 another fourteen cities along the coast side as open cities. These fourteen coastal cities were chosen for the same reason namely to attract FDI and new technology. In contrast to most of the SEZs these cities were more important, meaning that they had an industrial base and a well educated labour force. These factors attracted even more investors from abroad (OECD, 2000 and Fung et al., 2002).

2.2. Modes of Foreign Direct Investments

Theory distinguishes between the following types of foreign direct investments.

2.2.1. Export- and Market-Oriented Foreign Direct Investments

From the investor's point of view there are in general two types of FDI, namely export-oriented and domestic-market-oriented FDI depending on his aims (table 2).

Table 2: Types of Foreign Direct Investments

Type of FDI	Definition	Main Goals and Motivation
Export-Oriented or Vertical FDI:	FDI inflows are only for the production and the manufactured goods will be exported again. The host market doesn't consume the produced goods.	Reduction of production costs by using the abundant supply of cheap labour in the host country. Cost competitiveness as a main driving force.
Domestic-Market-Oriented or Horizontal FDI:	FDI inflows are for market penetration and expansion of the investing corporation, the produced goods will be sold in the host country.	Business expansion and growth of the Multinational Corporations (MNCs).

Source: OECD (2000), Tseng and Zebregs (2002).

In the beginning of the reform era the dominant form of FDI in China was especially the export-oriented FDI that wanted to benefit from the cheap labour force in China. These FDIs came mainly from Asian countries like Hong Kong that wanted to outsource their production due to the increasing wages in their domestic markets. But with the increasing wealth of the Chinese population an attractive consumer market emerged and attracted corporations with market-oriented investments. The FDI flows from North America and Western Europe are more in the horizontal category which seeks to service the Chinese market.

2.2.2. Different Legal Forms of Foreign Direct Investments

Generally there are three forms of investment: foreign loans, foreign direct investments and other investments like leasing or compensation trade. This paper investigates the second form of investment namely FDI. It can be distinguished between the following types of foreign direct investments (Fung et al., 2002 and OECD, 2000):

1. Joint Exploration: Several foreign firms get aligned with each other to explore the Chinese market with certain smaller projects. This form was important in the early

reform stages to get to know the host market.

2. Contractual Joint Ventures (CJVs): Partnership or cooperation between a foreign investor and a domestic firm for a certain project. CJVs were important in the early stages of the reform because of the lower risk for the foreign investor.

3. Equity Joint Ventures (EJVs): Joint investment by a Chinese firm and a foreign partner to establish a new legally independent enterprise. The losses and the risks are shared. The peak of this investment form was in the 90's, but recent trends show a decrease du to problems in the field of IPR and the permission of WFOs.

4. Wholly Foreign-Owned Enterprises (WFOs): A foreign corporation settles a new subsidiary in the host market. The investor holds the risks but also the profits. This form of investment is strongly increasing since the permission in 1986.

In the beginning of the reform era during the 80's equity joint ventures were the prevailing investment form as there are lower risks for the foreign investor than in directly establishing a wholly-foreign-owned enterprise (OECD, 2000). A second reason was that the regime didn't want to give up its control and the monopoly status in a lot of economic fields and therefore WFOs were forbidden before 1986. In addition foreign firms should work together with domestic businesses so that the local firms could absorb the advanced knowledge and benefit from spill-overs.

2.2.3. Legal Status of Foreign Direct Investments

In 1995 the *Provisional Guidelines for Foreign Investment Projects* were launched. These principles and instructions gave priority to FDIs in agriculture, energy, high-tech industries and FDI inflows that used resources in the northwestern regions. With this policy the government wanted to attract FDI in these so far neglected provinces and aimed at a greater geographic dispersion of FDI. In line with the new guidelines FDI projects were classified into four categories (Fung et al., 2002):

1. Encouraged: Projects in undeveloped industries that upgraded the domestic production function by using the foreign advanced technology or generally export-oriented FDI.

2. Restricted: Projects that were under state monopoly or exploited rare material.

3. Prohibited: Projects that harmed the public interest or environment, applied technologies unique to China or endangered the functioning of military facilities.

4. Permitted: Projects that were not in one of the categories mentioned above.

As can be seen in the latter segmentation of projects the Chinese regime had always a clear intention what they wanted to foster. So the market system in the 90's was still far away from a traditional market system.

2.3. Main Determinants of FDI Inflows

The increasing attracting of foreign direct investments is considered as one of the main driving forces of the Chinese economic growth in the last three decades. The most important factors that contributed to the attractivity of China as a FDI recipient are summarized in the following subsections (Fung et al., 2002 and Ali and Guo, 2005).

2.3.1. Economic Structure

The most influential determinant is the economic structure. Results show that especially the market size of the host country is a major factor for FDI attraction. So the larger the market size of a province the more FDI will be received. In addition cost factors for production like low wages are important for export-oriented FDI. Over and above one could also mention the rapid developments in communication technology that substantially helped attracting foreign investments especially in the coastal regions (table 3). Due to the rapid growth of the communication technology the geographical distance seems to have little influence on the FDI location (Ali and Guo, 2005).

2.3.2. Policies

China has indeed many country specific advantages for production but the main factor for the huge FDI inflow was the promotion of the opening and the incentives for foreign investors (table 4). Also other factors contributed to the high FDI inflows such as domestic currency appreciation or rather the devaluation of China's real exchange rate that favours exports.

2.3.3. Cultural and Legal Environment

Even though it has been argued that political problems like the defiance of human rights in certain cases can discourage the inflow of FDI, this doesn't seem to be the case in China. Although not democratically ruled the Chinese regime seems stable and reliable compared to other developing countries. Additionally the accession to the WTO helped improving the problems with nepotism and generated a more coherent framework for investments (table 5).

Table 3: Main Determinants of Foreign Direct Investments - Economic Structure

Main Determinant		China's Characteristics
Economic Structure	Market Size	A big market size with a huge population and a high growth rate is attractive for domestic-market-oriented FDI as it serves as a high potential selling market.
	Abundant Supply of Cheap Labour	Relatively low wages are attractive for export-oriented FDI for the production of manufacturing goods.
	Infrastructure	The relatively well developed infrastructure in the eastern coastal regions attracts both export-oriented and market-oriented FDI.

Source: Tseng and Zebregs (2002), OECD (2000), Ren and Pentecost (2007).

2.3.4. Market Liberalization

The development from a centrally planned communistic economy to a market-driven one is on the one hand side a determinant of FDI but on the other side it is also a result of the Open Door Policies as FDI helped to facilitate the transition process. An open and liberalized market encourages trade and foreign investment. Nonetheless there are still many industries that are state monopolies and where market access is forbidden (table 6).

2.4. Impacts of FDI Inflows

There are various channels through which FDI can affect economic development. This section shortly discusses the impact of FDI on GDP (Tseng and Zebregs, 2002), on exports and on economic transition as it seems important for the case of China (Zhang, 2001). Additionally there are pitfalls worth to mention.

2.4.1. Impact on GDP

The most obvious impact of FDI inflows is GDP growth according to standard propositions of neoclassical theory. Anyway it is difficult to say whether increasing FDI is a response to higher GDP growth or the other way around due to the fact of reverse causality. Nevertheless

Table 4: Main Determinants of Foreign Direct Investments - Policies

Main Determinant		China's Characteristics
Policies	Tax Concessions	Tax concessions and other privileges for foreign investors intensify the attractivity for FDI.
	Open Door Policies	Due to the Open Door Policies the number of foreign investors increased constantly what makes investment even more attractive (scale effects).
	Currency	The devaluation of the Chinese currency favours exports and economic development.

Source: Tseng and Zebregs (2002), OECD (2000), Ren and Pentecost (2007).

Table 5: Main Determinants of Foreign Direct Investments - Cultural and Legal Environment

Main Determinant		China's Characteristics
Cultural and Legal Environment	Stable Political System	With the opening the political environment became more coherent and trustable.
	Low Corruption Rate	Relative to other developing countries the corruption rate is relatively low.

Source: Tseng and Zebregs (2002), OECD (2000), Ren and Pentecost (2007).

FDI is supposed to have contributed directly or indirectly to economic growth in several ways:

- Taxation revenues, earnings from foreign enterprises and tariffs increase the government's income.
- FDI has enhanced capital formation and formed an important part of capital accumulation. This effect is estimated to range from 4 percentage points of growth in provinces that have high FDI inflows to negligible amounts in the northwestern provinces (Tseng and Zebregs, 2002).
- Inward FDI augmented the total factor productivity of the host country as new inputs and ideas increase the productivity parameter of the production function. According to

Table 6: Main Determinants of Foreign Direct Investments - Market Liberalization

Main Determinant		China's Characteristics
Market Liberalization	Reduction of trade barriers (lower tariff rates and quota)	Easier market access increases FDI and exports.
	Investment protection and intellectual property rights	Especially after the accession to the WTO China made substantial commitments in the range of IPR and investment protection.

Source: Tseng and Zebregs (2002), OECD (2000), Ren and Pentecost (2007).

Whalley and Xin (2006) Foreign-Invested Enterprises have a labour productivity that is about 9 times higher than the one in domestic enterprises.

- Foreign investments have created lots of spill-overs for local businesses due to the adoption of advanced technology and know-how from western investors. As for the spillovers, the transfer of advanced technology represents one of the main reasons why developing countries favour FDI from industrial advanced countries. So its no surprise that in recent years more projects in the high technology sector were promoted.
- In addition FDI inflows created various job opportunities and skills for local workers. Unemployment rate in China decreased constantly over the last three decades. Interestingly according to Whalley and Xin (2006) FIEs constitute for about 20% of China's GDP but they employ only 3% of the population. What would lead to the suggestion that the impact on the unemployment rate was not that big as expected.

2.4.2. Impact on Trade

One of the most acknowledged contributions of FDI is the expanding of the Chinese manufacturing exports. China's exports increased from an almost negligible amount of 0.5 billion US$ in 1979 to 1442.8 billion US$ in 2008 (www.mofcom.gov.cn). Export promotion through FDI has been one of the key reasons for the Chinese government to attract FDI. Foreign-Invested-Enterprises have been responsible for the improvement in export performance. Through exporting firms local firms can benefit from spillovers and technology transfers as well as from soft skills like marketing, strategies and new channels of distribution. Along with the increasing exports the imports raised as well and led to a high trading rate. The FIEs did not only increase the exports but also upgraded the whole export structure (Zhang, 2001). And also directly the GDP increases through a surplus of exports on the balance sheet of

the economy. As a result China's trade balance with the world became positive in 1990 and reached its peak of 43.5 billion US$ in 1998 (Zhang and Song, 2000).

2.4.3. Impact on Economic Transition

Another often neglected impact of the Open Door Policies is the impact on economic transition. The neoclassical theory implies that markets are a better way to organize an economy than central planning. China however has been a centrally planned communistic economy until 1978. FDI inflows have contributed to the economic transition towards a market-oriented economy by having positive effects on the following points (Zhang, 2001 and Ali and Guo, 2005):

- Diversifying the Ownership-Strucutre: Before 1978 almost all enterprises were under state control. Along with the promotion of FDI China's economy moved to a more mixed ownership-structure of state enterprises, collective and private businesses. Especially the increasing number of Foreign-Invested-Enterprises intensified the competition in the domestic market and encouraged a more market-oriented economy.
- Establishing Market-Oriented Institutions: Along with FDI inflows the emergence of a market-oriented framework took place. The attraction of FDI exerted constantly pressure on the creation of a legal framework regarding IPR or the creation of reforms in the accounting systems.
- Facilitating Reforms of State-Owned Enterprises (SOEs): Many SOEs were joint ventures with Foreign-Invested Enterprises (FIE) and could therefore benefit from various management systems, incentive schemes or risk management.
- Competition: Domestic as well as international competitiveness has been improved by FDI by breaking oligopolistic structures or state monopolies. Due to the FDI a highly competitive manufacturing sector emerged in China.

2.4.4. Drawbacks of the Attraction of Foreign Direct Investments

Despite the various advantages of FDI on the economic development there are also some pitfalls worth to mention (Zhang, 2001):

- Dependency: One may think of an exploitation by western countries when talking about FDI since the dependency of the Chinese economy on foreign investors has been growing rapidly with the adoption of the Open Door Policies.

- Suppression: Foreign-Invested-Enterprises might suppress and demoralize domestic market development by using their advanced technology.
- Domestic Savings: In addition FDIs might lower domestic savings instead of closing the gap between domestic savings and investments. Therewith FDIs could increase dependency and decrease GDP in the long run. But Borensztein et al. (1998) do not corroborate this theory as they find evidence that foreign and domestic investments are complementary to a certain degree.
- Tax System: China has an increasingly complex tax system favoring FIEs. This leads to incoherence and further to increasing round-tripping.
- Unequal Treatment: FIEs might get more favorable conditions and incentives from the government. These policies could suppress domestic businesses that were competitive before in the local market.
- Growing Regional Inequalities: A dualistic economic structure might be set up due to an uneven distribution of FDI and that could exacerbate income inequalities. According to Jones et al. (2003) approximately 90% of the country's population who live in absolute poverty live in the western provinces and the disparity in income is going to increase as the Chinese economy continues to grow.

2.5. Sectoral Distribution of Foreign Direct Investments

While observing the development of FDI one could have seen changes in the sectoral distribution of FDI. This part addresses the reasons of the sectoral distribution of FDI and its development (Zhang, 2006a and OECD, 2000).

2.5.1. The Beginning of Trade: Causes

The underlying motive for developed countries to invest in China is mainly to use the cheap labour force and to export the manufactured goods again. Along with the growing exports China's imports were growing as well resulting in trade. In a nutshell there are two basic reasons for trade: comparative advantages of a country and economies of scale. Corresponding to them there are two types of trade: Inter-industry and intra-industry trade. Inter-industry trade evolves from comparative advantages. A labour-abundant country like China might export labour-intensive goods (manufactured goods) to a capital-intensive country like Switzerland and the other way around. On contrary intra-industry trade results from economies of scale meaning that specializing in differential goods increases variety and therefore countries

import and export. In reality trade between developing and developed countries is in most cases inter-industry trade (table 7).

Table 7: Reasons and Types of Trade

Reason	Type	Example
Comparative Advantages	Inter-Industry Trade	Trade between developing and developed countries exchanging labour-intensive and capital-intensive goods.
Economies of Scale	Intra-Industry Trade	Trade between similar countries based on specialization and differentiation in order to increase the variety of a product segment.

Source: Zhang (2006a).

China has a comparative advantage due to its huge population, it accounts for one-fourth of the world's population but only for three percent of the world's capital. So the main structural weakness or comparative disadvantage in China is in capital and technology intensive goods. This leads to low wages but rather high capital costs. In a developed country the contrary holds.

As most of the FDI came from Asian Newly Industrialized countries (NIEs) in the first period of the reform process, the trade was mainly based on comparative advantages (inter-industry). The NIEs reallocated their production into China due to their increasing domestic wages. The main share of FDI of the NIEs was needed for processing trade or rather for the manufacturing sector. This implied that all material or components that were imported were used for export goods again. Today most of China's trade is still inter-industry (Wang, 2006).

2.5.2. Development of Trade Patterns

Especially in the early stages of the market opening foreign investment has concentrated on secondary industries where the lion's share of FDI was used in the manufacturing field which implies 60% of the total FDI. Among the manufacturing businesses about half of the FDI is drawn for the labour intensive industries which suggests that one of the main motivations to invest in China is to take advantage of the low labour costs. Due to industrial upgrading and raising GDP in China there is a shift in trade pattern: Namely the shift from labour-intensive (for instance textiles) to capital-intensive manufacturing products (for instance electric equipment). Anyway the share of high-tech exports is relatively low because

the technology base remained rather limited and the capital infrastructure that is needed to produce high-tech is largely absent (Wang, 2006).

2.5.3. Recent Trends and Future

In the future the share of FDI in service trade is expected to grow as a result of further liberalization and concessions made to the WTO. Despite the development of China's trade pattern its trade is still basically inter-industry. Even though the Chinese government has put more emphasis on the development of high-tech products the population lacks the required know-how. In the long run however China is supposed to have the ability to foster its human capital while retaining the low wages (Zhang, 2006a and Wang, 2006).

2.6. Geographical Distribution of Foreign Direct Investments

The FDI distribution in China shows a big disparity among different regions. Especially in the beginning of the reform period when special treatment was granted to the four SEZs and the fourteen coastal cities, the eastern regions took up to 87.8% of FDI. Among the eastern provinces Guangdong attracted most of the FDI with a share of about 30% of the total. The reason for that lies in the geographical proximity to Hong Kong, the main FDI supplier, and in the fact that Guangdong province includes three of the four SEZs (Zhang, 2006a).

Table 8: Foreign Direct Investments in Different Provinces of China, 1985 and 2005 in 10'000 US$ and in %

Province	1985	2005
Guangdong	1'513.25=62.5%	101'304=20.8%
Jiangsu	34.97=2.3%	77'850.7=16%
Ningxia	0.73=0.05%	345.27=0.7%

Source: China Statistical Yearbook, various years.

With the adoption of a more nation-wide FDI attraction programme in the 1990s FDI inflows started to spread more equally. Another reasonable explanation for the changes in directions of FDI is that the eastern regions had lost their advantages in terms of low labour cost and investors switched to other regions providing lower labour costs. Newer data show (table 8) that Guangdong province still attracts a relatively huge share of FDI but it has declined in 2005 to one-third of its value in 1985. In contrast the shares of other coastal provinces as Jiangsu or Zhejiang have increased steadily resulting in a more even distribution of FDI along the coast side of the country. The western or northern less developed provinces

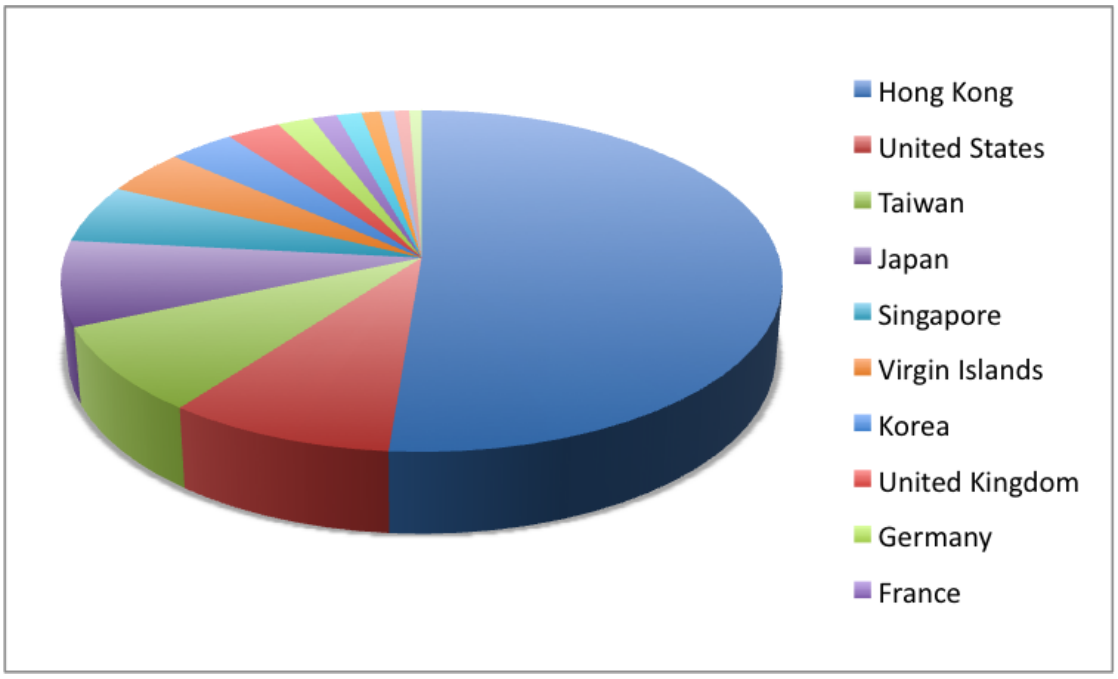
received only a very small amount of FDI in 1985 and could not attract higher shares of FDI in the last years. In contrast to other coastal provinces their share of FDI is not increasing significantly as the example of Ningxia illustrates.

It can be summarized that FDIs have on the one hand side diffused from the southern part to the south-eastern coast as well as to some inland areas. But the gap between the central and western regions and the eastern regions has actually increased in terms of the absolute magnitude of FDI (Zhang, 2006a).

2.7. Source Countries for Foreign Direct Investments

With regard to the FDI sources it is broadly accredited that the main share of inflows has been from Asian countries, especially from Hong Kong as can be seen in figure 4. Over 90% of China's FDI inflows were from industrialized countries in 2000 (Ali and Guo, 2005).

Figure 4: FDI Share of the Top 15 Source Countries in %, 1983-2000



Source: China Statistical Yearbook, various years and Ministry of Commerce, China (www.mofcom.gov.cn).

2.7.1. Asian Countries

Partly as a result of the government's policies, investment from oversea Chinese has been the main source of FDI. Especially the so-called round-tripping of investments through Hong Kong SAR, Macao and Taiwan contributes a big share to the total FDI. Round-tripping is defined by the Wall Street Journal (2008) as a form of barter involving a business selling an asset to another one by agreeing at the same time to buy the asset back later to approximately the same price. So can a Chinese firm invest in a firm in Hong Kong which in turn benefits from the tax incentives by investing in China. This idea can be confirmed by the fact that the SEZs were all in the southeast coastal areas. So shares Shenzhen a border with Hong Kong whereas Zhuhai is next to Macao and Xianmen near to Taiwan. Xiao (2004) estimated for instance that China's overall ratio of round-tripping is approximately 40% which seems rather high.
The advantages of the Asian economies are the short geographical distance and the fact that there live a lot of Chinese what makes the communication a lot easier. Asian Newly Industrialized Countries (NIEs) as Hong Kong were especially in the beginning of the reform period the dominant FDI supplier (export-oriented and labour-intensive). Even though the NIEs maintained their important role as dominant FDI suppliers there is a trend in the last 10 years that investments from the western world (Europe and North America) - which are inclined to invest more in high tech and differentiated products - have gained strength.

2.7.2. United States and Western Europe

Except the USA and Japan the main industrial countries did not invest substantial amounts of FDI into China up to the year 2002. It seems interesting that China - being the largest recipient of FDI in the world - has not attracted huge inflow of FDI from major industrial countries. One possible explanation is that western developed countries want to access the Chinese market whereas Hong Kong for instance is mainly driven by exports. A market access takes more time for the development of a strategy and the risks should be assessable. However trends have shown (Whalley and Xin, 2006) that the investment from major industrial countries like the United States or western Europe are increasing whereas the relative and absolute amount of investment from Hong Kong is decreasing. The reason for this development might be partly due to the accession to the WTO in 2001.

3. Datawork

3.1. The Dataset

This paper employs a dataset based on provincial level. The data used are panel data covering all provinces over a time period from 1985-2005. A list of the provinces separated in coastal and rural ones is included in the appendix. Because of its late separation in 1991 from the province of Sichuan the data for the province of Chongqing are only available since 1991. Also some data from Tibet are missing. Nevertheless the sample seems to have a sufficiently large number of observations. All the data are collected from the Chinese Statistical Yearbook and the website of the Ministry of Commerce, China (www.mofcom.gov.cn).
The datawork includes particulars about annual GDP growth of the provinces and of the whole country, specifications about foreign direct investments, exports, population growth, initial size of the economy in 1978 and human capital on provincial level. The human capital is measured as the number of students enrolled in senior secondary high school, GDP is measured in 100 mio yuan whereas FDI and exports are handed down in 10'000 US$. Population growth is written as one-tenth of a percent. One sample uses the data in absolute terms according to Wei (1993) and the second sample uses per capita values in the style of Barro and Sala-i-Martin (2004).

The quality of the data might be regarded with doubts about the reliability of the Chinese government from which the data were collected. However there is no other more reliable source available and despite some inconsistencies there has beyond doubt been a huge growth process in China so that the data can be used without major uncertainties.
The sample collects data from 1985-2005. This period seems equitable for several reasons: First of all for a lot of provinces data are not available or missing before 1985. Second even though the Open Door Policies started in 1978 the real FDI boom began later around 1985, that's why it seems reasonable to use this time period. One shortcoming is the shorter time period of only twenty years because it might be dominated by cyclical factors. Nevertheless the empirical assessment of this paper will be limited to the data in 1985-2005.

3.2. The Model

In this part of the thesis a rudimental model will be set up to empirically investigate the relationship between FDI and GDP growth on provincial level. The model is based on the conceptual framework used by Shang-Jin Wei (1993). We start with the following production function by assuming that the output of a firm f in the province p depends only on its productivity parameter A and the production function f with labour L as its only input.

Capital input will be neglected as the production function belongs to a developing country that produces its output only with labour.

$$Y_{fp} = A_{fp} f[L_{fp}] \tag{2}$$

Let's further assume that the productivity parameter consists of the provincial and national components meaning that the productivity of a firm depends on the productivity in the province where it is settled and on the productivity of the whole country:

$$A_{fp} = A_{China} + A_{province} \tag{3}$$

And we suppose that the production function has the following form due to the mostly used Cobb-Douglas-Function:

$$f[L_{fp}] = L_{fp}^{\alpha} \tag{4}$$

By combining the equations 3 and 4 the following relation can be derived:

$$Y_{fp} = [A_{China} + A_{province}] L_{fp}^{\alpha} \tag{5}$$

The next equation 6 is derived by taking the time derivative of equation 5. By doing this the result shows that the GDP growth rate of a province depends on the productivity growth rate of the whole country, the productivity growth rate of the province and the population growth rate of the province. In order to use this equation we need to assume that the growth rate of a province is the average growth rate of all the firms in this province. To sum up the GDP growth rate of a random province is the following:

$$g_{province} = g_{A_{China}} + g_{A_{province}} + \alpha g_{L_{province}} \tag{6}$$

In a next step it's assumed that the productivity growth of a province depends on the FDI, the exports, the initial size of the industrial sector and the human capital:

$$g_{A_{province}} = f[FDI_{province}, EXP_{province}, Y_{province_{1978}}, H_{province}] \tag{7}$$

As a last assumption a linear version of f [.]will be taken and therefore this following equation is the basis for the further analysis:

$$g_{province} = g_{A_{China}} + \beta_1 FDI_{province} + \beta_2 Exp_{province} + \beta_3 Y_{province_{1978}} + \beta_4 H_{province} + \alpha g_{pop_{province}} + e_{province} \quad (8)$$

The last term represents an error term with an average value of 0.

One major diversification of this paper is that the productivity growth rate of China will be captured as the GDP growth rate of the country simply because of the difficulties to measure the productivity parameter. However this proxy seems plausible. And the alpha in front of the population growth is one as capital input has been neglected. A second and last modification is that the GDP growth rate of China and the population growth rate of the province won't be taken as constants but will be included in the linear regression:

$$g_{province} = \beta_1 g_{China} + \beta_2 FDI_{province} + \beta_3 Exp_{province} + \beta_4 Y_{province_{1978}} + \beta_5 H_{province} + \beta_6 g_{pop_{province}} + e_{province} \quad (9)$$

All in all the provincial GDP growth rate depends on the GDP growth rate of China, on exports, FDIs, population growth, human capital and the the initial size of the economy. The question arising is to what extent the independent variables influence GDP growth. The empirical results for the previous regression will be discussed in section 4.

3.3. Explanation of the Variables

In this part the variables included in the previous formula will be briefly discussed and it will be exposed why they seem to influence provincial GDP growth. In addition it will be described what value is expected to result from the regression. Again informations are mainly based on Wei (1993).

3.3.1. GDP Growth Rate of China

As it is difficult to measure the productivity parameter of a country the GDP growth rate is used as a proxy for it. The intuition is logical: Due to spillovers, redistribution of wealth and inter-country trade the GDP growth of the whole country does have an impact on the growth rate of the single province. Therefore the coefficient is expected to be positive.

3.3.2. Foreign Direct Investments

FDIs are supposed to increase GDP growth by adding missing capital and transferring technology and management skills from developed countries.There are a lot of papers that investigated the effect of FDI on economic growth and a good portion of them found a positive relationship between the two of them like Zhang (2001) or Wei (1993). Anyway there are also reasons or considerations that would imply a negative relationship between them as has been shown in section 2.4.4. Anyway for now we would expect a positive coefficient for FDI.

Regarding the measurement FDIs can be measured in two ways: Either as a share of the total investments in a province or as an absolute value. If the assumption holds that FDI is merely an inflow of missing capital without any other spillover effects on domestic firms, the contribution of FDI to the GDP growth of a province is the same as the contribution of domestic investments. This means that FDI should be included proportional to the total amount of investments. This will be called intensity effect as the contribution of FDI to the province's growth will then be proportional to its share in total investments. On the other hand there could exist a certain spillover effect meaning that also firms that do not receive FDI directly benefit indirectly through the presence of FDI. This effect will be called scale effect meaning that the impact of FDI on economic growth increases disproportionately high. As it it broadly accepted that foreign direct investments have positive spillover effects on domestic firms FDIs are measured in absolute scale.

3.3.3. Exports

Exports are positively related to GDP growth as they improve the competitiveness of the exporting firms and of the whole economy. In addition a large amount of exports improves the country's trade balance with the rest of the world. According to theory and experience we would therefore expect the coefficient of exports in the regression to be positive.

Like FDI exports can enter the regression in two ways: As absolute scale when assuming spillover effects or as a share of total industrial output if no spillover effects are expected. It is mainly accredited that exports do have positive spillover effects on the economy resulting from exchanging ideas between exporting and non-exporting firms, using new channels of distribution or economies of scale. Therefore they will be measured in absolute scale.

3.3.4. Initial Size of the Industrial Sector

The reason for the incorporation of the initial size of the industrial sector lies in the effects of increasing returns to scale or the notions of learning-by-doing. If the initial scale of the economy is relatively large a higher growth rate in the future is expected due to technology

spillovers and increasing returns to scale. In addition a higher initial size of the economy might attract more FDI. On the other side an economy with a high GDP does not grow as fast as an economy with a low GDP due to the convergence to the steady state theory and the therefore decreasing returns to scale of an additional unit of input. If these effects act contrariwise they will cancel and therefore a coefficient close to zero is expected for the initial size of the economy.
The initial size of the economy is rather difficult to define. It includes the machines and techniques used by the industry for production and the knowledge of the population to implement these factors. An easier way to assess the initial size of the economy than counting machines is to take its GDP into account. The GDP includes information about technology and knowledge and its values are known for all the provinces.

3.3.5. Human Capital

The component for the human capital captures the contribution of education to economic growth. It is widely acknowledged that an educated population increases GDP. Therefore a positive coefficient is expected. However there could exist a certain reverse causality: An investor might more likely invest in a province where a higher level of education is guaranteed. So a high level of human capital can increase GDP but an increasing GDP leads mostly also to a higher level of education.

The level of human capital is difficult to define. As there are data available for the number of students enrolled in middle secondary high school these measurements will be used in this paper. As for the previously mentioned FDI and exports there are also two ways of measuring human capital, one is to include it as a fraction of the whole population - assuming no spillovers - and the other one including them as an absolute number. Because of the acknowledged positive externalities of education the human capital is also measured in absolute scale.

3.3.6. Population Growth

It is reasonable that the absolute value of GDP in a country grows when its population grows as more workers are available. Nevertheless a higher population growth is in lots of studies supposed to have a negative effect on wealth or on GDP per capita. Especially in the case of China that already has a large population an increase would rather decrease GDP per capita. As these two effects act contrariwise the coefficient of population growth is expected to be around zero or slightly negative.

4. Regression Results

Although theoretical and qualitative insights about the impact of FDI on GDP are valuable and useful, empirical analysis are needed for the enhanced evidence. This section will therefore discuss and valuate the empirical findings.

4.1. Panel Regressions with Random Effects and Fixed Effects in Absolute Terms

In this part regressions will be made with the following regression model using fixed and random effects including the data in absolute scale:

$$\begin{aligned} g_{province} = \quad & \beta_1 g_{China} + \beta_2 FDI_{province} + \beta_3 Exp_{province} + \beta_4 Y_{province_{1978}} + \\ & \beta_5 H_{province} + \beta_6 g_{pop_{province}} + e_{province} \end{aligned} \tag{10}$$

All regressions made will have a constant but the paper will not go into it more closely.

4.1.1. Panel Regression with Fixed Effects in Absolute Terms

The results of the regression with fixed effects can be seen in figure 6 in the appendix and in table 9. The coefficient of the GDP growth rate of China is positive as it has been expected and highly significant at the 1%-level. Meaning that an increase of the GDP growth rate of China of 1 unit would lead to an increase of the provincial GDP growth rate of 0.576 units. Surprisingly the coefficient for FDI is slightly negative and approximates the value of zero with a significance of 1%. The coefficient describing the effect of exports on GDP is similarly close to zero even though slightly positive and not significant. Also the coefficient of human capital is slightly positive and significant at the 1%-level. The coefficient of the initial size of the economy has been dropped, so there seems to be no considerable relation to GDP growth. At last the coefficient for the population growth is -0.00035 though statistically not significant.
The highly significant FDI-coefficient implies that there is indeed a substantial relationship between GDP growth and FDI. Even though the coefficient has a small and negative absolute value the significance matters because the absolute value of the coefficient depends only on the units of the regressors.

4.1.2. Panel Regression with Random Effects in Absolute Terms

As can be seen in figure 7 in the appendix and in table 9 the obtained results of the random effects regression are quite similar to the one with fixed effects. The coefficient of the GDP growth of China is 0.57 and again highly significant at the 1%-level. In contrary to the regression with fixed effects the coefficient of FDI is only significant at the 5%-level but still with a slightly negative value of approximately zero. The export-coefficient is again positive and close to zero but significant at the 5%-level and the value of the initial size of the economy has a positive value of 0.0000217 but is not significant. Neither is the coefficient of the population growth significant but it has a negative value of -0.0001416 meaning that an increase of population growth of 1 unit would lead to a decrease in GDP of 0.0001416. The coefficient of the human capital is still small and positive and significant at the 5%-level.

Even though the results for the fixed and random effects regressions are quite similar it is in this case better and safer to use fixed effects. The reason is the following: By running regressions it is required that the regressors do not correlate with the error term. With panel data however it is likely that they do correlate because the error term might not be random but influenced by provincial characteristics. This in turn will result in wrong or biased findings. So from now on the regressions will be made by using only the method with fixed effects.

4.1.3. Upshot

Concluding from the last two subsections about the regression results there is indeed a relationship between FDI and GDP growth since the statistical significance is very high. The following table summarizes the obtained results:

Table 9: Summary: Results of the Regressions with Fixed and Random Effects including all Provinces, 1985-2005

Coefficient	Fixed Effects	Random Effects
GDP Growth of China	0.576*** (0.036)	0.572*** (0.036)
FDI	-1.2e-06*** (3.35e-07)	-7.07e-07** (3.08e-07)
Exports	1.77e-09 (2.75e-09)	5.27e-09** (2.49e-09)
Initial Size of the Economy	dropped	0.0000217 (0.00002)
Human Capital	5.23e-08*** (1.68e-08)	2.32e-08** (1.18e-08)
Population Growth	-0.0003499 (0.0008839)	-0.0001416 (0.0006322)
Overall R-Squared	0.2966	0.3256
Number of Observations	577	577

() Standard error, *significant 10%-level, **significant 5%-level, ***significant 1%-level
Source: Results datawork, own calculations.

4.2. Possible Explanations for the Regression Results

In the next sections possible explanations for the obtained results will be exposed for every coefficient in the regression.

4.2.1. GDP Growth Rate of China

The coefficients of the impact of the GDP growth rate of the whole country on the economic growth of a single province were positive and highly significant in both regressions with values of 0.576 and 0.571. The obtained results are concordant with what has been expected. If an economy itself has positive economic growth it is highly probable that also one part of the economy (a province) will benefit from this due to spillovers and redistribution of wealth.

4.2.2. Exports

The obtained values for the impact of exports on economic performance were both small and positive but only in the regression with random effects statistically significant at the 5%-level. Even though the magnitude seems to be negligible the absolute value of the coefficient does not say a lot about the impact because it is determined by the units of the regressors. So the results are consistent with what has been expected but the statistical significance has to be improved, especially when using fixed effects.

Several considerations are noteworthy in this context: One aspect worth to mention is that only the exports to other countries were measured in this regression. But in a large country like China there is also a huge amount of intra-provincial trade that improves the trade balance and therefore the economic growth performance. But this factor has been ignored. On the other side the positive impact of exports related to FDI were mainly due to the managerial and technological know-how that a firm experiences when trading with other more developed countries. These positive impacts are lower or not existent with intra-provincial trade. Therefore it might not be necessary to include intra-provincial trade. Nevertheless it could be influential. A second consideration is that most of the trade growth does not come from ordinary trade but from processing trade which has little impact on domestic economy because the value-added from this type of trade is actually rather small. The duty-free imports are mainly used for export goods which are processed in China by using the cheap labour force but are then exported again (Zhang, 2006a and Wang, 2006). Only the wages stay within the host country, but in the case of China they are rather small anyway.

4.2.3. Initial Size of the Economy

The coefficient for the initial size of the economy was in in the second regression small and insignificant and was even dropped in the first one. There are several considerations when trying to explain these findings: A first indication explicates that investors from developed countries are attracted by developed as well as by undeveloped regions. Undeveloped areas can be attractive for investors to sell their old technology or to use resources that are not yet exploited. On the other side highly developed regions can be attractive as they are supposed to grow faster in the future due to infrastructure, education and other factors that are already available in this region. So it might be possible that there is indeed no substantial relationship between the GDP growth rate and the initial size of the economy and the investment decision depends only on the preferences of the investor. Another third consideration worth to mention is the following: A province with a high initial GDP tends to grow less according to neoclassical theory because of the convergence to the steady state and the decreasing returns to scale of FDI, education and other inputs. By taking these aspects into account the different effects could cancel and this would explain the obtained outcome. Up to now there seems to be no pregnant relationship between the initial size of the economy and the GDP growth rate because the results are not significant.

4.2.4. Human Capital

The coefficients for the human capital were in both regressions positive, small and statistically significant. Meaning that there is indeed a positive impact of education on economic growth. Nevertheless the theory would probably expect a stronger relationship between them. In the here presented work the measurement might be inappropriate as the number of students does not say anything about the quality of the education and probably the average years of schooling might have been a better way to capture the human capital but those data were not available. A second thought includes the fact that the effect of a higher educated population might be delayed so that the positive impact is not yet measurable in the short time period of only twenty years. In addition it has to be considered that the improvement of the educational system costs a lot of money and therefore the GDP might be lower in the set-up period than later when the human capital will unfold. In the time period of twenty years the positive and negative points might cancel but in the long run the positive impacts are supposed to prevail.

4.2.5. Population Growth

The coefficients describing the impact of the population growth on economic performance are in both regressions small, negative and statistically not significant. The explanation is intuitive because even if an increase in workers leads to a higher GDP in absolute scale it might lower GDP per capita. In China workers are abundant and therefore the marginal utility of an additional human worker is almost zero whereas the marginal utility of capital is supposed to be very high.This is concordant with what has been expected in the previous section but results should be improved in order to get significant values.

4.2.6. Foreign Direct Investment

As the marginal utility of capital is supposed to be very high in a labour-abundant country like China a high and positive coefficient for FDI has been expected. Surprisingly the coefficients for FDI were in both regressions small and slightly negative but statistically significant at the 1% and 5%-level. Even though economic theory would expect a positive correlation there are certain considerations that might relativize the obtained outcomes:

Reliability of the Data: For lack of more reliable sources the FDI-data of the Chinese government have to be used. Nevertheless the reliability of the data on provincial level is a bit dodgy because the local governments have indeed incentives to overvalue the amount of FDI they attracted. During the reform era the local principles were measured and paid by their performance and the performance included the highest possible attraction of FDI. A certain competition between the provinces emerged and tempted the local government to please the central cabinet with false data. This in turn leads to biased and overestimated data about the FDI inflows. This could explain part of the inconsistencies.

Quality of Foreign Projects: The attraction of FDI has been one of the main goals of the central government during the reform era. In the centrally structured China the governors of the different provinces had to meet the objectives with regard to the amount of attracted FDI prescribed by the central government. There was however a certain pressure on the local governors to increase FDI. This pressure could lead to an irrational decision making regarding the available projects. If it is assumed that there are two projects, one of a domestic investor and one of a foreign investor, the local governor might then be tempted to support the foreign investor even though his project might be less profitable than the one from the domestic investor because he has to achieve his objectives. If these politics are often adopted it leads compulsorily to a decrease in GDP.

Crowding Out of Domestic Investments: Some research papers claim that FDIs lower domestic investments and the domestic saving rate. This in turn would lead to a negative

coefficient for FDI because when the domestic savings decrease, the GDP decreases as well in the long run. Combined with the positive effects of a capital infusion of FDI this could lead to a coefficient around zero as it has been accomplished in this paper. Borensztein et al. (1998) state that the effect of FDI could go either directions: For the reasons of competition foreign-invested enterprises could displace domestic firms and increase efficiency or conversely FDI might support domestic investment due to a certain complementary (technology spillovers). According to their results FDI supports the crowding-in of domestic investment.

Hindered Absorption of Advanced Technology: Borensztein et al. (1998) conclude that FDI has only a higher contribution to economic growth than domestic investment if the host country has a sufficiently large basis of human capital for the absorption of the advanced technology that comes along with the foreign investments. So the GDP growth rate of the developing country depends to a large extent on the implementation of the newly introduced technologies. If the host country can not use or absorb the new technology FDI might even cause a step backwards implying a negative impact of FDI on economic growth.

Reverse Causality: In the case of the relationship between FDI and GDP there might be a certain reverse causality meaning that economic growth might enhance FDI and not the other way around or that there is a certain interaction between them. It is possible that investors are attracted by a province or a region that already has attracted a huge amount of FDI as this could be interpreted as a good investment place. It is difficult to assess the causality in absolute numbers but the only thing that can be sure about is that there is a certain interaction because of the high significance of the regression outcomes, but it is not clearly visible from which direction it comes.

4.2.7. General Explanations

Endogeneity Problems: Panel regressions like the one presented here may be subject to endogeneity problems. As an example any omitted factors that increase the return on capital will also raise the GDP growth rate as well as the FDIs simultaneously. But there doesn't seem to be an appropriate IV for FDI that could solve this problem.

Heteroscedasticity or Homoscedasticity: The fact of heteroscedasticity might distort the obtained results. But the results of the robustness check made with stata did not show any substantial danger of heteroscedasticity.

As there are various problems or facts that could explain part of the antagonisms between the obtained results and the economic theory there will be certain changes made in the regression. The following subsections will check whether the coefficients change due to these modifications.

4.3. Possible Diversifications of the Model

4.3.1. Measuring Foreign Direct Investments in Different Ways

FDI over Total Investments instead of FDI as an absolute value: As described in a previous part of the paper there are different forms of foreign investments like foreign loans, FDI and others. The model could incorporate FDI over the total of foreign investments or even FDI over the total investments including domestic investments. As the latter method would imply that FDI has no spillover effect it is not implemented in this paper because it seems rather unreasonable. Regarding the first diversification when using the total of foreign investments, it is rather difficult to obtain the relevant data or in many cases they are not reported especially in the earlier time period. In addition one could say that foreign loans act more similar to domestic investment. Then also the first alternative would imply that FDI has no spillovers what is not reasonable.

FDI Per Capita: Instead of the up to now used total amount of FDI in a province the FDI per capita will be used to check whether a positive relationship can be observed. For the implementation of this method it is necessary to convert all variables in per capita scale. This kind of diversification will be accomplished and discussed in section 4.6 of this paper.

Using the FDI/GDP-Ratio: Another approach to improve the empirical findings is to use the ratio between the FDI of a province and its GDP instead of the single FDI value. This method will be conducted and discussed in section 4.8 of the thesis.

Different Kinds of FDI: One could ration the total FDI to the different sectors where they are invested in and then measure their impacts separately. For instance measure the effect of FDI invested in the manufacturing sector or in the primary sector and so on. The difficulties arising with this method is that there are no data available for a lot of provinces especially in the beginning of the reform era around 1985. In addition most of the FDI were used in the manufacturing sector anyway.
Furthermore a distinction between net and gross FDI could be made. But as the outflow of foreign direct investments is not supposed to implicate negative effects on economic growth this method is not implemented and only the gross data are used.

4.3.2. Other Approaches for the Data Analysis

Different Time Periods: As there might be differences in the effects of FDI on GDP during the time period of twenty years, the epoch 1985-2005 is split into two periods to check the relationship independently for each other. The time periods from 1985-1995 and 1996-2005 were chosen. The accordant regression outputs are collected in the appendix and the statistical outcomes will be discussed in section 4.4 of this work.

Coastal and Rural Provinces: In another modification the dataset will be divided into a dataset including only coastal provinces and into another one including only rural provinces in order to capture the effect of being near the coast and being granted more incentive policies for the attraction of FDI. To measure the effect of FDI in the different regions one could also insert dummies in the normal regression to check whether there is a relationship. Anyway this thesis accomplishes the method with two different datasets in section 4.5.

Interaction Terms: Following the developed model by Borensztein et al. (1998) an additional interaction term could be included to capture the interaction between two independent variables. Borensztein et al. (1998) state that the growth rate of GDP depends mainly on the absorption of advanced technology that is accompanied by FDI inflows. According to them FDI increases GDP mainly due to the spillovers of advanced technology. Otherwise FDI would have the same effects as domestic investments. The absorption of advanced technology in turn depends on the level of human capital. Therefore an additional interaction term consisting of the multiplication of FDI and human capital is included in the regression model. The GDP growth rate is supposed to depend on the interaction between FDI and human capital which are thought to be complementary:

$$g_{province} = \beta_1 g_{China} + \beta_2 FDI_{province} + \beta_3 Exp_{province} + \beta_4 Y_{province_{1978}} + \beta_5 H_{province} + \beta_6 g_{pop_{province}}$$

It was found that there is a strong complementary effect between FDI and human capital because the contribution of FDI to GDP is enhanced by its interaction with the level of human capital. This modification will be implemented in chapter 4.7 because it allegorizes an interesting variation of the regression model.

Instrumental Variables (Borensztein et al., 1998): IVs would lower the effects of endogeneity, but there does not seem to be an appropriate one for FDI.

Log-Linear Model: The transformation of the dependent variable in a log scale could improve the results. This means that the provincial GDP growth rate would be measured in log-scale. This method has been implemented by Ren and Pentecost (2007).

Adjust Data with the CPI: Due to the effects of inflation the data need to be adjusted using the Consumer Price Index. This correction has been accomplished for all empirical analyses but there were no better results regarding the significance nor regarding anything else. Therefore the resulting outcomes are neither reported in the appendix nor in one of the following chapters.

City-Level Data: One could use city-level data instead of provincial data. This method was conducted by Jones et al. (2003) who found that the awarding of the SEZ status to a province enhances FDI inflows and therefore growth substantially of 5.5 percentage points.

Also Wei (1993) used data on city-level for his empirical assessments.

4.4. Regressions with Different Time Periods

In the period 1985-1995 the coefficients of the GDP growth rate of China and of the population growth are statistically highly significant (figure 8 in the appendix or table 10). These values are again as expected. The coefficient of FDI on the other side is again approximately zero and negative but significant at the 5%-level whereas the coefficient for exports is scarcely significant and almost zero. In the period 1996-2005 the regression shows a positive but insignificant value for the FDI (figure 9 in the appendix) and a highly significant and positive value for the human capital and the population growth. The effects of exports on contrary are not significant.

Table 10: Summary: Results of the Regressions with Fixed Effects including all Provinces, 1985-1995 and 1996-2005

Coefficient	1985-1995	1996-2005
GDP Growth of China	0.2822*** (0.0705)	0.3517*** (0.0560)
FDI	-2.97e-06** (1.25e-06)	1.8e-07 (3.05e-07)
Exports	4.05e-08* (2.44e-08)	-2.19e-09 (1.57e-09)
Initial Size of the Economy	dropped	dropped
Human Capital	-8.97e-08 (1.30e-07)	9.99e-08*** (1.26e-08)
Population Growth	-0.0088*** (0.0019)	-0.0085*** (0.0016)
Overall R-Squared	0.1189	0.2613
Number of Observations	297	280

() Standard error, *significant 10%-level, **significant 5%-level, ***significant 1%-level
Source: Results datawork, own calculations.

By comparing these outcomes with those in the regression covering data from 1985-2005 it can't be said that the distinction in two time periods definitely improves the results. The coefficient for the exports became significant in 1985-1995 and the one for the population growth shows even high significance in both periods but the FDI coefficient reveals a higher significance in the longer time period of 1985-2005. Regarding the differences between the results of 1985-1995 and 1996-2005 especially the effect of the human capital is interesting because it is negative in the first period but becomes positive in the second which affirms the ideas explained in the previous sections that education first costs a lot of money but unfolds its positive effects later. But in the case of FDI this method does not improve the statistical relevance of the coefficients.

4.5. Regressions with Coastal and Rural Provinces

The relevant outputs are again collected in the appendix (figures 10-15). Both regressions - the one including only coastal provinces as well as the one with only rural provinces - show a highly significant coefficient for the FDI in 1985-2005. The values however are still negative and approximately zero as in the previous regressions. In order to improve the results both datasets were again split into two time periods of 1985-1995 and 1996-2005. However the coefficients for FDI are then insignificant and therefore not meaningful in this context except for the one of the coastal regions 1985-1995 which shows again a slightly negative value for FDI. As can be seen in the following table 11 also the other coefficients are similar to the basic regressions results of section 4.1. Therefore the author won't go deeper into the obtained results but the outputs can be reviewed in the appendix.

Table 11: Summary: Results of the Regressions with Coastal and Rural Provinces, 1985-2005

Coefficient	Coastal Regions	Rural Regions
GDP Growth of China	0.5865*** (0.0662)	0.5693*** (0.0398)
FDI	-1.11e-06*** (4.29e-07)	-5.47e-06*** (1.91e-06)
Exports	2.11e-09 (3.46e-09)	-4.97e-08 (6.86e-08)
Initial Size of the Economy	dropped	dropped
Human Capital	3.60e-08 (2.98e-08)	9.03e-08*** (2.63e-08)
Population Growth	-0.0009 (0.0016)	-0.0012 (0.0013)
Overall R-Squared	0.2611	0.4044
Number of Observations	248	328

() Standard error, *significant 10%-level, **significant 5%-level, ***significant 1%-level
Source: Results datawork, own calculations.

Regarding the differences between the coastal and rural regions the impact of FDI and human capital seems to be stronger in the agrarian parts of the country because the absolute value of the coefficient is larger in the rural regression outcome. This appears reasonable because there are less FDIs in the countryside and therefore the marginal utility is larger. The same argument holds for the human capital.

4.6. Regressions in per Capita Terms

In order to improve the empirical findings another assessment will be conducted using the same regression but including data in per capita terms for all variables as it has been made by Barro and Sala-i-Martin (2004). The following three subchapters describe the obtained results for regressions including first all provinces, then only coastal and only rural provinces. A summary is provided in table 12 and the results can be reviewed in the appendix.

4.6.1. Regression Results including all Provinces

Only the coefficient for the GDP growth rate of China is statistically significant. But the absolute value of the FDI-coefficient is more reasonable than in the previous regressions because it shows a positive value. In order to improve the statistical significance the dataset was again divided in two separate ones covering the years 1985-1995 and 1996-2005. The FDI-values were -0.0013 in 1985-1995 and 0.00028 in 1996-2005. The coefficients however were insignificant and therefore these results won't be discussed in more detail. These results suggest that the model with absolute values provides more useful information because the statistical significance is higher.

4.6.2. Regression Results including only Coastal Regions

Like in the regression including all provinces only the coefficient of the GDP growth rate of China is statistically significant. The value of the FDI however is 0.004 which seems rather reasonable. Nevertheless it's not significant. Also this dataset was divided in one covering the years 1985-1995 and another one covering the time 1996-2005. The accordant outputs are not collected in the appendix because they do not show any higher significance.

4.6.3. Regression Results including only Rural Regions

Again the coefficient for the FDI is not significant but the ones for the GDP growth rate of China, the exports and the population growth are significant. Also the negative value is unexpected because it shows a negative impact of FDI per capita on GDP growth. In order to check for the impact in different time periods also this dataset was divided into one covering the years 1985-1995 and another one covering the years 1996-2005. But also for these outputs the coefficients were not significant and are therefore not reported.

As can be seen in table 12 the empirical outcomes are less significant than in the basic regression from section 4.1. Therefore more modifications will be accomplished in order to improve the analysis regarding the significance.

4.7. Regressions including an Interaction Term

This chapter conducts the empirical analysis by including an additional interaction term in the regression. As explained in subsection 4.3.2 (equation 11) the interaction variable captures the interdependency between the level of human capital and the FDI. Since FDI is supposed to increase GDP through the channel of advanced technology, FDI only helps GDP growth if the amount of human capital is large enough to absorb the higher technology (Borensztein

Table 12: Summary: Results of the Regressions with Fixed Effects including all Provinces, only Coastal and only Rural Provinces in per Capita Terms, 1985-2005

Coefficient	All Regions	Coastal Regions	Rural Regions
GDP Growth of China	0.9442*** (0.2315)	1.4510** (0.6125)	0.6308*** (0.0395)
FDI per Capita	0.000725 (0.0074)	0.0041 (0.0176)	-0.0011 (0.0014)
Exports	0.000024 (0.000075)	0.0000134 (0.00016)	0.0000275 (0.0000155)
Initial Size	dropped	dropped	dropped
Human Capital	0.1778 (5.8356)	-1.1659 (15.94)	0.8404 (0.9990)
Population Growth	-0.00022 (0.0058)	0.0032 (0.0159)	-0.0020 (0.0010)
R-Squared	0.0277	0.0303	0.4155
No. of Observations	609	231	378

() Standard error, *significant 10%-level, **significant 5%-level, ***significant 1%-level
Source: Results datawork, own calculations.

et al., 1998). The analyses were made with data in absolute scale but also with the data in per capita scale. As the latter method did not show any statistical significance the results are not reported in this thesis. Also the splitting into two time periods did not improve the results and is therefore not reported. The outputs for the regressions with absolute values for the time period 1985-2005 are in the appendix (figures 19-21) and will be discussed in more detail in the next sections.

4.7.1. Regression Results including all Provinces

The output for the regression including all provinces shows inter alia statistically significant coefficients for the FDI and the interaction term. The value for the FDI is again slightly negative. The interaction term however has a small but positive value meaning that human capital indeed enhances GDP growth through FDI as a channel of knowledge and advanced technology. Also Borensztein et al. (1998) found these results: A negative value for FDI and a positive one for the interaction term. This is consistent with the here explored findings. However they refer to the negative FDI-coefficient as puzzling and explain it with a nonlinear interaction between FDI and human capital. But they find this explanation nonsatisfying.

4.7.2. Regression Results including only Coastal Regions

The results for the regression including only coastal provinces show a similar pattern as the previous one. The coefficient for FDI is negative and small but statistically highly significant and the interaction term is positive and significant at the 5%-level.

4.7.3. Regression Results including only Rural Regions

The corresponding outputs for the rural regression show less significant coefficients as the interaction term is not significant but again positive. The FDI on the other side is once more slightly negative and statistically significant what argues for a significant relationship between FDI and GDP.

Table 13: Summary: Results of the Regressions with Fixed Effects including all Provinces, only Coastal and only Rural Provinces and an Interaction Term, 1985-2005

Coefficient	All Regions	Coastal Regions	Rural Regions
GDP Growth of China	0.5732*** (0.0360)	0.5652*** (0.0663)	0.5666*** (0.0399)
FDI	-1.66e-06*** (4.3e-07)	-1.9e-06*** (5.5e-07)	-9.96e-06** (4.31e-06)
Exports	-6.15e-10 (3.08e-09)	-8.95e-10 (3.68e-09)	-4.07e-08 (6.90e-08)
Initial Size	dropped	dropped	dropped
Human Capital	3.45e-08* (1.98e-08)	-2.76e-08 (4.10e-08)	6.07e-08* (3.66e-08)
Population Growth	-0.0009 (0.0009)	-0.0024 (0.0017)	-0.0019 (0.0014)
Interaction Term	8.11e-13* (4.79e-13)	1.51e-12** (6.74e-13)	5.91e-12 (5.09e-12)
Overall R-Squared	0.2919	0.2413	0.4143
No. of Observations	577	248	328

() Standard error, *significant 10%-level, **significant 5%-level, ***significant 1%-level
Source: Results datawork, own calculations.

4.8. Regressions using the FDI/GDP-Ratio

In order to improve the empirical results the FDI will be included in the regression as the ratio between FDI and GDP instead of the absolute value of FDI. This method was conducted in per capita scale as well as in absolute scale. Because the results in per capita scale were not significant they are not reported here and won't be discussed. The datasets were as well divided into different time periods but as the results were not different or even less significant than the set covering the years 1985-2005 they will neither be discussed here. The following sections will discuss the obtained results for the implementation in absolute values which can also be seen in the following table 14.

4.8.1. Regression Results including all Provinces

By including the FDI as a ratio to GDP the regression output shows a highly significant value for the FDI of -0.00353. Even though the value is negative there seems to be a stronger relationship than in the basic regression. Also the coefficients for the GDP growth of China, the exports and the human capital are significant.

Table 14: Summary: Results of the Regressions including all Provinces, only Coastal and only Rural Provinces including FDI as a FDI/GDP-Ratio, 1985-2005

Coefficient	All Regions	Coastal Regions	Rural Regions
GDP Growth of China	0.5982*** (0.0370)	0.5914*** (0.0676)	0.5863*** (0.0419)
FDI/GDP-Ratio	-0.0035*** (0.0013)	-0.0002 (0.0006)	-0.0089* (0.0050)
Exports	-3.88e-09* (2.18e-09)	-2.18e-09 (3.07e-09)	-3.02e-08 (6.86e-08)
Initial Size	dropped	dropped	dropped
Human Capital	4.19e-08** (1.69e-08)	2.08e-08 (3.01e-08)	6.46e-08** (2.57e-08)
Population Growth	-0.0005 (0.0009)	0.0004 (0.0017)	-0.00066 (0.0013)
Overall R-Squared	0.2876	0.2658	0.3950
No. of Observations	577	248	328

() Standard error, *significant 10%-level, **significant 5%-level, ***significant 1%-level
Source: Results datawork, own calculations.

4.8.2. Regression Results including only Coastal Regions

The regression including only the provinces bordering the coast gives an insignificant value for the FDI-ratio. The value however is also negative and larger in absolute scale than in the basic regression. Neither are the exports nor the human capital significant.

4.8.3. Regression Results including only Rural Regions

The coefficient for the FDI/GDP-ratio is again significant in the regression for the rural provinces with a value of -0.0089.

4.9. Interpretation of the Datawork

In this subsection a short summary of the obtained regression results will be made. As the main goal of this thesis was to investigate the impact of FDI on GDP only the coefficients of the FDI will be taken into account. The following table 15 shows all the results for FDI.

Table 15: Summary: Results of the Regressions for the FDI-Coefficient

Measurement	Basic	Coastal	Rural	Per Capita	Interaction	Ratio
1985-2005	-1.2e-6***	-1.1e-6***	-5.5e-6***	0.000725	-1.7e-6***	-0.0035***
1985-1995	-2.97e-6**	-3.01e-6*	-7.3e-6			
1996-2005	1.8e-7	-2.37e-8	-8.36e-8			

*Significant 10%-level, **significant 5%-level, ***significant 1%-level
Source: Results datawork, own calculations.

In this paper there is indeed evidence that FDI contributed to GDP growth in China. This is confirmed by the high statistical significance of the basic regression. However the coefficients were mainly negative. An intuitive explanation is the following: Panel regressions include two different types of analysis, time series (longitudinal) and cross-sectional analysis. In time series analysis one province will be observed over some time periods. Corresponding graphics can be seen in the appendix (figures 25 and 26). In cross-sectional analysis however several provinces will be investigated over only one time period (figure 27). If our data are split into these two different analysis we can see that FDI increased in every province over time whereas the GDP growth rate remained rather constant or was even decreasing. On the other side by observing the cross-sectional analysis it can be seen that those provinces which had high GDP growth also had high FDI values which makes it plausible that FDI enhances GDP. But the high GDP growth rate of these provinces stayed constantly high over time. The consideration is now the following: Panel regressions are often used to detect the effect of time series analysis which would mean that we just see the constant or slightly decreasing GDP growth rate over time accompanied by a highly increasing FDI. Therefore the coefficients are small and negative. The contribution of FDI on economic growth is more cross-sectional which can't be detected with the used panel regressions because we used fixed effects which show only the effects of the time series. On the other side random effects would show us both effects but we could not use random effects because it is highly probable that the error term is not random but influenced by provincial characteristics. This logic might partly explain the obtained results but in order to rely on it there is empirical proof needed. Therefore further research should be made by focusing on the cross-sectional effect which will provide a highly positive impact of FDI on GDP. One possibility might be to insert a time-FDI interaction term which will be able to allow different effects for different years.

Anyway the accomplished modifications in this paper did not account for more coherence than the basic regression but the interaction term provides meaningful information and affirms the interdependency between human capital and FDI regarding GDP growth. Even though substantial economic literature supports the position that FDI played an important role to increase GDP there is other literature that concludes that most of the correlation between FDI and economic performance is due to reverse causality (Rodrik, 1999). A second thought is given by Woo (1995) who argues that the role of FDI and its spillovers has been overstated due to the fact that FDI flew into regions that were liberalized.

There is one additional point noteworthy: It is important to recognize that there are other factors affecting GDP growth that were not included in the model, therefore this thesis may not be regarded as a matter of fact but as a first attempt to quantify some merits of FDI.

5. Concluding Remarks

5.1. Summary

This paper discusses the relationship between FDI and GDP in China on provincial level. It summarizes the main determinants of FDI as well as their impact on GDP. The determinants include the huge local market size, the abundant supply of cheap labour and the effects of the Open Door Policies like tax concessions and other incentives for foreign investors. The boom of FDI into China has affected the Chinese economy through various channels. Noteworthy are the impact on GDP, on trade and on economic transition. Generally the correlations between these variables are assumed to be positive. According to a former research paper by Whalley and Xin (2006) the contribution of FDI on economic growth was 3.4 percentage points in the last years meaning that without inward FDI China's growth rate would have been 3.4 percentage points lower. Nevertheless the impact of FDI on economic growth remains highly controversial. Some literatures refer to a negative impact of FDI through the crowding-out of domestic investments or they argue that the correlation between FDI and GDP may be caused through reverse causality (Woo, 1995 and Rodrik, 1999).

An empirical assessment was set up to investigate the theoretical arguments supporting a positive relationship between FDI and GDP. The regression model included data about GDP growth, population growth, FDI, exports and initial levels of the economy in absolute as well as in per capita terms. The main results can be summarized as follows: The quantitative assessment based on absolute values found a slightly negative but highly significant relationship between FDI and GDP. By dividing the time period there couldn't be found a meaningful difference between the periods 1985-1995 and 1996-2005. On the other side the effect of FDI on GDP seems to be stronger in the rural areas than in the coastal areas as the coefficient was larger in all samples. On per capita basis the results were mainly positive though statistically not significant. The effects were positive in the coastal regions and the negative in the rural provinces. The included interaction term described the interaction between FDI and human capital. As the coefficient was positive and significant in the samples including all provinces and only the coastal provinces it can be presumed that FDI and human capital are indeed complementary and increase GDP. If FDIs are contained in the regression as a ratio to GDP the coefficient is negative for the sample covering all provinces, only coastal provinces and only rural provinces. However it is only significant for the first two samples.

This paper can only confirm a certain interaction between FDI and GDP but it could not proof empirically the widespread belief about the beneficial growth-effects of FDI in China sufficiently. Only an intuitive explanation was described for the negative FDI-coefficients. And probably the importance of FDI is not the FDI itself but the degree of openness the

government established when attracting FDI. This openness leads to a free market economy and finally to a wealthy economy.

5.2. Economic Prognosis

In recent time it has been actively debated whether the Chinese growth performance of the last twenty years is sustainable in the future. There are mainly two considerations to be cautious about. First it is questionable whether the FIEs - that contributed the lion's share of growth - can keep their impressive growth rate or whether their performance is going to slow down as it gave the impression since the year 2005. According to the calculations made by Whalley and Xin (2006) the average growth rate of FIEs was 18% which is definitely difficult to hold. A second potential problem imposes the absorptive capacity of the OECD markets as they might not be large enough to absorb all the future Chinese exports. For exemplification China's share of world exports was approximately 6% in 2006 but it's growing at a rate of 35%, what means that their share in world's exports is doubling every three years. Exporting firms may then encounter problems in the future.
Another concern is about the regional inequalities within China. As it has been shown in this paper the distribution of income is still very uneven. For reasons regarding political stability and therefore growth it seems indispensable to foster further distribution of FDI. Furthermore China's large trade surplus with the EU and the US boosts the demand for protective duties. On the other side the fulfillment of the WTO commitments in terms of capital market liberalization and others will attract more FDI. In addition the Chinese human capital is supposed to grow substantially especially in the coastal regions and the Chinese government is working to move up the technology latter to catch up with the developed countries.

5.3. Further Research

This paper is an attempt to identify and quantify the impact of FDI on economic growth on provincial level. China represents a huge field for further studies. The here presented empirical model should be modified and developed in various ways as it has been explained in previous chapters. Due to the length constraints the results were not yet completely satisfying but still more findings are likely to be found in order to enrich our understanding of this fascinating area.

References

Ali, Shaukat, and Wei Guo, 2005. "Determinants of FDI in China." *Journal of Global Business and Technology*, 1 (2): 21–33.

Barro, Robert J., and Xavier Sala-i-Martin, 2004. *Economic Growth.* Second Edition. Cambridge, MA: MIT Press.

Blanchard, Olivier, and Gerhard Illing, 2006. *Makrooekonomie.* Muenchen: Pearson.

Borensztein, E., De Gregorio, J., and J.-W. Lee, 1998. "How does foreign direct investment affect economic growth?" *Journal of International Economics,* 45: 115-135.

Carter Hill, R., Griffiths, William E., and George G. Judge, 2001. *Undergraduate Econometrics.* John Wiley and Sons Inc.

Cheng, Leonard K., and Yum K. Kwan, 2000. "What are the determinants of the location of foreign Direct Investment? The Chinese Experience." *Journal of International Economics*, 51: 379–400.

China Statistical Yearbook, various years. Beijing: China Statistics Press, various years.

Fung, K.C., Iizaka, Hitomi, and Sarah Tong, 2002. "Foreign Direct Investment in China: Policy, Trend and Impact. Preliminary and incomplete" *University of California and University of Hong Kong*. Hong Kong.

Graham, Edward M., and Erika Wada, 2001. "Foreign Direct Investment in China: Effects on Growth and Economic Performance. " In *Achieving High Growth: Experience of Transitional Economies in East Asia.* Oxford, Oxford University Press.

Jones, Derek, Li, Cheng, and Ann L. Owen, 2003. "Growth and Regional Inequality in China during the Reform Era." *The William Davidson Institute.* William Davidson Working Paper 561.

Kuhn, Andreas, and Oliver Ruf, 2006. "Einfuehrung in die Statistiksoftware STATA." *Institute for Empirical Research in Economics, University of Zurich.* University of Zurich Working Paper ISSN 1424-0459.

Maeding, Klaus, 2002. *China: Kaiserreich und Moderne.* Berlin: Cornelsen Verlag.

Ministry of Commerce of the People's Republic of China, various years. www.mofcom.gov.cn.

Moore, David S., McCabe, George P., Duckworth, William M., and Stanley L. Sclove, 2003. *The Practice of Business Statistics.* New York: W.H. Freeman and Company.

OECD, 2000. "Main Determinants and Impacts of Foreign Direct Investment on China's Economy." Working Papers on International Investment 2000/4.

Ren, Jia, and Eric Pentecost, 2007. "The Determinants of Foreign Direct Investment in China." *Economic Department, Loughborough University*. Leicestershire.

Rodrik, D., 1999. "The New Global Economy and Developing Countries: Making Openness Work." *Overseas Development Council Washington DC.* Policy Essay No.24.

Song, Zheng, Storesletten, Kjetil, and Fabrizio Zilibotti, 2008. "Growing like China." *Fudan University, University of Oslo, University of Zurich and CEPR.*

Tang, Sumei, Selvanathan, E.A., and S. Selvanathan, 2008. "Foreign Direct Investment, Domestic Investment and Economic Growth in China." *United Nations Universitiy, World Institute for Development.* Research Paper No. 2008/19.

The Wall Street Journal, 2008. "Round-tripping." *Found on http://en.wikipedia.org/wikiFile Wall Street Journal 28 April 2008.* 07/11/08.

Tseng, Wanda, and Harm Zebregs, 2002. "Foreign Direct Investment in China: Some Lessons for Other Countries." *International Monetary Fund.* IMF Policy Discussion Paper.

Wang, Yanling, 2006. "Cheap labor and China's." In *Chinas as the World Factory.* Kevin Honglin Zhang, eds. New York: Routledge.

Wei, Shang-Jin, 1993. "Open door policy and China's rapid growth: Evidence from city-level data." *National Bureau of Economic Research.* NBER Working Paper 4602.

Woo, W.T., 1995. "Comments on Wei's (1995) Foreign Direct Investment in China: Sources and Consequences. In *Financial Deregulation and Integration in East Asia.* A. Kruger, eds. Chicago: The University of Chicago Press.

Whalley, John, and Xian Xin, 2006. "China's FDI and non-FDI economies and the sustainability of future high chinese growth." *National Bureau of Economic Research.* NBER Working Paper 12249.

Xiao, G., 2004. "People's Republic of China's Round-tripping FDI: Scale, Causes and Implications." *Asia Development Bank Institute.* Discussion Paper No. 7.

Zhang, Kevin Honglin, 2001. "How does Goreign Direct Investment affect Economic Growth in China?" *Economics of Transition*, 9 (3): 679–693.

Zhang, Kevin Honglin, 2006a. "China's foreign trade and export boom: 1978-2004." In *China as the World Factory.* Kevin Honglin Zhang, eds. New York: Routledge.

Zhang, Kevin Honglin, 2006b. "The Role of FDI in China's Export Performance." In *Chinas as the World Factory.* Kevin Honglin Zhang, eds. New York: Routledge.

Zhang, Kevin Honglin, and Shungfeng Song, 2000. "Promoting Exports: The Role of Inward FDI in China." *China Economic Review*, 11: 385–396.

A. Appendix

Figure 5: The Special Economic Zones and the 14 Coastal Cities of China

Source: http://www.populationdata.net 06/30/09.

Table 16: Chinese Provinces

Coastal Provinces	Rural Provinces
Beijing, Fujian, Guangdong, Guanxi, Hainan, Hebei, Jiangsu, Liaoning, Shandong, Shanghai, Tianjin, Zhejiang.	Anhui, Chongqing, Gansu, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Inner Mongolia, Jiangxi, Jilin, Ningxia, Qinghai, Shaanxi, Shanxi, Sichuan, Tibet, Xingjang, Yunnan.

Source: Maeding (2002).

Figure 6: Output with absolute Data including all Provinces with Fixed Effects, 1985-2005

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       577
Group variable: provincenu~r                    Number of groups   =        28

R-sq:  within  = 0.3445                         Obs per group: min =        13
       between = 0.0577                                        avg =      20.6
       overall = 0.2966                                        max =        21

                                                F(5,544)           =     57.19
corr(u_i, Xb)  = -0.1934                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.576079	.0360767	15.97	0.000	.5052124	.6469457
fdi	-1.20e-06	3.35e-07	-3.58	0.000	-1.86e-06	-5.43e-07
exp	1.77e-09	2.75e-09	0.64	0.520	-3.63e-09	7.17e-09
initial	(dropped)					
human	5.23e-08	1.68e-08	3.11	0.002	1.93e-08	8.52e-08
pop	-.0003499	.0008839	-0.40	0.692	-.0020862	.0013864
_cons	.0636243	.0139094	4.57	0.000	.0363016	.0909471
sigma_u	.02208189					
sigma_e	.06566616					
rho	.10159273	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 7: Output with absolute Data including all Provinces with Random Effects, 1985-2005

```
6 . xtreg gdpgrowth china fdi exp initial human pop , re

Random-effects GLS regression                   Number of obs      =       577
Group variable: provincenu~r                    Number of groups   =        28

R-sq:  within  = 0.3326                         Obs per group: min =        13
       between = 0.1559                                        avg =      20.6
       overall = 0.3256                                        max =        21

Random effects u_i ~ Gaussian                   Wald chi2(6)       =    275.15
corr(u_i, X)       = 0 (assumed)                Prob > chi2        =    0.0000
```

gdpgrowth	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
china	.5716978	.0362156	15.79	0.000	.5007166	.642679
fdi	-7.07e-07	3.08e-07	-2.29	0.022	-1.31e-06	-1.02e-07
exp	5.27e-09	2.49e-09	2.12	0.034	3.97e-10	1.01e-08
initial	.0000217	.00002	1.09	0.278	-.0000175	.0000608
human	2.32e-08	1.18e-08	1.96	0.050	-4.34e-12	4.64e-08
pop	-.0001416	.0006322	-0.22	0.823	-.0013806	.0010975
_cons	.0600381	.0107153	5.60	0.000	.0390365	.0810398
sigma_u	0					
sigma_e	.06566616					
rho	0	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 8: Output with absolute Data including all Provinces with Fixed Effects, 1985-1995

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       297
Group variable: provincenu~r                    Number of groups   =        28

R-sq:  within  = 0.2290                         Obs per group: min =         3
       between = 0.0157                                        avg =      10.6
       overall = 0.1189                                        max =        11

                                                F(5,264)           =     15.68
corr(u_i, Xb)  = -0.4922                        Prob > F           =    0.0000

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       china |   .2821913   .0705347     4.00   0.000     .1433091    .4210734
         fdi |  -2.97e-06   1.25e-06    -2.39   0.018    -5.43e-06   -5.19e-07
         exp |   4.05e-08   2.44e-08     1.66   0.098    -7.54e-09    8.86e-08
     initial |  (dropped)
       human |  -8.97e-08   1.30e-07    -0.69   0.491    -3.46e-07    1.66e-07
         pop |  -.0088292   .0019213    -4.60   0.000    -.0126123   -.0050462
       _cons |   .2726896   .0442664     6.16   0.000     .1855294    .3598497
-------------+----------------------------------------------------------------
     sigma_u |   .0414062
     sigma_e |  .07714768
------------------------------------------------------------------------------
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 9: Output with absolute Data including all Provinces with Fixed Effects, 1996-2005

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       280
Group variable: provincenu~r                    Number of groups   =        28

R-sq:  within  = 0.5955                         Obs per group: min =        10
       between = 0.0710                                        avg =      10.0
       overall = 0.2613                                        max =        10

                                                F(5,247)           =     72.74
corr(u_i, Xb)  = -0.7433                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.3517289	.0560986	6.27	0.000	.2412362	.4622215
fdi	1.80e-07	3.05e-07	0.59	0.555	-4.20e-07	7.80e-07
exp	-2.19e-09	1.57e-09	-1.40	0.163	-5.27e-09	8.95e-10
initial	(dropped)					
human	9.99e-08	1.26e-08	7.94	0.000	7.51e-08	1.25e-07
pop	-.0085201	.0015618	-5.46	0.000	-.0115962	-.005444
_cons	.0973444	.0144114	6.75	0.000	.0689594	.1257293
sigma_u	.04721176					
sigma_e	.03189241					

Source: Calculations from the China Statistical Yearbook, various years.

Figure 10: Output with absolute Data including only Coastal Provinces with Fixed Effects, 1985-2005

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       248
Group variable: provincenu~r                    Number of groups   =        12

R-sq:  within  = 0.2943                         Obs per group: min =        18
       between = 0.0694                                        avg =      20.7
       overall = 0.2611                                        max =        21

                                                F(5,231)           =     19.26
corr(u_i, Xb)  = -0.1625                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5864619	.0662023	8.86	0.000	.4560244	.7168994
fdi	-1.11e-06	4.29e-07	-2.59	0.010	-1.95e-06	-2.65e-07
exp	2.11e-09	3.46e-09	0.61	0.543	-4.71e-09	8.92e-09
initial	(dropped)					
human	3.60e-08	2.98e-08	1.21	0.229	-2.27e-08	9.46e-08
pop	-.0009254	.0016224	-0.57	0.569	-.004122	.0022713
_cons	.0869615	.0232516	3.74	0.000	.0411492	.1327738
sigma_u	.02199718					
sigma_e	.07803084					
rho	.07361918	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 11: Output with absolute Data including only Coastal Provinces with Fixed Effects, 1985-1995

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       129
Group variable: provincenu~r                    Number of groups   =        12

R-sq:  within  = 0.2006                         Obs per group: min =         8
       between = 0.5206                                        avg =      10.8
       overall = 0.0312                                        max =        11

                                                F(5,112)           =      5.62
corr(u_i, Xb)  = -0.6757                        Prob > F           =    0.0001
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.2697059	.1316676	2.05	0.043	.0088234	.5305883
fdi	-3.01e-06	1.60e-06	-1.88	0.063	-6.18e-06	1.60e-07
exp	3.84e-08	3.01e-08	1.28	0.204	-2.12e-08	9.80e-08
initial	(dropped)					
human	-1.46e-07	1.81e-07	-0.80	0.423	-5.04e-07	2.13e-07
pop	-.0101939	.0030051	-3.39	0.001	-.0161481	-.0042397
_cons	.3006654	.0657184	4.58	0.000	.1704527	.430878
sigma_u	.06724348					
sigma_e	.09368956					
rho	.33999122	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 12: Output with absolute Data including only Coastal Provinces with Fixed Effects, 1996-2005

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       119
Group variable: provincenu~r                    Number of groups   =        12

R-sq:  within  = 0.6257                         Obs per group: min =         9
       between = 0.2517                                        avg =       9.9
       overall = 0.3417                                        max =        10

                                                F(5,102)           =     34.10
corr(u_i, Xb)  = -0.7482                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.3399278	.0790072	4.30	0.000	.1832175	.4966382
fdi	-2.37e-08	3.00e-07	-0.08	0.937	-6.18e-07	5.71e-07
exp	-3.88e-09	1.70e-09	-2.29	0.024	-7.25e-09	-5.16e-10
initial	(dropped)					
human	1.32e-07	1.86e-08	7.12	0.000	9.55e-08	1.69e-07
pop	-.0072902	.0026345	-2.77	0.007	-.0125157	-.0020646
_cons	.0668394	.0170806	3.91	0.000	.03296	.1007187
sigma_u	.04316164					
sigma_e	.02889824					
rho	.69047538	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 13: Output with absolute Data including only Rural Provinces with Fixed Effects, 1985-2005

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       328
Group variable: provincenu~r                    Number of groups   =        16

R-sq:  within  = 0.4210                         Obs per group: min =        13
       between = 0.1196                                        avg =      20.5
       overall = 0.4044                                        max =        21

                                                F(5,307)           =     44.64
corr(u_i, Xb)  = -0.1450                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5693022	.0398442	14.29	0.000	.4908999	.6477045
fdi	-5.47e-06	1.91e-06	-2.86	0.004	-9.24e-06	-1.71e-06
exp	-4.97e-08	6.86e-08	-0.73	0.469	-1.85e-07	8.52e-08
initial	(dropped)					
human	9.03e-08	2.63e-08	3.43	0.001	3.85e-08	1.42e-07
pop	-.0011663	.0012653	-0.92	0.357	-.003656	.0013235
_cons	.0606504	.0194973	3.11	0.002	.0222852	.0990156
sigma_u	.01226517					
sigma_e	.05468767					
rho	.04789112	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 14: Output with absolute Data including only Rural Provinces with Fixed Effects, 1985-1995

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       168
Group variable: provincenu-r                    Number of groups   =        16

R-sq:  within  = 0.2912                         Obs per group: min =         3
       between = 0.0581                                        avg =      10.5
       overall = 0.1750                                        max =        11

                                                F(5,147)           =     12.08
corr(u_i, Xb)  = -0.6300                        Prob > F           =    0.0000

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       china |   .3315497   .0802563     4.13   0.000     .1729445    .4901549
         fdi |  -7.30e-06   7.48e-06    -0.98   0.331    -.0000221    7.48e-06
         exp |   4.44e-07   2.93e-07     1.51   0.132    -1.35e-07    1.02e-06
     initial |  (dropped)
       human |   1.60e-07   2.35e-07     0.68   0.497    -3.04e-07    6.25e-07
         pop |  -.0059701   .0030395    -1.96   0.051    -.0119768    .0000366
       _cons |   .1419233   .0849789     1.67   0.097    -.0260148    .3098614
-------------+----------------------------------------------------------------
     sigma_u |  .03496546
     sigma_e |  .06242656
------------------------------------------------------------------------------
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 15: Output with absolute Data including only Rural Provinces with Fixed Effects, 1996-2005

```
6 . xtreg gdpgrowth china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       160
Group variable: provincenu~r                    Number of groups   =        16

R-sq:  within  = 0.5874                         Obs per group: min =        10
       between = 0.0010                                        avg =      10.0
       overall = 0.2133                                        max =        10

                                                F(5,139)           =     39.58
corr(u_i, Xb)  = -0.7124                        Prob > F           =    0.0000

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       china |   .3750955   .0831413     4.51   0.000     .2107103    .5394807
         fdi |  -8.36e-08   1.74e-06    -0.05   0.962    -3.53e-06    3.36e-06
         exp |  -3.22e-09   5.37e-08    -0.06   0.952    -1.09e-07    1.03e-07
     initial |  (dropped)
       human |   7.83e-08   2.28e-08     3.43   0.001     3.32e-08    1.23e-07
         pop |  -.0100888   .0020422    -4.94   0.000    -.0141266   -.0060509
       _cons |   .1310232   .0228437     5.74   0.000     .0858571    .1761893
-------------+----------------------------------------------------------------
     sigma_u |  .04951401
     sigma_e |  .03390622
------------------------------------------------------------------------------
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 16: Output with per Capita Data including all Provinces with Fixed Effects, 1985-2005

```
5 . xtreg gdp china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       609
Group variable: provincenu~r                    Number of groups   =        29

R-sq:  within  = 0.0304                         Obs per group: min =        21
       between = 0.0129                                        avg =      21.0
       overall = 0.0277                                        max =        21

                                                F(5,575)           =      3.60
corr(u_i, Xb)  = -0.0320                        Prob > F           =    0.0032

------------------------------------------------------------------------------
         gdp |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       china |   .9442051   .2315359     4.08   0.000     .4894459    1.398964
       fdipc |    .000725   .0073555     0.10   0.922    -.013722     .015172
         exp |   .0000239   .0000749     0.32   0.750    -.0001233    .0001711
     initial |  (dropped)
       human |   .1777985   5.835609     0.03   0.976    -11.28391    11.63951
         pop |  -.0002218   .0058523    -0.04   0.970    -.0117162    .0112727
       _cons |  -.0002714   .1066426    -0.00   0.998    -.2097279    .2091851
-------------+----------------------------------------------------------------
     sigma_u |  .08591249
     sigma_e |  .42919802
         rho |  .03852436   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 17: Output with per Capita Data including only Coastal Provinces with Fixed Effects, 1985-2005

```
6 . xtreg gdp china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       231
Group variable: provincenu~r                    Number of groups   =        11

R-sq:  within  = 0.0301                         Obs per group: min =        21
       between = 0.0511                                        avg =      21.0
       overall = 0.0303                                        max =        21

                                                F(5,215)           =      1.34
corr(u_i, Xb)  = 0.0137                         Prob > F           =    0.2505
```

gdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	1.451062	.6125207	2.37	0.019	.2437478	2.658377
fdipc	.0040792	.0176226	0.23	0.817	-.0306561	.0388145
exp	.0000134	.0001652	0.08	0.936	-.0003123	.0003391
initial	(dropped)					
human	-1.165884	15.94095	-0.07	0.942	-32.58644	30.25468
pop	.0032255	.015869	0.20	0.839	-.0280532	.0345043
_cons	-.0823611	.2905686	-0.28	0.777	-.655089	.4903668
sigma_u	.13035541					
sigma_e	.69532496					
rho	.03395319	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 18: Output with per Capita Data including only Rural Provinces with Fixed Effects, 1985-2005

```
6 . xtreg gdp china fdi exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       378
Group variable: provincenu~r                    Number of groups   =        18

R-sq:  within  = 0.4235                         Obs per group: min =        21
       between = 0.1344                                        avg =      21.0
       overall = 0.4155                                        max =        21

                                                F(5,355)           =     52.15
corr(u_i, Xb)  = -0.0599                        Prob > F           =    0.0000
```

gdp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.6308005	.039555	15.95	0.000	.5530089	.7085921
fdipc	-.0011089	.0013589	-0.82	0.415	-.0037814	.0015636
exp	.0000275	.0000155	1.78	0.077	-2.95e-06	.0000579
initial	(dropped)					
human	.8404244	.9990578	0.84	0.401	-1.124391	2.80524
pop	-.0019609	.0009859	-1.99	0.047	-.0038999	-.0000219
_cons	.0464783	.0179169	2.59	0.010	.0112417	.0817149
sigma_u	.01047649					
sigma_e	.05793129					
rho	.03166864	(fraction of variance due to u_i)				

Source: Calculations from the China Statistical Yearbook, various years.

Figure 19: Output with absolute Data including all Provinces and an Interaction Term with Fixed Effects, 1985-2005

```
3 . xtreg gdpgrowth china fdi exp initial human pop interaction , fe

Fixed-effects (within) regression               Number of obs      =       577
Group variable: provincenu-r                    Number of groups   =        28

R-sq:  within  = 0.3480                         Obs per group: min =        13
       between = 0.1109                                        avg =      20.6
       overall = 0.2919                                        max =        21

                                                F(6,543)           =     48.30
corr(u_i, Xb)  = -0.2152                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5731619	.0360559	15.90	0.000	.5023357	.6439881
fdi	-1.66e-06	4.30e-07	-3.86	0.000	-2.51e-06	-8.15e-07
exp	-6.15e-10	3.08e-09	-0.20	0.842	-6.67e-09	5.44e-09
initial	(dropped)					
human	3.45e-08	1.98e-08	1.75	0.081	-4.31e-09	7.33e-08
pop	-.0008795	.0009361	-0.94	0.348	-.0027184	.0009594
interaction	8.11e-13	4.79e-13	1.69	0.091	-1.29e-13	1.75e-12
_cons	.0766227	.015864	4.83	0.000	.0454604	.107785
sigma_u	.02341066					
sigma_e	.06555355					
rho	.11311085	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(27, 543) =     1.40                 Prob > F = 0.0888
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 20: Output with absolute Data including only Coastal Provinces and an Interaction Term with Fixed Effects, 1985-2005

```
3 . xtreg gdpgrowth china fdi exp initial human pop interaction , fe

Fixed-effects (within) regression               Number of obs      =       248
Group variable: provincenu~r                    Number of groups   =        12

R-sq:  within  = 0.3093                         Obs per group: min =        18
       between = 0.3254                                        avg =      20.7
       overall = 0.2413                                        max =        21

                                                F(6,230)           =     17.17
corr(u_i, Xb)  = -0.2791                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5651712	.0663216	8.52	0.000	.4344956	.6958468
fdi	-1.90e-06	5.52e-07	-3.44	0.001	-2.99e-06	-8.11e-07
exp	-8.95e-10	3.68e-09	-0.24	0.808	-8.15e-09	6.36e-09
initial	(dropped)					
human	-2.76e-08	4.10e-08	-0.67	0.501	-1.08e-07	5.31e-08
pop	-.00241	.00174	-1.39	0.167	-.0058383	.0010184
interaction	1.51e-12	6.74e-13	2.24	0.026	1.80e-13	2.84e-12
_cons	.1273336	.0292739	4.35	0.000	.0696543	.1850129
sigma_u	.02907981					
sigma_e	.07736279					
rho	.12380039	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(11, 230) =     1.17                 Prob > F = 0.3064
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 21: Output with absolute Data including only Rural Provinces and an Interaction Term with Fixed Effects, 1985-2005

```
3 . xtreg gdpgrowth china fdi exp initial human pop interaction , fe

Fixed-effects (within) regression               Number of obs      =       328
Group variable: provincenu~r                    Number of groups   =        16

R-sq:  within  = 0.4235                         Obs per group: min =        13
       between = 0.1390                                        avg =      20.5
       overall = 0.4143                                        max =        21

                                                F(6,306)           =     37.47
corr(u_i, Xb)  = -0.0737                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5665534	.0398917	14.20	0.000	.4880566	.6450501
fdi	-9.96e-06	4.31e-06	-2.31	0.021	-.0000184	-1.49e-06
exp	-4.07e-08	6.90e-08	-0.59	0.556	-1.76e-07	9.51e-08
initial	(dropped)					
human	6.07e-08	3.66e-08	1.66	0.099	-1.14e-08	1.33e-07
pop	-.0018852	.0014078	-1.34	0.182	-.0046554	.000885
interaction	5.91e-12	5.09e-12	1.16	0.246	-4.10e-12	1.59e-11
_cons	.079811	.0255262	3.13	0.002	.0295818	.1300402
sigma_u	.01056318					
sigma_e	.05465649					
rho	.03600644	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(15, 306) =     0.56                 Prob > F = 0.9034
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 22: Output with absolute Data including all Provinces and FDI as a Ratio to GDP with Fixed Effects, 1985-2005

```
3 . xtreg gdpgrowth china ratio exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       577
Group variable: provincenu~r                    Number of groups   =        28

R-sq:  within  = 0.3386                         Obs per group: min =        13
       between = 0.0176                                        avg =      20.6
       overall = 0.2876                                        max =        21

                                                F(5,544)           =     55.69
corr(u_i, Xb)  = -0.2275                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5982939	.0370018	16.17	0.000	.52561	.6709778
ratio	-.0035306	.0012639	-2.79	0.005	-.0060133	-.0010479
exp	-3.88e-09	2.18e-09	-1.78	0.076	-8.17e-09	4.08e-10
initial	(dropped)					
human	4.19e-08	1.69e-08	2.48	0.014	8.67e-09	7.50e-08
pop	-.000472	.0009231	-0.51	0.609	-.0022853	.0013414
_cons	.067083	.0146479	4.58	0.000	.0383096	.0958564
sigma_u	.02288706					
sigma_e	.06596521					
rho	.10744471	(fraction of variance due to u_i)				

```
F test that all u_i=0:     F(27, 544) =     1.30                 Prob > F = 0.1453
```

Source: Calculations from the China Statistical Yearbook, various years.

Figure 23: Output with absolute Data including only Coastal Provinces and FDI as a Ratio to GDP with Fixed Effects, 1985-2005

```
3 . xtreg gdpgrowth china FDIRatio exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       248
Group variable: provincenu-r                    Number of groups   =        12

R-sq:  within  = 0.2742                         Obs per group: min =        18
       between = 0.0425                                        avg =      20.7
       overall = 0.2658                                        max =        21

                                                F(5,231)           =     17.45
corr(u_i, Xb)  = -0.0401                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5914067	.0676262	8.75	0.000	.4581636	.7246497
FDIRatio	-.0002117	.0005814	-0.36	0.716	-.0013572	.0009337
exp	-2.18e-09	3.07e-09	-0.71	0.479	-8.23e-09	3.87e-09
initial	(dropped)					
human	2.08e-08	3.01e-08	0.69	0.489	-3.84e-08	8.01e-08
pop	.0004204	.0016603	0.25	0.800	-.0028509	.0036917
_cons	.0711101	.0243568	2.92	0.004	.0231202	.1191001
sigma_u	.01607916					
sigma_e	.07913142					
rho	.03965131	(fraction of variance due to u_i)				

F test that all u_i=0: F(11, 231) = 0.61 Prob > F = 0.8161

Source: Calculations from the China Statistical Yearbook, various years.

Figure 24: Output with absolute Data including only Rural Provinces and FDI as a Ratio to GDP with Fixed Effects, 1985-2005

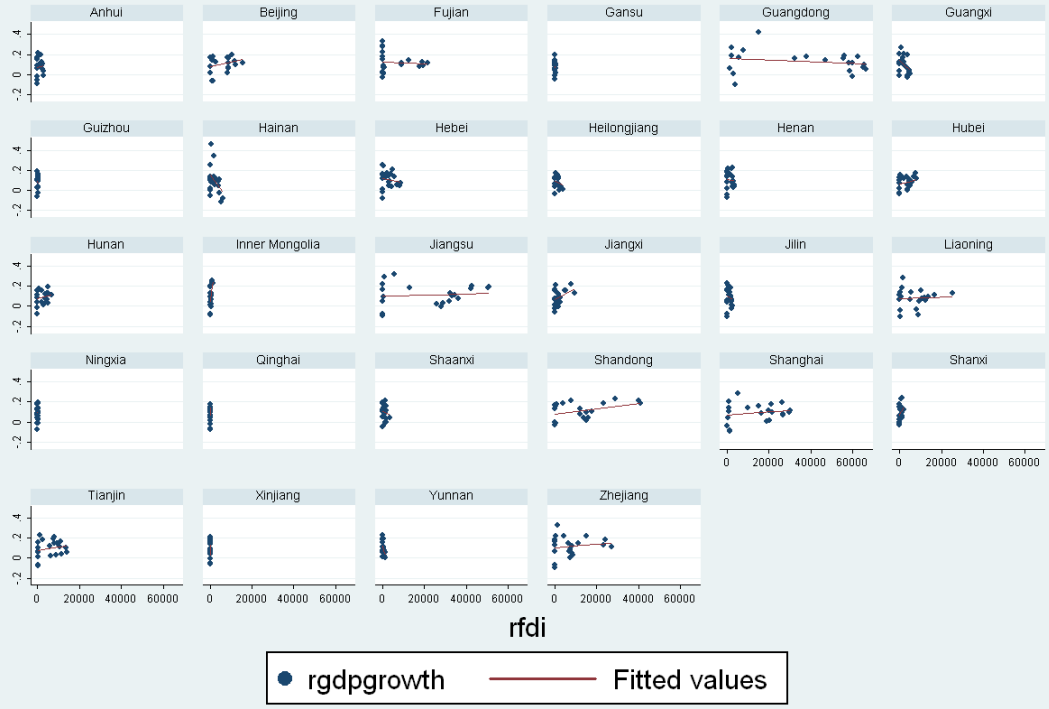
```
3 . xtreg gdpgrowth china FDIRatio exp initial human pop , fe

Fixed-effects (within) regression               Number of obs      =       328
Group variable: provincenu~r                    Number of groups   =        16

R-sq:  within  = 0.4114                         Obs per group: min =        13
       between = 0.0801                                        avg =      20.5
       overall = 0.3950                                        max =        21

                                                F(5,307)           =     42.92
corr(u_i, Xb)  = -0.1273                        Prob > F           =    0.0000
```

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
china	.5862588	.0418817	14.00	0.000	.5038474	.6686702
FDIRatio	-.0088824	.0050577	-1.76	0.080	-.0188345	.0010697
exp	-3.02e-08	6.86e-08	-0.44	0.660	-1.65e-07	1.05e-07
initial	(dropped)					
human	6.46e-08	2.57e-08	2.51	0.013	1.39e-08	1.15e-07
pop	-.0006609	.0013327	-0.50	0.620	-.0032833	.0019616
_cons	.0569899	.0213277	2.67	0.008	.0150231	.0989568
sigma_u	.01221129					
sigma_e	.05513637					
rho	.04675736	(fraction of variance due to u_i)				

F test that all u_i=0: F(15, 307) = 0.52 Prob > F = 0.9284

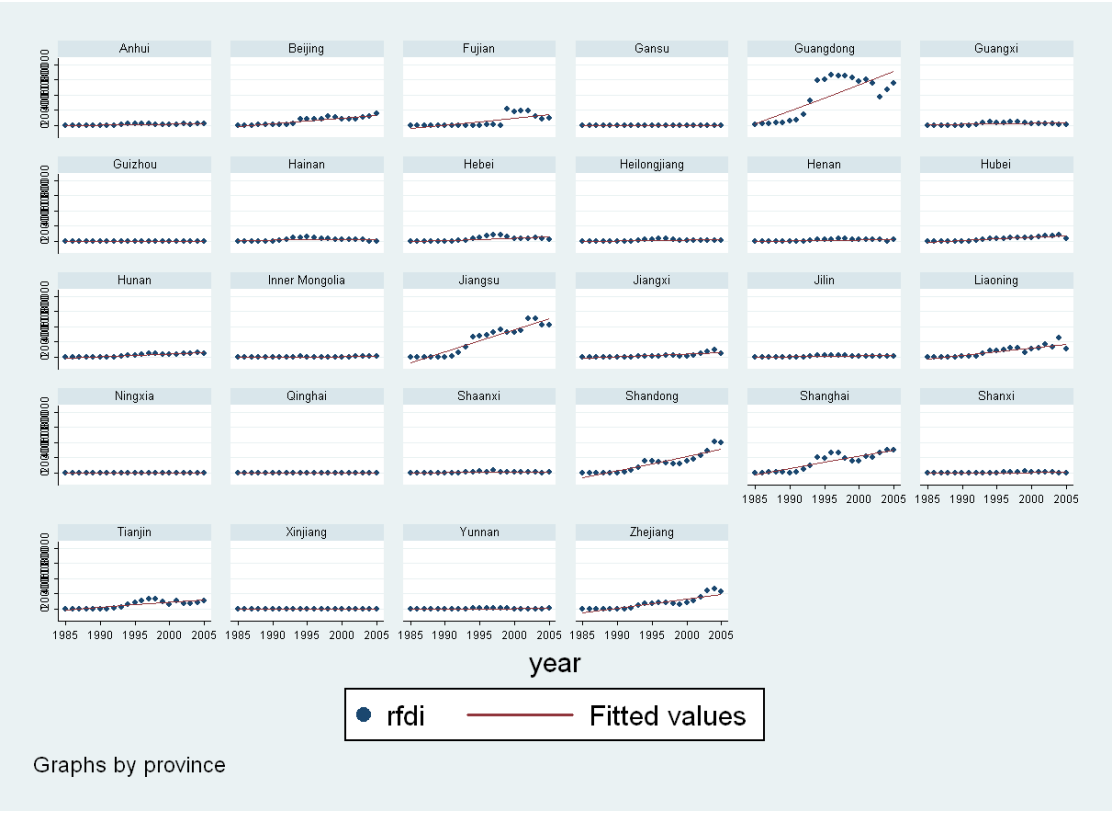
Source: Calculations from the China Statistical Yearbook, various years.

Figure 25: Time Series of the Real GDP Growth by Province



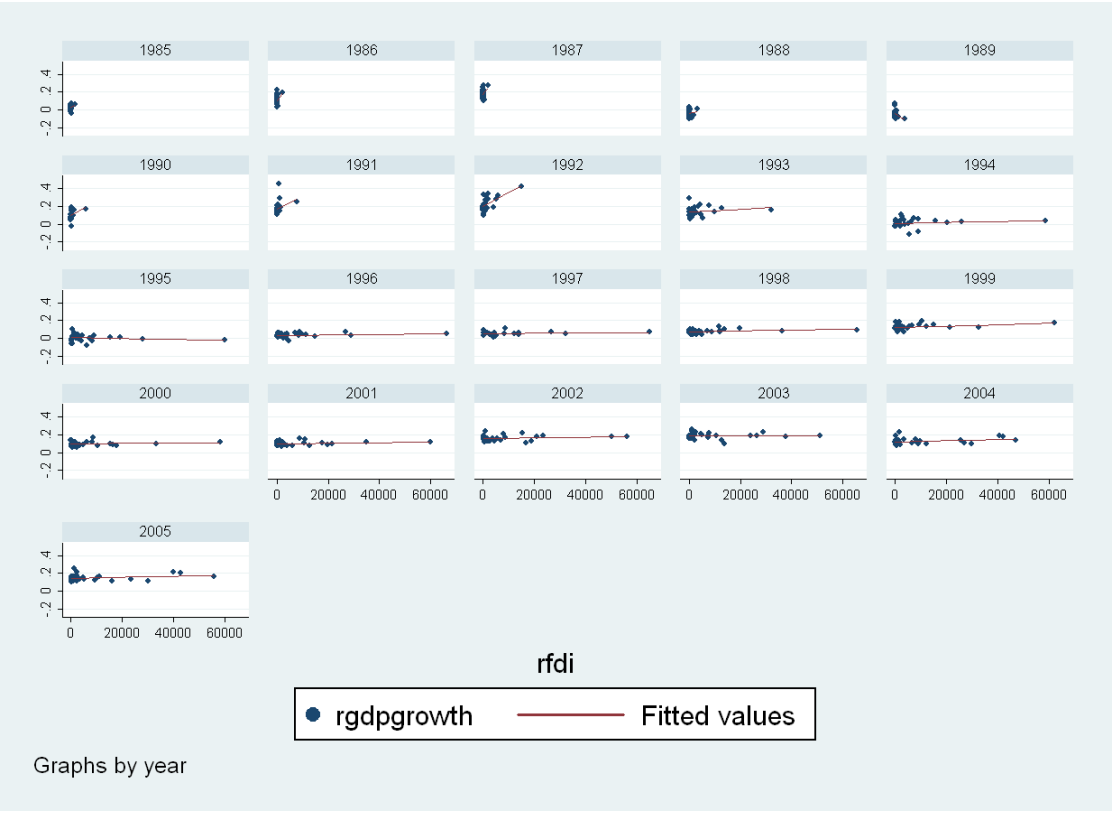
Source: Calculations from the China Statistical Yearbook, various years.

Figure 26: Real FDI inflows by Province



Source: Calculations from the China Statistical Yearbook, various years.

Figure 27: Cross-sectional Data of Real GDP Growth and Real FDI by Year



Source: Calculations from the China Statistical Yearbook, various years.