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Does and How does FDI Promote the Economic Growth? Evidence from Dynamic Panel Data of Prefecture City in China

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Abstract

This paper employed GMM proposed in [1] to re-evaluate the effect of FDI on the economic growth in China and the relevant factor of FDI during the period 1994-2010,based on dynamic panel data from 254 prefecture-level cities in China. We found that FDI exert positive impact on the economic development. Furthermore, economies of scale, human capital, infrastructure level, wage levels, regional differences interact actively with FDI and promote economic growth in China, while the openness of trade does not induce FDI significantly. Especially it is likely that FDI has crowded out the domestic capital and leave the domestic capital and huge foreign exchange reserves with the problem of rational usage.

1. Introduction

Since [2] proposed that technology spillovers from international trade can be extended to foreign direct investment, governments around the world has derived the general consensus that FDI contribute to economic growth. Almost all countries try to attract foreign investment to stimulate national economy, especially in the

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developing countries the governments often adopt preferential policies for FDI .The world market of FDI is highly competitive .

Both FDI and domestic investment increased investment, capital stock and employment. Furthermore FDI generate cross-sector overflows and improve the output through its upstream and downstream enterprises [3, 4, 5, 6]. Most importantly, as a synthesis of capital stock, knowledge and technology FDI push the technological progress .Especially in developing countries, [7,8 etc.] confirm the technology spillover effect of FDI.

The Chinese government has taken a number of preferential policies to absorb and encourage FDI to bridge the gap of domestic savings and foreign exchange gap since the reform and opening-up last century and FDI expand greatly year by year. At the same time the economy of China enter the long-term growth miracle, with the growth rate up to 3 times of the world economic growth at the same period, which is closely related to FDI.

With the development in China, the promotion of the production technology and the economic structure, the domestic funds is increasingly abundant and the foreign exchange reserves is up to $ 3.181 trillion in 2011. [9] believed that the existence of the gap between FDI and domestic use of preferential policies will affect the fairness and hinder economic growth. [7] confirmed that FDI is not crowding out domestic investment. Whether further introduction of FDI which is up to $ 0.118 trillion in 2011 would crowd out the domestic investment and still play a positive role is urgent problem to be solved in China currently.

Most literature employ econometric method and derive conclusion that FDI promotes economic growth in host countries such as [5, 7, 10]. [11, 12] found the economies with more openness achieve greater impact of FDI. [13] deemed FDI stimulate the economic growth not only directly but also indirectly through the interaction with human capital with the single and simultaneous equation system technology. However, some scholars hold the opposite view. [14] found that FDI impose blurred effect on economic growth. [15] proposed that exogenous part of FDI on economic growth could not play a good role independently.[16] demonstrated negative correlation between FDI and economic growth theoretically and empirically.

Concerning the influencing factors of FDI, [14, 10] confirmed that the contribution of FDI depends on whether the host country had well-developed financial market system. [6] found that market size, the level of infrastructure and stable macroeconomic policy induced FDI, while trade and human resources not. [7] found that FDI improve economic only when the host country cross the threshold of human resources. [5] found that the impact of FDI varies from sector to sector. [17] proposed that four major location factors including trade, cost factors and investment climate influenced FDI.

This paper employ the GMM proposed in [1] to re-evaluate the effect of FDI and the relevant factor on the economy currently, based on the dynamic panel date from up to 254 prefecture-level cities from 1994 to 2010 in China. We update the data timely and expand the sample size greatly to help overcome the small sample bias, capture the current characteristic of FDI and derive more reliable results.

2. The econometric model, data sources and variable declaration

This paper investigate the impact of FDI on the economic growth. There are inertia, menu cost and various adjustment lag during the economic development and makes the short-term economic growth deviate from the equilibrium and presents the slow adjustment process. We include the lagged economic growth in the independent variables to capture the adjustment process and obtain more reliable estimators. Finally we consider the fixed effects due to the heterogeneity of the prefecture-level cities throughout China. According to the existing literature we set the basic models as equation(1),(2),(3),(4),(5),(6).

$$g_{it} = \alpha_0 + \alpha_1 g_{i(t-1)} + \alpha_2 FDI_{it} + \alpha_3 FDI_{it-1} + \alpha_4 FH_{it} + \alpha_5 FH_{it-1} + \sum_{j=6} \alpha_j CV_{it} + \eta_i + \lambda_t + v_{it} \qquad (1)$$

$$g_{it} = \alpha_0 + \alpha_1 g_{i(t-1)} + \alpha_2 FDI_{it} + \alpha_3 FDI_{it-1} + \alpha_4 FW_{it} + \alpha_5 FW_{it-1} + \sum_{j=6} \alpha_j CV_{it} + \eta_i + \lambda_t + v_{it} \qquad (2)$$

$$g_{it} = \alpha_0 + \alpha_1 g_{i(t-1)} + \alpha_2 FDI_{it} + \alpha_3 FDI_{it-1} + \alpha_4 FFX_{it} + \alpha_5 FFX_{it-1} + \sum_{j=6} \alpha_j CV_{it} + \eta_i + \lambda_t + v_{it} \qquad (3)$$

$$g_{it} = \alpha_0 + \alpha_1 g_{i(t-1)} + \alpha_2 FDI_{it} + \alpha_3 FDI_{it-1} + \alpha_4 FG_{it} + \alpha_5 FG_{it-1} + \sum_{j=6} \alpha_j CV_{it} + \eta_i + \lambda_t + v_{it} \qquad (4)$$

$$g_{it} = \alpha_0 + \alpha_1 g_{i(t-1)} + \alpha_2 FDI_{it} + \alpha_3 FDI_{it-1} + \alpha_4 Fregdum_{it} + \alpha_5 Fregdum_{it-1} + \sum_{j=6} \alpha_j CV_{it} + \eta_i + \lambda_t + v_{it} \qquad (5)$$

$$g_{it} = \alpha_0 + \alpha_1 g_{i(t-1)} + \alpha_2 FDI_{it} + \alpha_3 FDI_{it-1} + \alpha_4 Fopen_{it} + \alpha_5 Fopen_{it-1} + \sum_{j=6} \alpha_j CV_{it} + \eta_i + \lambda_t + v_{it} \qquad (6)$$

in which $CV_{it} = (H_{it}, K_{it}, G_{it}, T_{it}, IV_{it}, C_{it}, L_{it})$, η_i is region-specific effect and capture various unobservable factor on economic growth. λ_t is the specific effects of time and describe the changes of production technologies, trade structure, price and other factors. v_{it} is the random disturbance term. These models investigate the effect of FDI on economic growth and the relevant location factors of FDI.

Specifically the dependent variable is economic growth rate in China (g_{it}), measured by the log of the GDP per capita. Explanatory variables include the lagged dependent variable, the core independent variables and control variables set. Core independent variables include ①FDI (F_{it},%) is indicated by the logarithm of FDI per capita and expected to play a positive role in the economic growth. we use the cross terms of the location factors and FDI to capture their interaction and anticipate that they enhance mutually and exert positive effect on the economic growth. The major location factors of FDI is human resources, market size, level of infrastructure , wage levels and regional differences as follows:②the cross terms of FDI and human resources(H_{it}) as (FH_{it}) investigate the interaction of human resources and FDI and relevant impact on economic growth. ③the cross terms of FDI and market size (FG_{it}), in which market size(G_{it}) indicated by GDP ④the cross terms of FDI and infrastructure level (FX_{it}) as (FFX_{it}), where infrastructure (FX_{it}) is measured by the proportion of the average annual balance of fixed assets in local output. ⑤the cross terms of FDI and wage levels (W_{it}) as (FW_{it}), where the wage level (W_{it}) is scaled by the average wage level .⑥the cross terms of FDI and regional differences (regdum$_{it}$) as(Fregdum$_{it}$),in which regional differences variables (regdum$_{it}$) is region dummy variable . it represents the eastern region when regdum$_{it}$= 0 while the central and west region when regdum$_{it}$=1. Fregdum$_{it}$ denote the regional differences on the effect of FDI ⑦the cross terms of FDI and trade openness open$_{it}$ (Fopen$_{it}$), where the trade openness open$_{it}$ is signified by the weight of trade volume to GDP. Finally economic growth in China is influenced by the accession to the WTO and other factors changes, we introduce year dummy variables to control these common factors.

On the basis of economic growth theory this paper set the control variables as follows: ①Capital stock per capita (K_{it}, per million people) is denoted by the proportion of fixed assets average balance to average number of industrial employees and expected to be positive as the significant component of economic growth. ② Actual tax levels (T_{it},%) is denoted by the ratio of revenue financial accounts in the local total output. The tax come from the people and benefit the people and the symbol is not clear. ③ Fixed asset investment (IV_{it}, %) is represented by the weight of fixed assets investment in GDP and is expected to be positive due to providing infrastructure ④Human capital (H_{it},%) is signified by the percentage of colleges and secondary school students in the students in school and is expected to be positive. ⑤ Funds (C_{it}, %) is represented by the weight of the year-end balance of loans in industrial output and expected to promote the economic growth. ⑥ Government expenditure (G_{it}, %) is denoted by the percentage of government budget expenditure in the local output with unclear symbol. ⑦Labor (L_{it},%) is signified by the ratio of employment in the total population .We anticipate it provide positive effect on economic growth.

The unbalanced panel data in this paper come from " City Statistical Yearbook in China" over the years, and the exchange rate data are from "China Statistical Yearbook". Limited by the availability of sample data,

the sample year begin from 1994 and the prefecture-level cities is up to 284. We use the STATA12.0 and run the xtabond2 procedure introduced in[18] to estimate the dynamic model in this paper.

3. Empirical results and analysis

The system GMM need classify the variables into three types including endogenous variables, strictly exogenous variables and non-strict exogenous variables. With respect to the endogenous problem we take the control variables as non-strict exogenous variables out of caution.Table1 presents the empirical results and the Regression coefficients retained three decimal places.

Table 1. The system-GMM estimation results of the relationship between FDI and economic growth

Variables	Model(1)	Model(2)	Model(3)	Model(4)	Model(5)
$g_{i(t-1)}$	0.951(0.002)	0.951(0.001)	0.940(0.001)	0.947(0.002)	0.946(0.003)
FDI_{it}	0.043(0.002)	0.006(0.001)	0.013(0.001)	0.005(0.001)	0.047(0.001)
$FDI_{i(t-1)}$	-0.023(0.001)	-0.007(0.000)	-0.011(0.000)	-0.005(0.001)	-0.049(0.001)
FH_{it}	-0.077(0.005)				
$FH_{i(t-1)}$	0.033(0.002)				
FW_{it}		1.69e-07(6.74e-09)			
$FW_{i(t-1)}$		-1.45e-07(4.67e-09)			
FFX_{it}			-0.005(0.000)		
$FFX_{i(t-1)}$			0.004(0.000)		
FG_{it}				1.27e-09(1.89e-11)	
$FG_{i(t-1)}$				-1.52e-09(2.15e-11)	
$Fregdum_{it}$					-0.046(0.002)
$Fregdum_{i(t-1)}$					0.045(0.002)
H_{it}	0.364(0.028)	0.078(0.005)	0.028(0.007)	0.076(0.007)	0.051(0.008)
K_{it}	3.93e-08(1.86e-09)	4.54e-08(1.75e-09)	8.31e-08(3.84e-09)	4.61e-08(1.25e-09)	4.33e-08(2.04e-09)
G_{it}	-0.100(0.012)	-0.074(0.016)	-0.108(0.015)	-0.142(0.013)	-0.117(0.014)
T_{it}	0.377(0.052)	0.218(0.033)	0.309(0.031)	0.283(0.030)	0.271(0.034)
IV_{it}	0.125(0.005)	0.118(0.004)	0.127(0.004)	0.115(0.005)	0.127(0.004)
C_{it}	-0.022(0.001)	-0.021(0.001)	-0.026(0.001)	-0.019(0.001)	-0.022(0.001)
L_{it}	0.140(0.014)	0.112(0.008)	0.213(0.012)	0.130(0.007)	0.198(0.018)
_cons	0.405(0.022)	0.528(0.016)	0.635(0.011)	0.582(0.011)	0.603(0.028)
AR(1)	0.000	0.000	0.000	0.000	0.000
AR(2)	0.447	0.606	0.429	0.450	0.443
Hansen	1.000	1.000	1.000	1.000	1.000
Observations	2029	2040	2030	2055	2055

Note: 1. The value in the Brackets are the robust standard errors of the estimators 2. AR (1) test whether there is first-order serial correlation concerning the error in a differential equation while AR (2)test whether the second-order serial correlation, and the null

hypothesis is that there is no serial correlation. 3.Hansen statistic test whether the over-identification restrictions are valid, the null hypothesis that the over-identification restrictions is valid. The table reports the p-value of the test statistic.

GMM requires second-order serial irrelevance concerning the residual but first-order serial irrelevance is unnecessary. [1] constructed AR(2) statistic to test the residual second-order serial correlation with the residual. In addition, Hansen test is taken to examine the overall effectiveness of the instrumental variables in GMM. The paper reported the P-value of AR (1), AR(2) and Hansen test below Table 1. Most estimators is significant at the confidence level of 0.1%.

The coefficient of lagged economic growth is 0.9 and significant in line with expectations, which confirms the existence of the dynamic adjustment process in economic growth. In addition, lagged FDI and the cross-terms are also significant, which further validate the dynamic adjustment process and the lagged effect. The P values of AR(2) are above 30%, we can not deny second-order serial irrelevance assumptions. AR(1) failed to pass while is unnecessary. The P values of Hansen statistic were close to 100% and the overall instrumental variables is effective. Therefore the model meet the prerequisite requirements of GMM and the empirical results is significantly and reliable. Especially FDI_{it} as an important part of investment stimulate the economic growth in the short run while FDI_{it-1} is not obvious, maybe because FDI will take some time to fully play out. Concerning the Cross terms of FDI, FFH_{it-1} and FFX_{it-1} are proved to be positive, which imply that the human resources and infrastructure is in virtuous circle and contribute to the economic growth while the virtuous circle take time. FW_{it} and FG_{it} enhance mutually and stimulate the economic growth in the short run while FW_{it-1} and FG_{it-1} do not form prominent impetus for the economic growth. Regarding the regional differences, the contribution of FDI_{it} and FDI_{it-1} to economic growth in east region is 0.047 and -0.049 while the central and western regions merely 0.001 and -0.004 respectively, which signify that there are significant regional differences on FDI .That is closely related with the fact that the east region was open up to the world earlier with more developed economy and more mature human capital and other facilities. The introduction of $open_{it}$ in model (6) bring great bias to the empirical results and therefore we do not include the results in table 1 ,which imply that trade openness do not induce FDI and stimulate economic growth prominently in China.

With respect to the control variables, K_{it}, H_{it} and L_{it} are proved to be positive as parts of economic growth, which confirm that the human resources, capital stock, labor contribute to the economic growth in China. T_{it} as an important component of financial income showed positive effects on the output, implying the positive effects of tax predominate the income-reducing impact. Government expenditure (G_{it}) seems to slow down the economic growth in China. Funds (C_{it})is negative which may be linked to the phenomenon of huge foreign exchange reserves do not get rational and fully utilization. Most of the bank loans flow to state-owned enterprises while private enterprises difficult to get loans. IV_{it} also showed positive stimulus for providing good infrastructure and increasing investment. Therefore we found that FDI still remain as the driving force for the economic growth in China in the new era. However it is likely that FDI has produced certain degree of crowding-out effect on the domestic funds and investment.

4. Concluding remarks

This paper employed GMM method to estimate the dynamic empirical relevance between FDI and the economic growth and the relevant factors based on the panel data of 284 Chinese Prefecture cities from 1994 to 2010.We derive the robust and reliable empirical results. We found that FDI still stimulate the economic growth in China, and the factor of FDI including the economic scale, human capital, infrastructure level, wage levels, regional differences generate positive interaction with FDI and promote the output jointly in lag adjustment process. On the other hand it seems that the trade openness does not obviously induce FDI and contribute to the economic growth in China and the expenditure slow down the growth. Specially it is likely

that FDI has exert certain degree of crowding-out effect on the domestic investment and funds, which make the problem how to rational use the huge foreign exchange reserves and bank loan in China stand out.

References

[1] Arellano, Manuel ,Stephen Bond. Some Tests of Specification for Panel Data: Monte-Carlo Evidence and an Application to Employment Equations. Review of Economic studies 1991;58:277-297.
[2] Grossman, G, Helpman, E, Trade ,Knowledge Spillovers and Growth, European Economic Review1991; 1991;35:517-526.
[3] Jansen, K, The Macroeconomic Effects of Direct Foreign Investment: the Case of Thailand , World Development 1995; 23:193 -210.
[4] Sun, H, Direct Foreign Investment and Linkage Effects: the Experience of China, Asian Economics1996; 25:5 -28
[5] Chandana Charkaborty, Peter Nunnenkamp, Economic Reforms, FDI, and Economic Growth in India: A Sector Level Analysis. World Development 2008; 36:1192–1212
[6] Ayanwale, Adeolu B., FDI and economic growth: evidence from Nigeria, AERC research paper 165(2007)
[7] Borenztein, E.J. De Gregorio, J. W. Lee, How does Foreign Investment Affect Economic Growth? Journal of International Economics1998; 45:115 -135.
[8] Helleiner, G. K, Transnational corporations and direct foreign investment, in H. Chenery andT. N. Srinivasan (eds.) Handbook of Development Economics, Vol. II (1989)
[9] Easterly,W,How much do distortions affect growth, Journal of Monetary Economics1993 ,32:187-212.
[10] Niels Hermes, Robert Lensink, Foreign Direct Investment, Financial Development And Economic Growth, The Journal of Development Studies2003; 38
[11] Usha Nair-Reichert, Diana Weinhold, Causality Tests for Cross-Country Panels: New Look at FDI and Economic Growth in Developing Countries 2000
[12] Kevin Honglin Zhang, Does foreign direct investment promote economic growth? Evidence from East Asia and Latin America, Contemporary Economic Policy2001;19
[13] Xiaoying Li, Xiaming Liu, Foreign Direct Investment and Economic Growth :An Increasingly Endogenous Relationship, World Development 2005; 33:393-407
[14] Laura Alfaroa, Areendam Chandab, Sebnem Kalemli-Ozcanc,Selin Sayekd. FDI and economic growth: the role of local financial markets，Journal of International Economics 2004 ;64:89–112
[15] Information on http;//ssrn.com/abstract=314924 or http://dx.doi.org/10.2139/ssrn.314924
[16] Saltz, Ira S. The negative correlation between foreign direct investment and economic growth in the third world :theory and evidence, Rivista Internationale di scienze Economiche e commerciali1992,39:617-33.
[17] Dunning , J H , Toward an Eclectic Theory of International Production : Some Empirical Tests , Journal of International Business Studies 1980; 317-3351
[18] Roodman, David, How to Do xtabond2: An Introduction to Difference and System GMM in Stata. Center for Global Development Working Paper2006; 103