ABSORBING THE FOREIGN INVESTMENTS, TWO-SECTOR MODEL AND ECONOMIC GROWTH IN CHINA

Yu Ping[1,3], K.C.Chen[2]
1. Wuhan University of Technology, School of Economics;Add:1680 E. Barstow Apt. 218 Fresno CA 93710;Tel: 1-559-495-9053; Email: toyuping@hotmail.com // yping@csufresno.edu.
2. California State University, Fresno, Craig School of Business; Tel: 1-559-250-5525; Email: kchen@csufresno.edu.
3. Beijing Normal University, School of Economics and Business Administration

Abstract: This article consists of two versions of two-sector (the foreign investment sector and the domestic investment sector) model for analyzing the interrelation between foreign investment and economic growth in terms of intersectoral externalities, and favors the intersectoral externalities in China on the basis of empirical analysis. On analyzing the character of data, regression of two-sector model and externalities effect in two-sector of China, It is discovered that the foreign investment, whose externalities effect is weakening, becomes the more and more important in Chinese economy. This implies that the policy of absorbing the foreign investment should change from the policy-favored to builduping economic strength in China.

1 INTRODUCTION

With the economic globalization penetrating into the production field, the study of foreign investment has gradually become a hot research topic. Compare with the theory of international trade, the theory of international investment, whose core content is about foreign direct investment, lacks a systematic framework. From the perspective of host country who receives the investment, research could concentrate on two points of view. One is how foreign direct investment impacts on domestic economy, focusing on the spillover effect of foreign capital; second is how to absorb foreign direct investment, focusing on the spillover effect of domestic capital. The above-mentioned two points of view essentially consider the bidirectional causal relationship between foreign capital and domestic capital. This paper bases on the summary of related academic achievement in this field.

Research outcomes about the impact of foreign investment on host country can be divided into camps with opposing viewpoints. One view is that foreign technology, human resources and management concept have a positive impact on host country. Barro R. (1995, 1997) analyzed technical progress, technological gap, technological spillover, human resources and other factors influencing economic growth and established a model to show the relationship among these factors. His ground-breaking analysis about the relationship among economic growth, technical progress and human resources and the economic convergence provides a foundation to the study about the relationship between international investment and economic growth. Walz U. (1997) incorporated foreign investment in a dynamic general equilibrium model with endogenous growth technological change. His economic environment allows for geographical separation of the innovation and production of newly developed goods. Firms acquire specific knowledge through R&D investment in the more developed country and use their specific asset to establish a production plant in the low-cost country. Foreign direct investment is accompanied by inter-regional spillovers of knowledge from the more to less advanced country.

The empirical study consists of the test about the casual relationship between FDI and economic growth by use of Granger approach and regression analysis using time-series data from one particular country, cross-section data from different regions, or panel data. Balasubramanyam V., Salisu M. and Sapsford D. (1996) examined the role that foreign direct investment plays in the growth process in the context of developing countries characterized by differing trade policy regimes within a new growth theory framework and tested, using cross-section data relating to a sample of forty-sis developing countries, the hypothesis advanced by Bhagwati J., according to which the beneficial effect of foreign direct investment, in terms of enhanced economic growth, is stronger in those countries that pursue all outwardly oriented trade policy than it is in those countries adopting an inwardly oriented policy. Many scholars studied the impact of FDI on China's economic growth. For example, Jordan S., Tian G and Sun F. (1999)'s study indicated a bidirectional casual relationship between China's industrial production growth and utilization of foreign capital. China could maintain a steady economic growth using the combination of foreign capital and domestic resources.

The other viewpoint is that the introduction of foreign capital has a negative impact on host country. Salz. I. (1992) showed a negative relationship between FDI and economic growth in the third world in both theoretical and empirical ways. Easterly (1993) presented a result that domestic investment will be impeded by the introduction of foreign capital using preferential policy. The introduction of foreign capital has a negative on economic growth if there is a huge gap between the business earnings of foreign-funded enterprises and domestic-funded enterprises. Cornwall J. and Cornwall W. (1994) proposed a model including demand and structural change to the effect of European uniform market. They assert that the effect of trade and the movement of production factors to economic growth have been exaggerated by New economic growth model.

The relationship between introduction of foreign capital and China's economic growth has been analysed by many Chinese scholars. Niu Nanjie (1998) analyzed the impact of FDI inflow on China's economy in an all-round way. The inflow of FDI proposes stern challenge to China's macroeconomic regulatory system from the demand side and has a significantly positive impact on China's economic growth from supply side. Zhao Jinping (2001), on the basis of qualitative and quantitative analysis, established a model describing the relationship between FDI and major macroeconomic indicators to study the impact of FDI

inflow on China's economic growth. Shen kunrong and Gen Qiang (2001) built an endogenous growth model with spillover effect of foreign capital and did empirical analysis using data from China. Their result indicates that the increase of FDI inflow causes the increase of China's economic growth rate, not vice versa. Sang Xiuguo (2002) presented a theoretical model based on New Growth Theory and made a conclusion that increase of FDI inflow positively relates to economic growth. However, increase of FDI can not be considered as one reason of economic growth. Contrarily, China's economic growth is one reason of FDI inflow.

Obviously, the existing academic achievements have two limitations. Firstly, they focused on studying the impact of FDI inflow on host economy and neglected the absorbing action of host economy to foreign investment. Secondly, they concentrated on the qualitative analysis and neglected the quantitative analysis. To compensate for above-mentioned limitations, this paper establishes a two-sector model studying the spillover effect of one sector to the other. Further, we analyze empirically about this issue using data from China and give some powerful suggestions for the introduction of foreign investment.

2 SPECIFICATION OF THEORETICAL MODEL

Feder (1983) presented a two-sector model which divides production sector into export sector and non-export sector to evaluate the impact of export on economic growth. Similarly, Ram (1987), using above-mentioned model, tested the economic effect of the incentives devised to promote exports in 88 countries. Odedokun (1996) and Wang (1999) slightly improved the model and studied the mutual influence between financial development and economic growth. This paper, using this model, studies the relationship between introduction of foreign investment and economic growth. We divide production sector into foreign-funded sector and domestic-funded sector.

2.1 Foreign Investment Supply-guided Model

This model studies the impact of foreign investment introduction on economic growth. We arbitrarily assume a gap in the factor productivities between foreign-funded sector and domestic-funded factor. The economy is consisting of foreign-funded sector and domestic-funded sector.

The production functions are as follows:

$$F_t = F(L_{Ft}, K_{Ft}) \quad (1)$$

$$D_t = D(L_{Dt}, K_{Dt}; F_t^*) \quad (2)$$

And,

$$F_t^* - F_{t-1}^* = \theta(F_{t-1} - F_{t-1}^*), 0 < \theta < 1 \quad (3)$$

$$Y_t = F_t + D_t \quad (4)$$

$$L_t = L_{Ft} + L_{Dt} \quad (5)$$

$$K_t = K_{Ft} + K_{Dt} \quad (6)$$

Here, F_t and D_t represent production of foreign-funded sector and domestic-funded sector at time t separately. Y_t stands for the total production at time t. L_{Ft} and L_{Dt} represent the labor input of the two sectors, and K_{Ft} K_{Dt} represent the capital input.

Assume that (1) and (2) meet the characteristics of neo-classical production function. Due to the existence of spillover effect of foreign-funded sector, the production of domestic-funded sector is a function of not only capital and labor but also the expected production of foreign-funded sector. Equation (3) indicates that the production of foreign-funded sector is expected according to the principle of adaptive expectations. (4),(5) and (6) state that the two sectors cover the overall economic activities and they absorb all the capital and labor.

Assume that the present allocation of social resources is not optimal. In other words, the marginal productivity of factor in the two sectors does not equal to each other.

$$F_L / D_L = F_K / D_K = 1 + \delta \quad (7)$$

Here, F_L , F_K , D_L and D_K stand for the marginal productivity of labor and capital in foreign-funded sector and domestic-funded sector separately. δ represents the difference of productivity between the two sectors. In most developing countries, the productivity in foreign-funded sector is higher than that in domestic sector ($\delta > 0$). With the economic development, δ tends to be zero.

We derive the following equation from above-mentioned analysis.

$$dY_t / Y_t = \alpha(dK_t / Y_t) + \beta(dL_t / L_{Dt}) + [(\delta/(1+\delta)) + D_{F_t*}](dF_t / F_t)(F_t / Y_t) \quad (8)$$

Here, dY_t / Y_t represents the economic growth rate. dK_t / Y_t represents the ratio of investment to production. dL_t / L_{Dt} stands for the ratio of labor increment to labor employed in domestic-funded sector. $(dF_t / F_t)(F_t / Y_t)$ stands for the weighted production growth rate in foreign-funded sector. $D_{F_t*} = \partial D_t / \partial F_t^*$ states the spillover effect of foreign-funded sector to domestic-funded sector. Parameters α and β have similar economic interpretation with those in traditional neo-classical growth model. The equation can be simplified to neo-classical production function when $\delta = 0$ and. $D_{F_t*} = 0$

In order to facilitate empirical research, we decompose the last item of equation (8) $[(\delta/(1+\delta)) + D_{F_t*}]$. Assume the spillover effect of foreign-funded sector has constant elasticity ω .

$$D_t = D(L_{Dt}, K_{Dt}; F_t^*) = (F_t^*)^{\omega} \psi(L_{Dt}, K_{Dt}) \quad (9)$$

As a result, $\partial D_t / \partial F_t = \omega(D_t / F_t)$ holds. The elastic coefficient ω is a indicator evaluating the level of spillover effect. The following equation can be derived from the combination of (8) and (9).

$$dY_t / Y_t = \alpha(dK_t / Y_t) + \beta(dL_t / L_{Dt}) + [(\delta/(1+\delta)) - \omega](dF_t / F_t)(F_t / Y_t) + \omega(dF_t^* / F_t^*) \quad (10)$$

Then, we revise equation (4) to the following form.

$$F_t^* = \theta F_{t-1} + (1-\theta)F_{t-1}^* \quad (11)$$

And, equation (11) can be further edited to

$$F_t^* = \theta \sum_{s=0}^{\infty} (1-\theta)^s F_{t-s} \quad (12)$$

Due to $\theta \sum_{s=0}^{\infty} (1-\theta)^s = 1$, F_t^* is the weighted value of current and past F_t.

From (9),(11) and Koyck Geometric Lag Model, we obtain the dynamic function with regard to economic growth.

$$dY_t / Y_t = \alpha\theta(dK_t / Y_t) + \beta\theta(dL_t / L_{Dt}) + [(\delta/(1+\delta)) - \omega]\theta(dF_t / F_t)(F_t / Y_t) + \omega\theta(dF_t / F_t) + (1-\theta)(dY_{t-1} / Y_{t-1}) \quad (13)$$

Depend on this function, we will do empirical research in Part Three.

2.2 Domestic Investment Demand-driven Model

This model studies the reaction of domestic-funded sector to foreign-funded sector. We consider the spillover effect of domestic-funded sector to foreign-funded sector.

The economy can be described as follows.

$$D_t = D(L_{Dt}, K_{Dt}) \quad (14)$$

$$F_t = F(L_{Ft}, K_{Ft}; D_t^*) \quad (15)$$

And, $$D_t^* - D_{t-1}^* = \lambda(D_{t-1} - D_{t-1}^*), 0 < \lambda < 1 \quad (16)$$

(4), (5) and (6) hold here. Assume the difference of marginal productivity between the two sectors is γ, the spillover effect of foreign-funded sector has constant elasticity η.

$$F_L / D_L = F_K / D_K^* = 1 + \gamma \quad (17)$$

$$F_t = F(L_{Ft}, K_{Ft}; D_t^*) = (D_t^*)^{\eta} \Phi(L_{Ft}, K_{Ft}) \quad (18)$$

As a result, $\partial F_t / \partial D_t^* = \eta(F_t / D_t^*)$ holds. η is a indicator evaluating the level of spillover effect.

$$dY_t / Y_t = \rho(dK_t / Y_t) + \sigma(dL_t / L_{Ft}) + [(\gamma/(1+\gamma)) - \eta](dD_t / D_t)(D_t / Y_t) + \eta(dD_t^* / D_t^*) \quad (19)$$

According to the principle of adaptive expectations, we derive the dynamic function.

$$dY_t / Y_t = \rho\lambda(dK_t / Y_t) + \sigma\lambda(dL_t / L_{Ft}) + [(\gamma/(1+\gamma)) - \eta]\lambda(dD_t / D_t)(D_t / Y_t) + \eta\lambda(dD_t / D_t) + (1-\lambda)(dY_{t-1} / Y_{t-1}) \quad (20)$$

Equation (20) is the other function depends which our empirical analysis works.

Based on above-mentioned theoretical framework, (13) and (20) can be transformed to following two equations.

$$(dY/Y)_t = a_0 + a_1(dK/Y)_t + a_2(dL/L_D)_t + a_3(dF/F)_t(F/Y)_t + a_4(dF/F)_t + a_5(dY/Y)_{t-1} + u_t \quad (21)$$

$$(dY/Y)_t = b_0 + b_1(dK/Y)_t + b_2(dL/L_F)_t + b_3(dD/D)_t(D/Y)_t + b_4(dD/D)_t + b_5(dY/Y)_{t-1} + v_t \quad (22)$$

u_t and v_t are random disturbance terms.

3 EMPIRICAL TESTS

3.1 Variable Selection and Data Sources

The data used in the Empirical Analysis come from the "China Statistical Yearbook"(1983-2002) and "National Economic and Social Development Statistical Bulletin" which published by the National Bureau of Statistics. The period of the sample data is from 1984 to 2002, sum into 19 years. Taking into account the proportion of foreign investment is too small, as well as the availability, we chose 1984 as the starting point. In the paper, we use the actual GDP value at the t year as the whole economic output Y_t; fixed assets investment of the whole society as the aggregated capital investment K_t; Foreign sector output F_t represents the sum of output value in the foreign-invested enterprises and Hong Kong, Macao and Taiwan-invested enterprises, while the product of domestic sector D_t is the difference between GDP and F_t, L_t is the number of the whole labor employment. The labor employment of foreign sector L_{Ft} use the number of labor employment in foreign-invested enterprises and Hong Kong, Macao and Taiwan-invested enterprises while the labor employment in domestic sector L_{Dt} is the difference between L_t and L_{Ft}.

3.2 Descriptive Analyses of Two-sector Data

The use of foreign capital is an important content of China's opening to the outside world. It should be said that China has made use of foreign capital a great success for foreign investment in China in 2002 exceeded 50 billion U.S. dollars, the first time surpassed the United States as the world's largest foreign investment since the introduction of foreign investment in 1978. Table 1 describes the comparative relationship of output and employment of China's foreign and domestic capital, reflecting the status and trends of foreign capital introduction.

Table1: output and employment in foreign-funded sector and domestic-funded sector from 1984 to 2002

Year	D_t / Y_t	F_t / Y_t	L_{Dt} / L_t	L_{Ft} / L_t	D_t / L_{Dt}	F_t / L_{Ft}

1984-1985	0.9917	0.0083	0.9999	0.0001	1,629.03	157,500.0
1986-1990	0.9749	0.0251	0.9979	0.0021	2,457.02	103,043.2
1991-1995	0.8892	0.1108	0.9952	0.0048	4,946.19	130,655.5
1996-2000	0.7816	0.2184	0.9916	0.0084	8,794.59	289,961.3
2001-2002	0.7018	0.2982	0.9907	0.0093	9,565.99	432,529.8
Mean	0.8745	0.1255	0.9950	0.0050	5,441.00	199,913.7

The original data sources: 1.National Bureau of Statistics released the "National Economic and Social Development Statistical Bulletin" (years 1983-2002); 2. National Bureau of Statistics for the "China Statistical Yearbook" (1983-2002 years).

The first and second list in Table 1 show that the output in the domestic sectors constitute the main part of the total output with the proportion declining while and foreign sector output does not constitute the main body of the total output, but the proportion rising. The status of foreign investment in the national economy is gradually increased. The third and fourth list states that employment in the domestic sector accounting for a high proportion of the whole country's employment with a slow downward trend while the employment in the foreign sector a slow upward trend with an insignificant proportion. Line five and six indicate that both of the per capita outputs in foreign and domestic capital sector are an upward trend while the former is higher than the latter.

3.3 Regression Analysis of Two-sector Model

Using SPSS statistical software on the basis of the calculation and collation to the time -series original data to do ordinary least squares (OLS) regression analysis on equations (21) and (22), the regression results are shown in table 2. From the regression results of Table 2, we found that the coefficients of dF_t / F_t and dD_t / D_t are positive, and both of them pass through the different levels of parameters significance test, showing that the spillover effects between the two exists. Comparing the two regression results of the model, the domestic demand-driven models is superior to the" foreign capital supply"-guided model in the respects such as the model fit, overall significance test, as well as the significance test of parameters.

Table 2: the recession results of domestic demand-driven models and foreign supply-guided model

foreign investment supply-guided model		domestic investment demand-driven model	
dK_t / Y_t	0.685 (0.981)	dK_t / Y_t	0.248** (2.398)
dL_t / L_{Dt}	-0.179 (-0.375)	dL_t / L_{Ft}	-4.502E-06 (-0.171)
$(dF_t / F_t) (F_t / Y_t)$	-0.185 (-0.291)	$(dD_t / D_t) (D_t / Y_t)$	-0.808* (-2.049)
dF_t / F_t	0.312* (1.762)	dD_t / D_t	1.674*** (4.389)
dY_{t-1} / Y_{t-1}	0.0334 (0.154)	dY_{t-1} / Y_{t-1}	0.0343 (0.735)
R^2	0.785	R^2	0.990
F	4.186	F	125.766
D.W.	2.169	D.W.	2.747

Note: the value in parentheses is t statistics ,*,**,*** represent 10%, 5%, 1% significant level.

In the results of the two regression models, denotations of coefficient before the explanatory variables are on all fours and pass the significance test of the holistic equation. Fitting degree of the holistic equation is high. Reviewing the coefficient significance of the single explanatory variables, we find that the affects to equation bring from domestic demand is much better than that from foreign capital. Coefficients before the explanatory variable dK_t / Y_t in the two models are positive, which illustrates investment and economic growth has positive correlation and the investment stimulates the economic growth. Coefficients before the explanatory variables dL_t / L_{Dt} and dL_t / L_{Ft} are both negative, and statistic t is not significant, which reflects labor force growth have limited affects to Chinese economic growth and account for situation that Chinese labor force is excessive. Coefficients before the explanatory variables $(dF_t / F_t)(F_t / Y_t)$ and $(dD_t / D_t)(D_t / Y_t)$ are both negative ,and Coefficients before the explanatory variables dF_t / F_t and dD_t / D_t are positive, which declares output

growth and economic growth have positive correlation in the two departments while output weighted growth and economic growth have negative correlation. On the one hand, it shows that the total output growth and economic growth had the same direction, and the spillovers exist between the two; On the other hand, it also shows that the proportion of two-sector structure of output is in the continuous adjustment, which is opposite to the direction of economic growth. It, to some extent, hinders the economic growth. The coefficients of the entire explanatory variable dY_{t-1} / Y_{t-1} are positive and not significant, showing that the inertia of economic growth exists, but has a weak role.

3.4. The Empirical Analysis of Spillover Effect

According to the return results of Table 2, the spillover effect value between the two departments each year can be calculated through the formula $\partial D_t / \partial F_t^* = \omega(D_t / F_t^*)$ and $\partial F_t / \partial D_t^* = \eta(F_t / D_t^*)$. The results are shown in table 3.

Table 3: spillover effect value between the two sectors

Year	The spillover effect of foreign-funded sector to domestic-funded sector	The spillover effect of domestic-funded sector to foreign-funded sector	Year	The spillover effect of foreign-funded sector to domestic-funded sector	The spillover effect of domestic-funded sector to foreign-funded sector
1983	-	-	1994	3.5263	0.3694
1984	59.4900	0.0155	1995	2.3551	0.4596
1985	54.0958	0.0198	1996	1.7011	0.4352
1986	40.1885	0.0220	1997	1.6069	0.4426
1987	33.7045	0.0330	1998	1.3658	0.5053
1988	24.5917	0.0504	1999	1.1552	0.5337
1989	13.6440	0.0622	2000	1.1256	0.6350
1990	10.9925	0.0866	2001	0.9514	0.7051
1991	9.1361	0.1076	2002	0.8386	0.7959
1992	7.2538	0.1537	Mean	14.3801	18.8491
1993	5.4984	0.2585	S.D.	0.2995	0.2604

The average value of spillover effect for foreign capital to domestic capital is 14.3801 in the “foreign capital supply”- guided model, while the value for domestic capital to foreign capital is 0.2995 in the demand-driven model. It indicates that the spillover effect of foreign investment capital was stronger than that of domestic and china’s introduction of foreign investment have had a strong positive impact on economic growth. However, the spillover effect of foreign investment was declining while that of the domestic investment had an upward trend year after year. To 2002, the spillover effects of the two departments have been very close to each other, only 0.0427 in difference. This shows that the difference between the two departments is being reduced and the strength of the domestic sector has been greatly enhanced. It also contain a layer of policy implication that that, if we put the year 2002 as the cut-off point, then we would find foreign investment was attracted by preferential policies before 2002 (foreign capital supply -guided model), but now we should rely on the strength of domestic capital to attract foreign investment (domestic demand-driven model). This also happens to coincide with the institutional reform of the State Council since SASAC was established and Foreign Trade department was merged in the early 2003 with the establishment of the SASAC. It should be said that the year 2002 is a cut-off point of the country's economic policy’s focus. Our country focused on opening to outside world before 2002, but focus on internal reform now.

4 CONCLUSIONS

According to the two sectors Theory Modal of foreign and domestic capital and the empirical test on Chinese data from 1984 to 2002, it comes to some conclusions as follows:

(1)According to the descriptiveness analysis between the two sectors' data, it appears that the output of Sector domestic capital is the main body of the whole output, however, the foreign capital is becoming more significant in the National economy. The domestic capital sector provides more employments absolutely in the nation, and foreign capital is limited on the solution of Chinese employment.

(2)According to the regression analysis on the two-sector modal of foreign and domestic capital, we found that investments have a great effect in promoting economic growth while labor force growth have limited impact on China's economic growth. The spillover-effect exist between the two departments while the proportion structure of two-sector output is in continuous adjustment, which is in the opposite direction of economic growth and, to some extent, hinder economic growth.

(3)According to the spillover effect analysis of foreign and domestic capital sector, it is found that the “effect” of foreign capital to domestic capital is stronger then that of domestic to foreign capital. What’ more, it shows that the introduction of foreign investment had a strong positive impact on China's economic growth. However, the spillover effect of foreign investment was declining year by year and the spillover effect value in these two departments was very close in 2002. These contain a layer of policy meaning that the policy of foreign investment introduction should be changed from mainly relying on preferential policies to enhancing capital strength.

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