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Foreign Direct Investment in China: 1981–2001

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Foreign Direct Investment in China[1]: 1981–2001

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Abstract:

Since the opening up in late 1970's, foreign direct investment (FDI) inflows have been increasing rapidly in China. China has become one of the biggest FDI host countries in the world, while the distribution of FDI is quite uneven across provinces. This paper tries to explain the factors driving the unevenness of FDI inflows into different regions, and then the effects of FDI on domestic economy. A general equilibrium theoretical model is built to simulate the process of FDI flowing into the host area. The model indicates that after FDI comes in, better infrastructure in a province attracts more FDI, which consequently increases the wage levels of both educated workers and uneducated workers in the host regions. This will increase consumer's purchasing power and then domestic investment in that area. By using the panel data of 29 provinces in China from 1980 to 2001, this paper tests the results induced from the model. The empirical results support that better transportation and communication infrastructure attract FDI flowing into the area, associated with larger market size and superior financial development. FDI stock in past periods also has a positive effect. The paper also tests how FDI affects average wage levels. The results are that FDI of last period will increase wages in this period significantly. The effect of FDI on domestic investment is also estimated, which is significant and with an expected positive sign.

Keywords: FDI, Domestic Investment, Wage, Trade

[1] In this paper, we only consider the 31 provinces of mainland China, while the investment from Hong Kong, Taiwan and Macau are taken as FDI inflows.

I. Introduction

Since late 1978, massive economic reforms had been put into practice in China in an effort to restructure its economy to be more market oriented. Foreign Direct Investment (FDI) was one of the main reforms and had been participating in boosting China's economic growth and upgrading its overall production technology. By now China has become one of the most important countries in the world to host foreign direct investment. More than 100 countries have invested in China. FDI has a big effect on the development of China's economy. In fact, there are two questions caused by these economic facts: what attract FDI flow into China? What are the effects of FDI on the domestic economy?

Since the passing of the Equity Joint Venture Law in late 1979 which granted legal status to FDI in Chinese territory, China has gradually liberalized its FDI regime, and an institutional framework has been developed to regulate and facilitate such investments. FDI inflows into China increased rapidly after 1979, particularly during the early 1990s. The total accumulated amount of FDI at current prices rose from the initial US$0.057 billion in 1980 to US$53.5 billion in 2003, at an annual growth rate of 34.64 percent (FDI database, UN Conference on Trade and Development, 2003). In 1991, China ranked only thirteenth in the world and third among the developing countries in terms of FDI inflows (UN, 1994). Since 1993 China has become the second largest FDI recipient in the world following the United States and the single largest host country among the developing countries (UN, 1995). In 2002, China became the largest FDI host country in place of the United States for the first time (UN, 2003).

Over the course of the last two decades, FDI became well-established, and the activities of Multinational Enterprises (MNEs) came to play a more important role in capital formation, labor training, technology transferring, international trade, and accelerating the transition from a planned economy to a market economy in China. As a result, FDI has integrated the China's economy into the world economy gradually.

Figure 1 shows the FDI inflows in developed countries, developing countries and the whole world from 1980 to 2003. China and the United States are also graphed as two biggest FDI host countries in the world. We can see that FDI inflows in the world level had been increasing through the entire period except after 2000. This pattern is formed by two similar trends appearing in both developed and developing countries, with FDI inflows into the developed countries decreasing even more. The United States, the biggest FDI host country in the world for most of the time, follows the trend closely. However, China seems to be different. FDI into China has always been increasing even after 2000.

In some years, China absorbed half of the FDI inflows into the developing countries. If we look at the trend of the increase, we will find it amazingly rapid. Figure 2 gives us a clearer image of the change of FDI inflow in China. In 2003, the total realized FDI inflows reached US $53.3 billion, which is about 30 times the amount in the years from 1979 to 1982. Comparatively, the growth of FDI inflows is faster in 1990s than 1980s.

Figure 1

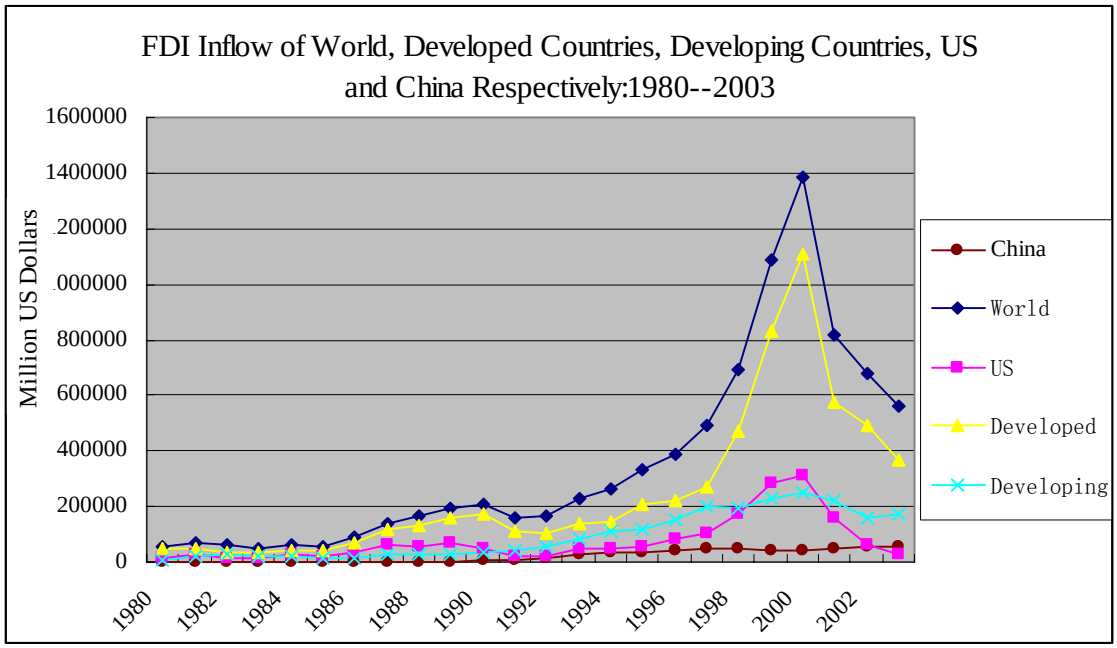
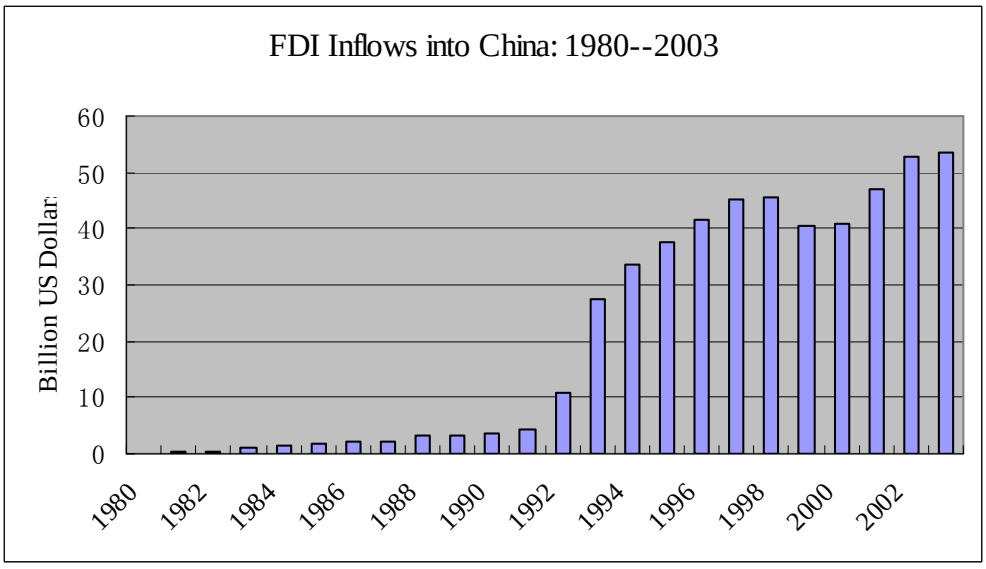


Figure 2



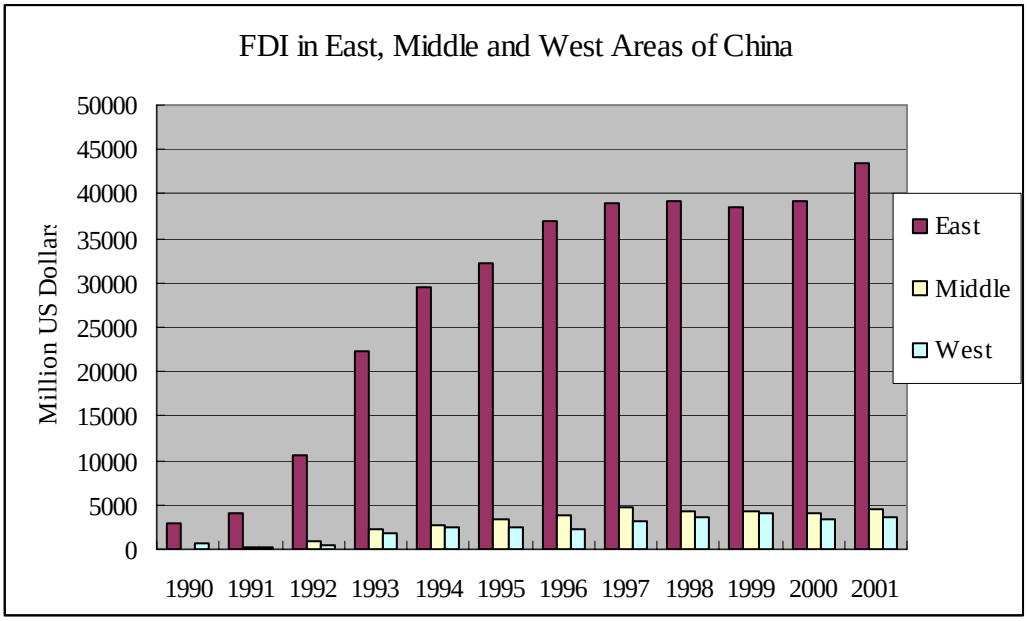
Although the amount of inward FDI is large, it is not distributed evenly across all provinces in China. Most of the FDI is concentrated in the east area, i.e., the coastal provinces. At the same time, FDI inflows into the middle and west[2] of China only take up a small proportion.

[2] There is a commonly used method of regional division of mainland China which is used by both the scholars and government. According to the economic development levels and the geographical locations of provinces, the 31 provinces are divided into three regions, namely, the east region, the central region, and the west region. Increasingly, the most important areas for hosting FDI are Yangzi River Delta including Shanghai, Jiangsu and Zhejiang, the Bohai Golf including Beijing, Tianjin, Hebei, Liaoning and Shandong, and southeast coastal provinces including Guangdong, Fujian, and Hainan. These areas are called east region. Central region includes 8 provinces: Jilin, Heilongjiang, Henan, Shanxi, Hubei, Hunan, Anhui, and Jiangxi. West region includes 12 provinces (municipalities, and autonomous regions): Yunnan, Guizhou, Guangxi, Sichuan, Chongqing, Neimenggu, Shaanxi, Gansu, Qinghai, Ningxia, Xinjiang, and Tibet.

In Figure 3, the red column is the FDI inflows into the east region. The yellow and blue columns are that into the middle and west regions. We can see clearly that most of the FDI went to the east provinces, especially after 1995. In late 1990's, the proportion of FDI in the east provinces is more than 80% of the total amount.

Naturally, this phenomenon leads to two questions: why does FDI choose east provinces instead of others? What are the special factors that attract FDI into different provinces? This paper tries to figure out the answers and provide at least some exogenous explanations. Furthermore, this paper will also talk about the effects of FDI on the domestic economic parameters, such as wages and domestic investment.

Figure 3



The structure of the paper is as the following. Part II will give an introduction to the background of FDI into China. In the third part, a theoretical model is built up to investigate the factors attracting FDI and the effects of FDI on wages and domestic investment. In part IV, we will talk about the empirical specification deducted by the results in Part III. The data source will also be introduced. Part V shows the empirical testing results. The last part provides a short conclusion.

II. History of FDI into China and Literature Review

The opening up and accepting FDI into China is a step-by-step progress. This progress can be divided into 4 phases. In the initial period of 1979-83, four Special Economic Zones (SEZs) in Guangdong and Fujian provinces were established. Accompanied by the special incentive policies for FDI offered by the Chinese government in these SEZs, FDI inflows into China were highly concentrated in these areas, particularly in the four SEZs. (State Statistical Bureau, 1992, p.353) The second phase began in 1984 when Hainan Island and fourteen

coastal cities across ten provinces were opened for FDI. During the period of 1984 to 1991, the Chinese government made many efforts to attract FDI inflows, including opening more and more areas and regions to FDI, and introducing a series of laws and regulations to encourage FDI inflows. The third phase is from 1992 to 1994. In this period, Deng Xiaoping's visit turned out to be a landmark and set the scene for China's move away from the uneven regional priority toward nationwide implementation of open policies for FDI. The Chinese government then adopted and implemented a series of new policies and regulations to encourage FDI inflows into China. As a result, since 1993 China has become the second largest FDI recipient in the world and the single largest host country among developing countries. From 1995 till now, it is the fourth phase. This period aimed at full-scaled economic liberalization, especially after China was accepted by WTO. Major FDI specific laws were enriched in this period. In 1999, the government put into practice the strategy of "going west" which put more emphasis on the inland provinces. Therefore, FDI absorption and economic opening were continued and expanded to cover the whole nation.

In the process, however, local governments have their own pursuits that are not always consistent with those of the central government. As a consequence of decentralization, local governments have increasingly become entrepreneurs and major stakeholders in local enterprises, regardless of the policy instructions of the central government. All regions recognize the significance of FDI to the local economy so that they aim at attracting FDI. This consequently leads to location competition, in terms of offering better preferential treatments. Their competition leads to high inflows of FDI on the one side but may lose the overall benefits that the central government aims to gain.

A large body of literature has empirically examined the FDI decisions of location across the world. Some of them begin with a partial equilibrium firm-level framework based in industrial organization and finance to motivate empirical analysis. These studies typically examine how exogenous macroeconomic factors affect the firm's FDI decision, with the primary focus on exchange rate movements, taxes, and tariffs.

Froot and Stein (1991) presents an imperfect capital markets story for why a currency appreciation may actually increase foreign investment by a firm. Blonigen (1997) provides another way in which changes in the exchange rate level may affect inward FDI for a host country. Other studies have generally found consistent evidence that short-run movements in exchange rates lead to increased inward FDI, including Grubert and Mutti (1991), Swenson (1994), Kogut and Chang (1996), and Lipsey (2001).

Effects of taxes on FDI have been considered from both international and public economists. MNEs face tax rates at a variety of levels in both the host and parent country and policies to deal with double taxation can substantially alter the effects of these taxes on a MNE's incentive to invest. Empirical approaches and data samples are different in a fair amount. Hartman (1984, 1985) finds a way in which certain types of FDI may not sensitive to taxes. Scholes and Wolfson (1990) believe tax treatments affecting FDI by examining the impact of US tax reform on inward US FDI. Desai, Foley and Hines (2004) find evidence that indirect

business taxes affect FDI in the same range as corporate income taxes.

Institution is an important determinant of FDI activity by affecting legal protection of assets, market costs, and infrastructure. Wei (2000a, 2000b) shows that a variety of corruption indices are strongly and negatively correlated with FDI. Many firm level studies have controlled for various trade protection programs using industry-level measures, including Grubert and Mutti (1991), Kogut and Chang (1996), and Blonigen (1997).

Trade is another factor affecting FDI. Lipsey and Weiss (1981, 1984) find a positive coefficient when regressing US outward FDI on exports to the host countries. Blonigen (2001) uses product-level trade and FDI data of Japanese 10-digit Harmonize Tariff System products in US to show that new FDI in US by Japanese firms increases Japanese exports of related intermediate inputs for these products, whereas new FDI leads to declines in Japanese exports of the same finished products. Head and Ries (2001) and Swenson (2004) show similar evidence when using Japanese firm-level data or US industry-level data, respectively. Some researches work on estimating general-equilibrium determinants of FDI, such as Carr, Markusen and Maskus (2001) and Blonigen and Davies (2004).

Some explanations for cross country FDI distribution, for example exchange rate, cannot be used to explain the distribution within a country since all the provinces in China share the same exchange rate decided by the central government. Other factor, such as infrastructure and trade, may play a role in examining the location of FDI inflows across provinces.

There also have been a lot of empirical studies on determinants of FDI in China. Some of them either use time-series data or cross section data. The time series studies use yearly data (Kerr and Peter, 2001) or quarterly data (Shan, 2002) and the results support that exchange rate and labor cost are main determinants. Some others use cross section data, including Chen (1996), Broadman and Sun (1997), Coughlin and Segev (1999), and Hsiao and Gastagana (2001). They agree with that coastal location, economy size and wages are significant affecting factors, with an exception of Chen (1996) who believes that wages are insignificant.

More researches focus on panel data, giving attention to the location determinants and aiming at studying the effects of all possible determinants simultaneously. Some researchers note the vast differences in attracting FDI among the eastern, central and western regions and provide some explanations. Chen (1996, 1997a, 1997b) uses the data at province level from 1987 to 1994 to estimate a log-linear model. He finds that market size, economic development, labour costs, accumulated FDI, transportation infrastructure, and government policy significant as the determination of FDI inflow. By fitting a random effect model to the province data from 1984 to 1996, Wei, Liu, Parker and Vaidya (1999) find that R&D manpower, agglomeration, information advantage and preferential investment also have positive effects on FDI. Zhang (2001) finds that the lower wage, education, cultural link and openness will boost FDI.

There are also studies that focus on the investigation of a particular determinant. To test the agglomeration effect predicted by a monopolistic model, Head and Ries (1996) use the firm

level data on FDI location choice from 1984 to 1991 to estimate a conditional Logit model. Ng and Tuan (2001) investigates the FDI promotion policies and governances in different regions of China. Liu, Wang and Wei (2002) find that the growth in China's import will lead to growth in inward FDI from a home country; and the growth in FDI in turn will boost China's export to the home country. Shi and Liang (2004) find that export has a positive impact on the inflow of FDI by using the national time series data from 1981 to 2001.

This paper tries to make a contribution in the following two aspects. First, since most of the literature use estimation specifications based on pure hypotheses without theoretical inductions, this paper tries to develop a stationary general equilibrium model to give out some theoretical support by inducing testable propositions for estimation. Second, most of the studies either do not have complete data either for all the provinces or long enough time periods after the opening up reform. Using a more complete data set, this paper provides more convincible and reliable results.

III. A Stationary General Equilibrium Model

This section builds a model to find out factors affecting FDI inflows and the effects of FDI on host economy. Suppose that in a society there are five factor owners: the labour owners including educated workers and uneducated workers, land owner, i.e., government, capital owners including domestic capital owners and foreign capital owners. Here we assume that government is the land owners who owns land and collect all the rent of land. We assume that both workers and capital owners are consumers at the same time. The typical consumer's objective function is

$$MaxU(g,t,s),$$

where g is the consumption of grain, t is the consumption of textile, and s is the non-traded service. The budget constraint for the typical consumer is the cost on all the consumptions is less than his or her income. It is reasonable to assume that there is a threshold consumption value of agriculture good, which naturally leads to the application of Stone-Geary utility function. The problem can be written as

$$MaxU(g_i,t_i,s_i) = (g_i - \bar{g})^{\alpha} t_i^{\beta} s_i^{1-\alpha-\beta} \quad (1)$$

$$s.t. \quad g_i + P_t t_i + P_s s_i \le Y_i \quad (2)$$

The model is quasi-linear in a three-dimensional space. Here $i \in N$, where N is the total number of consumers in the society. Notice that, we assume grain is the numeraire good, and consequently, the prices of textile and service are P_t and P_s respectively.

Solve this problem. The process is in Appendix 1. We can get the demand system as

$$g_i = \alpha Y_i + (1-\alpha)\bar{g}, \quad (3)$$

$$t_i = \frac{\beta}{P_t}(Y_i - \bar{g}), \tag{4}$$

$$s_i = \frac{1-\alpha-\beta}{P_s}(Y_i - \bar{g}). \tag{5}$$

From the demand equations we can get the total demand for each product by summation from i to N. The consumers in the society include educated workers, uneducated workers, and capital owners. Here we assume FDI investors also consume in the host country. Suppose that each worker has one unit of labour, and each capital owner has one unit of capital. There are N^e educated workers, N^u uneducated workers, and N^k capital owners, with $N_e + N_u + N_k = N$. The total demands are:

$$g^d = \sum_{i=1}^{N} g_i^d = \sum_{i=1}^{N} f_1(P_t, P_s, Y_i) = \sum_{i=1}^{N_e} f_1(P_t, P_s, W_e) + \sum_{i=1}^{N_u} f_1(P_t, P_s, W_u) + \sum_{i=1}^{N_k} f_1(P_t, P_s, r_k) \tag{6}$$

$$t^d = \sum_{i=1}^{N} t_i^d = \sum_{i=1}^{N} f_2(P_t, P_s, Y_i) = \sum_{i=1}^{N_e} f_2(P_t, P_s, W_e) + \sum_{i=1}^{N_u} f_2(P_t, P_s, W_u) + \sum_{i=1}^{N_k} f_2(P_t, P_s, r_k) \tag{7}$$

$$s^d = \sum_{i=1}^{N} s_i^d = \sum_{i=1}^{N} f_3(P_t, P_s, Y_i) = \sum_{i=1}^{N_e} f_3(P_t, P_s, W_e) + \sum_{i=1}^{N_u} f_3(P_t, P_s, W_u) + \sum_{i=1}^{N_k} f_3(P_t, P_s, r_k) \tag{8}$$

Now let's look at the supply side. We assume that the production function for the agricultural good is $g = g(L_u^g, h)$, where L_u^g is the labor input to agriculture production. Assuming agriculture only needs uneducated labor, and h is the land input, we can use a Cobb-Douglas production function here,

$$g = A(L_u^g)^{\theta} h^{1-\theta} \tag{9}$$

The production function of textile is

$$T = T(L_u^T, L_e^T, K_T, G) \tag{10}$$

Both kinds of workers participate in the production of textile. It also needs the input of capital and infrastructure. It is reasonable to put the infrastructure into the function. The basic establishment such as communication and transportation in an area will certainly affect the production. We can use the Cobb-Douglas form,

$$T = (L_u^T)^{\gamma_1} (L_e^T)^{\gamma_2} (K_T)^{\gamma_3} G^{1-\gamma_1-\gamma_2-\gamma_3}, \tag{11}$$

where we assume $\gamma_1 > 0$, $\gamma_2 > 0$, $\gamma_3 > 0$ and $1-\gamma_1-\gamma_2-\gamma_3 > 0$.

For the service production, we can also assume that its production depends on the

infrastructure. The production function is $S = S(L_u^S, L_e^S, K_S, G)$; again we use the Cobb-Douglas form

$$S = (L_u^S)^{\pi_1} (L_e^S)^{\pi_2} (K_S)^{\pi_3} G^{1-\pi_1-\pi_2-\pi_3}, \quad (12)$$

and similarly, $\pi_1 > 0$, $\pi_2 > 0$, $\pi_3 > 0$ and $1-\pi_1-\pi_2-\pi_3 > 0$.

An easy way is to solve the steady state at the general equilibrium. In general equilibrium, all the demand must equal to all the supply. Therefore, the following nine conditions, from (13) to (21), must be satisfied.

(13) $g^d = g$, which means that the total consumption of agriculture goods equal to domestic production. Here we assume that the amount of import of agricultural goods can be ignored.

(14) $T^d = T - X$, where X is the export to foreign countries. Here we assume that X is exogenously decided.

(15) $S^d = S$, which means all the demand of service equal to the supply.

(16) $L_u^g + L_u^T + L_u^S = L_u$

$L_e^T + L_e^S = L_e$

$L_u + L_e = N_u + N_e$

$N_e + N_u + N_k = N$

This condition includes four equations about labor. This first one is that uneducated workers hired in all of the three sectors equal to the total number of the supply of uneducated workers in the society. The second equation means the educated workers employed in manufacture sector and service sector equal to the supply of the total educated workers. The third equation means the labor supply equal to the labor demand, including both kinds of workers. The last one is the total number of the consumers in the society, which is equal to the number of workers.

(17) $K_T + K_S = K_D + K_F$. The left hand side of the equation is the capital used in manufacture sector and service sector, which has two sources, i.e., capital from domestic investors and foreign investors. In the right hand side, let $K_F = I(r_k, r_w)$, with the first term r_k as the domestic interest rate, and the second term r_k as the interest rate of the world level.

When the rent on capital is lower than the world level of interest rate, there is no demand for foreign capital. When the domestic interest rate is higher than the world level, there is a demand for FDI. So we can write the demand function of foreign capital as $K_F = I(r_k, r_w)$, where $I_1 > 0$ and $I_2 < 0$.

(18) $G = r_h h$. The rent of lands is collected by the government, which is spent on the infrastructure such as transportation and communication.

(19) $W_u = \frac{\partial G}{\partial L_u} = \frac{\partial T}{\partial L_u^T} P_t = \frac{\partial S}{\partial L_u^S} P_s$. Uneducated workers will get the same payment wherever they work.

(20) $W_e = \frac{\partial T}{\partial L_e^T} P_t = \frac{\partial S}{\partial L_e^S} P_s$. Similarly, educated workers will get the same payment too.

(21) $r_k = \frac{\partial T}{\partial k_T} P_t = \frac{\partial S}{\partial k_S} P_s$. This condition is about the rent to the capital. The real payment to each kind of capital should be the same.

Solving these equilibrium conditions, we can get three propositions as following. The first one is about the effect of infrastructure on FDI.

Proposition 1: Infrastructure affects the inflow of FDI in an area. The better the infrastructure is, the more FDI will flow into the area.

Proof: From (16a) we know that $K_F = K_T + K_S - K_D$

$$K_F = I(r_k, r_w) = I(P_t \frac{r_3}{K_T} T, r_w) = I(P_s \frac{\pi_3}{K_T} S, r_w)$$

Since from (19a) we know that $\frac{\theta}{L_u^g} g = P_t \frac{r_1}{L_u^T} T = P_s \frac{\pi_1}{L_u^S} S$, which means $P_t T = \frac{\theta}{r_1} \frac{L_u^T}{L_u^g} g$.

Substitute this equation into the expression of K_F, then we can get

$$P_t \frac{r_3}{K_T} T = \frac{\theta}{r_1} \frac{r_3}{K_T} \frac{L_u^T}{L_u^g} g = \theta g \frac{r_3}{r_1} \frac{L_u^T}{L_u^g} \frac{1}{K_T}$$

We also know that $G=(1-\theta)g$, therefore, $P_t\frac{r_3}{K_T}T=\frac{\theta}{1-\theta}G\frac{r_3}{r_1}\frac{L_u^T}{L_u^g}\frac{1}{K_T}$.

Hence $K_F=I(\frac{\theta}{1-\theta}G\frac{r_3}{r_1}\frac{L_u^T}{L_u^g}\frac{1}{K_T},r_w)$.

Since K_F is increasing with the first item in the expression, then we can easily get the conclusion that FDI is increasing with the infrastructure. This proposition is not perfect because it says nothing but infrastructure. There may be other explanations for the inflow of FDI. However, infrastructure in no doubt is one of the explanations.

Proposition 2: With the increase of FDI inflow, both the wage of educated workers and the wage of the uneducated workers will increase.

Proof: Let $N^u+N^e+N^k=N$, then (14a) can be rewritten as

$$T=\frac{\beta}{\alpha}\frac{1}{P_t}[g-N(1-\alpha)\bar{g}]-N\frac{\beta}{P_t}\bar{g}+X$$

Substitute this into the function of W_u, we can get

$$W_u=P_t\frac{r_1}{L_u^T}T=\frac{\beta}{\alpha}\frac{r_1}{L_u^T}[g-N(1-\alpha)\bar{g}]-N\beta\bar{g}+XP_t\frac{r_1}{L_u^T}$$

$$=\frac{\beta}{\alpha}\frac{r_1}{L_u^T}g+(\frac{r_1}{L_u^T}-\frac{1}{\alpha}\frac{r_1}{L_u^T}-1)N\beta\bar{g}+XP_t\frac{r_1}{L_u^T}$$

Since we know the relation that $\frac{\partial G}{\partial K_F}>0$, and $\frac{\partial g}{\partial G}>0$, then we can get $\frac{\partial g}{\partial K_F}>0$. From the above function, we can easily get $\frac{\partial W_u}{\partial K_F}>0$ since $\frac{\partial W_u}{\partial g}>0$. That is to say, when FDI flows in to the host country, the wage of uneducated workers will increase.

Similarly, let's look at the wage of educated workers.

$$W_e=P_t\frac{r_2}{L_e^T}T=\frac{\beta}{\alpha}\frac{r_2}{L_e^T}[g-N(1-\alpha)\bar{g}]-N\beta\bar{g}+XP_t\frac{r_2}{L_e^T}$$

$$=\frac{\beta}{\alpha}\frac{r_2}{L_e^T}g+(\frac{r_2}{L_e^T}-\frac{1}{\alpha}\frac{r_2}{L_e^T}-1)N\beta\bar{g}+XP_t\frac{r_2}{L_e^T}$$

Since we know the relation that $\frac{\partial G}{\partial K_F}>0$, and $\frac{\partial g}{\partial G}>0$, then we can get $\frac{\partial g}{\partial K_F}>0$. From the

above function, we can easily get $\frac{\partial W_e}{\partial K_F} > 0$, since $\frac{\partial W_e}{\partial g} > 0$. That is to say, when FDI flows in to the host country, the wage of educated workers will increase.

Proposition 3: The increasing inflow of FDI will also increase domestic investment.

Proof: $K_D = K_T + K_S - K_F = (1 + \frac{P_S \pi_3 S}{P_t r_3 T}) K_T - I(\frac{\theta}{1-\theta} G \frac{r_3}{r_1} \frac{L_u^T}{L_u^g} \frac{1}{K_T}, r_w)$

Since FDI is a function of K_T, we can write K_T as an inverse function of FDI.

$$K_T = H(G, \frac{L_u^T}{L_u^g}, K_F, r_w)$$

$$K_D = [1 + \frac{P_S \pi_3 S}{P_t r_3 T} - H(G, \frac{L_u^T}{L_u^g}, K_F, r_w)] K_F$$

When condition $1 + \frac{P_S \pi_3 S}{P_t r_3 T} - H(G, \frac{L_u^T}{L_u^g}, K_F, r_w) > 0$ is satisfied, the increase of FDI will increase domestic investment.

The above three propositions give us testable conclusions. For the first one, we can test whether infrastructure has a positive effect on FDI or not. For the other two, we can use FDI as an explainable variable to interpret wages and domestic investment. In the next sections, we will try to test these results by using a panel data of all of the provinces in China from 1981 to 2001.

IV. Empirical Specifications and Data Source

Firstly, we are trying to test how the infrastructure of each province affects the inflow of FDI. At the same time, we also consider other possible factors may play a role such as market size, remoteness of each province to coast, government policy, openness of each province, labour cost, degree of economic development, and domestic investment. By including these variables, we are trying to avoid missing variables problem.

The argument for the importance of market size as a location factor in the determination of the inflows of FDI is primarily based on the theory of economies of scale. The measure of market size used in this study is the Gross National Product (GNP) of each province. The trade (exports plus imports) to GDP ratio is usually used as an indicator for the degree of openness of an economy. It is expected to attract more FDI inflows, particularly the inflows of export-oriented FDI. Remoteness is a factor from gravity model. Since we only have the total FDI inflows into each province instead of the amount of FDI from source countries, we

use the distance of each province to the coast as the remoteness. More specifically, we use the distance of the capital of each province to the nearest coast. Low wage in developing countries is an important factor to attract FDI. Basically, FDI will flows into the areas where the wage is lower. However, there is a problem that we should take into consideration that where the wage is low, the productivity may be low too. Therefore, here we are in fact using an assumption that whatever the wage in a province, the productivity is similar. Economic development degree can be substituted by accumulation of fixed capital, financial development, and tax income from the business and manufacture industries. Here we use the ratio of total loan in the state owned banks to GDP as a proxy of financial development. A high degree of economic development is an indicator of development potential. We also use domestic investment as an explanation of FDI. The sign is not determinate, since they can be either complements or substitutes. Infrastructure includes transportation infrastructure and communication infrastructure. There are five variables in all, the freight ability of highway, railway and waterway respectively, the total operation of post office and the total number of telephones in urban household. Foreign multinational enterprises prefer to flow into areas where the infrastructure is well developed.

According to the discussion above, the following specification is established to test the impact of these variables on provincial aggregate FDI inflows:

$$FDI_{it} = \alpha_0 + \alpha_1 MarketSize_{it} + \alpha_2 Openness_{it} + \alpha_3 \mathrm{Re}\,moteness_{it} + \alpha_4 FixCapital_{it}$$

$$+\alpha_5 FinancialDevelopment_{it} + \alpha_6 TaxDevelopment_{it} + \alpha_7 DomesticInvestment_{it}$$

$$+\alpha_8 \sum_i Infrastructure_{it} + \sum_{j=1}^{4} \alpha_{9j} Policy_{jit} + \varepsilon_{it} \qquad (22)$$

ε_{it} is the stochastic disturbance, the αs are the coefficients to be estimated and the variables are as defined above. We should notice that there are 4 policy dummies in equation (22). The definition is as following: policy1 is equal to 1 when the year is from 1981 to 1984, equal to 0 otherwise; policy2 is equal to one when the year is from 1985 to 1991, equal to 0 otherwise; policy3 is equal to one when the year is 1 when 1992 to 94, 0 otherwise; policy4 is equal to 1 after 1995, 0 otherwise.

For the second results, the proxies for the average wage of educated workers and uneducated workers are the wages or income of workers in urban and rural areas. The data for average wages of each group is not available. We only have the average wage data for all employment. The proposition says that both kinds of wages will be increased. That is to say, the average wage level will be increased too, which is the modified proposition that we can test. In this specification, besides FDI, we also use market size, remoteness, domestic investment and employment as the explainable variables. FDI of last period is in the right hand side, because it is the investment in last period that affects the wages in this period. Therefore, the estimation equation is

$$Wage_{it} = \beta_0 + \beta_1 GNP_{it} + \beta_2 \mathrm{Re}\,moteness_{it} + \beta_3 FDI_{i,t-1}$$

$$+\beta_4 DomesticInvestment_{it} + \beta_5 Employment_{it} + u_{it} \quad (23)$$

u_{it} here is the stochastic disturbance, and the βs are the coefficients to be estimated.

The effect of FDI on domestic investment can be testified by using the flowing specification:

$$DomesticInvestment_{it} = \gamma_0 + \gamma_1 GNP_{it} + \gamma_2 FDI_{it} + \gamma_3 DomesticInvestment_{i,t-1} + \gamma_4 FixCapital + \upsilon_{it} \quad (24)$$

Here the dependent variable is the domestic investment; the explainable variables are economy size, FDI, domestic investment of last period and the capital accumulation. υ_{it} is the disturbance term which varies across regions and time.

Notice that in equation (23) and (24), instead of using GDP, we use GNP as one of the explaining variables. The reason is that GDP includes FDI; hence the coefficient on GDP will be biased upwards. Using GNP can avoid this problem.

The data used in the paper is a panel data from 1981 to 2001 of all of the 31 provinces in China. However, the FDI volume in Tibet is almost neglectable. The 31st province, Chongqing, which is in fact the 4th municipality, was established in 1996. I put the value of the variables from 1996 to 2001 together with those in Sichuan Province, where Chongqing used to belong to. There are 29 provinces which are useable.

The main data source is from China Statistical Yearbook (from 1980 to 2002), Editorial Board of the Almanac of China's Foreign Economic Relations and Trade (from 1984 to 2002), The 50 years' Statistic Collection of New China (1999), and Statistical Yearbook of provinces and cities. Some missing data in the early period of FDI and trade in some provinces are from the database of Information Center in Ministry of Commerce of the People's Republic of China, and Statistic Department of General Administration of Customs of People's Republic of China. The population data are from Editorial Board of the Almanac of China's Population (from 1985 to 2003), Editorial Board of the Almanac of China's Population and Family Planning (from 1986 to 2003), Communiqué of the Fourth National Population Census (1990) and Communiqué of the Fifth National Population Census (2000).

V. Regression Results and Explanations

The regression results of equation (22) are in Table 1. The first column is the results of fixed effect model. We can see that the effect from market size is significant, with the positive sign as expected. When the local market size increases by 1 billion Yuan, FDI inflows into this area will increase by 61.87 thousand US dollars. Although remoteness is insignificant, the negative sign is accordant with expectation. It means that coastal area is more likely to get

FDI. The regression results of policies are omitted here. Openness is positively significant. The ratio of trade over GDP can be used as a proxy for the opening extent of an area. Other factors controlled, when the trade value increases by 1 dollar, FDI inflows will be increased by 0.0799 dollar. The positive sign of labor cost is out of expectation. However, it is not significant. In China, although labor cost is lower in central and western regions, FDI still flows to the eastern region since there is better infrastructure and the labor can immigrant across provinces. FDI accumulation is not significant, which means that the existing foreign capital in a province does not affect the FDI inflow much and the influence is negative if exists. The next five variables are infrastructure variables. The first three transportation variables are positively significant, so is the coefficient of urban telephone. FDI will increase by 10 thousand US dollars when the railway freight increases by 24.90 thousand tons, or the highway freight increases by 24.82 thousand tons, or the waterway freight increases by 34.34 thousand tons. The telephone number in urban areas is a proxy to measure the development of communication. The positive sign means better communication will increase FDI inflows. Post business volume has a negative sign. Financial development is another infrastructure variable, which is positive and significant at 10% level. Since we use loan volume as the proxy of financial development, then when loan increase by 1 billion Yuan, FDI will increase by 242 US dollars. The magnitude of this variable is rather small. The variable of tax gathered by the government in last period is not significant. Domestic investment is negatively significant. When domestic investment increases by 1 billion Yuan, FDI inflow will decrease by 7876 US dollars.

Column (2)-(5) tests the robustness of the results. Column (2) records the results of random effect model, which are quite similar with the results in column (1). Market size and openness are positively significant, while remoteness, labor cost and FDI accumulation are insignificant and with negative signs. The five transportation and communication variables have the same sign and significance, so with the other three variables. First difference model (column 3) provides some difference. In this regression, remoteness and labor cost are significant, which are different from all the other regressions. Although FDI accumulation is still insignificant, the sign here is positive. Market size and openness still have positive effects on FDI. In the five infrastructure variables, post business is different here which has a positive effect although insignificant. In the log-linear form fixed effect model, FDI accumulation has a positive effect on FDI inflows. Some other variables, like railway freight, highway freight, telephone numbers in urban areas and domestic investment are nor significant any more.

To solve the endogeneity problem, here we use the two period lagged values of the explanatory variables except for the policy dummies and distance variables. Sargan Test has proved the validity of the instrument variables. Column (5) records the regression results of 2SLS. Market size is significant, while the magnitude is a little bit lower than that in fixed effect model. Remoteness again has a negative sign, which is not significant. Openness is significant, where the effect shrinks to about half of that in FE model. Labor cost is positive and insignificant and FDI accumulation is negatively insignificant. The five infrastructure variables all have positive signs, all significant except for post business and water freight at

the edge of significance. Financial development plays a much more important role here, with the magnitude eight times of that in fixed effect model. Domestic investment affects FDI inflows negatively, while the magnitude is about 5 times bigger than in column (1). From the above, we can see that the results are quite robust.

However, we cannot say that the endogeneity problem has been solved here. The instrument variables we used are not completely exogenous. The ideal IVs can be policies which affect the decisions of local government on wage, education, investment, infrastructures, financial development and so on, respectively. At the same time, these policies should have no effect on FDI. The difficulty is that it is hard to get qualified data for every province every year. Another possible way is to use panel cointegration which allows consistency of the long-run relation with the short –run adjustment. The short span of our data prevents us from using this method.

The estimation results of equation (23) are shown in Table 2. The first column records the regression of fixed effect estimation. Except for FDI of last period, which is at the edge of significance, all the other variables are significant. GNP affects wages positively. The average wage level increases by 1.156 Yuan when GNP increases by 100 million Yuan. The distance variable is negatively significant, i.e., the shorter the distance of a province to the coast, the higher the average wages will be. FDI of last period is only significant at the edge of 10% level. The sign still tells us that it affects average wages positively, although the magnitude is not that big after we consider the scale of the variables. The effect of domestic investment on wages is even smaller. One billion domestic investments can only increase the average wage level by about 0.005 Yuan. The sign of labor supply is as expected. When the population in the employment market increases, the average wage level will decrease given the labor demand does not change too much. The education variable is constructed as a proportion by dividing the population who have received secondary high school education or higher over the total population in this area. The numerator includes three parts: people who have received university or college education, senior high school education, and technical secondary school education. The negative sign is robust since we get the same sign in all of the regressions. This result is not accordant with common sense, since ordinarily more education will lead to higher income. However, if we notice that here the education index is calculated by using the number of people with secondary school or higher education, we can explain the negative sign in some way. Since most of the demand of labor by FDI enterprises are workers at a low cost, who can be trained to do simple production job although without much knowledge. Actually, a great amount of rural labours are hired and most of them do not have a secondary education level. Since low cost is the main objective of FDI enterprises and knowledge level does not affect productivity much, then the lower education level is, the lower the cost is, and then the higher possibility will be hired by the FDI enterprises and significant except in the first difference model.

Table 1: Explanations of inward FDI

Dependent Variable: FDI

Variable	FE （1）	RE （2）	FD （3）	Log-linear FE (4)	2SLS with IV (5)
Market Size	6.187 (9.35)***	4.434 (10.03)***	3.275 (4.93)***	0.044 (1.92)*	5.469 (2.54)**
Remoteness	-5.968 (-0.72)	-4.855 (-0.55)	86.518 (1.89)*	-3.46e-05 (-0.16)	-3.628 (-0.04)
Openness	0.0799 (13.66)***	.0764 (19.21)***	.0552 (8.12)***	.8664 (8.92)***	.0378 (3.55)***
Labor Cost	1.493 (0.52)	-.018 (-0.01)	8.925 (1.87)*	.652 (1.59)	.829 (0.02)
FDI Accumulation	-.0028 (-1.10)	-.0011 (-0.41)	.0016 (0.37)	.1525 (2.45)**	-.0133 (-0.67)
Railway Freight	2.490 (2.16)**	1.352 (3.94)***	10.36213 (2.21)**	.0878 (0.83)	3.642 (1.98)**
Highway Freight	2.482 (2.40)**	1.254 (5.56)***	-0.879 (-2.45)**	0.123 (1.36)	1.504 (2.49)**
Water Freight	3.434 (1.94)*	2.047 (2.33)**	3.020 (2.40)**	0.159 (4.11)***	7.912 (1.53)
Post Business	-5.814 (-3.70)**	-4.626 (-3.10)***	2.219 (0.77)	-.679 (-3.71)***	1.508 (0.08)
Urban Telephone	2.479 (3.90)***	2.058 (3.36)***	.0469 (0.28)	.0726 (0.29)	1.439 (3.83)***
Financial Development	.0242 (1.87)*	.0206 (1.84)*	0.0272 (2.17)**	.1509 (3.51)***	.1691 (1.96)*
Tax Gathering	4.056 (0.29)	14.012 (1.46)	26.848 (1.87)*	-.3196 (-2.19)**	67.676 (0.50)
Domestic Investment	-0.7876 (-3.44)**	-0.8431 (-4.12)***	-0.5747 (-2.05)**	-.1663 (-0.97)	-3.9984 (-1.73)*
R-Square	0.9076	0.9369	0.9293	0.6463	0.8940

Note: a. the number in the parentheses is t-value.

b. *, ** and *** means significant at 10%, 5% and 1% respectively.

Table 2: Effect of FDI on Domestic Average Wage Level

Variable	FE (1)	RE (2)	FD (3)	Log-linear FE (4)	With IV (5)
GNP	1.156 (12.25)**	1.312 (15.38)***	.1819 (2.40)**	0.874 (21.45)***	0.289 (1.20)
Distance	-2.001 (-12.75)***	2.083 (12.96)***	-2.979 (-2.15)**	6.67e-05 (3.35)***	1.167 (3.02)***
FDI of Last Period	6.269 (1.58)	-7.358 (-1.84)*	1.207 (0.45)	1.331 (1.70)*	29.278 (3.04)***
Domestic Investment	.00499 (2.57)**	.004563 (2.44)**	-.009372 (-6.95)***	.266164 (0.77)	.044866 (4.32)***
Labor Supply	-.666 (-2.39)**	-.372 (-2.87)***	-.0786 (-1.47)	-.887 (-6.12)***	-.334 (-2.82)***
Education	-40.566 (-2.84)***	-42.777 (-2.91)***	-2.370 (-0.13)	-.013 (-1.68)*	-27.331 (-1.11)
R-Square	0.5187	0.6520	0.1098	0.8394	0.2804

Notes: a. the number in the parentheses is t-value.

b. *, ** and *** means significant at 10%, 5% and 1% respectively.

The other regressions test the robustness and are shown in the following columns. We can see that, GNP is positively significant in all of the models and distance is significant in five models. However, only fixed effect model and first difference model, the sign is negative. The coefficient of FDI of last period is the emphasis of the estimation. The effect of domestic investment is consistently positive too, with an exception of log linear regression of fixed effect model. Labor supply and education level keep having negative effects in the following models. In the fifth column, we give out the results of 2SLS regression. The most possible endogenous relation may exist between GNP, FDI and domestic investment. The IV used for these variables are two-period lags of the independent variables except for distance. The results do not provide much difference with fixed effect model. The effect of GNP is still positive, if we loose the requirement of significance a little bit. FDI of last period and domestic investment are again positively significant. The difference is the magnitude of FDI of last period. Compared with the results in column (1) to (4), the result in 2SLS is about 5 times bigger than that in fixed effect model, and almost 20 times bigger than that in the first different model.

Table 3 record the regression results of equation (24). In the first column, we give out the fixed effect model results. GNP is significant, with a positive effect of 3.228 on domestic investment, which means that when GNP increases by 1 Yuan, domestic investment will increase 3.228 Yuan. The effect of FDI of last period is negative, which means that after FDI flows in, the investment from local area will be crushed out. The domestic investment of last period is proved to be positive with a magnitude of about 19%. To avoid the upward bias problem, we subtract the investment of last period from capital accumulation. The effect is very small, with 1 billion Yuan capital accumulation only increasing domestic investment by

0.0062 billion Yuan.

Table 3: Effect of FDI on Domestic Investment

Variable	FE(1)	FE (2)	RE (3)	FD (4)	Log-linear FE (5)	2SLS (6)
GNP	3.228 (16.85)***	2.347 (14.22)***	3.141 (16.78)***	.451 (2.83)***	.0756 (18.45)***	4.247 (5.53)***
FDI of last period	-1.756 (-11.14)***	-	-1.742 (-11.26)***	-.298 (-2.36)**	.053 (4.95)***	-3.086 (-2.03)**
FDI of this period	-	-.7868 (-9.57)***	-	-	-	-
Domestic Investment of Last Period	.1879 (6.68)***	.2024 (7.02)***	.1938 (6.92)***	-.4359 (-11.47)***	.0063 (0.45)	.0901 (1.26)
Capital Accumulation	.0062 (0.94)	.0005 (0.08)	.0074 (1.13)	.0043 (0.53)	.1457 (6.11)***	.0121 (0.30)
R-square	0.4881	0.3442	0.4808	0.2631	.3810	0.4013

Notes: a. the number in the parentheses is t-value.

b. *, ** and *** means significant at 10%, 5% and 1% respectively.

In column (2), instead of using FDI from last period, we use FDI of this period to explain domestic investment. The results are consistent with column (1). The significance and the magnitude of the variables are similar. The results of random effect and first difference model are shown in column (3) and (4). The only coefficient with different sign is domestic investment of last period in first difference model. The results in log linear form fixed effect model are not that consistent. Only in this regression, FDI has a positive effect of domestic investment, which means that instead of a substitution relation, FDI and domestic investment have a complementary relation. In this regression, lagged value of domestic investment has a positive effect, and capital accumulation has a bigger effect.

In this regression, again endogenous problem cannot be avoided when we use GNP, FDI and last period domestic investment as the independent variables. Column (6) is the result of 2SLS. Similarly, we use two period lagged values as the instrument variables. The results are quite consistent with column (1), except that now the effect of capital accumulation has been doubled.

VI. Conclusions

Up to now, we can get the conclusions of this paper. Since the opening up in late 1970's, FDI inflows have been increasing rapidly, together with the development of the economy in China. This paper builds a stationary general equilibrium model to simulate this process. The model indicates that infrastructure in each province has effect on FDI inflows; after FDI flows into

host region, it can increase the average wage levels and the domestic investment in that area.

By using the panel data of all the provinces from 1981 to 2001, this paper also testifies the results induced from the model. The empirical results are all quite satisfying. Better transportation and communication infrastructure attract FDI into the area, together with the market size, opening extent and financial development. However, export and FDI in China have bi-directional relationship, which means that both FDI affects export and export affects FDI. Therefore, we cannot use export level to explain FDI inflow simply. We also test whether FDI affects average wage levels. The results are positively significant. FDI of last period will increase wages in this period significantly. The effects of FDI on domestic investment are also estimated. It is positively significant as expected.

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