Waryoba, Fulgence Dominick

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Foreign Direct Investment and China's Productivity Growth during the 1997 Asian Financial Crisis

Fulgence Dominick Waryoba

School of International Education, Capital University of Economics and Business, No.2 Jintaili, Chaoyang District, Beijing, 100026 P.R. China, E-mail: fuldominick@yahoo.com

Abstract *The study estimates the fixed effect model using cross–section weights to estimate panel EGLS for 7 years in 29 regions of China. Though for the sample period, foreign direct investment influences productivity positively, the effect is very lower compared to other factors in the model. Conversely, labor has a very high influence on productivity for the period under consideration. Nevertheless, the years after 1997 have shown more productivity growth compared to the years before 1997. This is probably due to the fact that the government acted quickly to recover by boosting the external demand. Consequently, the contribution of export on productivity growth is significantly large. As long as China's productivity keeps growing, high technological foreign direct investments will continue to flow into the economy. Chinese government should continue to invest in human capital to match with high technology embodied in foreign direct investments for the economy to continue experiencing high productivity growth.*

Key words Foreign direct investment, export, productivity growth, economic growth

JEL Codes: D24, F40, F43

1. Introduction

China is one of the fastest growing economies in the world. The tremendous growth of Chinese economy took its shape from the post 1978 policy reform which opened China to the rest of the world (Jiang, 2012). Since the opening up policy China has attracted more inflows of foreign direct investment to fuel further economic growth. The flow of foreign direct investment to the China has been impressive, but with declining growth starting from 1997. The main reason offered for this decline is the 1997 financial crisis which might have caused neighbouring countries to reduce their investment in the country. China's export also declined during this time probably due to decline in competitiveness due to currency devaluation by neighbouring countries who were struggling to rescue their economies from the damage caused by the financial crisis (Chen and Demurger, 2017).

China has overtaken United States in terms of the flow of foreign direct investment since 2003 and could be named as the world's largest foreign direct investment destination. In the first half of 2012, for instance, the inflow to China was US$59 billion with a drop of 3 percent from US$61 billion in the previous period, ordinarily much better than US$ 57.4 billion inflow in United State which declined by 39.2 percent from previous year (Li, 2012).

The analysis by (Jiang, 2012) provides a sufficient explanation of how foreign direct investment has improved productivity in China at regional level. However, Jiang does not include export in his analysis and uses a different approach, even though; his study results remain profound to the readers. The current study concentrates on the period from 1997 to 2002, which the impact of Asian financial crisis was loud to the Chinese economy and check whether foreign direct investment still played its role of improving productivity growth. Nevertheless, this study takes into account the value of export, which is not in Jiang's analysis, due to the fact that export might influence foreign direct investment flow.

2. Literature review

Economic growth has been well cherished by all development partners. Analysis of the sources of output variation has been highly prioritized. Consequently, research on input variation, growth, and productivity in relation to output; have taken the center stage in growth accounting literatures (Turner *et al.*, 2013). The analysis of sources of growth is critical as far as economic development is concerned. Because some of growth effects are short lived and cannot be sustained, especially if this kind of growth is facilitated by input growth. Conversely, when growth is fueled by growth in input productivity, it can be sustained and long lived (Easterly and Levine, 2001).

Productivity improvement helps to escape from Malthus trap. Accompanied by decreased birth rate and increased education rate, higher productivity rates have managed to uplift the living standard of people (O'Rourke *et al.*, 2013). However, at some levels a continuous population decrease tends to decrease total factor productivity (Stulik *et al.*, 2013) even when education levels are increasing (Hanushek and Woessmann, 2012). Innovation from research results into volatility that fosters economic growth (Posch and Walde, 2011).

Technical know-how embodied in foreign direct investment improves productivity. Nevertheless, the differences in the diffusion rate of this technology accounts for productivity difference among firms (Aoyama *et al.*, 2010). Foreign direct

investment needs a combination of high developed human capital in which labor is highly devoted to production improvement (Weissfopf *et al.*, 1983). This is due to the fact that, it is profitability that attracts foreign direct investments, so cheap and high skilled labor plus other production augmenting factors takes a central foreign direct investment attraction role (Cheng and Kwan, 2000).

The possibility of domestic industrial productivity improvement resulting from spillover effect of foreign direct investments plays a major role for countries to attract foreign direct investment. However, a positive correlation between domestic firms' productivity and foreign direct investment might be due to the fact that multinational companies tend to crowd out less productive domestic firms (Javorcik, 2004). Javorcik has analyzed the distribution of foreign direct investment across sectors, and the linkages between foreign direct investment and domestic firms is found to be stronger for forward rather than backward linkage.

The analysis by OECD on foreign direct investment attraction strategy shows that trade liberalization has been used to attract more foreign direct investment. The evidence shows that on average, countries with high levels of export and import as a percentage of gross domestic products have higher foreign direct investment as a percentage of foreign domestic products. Developed nations therefore attract more foreign direct investment compared to their developing counterpart (OECD, 2002). This might explain why the coastal region of China, which has higher productivity, attracted about 87 percent of total foreign direct investment in China. The Eastern China has persistently continued to enjoy more foreign direct investment inflow than the central and western China combined (Zhang, 2006).

China, in the year 2005, had a higher foreign direct investment confidence index of 2.197, followed by India with 1.951 and U.S. comes third with 1.421. Nevertheless, foreign direct investment is estimated to have a large contribution on economic growth than domestic capital (Kornecki and Borodulin, 2011). Good policies, strong leadership, developed human capital and large size of the country are said to be special features that make China realize foreign direct investment benefits more than any developing country in the world. An impressive contribution of foreign invested enterprises to the government revenue shows the importance of foreign direct investment to the Chinese economy. In 2004, for instance, 21 percent of China's tax revenue came from foreign invested enterprises (Zhang, 2006). Nevertheless, the value of technology transfer that China has received, from 1979 to 1993, through investment rather than trade exceeded US$50 billion which is a very large proportion of the actual foreign direct investment of US$63 billion (Bennett and Steward, 1997).

3. Methodology of research

3.1. Data

The study utilizes data from different publications of China Statistical Yearbook. Each year's publication represents one year in the series of the data. This has been purposely due to the fact that the data for cross sectional units, namely regions are of the year of publication. The study uses a time series data of 7 years that from, 1994 to 2002 respectively and a cross section of 29 regions.

The time series selection in this study is based on the fact that each one contains all the variables used in the analysis, except for capital and labor which are missing for 1994 and 1996 in all the regions. The study could have used a longer time span but only two variables, namely export and real gross domestic product (GDP) could have been analyzed. Two regions, namely Tibet and Chongqing are excluded from the analysis due to lack of some information. Tibet, for instance does not have values of foreign direct investment for 1997, while Chongqing does not have export values for 1997.

3.2. Model

In 1956, Robert Solow provided a useful theory contributing to economic growth accounting literatures (see Solow, 1956). For almost all economic growth analysis, Solow growth model provides one of the best starting points. Ordinarily, it is a simple model to understand which aids in understanding other more complicated growth models (Jiang, 2012). Accordingly, Solow growth model provides a suitable model for economic growth and productivity growth analysis in this study.

Traditionally, there are four principle variables which the Solow growth model focuses on, namely, output (Y), capital (K), labor (L) and technology (A). These variables are related in a way that output comes from a combination of capital, and labor at a given technology. The relation can be either labor augmenting, in which technology and labor enter multiplicatively into a production function, or capital augmenting where capital and technology enter mutliplicatively into production, or neutral technological change. Following the neutral technological change formulation of the Solow growth model, this study adapts the Korneck and Borodulin's, (2011) fromulation as in equation (1).

$$Y = AK^{a}L^{b}e^{(logR+T+u)} \quad (1)$$

Where: Y stands for Real Gross Domestic Product (GDP); A is MFP (Multifactor productivity); K represents Gross fixed capital formation (GFCF); L is Labor force; $e^{\log R}$ is rate of productivity change; and *u* stands for factors explaining output

growth but not captured in the model. The time dummy, T, which takes into account the effect of the financial crisis takes the values of 1 for the year 1997 onwards, and zero otherwise.
In order to get the rate of change, it is necessary to take the derivative of the logarithmic form of (1) with respect to time.

$$\bar{Y}_{it} = \overline{MFP} + a\bar{K}_{it} + b\bar{L}_{it} + \bar{R}_{it} + \beta T + u_{it} \quad (2)$$

Where, $\bar{J} = \frac{1}{J}\frac{dJ}{dt}$

With the assumption that productivity change is positively influenced by export (X) and foreign direct investment stock (FDI), especially through technological transfer (see Bennett and Steward, 1997), and then productivity change is now expressed as in the following relationship.

$$\bar{R}_{it} = c\bar{X}_{it} + d\overline{FDI}_{it} \quad (3)$$

The residual component is decomposed in equation (4) above to show productivity difference resulting from regional differences, w_i, and productivity difference induced by time, v_t. Conversely, the most right component of equation (4) stands for the zero mean idiosyncratic error term.

$$u_{it} = \gamma w_i + \delta v_t + \varepsilon_{it} \quad (4)$$

Substituting equations (3) and (4) into equation (2) results into the following estimation equation.

$$\bar{Y}_{it} = \overline{MFP} + a\bar{K}_{it} + b\bar{L}_{it} + c\bar{X}_{it} + d\overline{FDI}_{it} + \beta T + \gamma w_i + \delta v_t + \varphi\varepsilon_{it} \quad (5)$$

Where, $\bar{Y}_{it}$ is the average annual rate of growth of GDP in the *i-th* region and *t-th* period; $\overline{MFP}$ stands for the average annual rate of growth of MFP in the *i-th* region and *t-th* period; $\bar{K}_{it}$ is the average annual rate of growth of capital in the *i-th* region and *t-th* period; $\bar{L}_{it}$ is the average annual rate of growth of labor force; $\bar{X}_{it}$ represents the average annual rate of growth of export; and $\overline{FDI}_{it}$ stands for the average annual rate of growth of inward foreign direct investment stock. γ is the coefficient showing the effect of regional differences on productivity, δ is the coefficient showing the effect of time variation on productivity, and φ is the coefficient on the idiosyncratic error which is assumed identically, and independtly distributed.

4. Findings and discussions

The study applies a two way random effect approach to estimate the panel EGLS as it is the one which provides significant results for this particular sample analysis. The results are as given in Table 1. The model explains about 85 percent of the variation in real gross domestic product. In error decomposition analysis, about 32.5 percent of growth is attributed to regional differences, and only 6.5 percent of growth is due to time variation. The coefficient on the idiosyncratic error is about 61.1 percent and is significant in this model.

Table 1. Estimation Results

A: Panel Estimation Results

Variables	Panel EGLS (Two-Way Random Effects)
MFP	-1.11***[-3.55]
Capital	0.10***[4.20]
Labor	0.55***[14.7]
Productivity Growth	
Export	0.28***[8.21]
FDI	0.05**[1.97]
β	0.22***[2.7]
ρ_i	0.325***(0.123)
δ_t	0.065(0.055)
φ_{it}	0.611***(0.169)
R^2	0.849
Adj. R^2	0.845
Observation	203

B: Eview's Output

Dependent Variable: LOG(INCOME)
Method: Panel EGLS (Two-way random effects)
Date: 06/12/17 Time: 14:19
Sample (adjusted): 1995 2002
Periods included: 7
Cross-sections included: 29
Total panel (balanced) observations: 203
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.108272	0.312528	-3.546155	0.0005
LOG(GCF)	0.101943	0.024288	4.197315	0.0000
LOG(LABOR)	0.549967	0.037377	14.71417	0.0000
LOG(FDI)	0.050245	0.025479	1.972004	0.0500
LOG(EXPORT)	0.282354	0.034375	8.213845	0.0000
T	0.222485	0.082086	2.710391	0.0073

Effects Specification	S.D.	Rho
Cross-section random	0.122953	0.3250
Period random	0.054765	0.0645
Idiosyncratic random	0.168510	0.6105

Weighted Statistics

R-squared	0.849426	Mean dependent var	2.785265
Adjusted R-squared	0.845604	S.D. dependent var	0.467624
S.E. of regression	0.183744	Sum squared resid	6.651119
F-statistic	222.2653	Durbin-Watson stat	1.389114
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.928303	Mean dependent var	7.773682
Sum squared resid	13.47981	Durbin-Watson stat	0.874213

From Table 1, it can be seen that for the sample used in this study, there is a negative influence of multifactor productivity for the years before 1997. The results are a bit strange because we expect the multifactor productivity to be positive. However, the time dummy coefficient is positive showing that the multifactor productivity is about 22 percent higher in the period after 1997 than in the period before the 1997 crisis. The effect of foreign direct investment on productivity growth is positive and statistically significant at 5 percent levels of significance. But the contribution is quite small as compared to other factors in the analysis, because a 10 percent increase in foreign direct investment for instance, increases productivity by only 0.5 percent which is pretty small. Ordinarily, it can be said that large portion of productivity growth in the regions of China, during the Asian crisis did not come from foreign direct investment. Instead much of productivity growth came from exports of goods and services. This is empirically supported by the proportion of export to productivity growth. In this analysis, an increase in export by 10 percent increases productivity by about 2.8 percent which is substantially higher compared to that of foreign direct investment. This is than even the share of capital on output growth. Capital increase, for instance by 10 percent leads into an increase in the predicted gross domestic product by about 1.02 percent, and the effect is statistically significant at all levels of significance. In this analysis, labor appears to be more prominent as compared to all other factors. For labor, an increase in labor unit by 10 percent, increases output by about 5.5 percent. In general, it can be concluded that for the period taken under consideration, labor plays a significant role as a pillar for economic growth in China. This is likely to be one of the advantages China had compared to the neighboring countries.

4. Conclusions

The study tested the hypothesis that foreign direct investment contributes positively to economic growth during 1997 Asian financial crisis. The findings verify the hypothesis that foreign direct investment contributes positively to economic growth and productivity growth. However, for the sample period under consideration, the contribution of foreign direct investment

on economic growth is less than that of domestic capital. This could be due to less foreign direct investment received during the financial crisis. The contribution of foreign direct investment in this analysis is the lowest compared to other factors included in this study. The contribution of export on productivity growth, for example, seems to be much louder than that of foreign direct investment. Nevertheless, the years after 1997 have seen more productivity growth than the year before 1997. There was a quick recovery from the crisis aided by the government efforts to boost external demand. Regional differences are also important in explaining productivity growth in China, as compared to time variation. Conversely, labor has been an important factor of production in the economy, for the contribution during this period of crisis, is much higher than any other factor in the model.

Finally, as long as productivity continues to grow, China will continue to experience inflows of foreign direct investment of high technology. Therefore, the government should continue to invest in human capital to obtain the necessary labor for the high technology capital.

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