Analysis on the Correlation between FDI and Economic Increase in Yangtze Delta and its squeezing-in and out effect

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Abstract: The economic development in Yangtze Delta in recent years attracted the attention of academic circle. Especially with the increasing Foreign Direct Investment in the area, the regional economy has been greatly promoted. This article analyzes the correlation between FDI and economic development in the Yangtze Delta and on this basis analyzes the squeezing-in and out effect of the regional economic development and draws the conclusion.

Key-Words: FDI; Yangtze Delta; squeezing-in and out effect; economic growth

1 Introduction

Foreign Direct Investment (FDI) shows the trend of decrease in the Yangtze Delta in 2005. FDI utilized and introduced in China was USD 60.3 billion (Statistics from the Ministry of Commerce), which has created new record after the USD 60 billion of FDI has been introduced into China in 2004. In 2005, the GDP in the Yangtze Delta amounted to RMB 3 385.9 billion, the per capita GDP exceeded RMB 38 230, FDI actually utilized and introduced was USD 26.247 billion, which are the historical breakthrough. According to the statistics of relevant department, the Yangtze Delta has become the strong magnetic field in attracting foreign investment. Under such historical background, this article attempts to explore into the correlation between FDI and the economic increase in the Yangtze Delta and perform deep analysis on the squeezing-in and out effect of FDI on the investment in the Yangtze Delta.

2 THE CORRELATION BETWEEN FDI AND ECONOMIC GROWTH IN THE YANGTZE DELTA

While investigating into the importance of FDI to he economic growth of the Yangtze Delta, we measure with the ratio between amount of FDI and GDP, because the economic growth in a certain area usually is reflected by the growth of GDP, and the ratio between the FDI amount in the Yangtze Delta and the GDP of this region is one of the important indicators of measuring the contribution of FDI in the economic growth.

In order to prove the correlation between FDI and economic growth in the Yangtze Delta from the quantitative perspective, this article uses the unary linear regression method to study the relation between the actual FDI and the GDP growth in the Yangtze Delta. In order to decrease errors and make this article more scientific, the change of foreign exchange rate for different periods has been considered while studying the ratio between total amount of FDI and total production output in the region.

The GDP in the Yangtze Delta has been showing steady and fast increase from 1992. The GDP of USD 65.431 in 1992 has increased to USD 409.414 in 2005, with an increase of 525.72%. The fast growth of total production output needs certain amount of key factors to match it so as to promote the process of social reproduction. As an integral part of the total amount of key factors, FDI promotes the economic growth through the national economic cycling system in the Yangtze Delta. In 1992, the actual FDI attracted is USD 2.88 billion in the region, and this number has increased to USD 26.247 billion in 2005 with a growth of 811.35% (See Table 1).

Table 1 Relation Between Accumulative actual FDI and GDP in the Yangtze Delta

Unit: billion USD

Item/Year	Accumulating Actual FDI	GDP in the Yangtze Delta
1991	4.71	512.59
1992	33.51	654.31
1993	94.53	901.57
1994	176.89	840.36
1995	265.55	1106.87
1996	373.69	1302.07
1997	489.54	1466.00

1998	601.13	1598.83
1999	702.48	1732.89
2000	808.12	1927.27
2001	939.09	2136.46
2002	1118.52	2414.32
2003	1376.40	2875.24
2004	1618.35	3476.63
2005	1888.25	4094.14

Note: 1. FDI is the accumulative quantity since 1991;

2. GDP is converted into US dollars as per the average mean of foreign exchange rate between RMB and USD.

Source of data: Relative statistics from Almanac of Statistics of Shanghai, Almanac of Statistics of Jiangsu Province, Almanac of Statistics of Zhejiang Province in different years.

X refers to the accumulative quantity of FDI, variable Y means the GDP, the empirical formula between the X and Y is established as per the statistics in the table above. The scatter diagram (Figure 1) shows that the distribution is approximately a straight line, which means that the linear relation exists between the variables.

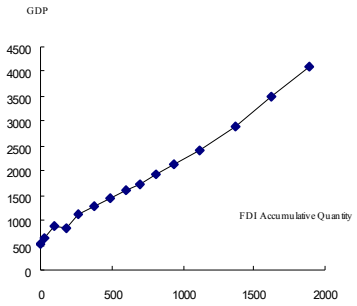

Figure 1 Scatter Diagram of GDP and FDI Accumulative Quantity in the Yangtze Delta

The regression formula is:

$$y_c = a + bx$$

Where, a and b are the undetermined variables, y_c is the estimate of y. The least square method shall be used,

Calculation shows that $a = 568.21$, $b = 1.77$

The correlation between variable x and y and the reliability of the regression formula can be tested with the determination coefficient R^2 which can be obtained through calculation as $R^2 = 0.99$, which means that the accumulative quantity of FDI can explain the variation of GDP with the percentage of 99%. The model selected matches the actual data fairly well. Meanwhile, F checksum is high as 1449.76, which is much larger than the critical value, the linear relation of the model is evidently established under the level of 95%. The results of regression analysis is shown as the following table:

Results of regression analysis

t and exp	of parad	l error ers	cs	eral prob
	5	2	5	
	3	5	5	
nation coeff	3	of explanatory v		7
d deterr ent	9	d difference tory variable		1
d differen on formula	6	nformation princi		4
l error s	1	nformation princi		4
m of the lil	27	tics		5
tistics	6	lity of F statistics		0

Since the DW statistics is 1.04, which is below the critical value, the model does not have the first-order serial correlation and passed the White testing.

Results of heteroscedasticity inspection

Heteroscedasticity Test:			
ic	1	ability	6
squared	9	ability	7

Its adjoin probability is 0.05, so the model has heteroscedasticity. In order to correct the estimate error resulted from the heteroscedasticity, use the weighted least squares method to get the results of estimate as $y_c = 571.00 + 1.76x$, , which has no heteroscedasticity.

It can be shown from the above analysis that the linear relation between x and y is evident, there is certain reliability to use the regression formula to predict, that is, there is evident linear relation between the accumulative quantity of FDI and the GDP of the Yangtze Delta, which means that there is fairly close correlation between the FDI and GDP growth in the Yan gtze Delta. Therefore, we can say that the FDI has promoted the economic growth in the Yangtze Delta.

2.1 Subsection

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2.1.1 Sub-subsection

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3 ANALYSIS ON THE SEQUEEZING-IN AND OUT EFFECT OF FDI ON THE INVESTMENT IN THE YANGTZE DELTA

The above analysis shows that FDI has promoted the economic development in the Yangtze Delta fairly well. However, with the increase of FDI scale, the marginal effect of FDI might decrease. Therefore, the appraisal of the squeezing-in and out effect of FDI on the domestic investment in the Yangtze Delta will be an indispensable part while appraising the effect of FDI on the economic growth in the Yangtze Delta. If the investment from multination companies squeezes in the domestic investment, the FDI promotes the new upstream or downstream investment flow in the region; or else, FDI will have the squeezing-out effect on the regional investment, that is, it will replace certain domestic investment in the region, which will not contribute to the increase of total investment or capital in the region, in stead, it will squeeze out some of the investment in the region and thus bring about certain exterior negative effect on the macro economy. Therefore, this article attempts to use a Total Investment Model and use the long-term coefficient of squeezing-in and out effect of FDI to analyze such effect of FDI on the investment in the Yangtze Delta.

3.1 The model and method of squeezing-in and out

In order to evaluate the squeezing-in and out effect of FDI on the investment in the Yangtze Delta, a Total Investment Model will have to be set up first. The total investment in a certain period equals to the domestic and foreign investment into the region from home and abroad as shown in equation (1).

$$I_t = I_{d,t} + I_{f,t} \quad (1)$$

As for the investment from abroad, only the FDI is considered here, usually there is as time gap between the FDI flow to the formation of real FDI as shown in equation (2).

$$I_{f,t} = \Phi F_t + \Phi_1 F_{t-1} + \Phi_2 F_{t-2} \quad (2)$$

The influencing factors from the domestic investment are many, we hereby only select the prophase investment increase and investment level that impact the domestic investment as shown in equation (3).

$$I_{d,t} = \Phi_0^1 + \Phi_1^1 G_{t-1} + \Phi_2^1 G_{t-2} + \lambda_1 I_{t-1} + \lambda_2 I_{t-2} \quad (3)$$

Then, Change the above formula into the total investment formula as shown in equation (4).

$$I_t = \alpha + \beta_1 F_t + \beta_2 F_{t-1} + \beta_3 F_{t-2} + \beta_4 I_{t-1} + \beta_5 I_{t-2} + \beta_6 G_{t-1} + \beta_7 G_{t-2} + \varepsilon_t \quad (4)$$

Where,

I——Investment ratio (total investment/GDP), where I_t, I_{t-1}, I_{t-2} are the investment ratio in the year of t, t-1, t-2;

F——Ratio between FDI flow-in and GDP, where, F_t, F_{t-1}, F_{t-2} are the investment ratio in the year of t, t-1, t-2;

G——GDP growth rate, where G_{t-1}, G_{t-2} are the GDP growth ratio in the year of t-1, t-2;

α ——Constant;

ε ——Serial incoherence random error.

The following coefficient can be used to appraise the squeezing-in and out of domestic investment by the FDI in a relatively long term as shown in equation (5).

$$\hat{\beta} = \frac{\sum_{j=1}^{3} \beta_j}{1 - \sum_{j=4}^{5} \beta_j} \quad (5)$$

When $\beta_j (j = 1,2,\cdots,5)$ is evident, the value of $\hat{\beta}$ can measure whether the FDI has squeezed in or out the domestic investment of a county or a region:

（1）$\hat{\beta} = 1$, that is, in the long term changes, growth of each 1 per cent of FDI/GDP will bring about 1 per cent of growth of I/GDP, which shows that the investment of multinational company is in parallel with the domestic investment. Where, $\sum_{j=1}^{5} \beta_j = 1$.

（2）$\hat{\beta} > 1$, that is, FDI has the squeezing-in effect on the domestic investment in the long-term changes, 1 unit of FDI brings about 1 unit of total investment, where $\sum_{j=1}^{5} \beta_j > 1$.

（3）$\hat{\beta} < 1$, that is, FDI has the squeezing-out effect on the domestic investment in the long-term changes, 1 unit of FDI brings about 1 unit decrease of total investment, that is to say, the FDI replaces the domestic investment. Where $\sum_{j=1}^{5} \beta_j > 1$.

When $\hat{\beta} \neq 1$, FDI has exterior impact on the macro economy of the host country or region, if it is the squeezing-in effect, it is the positive exterior impact; if it is the squeezing-out effect, it is the negative exterior impact.

3.2 Analogue results and analysis

The analogue analysis is done as per the relative data about the Yangtze River Delta from 1997 to 2005.

The analogue results are divided into two situation:

Situation I: the 7 variables are all used. The results of regression analysis is shown in Results 1 in Table 4. The F Test is basically evident, the regression coefficient is not idea. Where, $\hat{\beta} = 2.20$.

Situation I: After two variables, F_{t-1}, I_{t-2}, that have the least reliability and evident features are removed, The results of regression analysis is shown in Results 2 in Table 4. The analogue results are relatively ideal, and the reliability is relatively high. Where, $\hat{\beta} = 2.30$.

The results of the two kinds of analogue are all $\hat{\beta} > 1$, which shows that FDI has the squeezing-out effect on the investment in the Yangtze River Delta in long term, that is, the FDI use in the Yangtze River Delta has positive effect from the investment perspective.

Table 4 Analogue Results and Inspection of Investment Model

	F_t	F_{t-1}	F_{t-2}	I_{t-1}	I_{t-2}	G_{t-1}	G_{t-2}	Adjusted R^2	F value test probability
Result 1	3.281 (6.02)*	-3.176 (-2.85)	0.698 (0.531)	1.028 (3.314)	-0.393 (-0.954)	1.106 (3.343)	-0.548 (-3.097)	0.995	0.051
Result 2	3.092 (7.61)**	-2.306 (-4.14)**		0.735 (9.25)**		0.225 (3.55)**	0.135 (-3.41)**	0.995	0.000316

Note: The numbers above the brackets are $\hat{\beta}$ values, the numbers in the brackets are t test values, * means the evident features above 10% level, ** means the evident features at 5% level.

4 Conclusion

It can be seen from the above-mentioned analysis that the FDI has the squeezing-in effect on the investment in the Yangtze Delta, that is to say, FDI has promoted the investment in the Yangtze Delta in the process of making FDI. This shows that the FDI attracted by the Yangtze Delta has brought about better contribution for capital formation than the investment owned by the local producers in the Yangtze Delta. Just as what Jiang Xiaojuan (2005) said, the reason why the domestic investment cannot replace the foreign investment is that FDI has the function of improving capital quality, promoting technology, upgrading industrial structure, promoting the auxiliary industry, etc.. Therefore, in the process of attracting and using FDI, the local enterprises in the Yangtze Delta shall enhance cooperation with the foreign investment companies in the aspect of technological research and development, product innovation, etc so as to improve the upstream and downstream industrial correlation and make the Yangtze Delta the production base and R & D base of for the multinational companies and further elevate the international competitiveness of the Yangtze River Delta.

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