

Assessing the Effect of Foreign Direct Investment on Economic Growth in Host Countries Using the Bayesian Econometrics

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Abstract

The importance of investment in accelerating economic growth is discussed widely in literature. Evidence in the existing empirical literature on the causal relationship between foreign direct investment (FDI) and economic growth is rather inconclusive. Most of these studies conduct traditional causality tests, using single time series or panel data, while we use the Bayesian econometrics to analyze. The questions of this research are whether FDI influences economic growth in the host countries? And if the answer is yes, how strong is impact of FDI on these countries' economic growth in long-term compared to domestic investment?

The results show that foreign direct investment has a significant positive impact on economical growth in the sample host countries with a high probability occurrence rate, but its impact on growth is lower than domestic investment. These results are supported by another two indices of the Bayesian econometrics: the "posterior odds ratio" and "model probability".

Keywords: economic growth, foreign direct investment, domestic investment, Bayesian econometrics

1. Introduction

The importance of investment in accelerating economic growth is discussed widely in literature. The empirical work by Mankiw, Romer and Weil (1992) shows that using cross-country data the ratio of investment to GDP is an important determinant of growth (Hassan, 2003). Foreign direct investment and domestic investment are two sources of capital for countries. Empirical studies relating economic growth to capital formation have concluded that gross domestic investment exerts a major influence on economic growth (Choe, 2003: 44). On the other hand, based on UNCTAD report 2012, the share of FDI in host countries' gross fixed capital formation is increased compared to the 90s. The rationale for increased efforts to attract more FDI stems from the belief that FDI has several positive effects which include productivity gains, technology transfers, introduction of new processes, managerial skills, and know-how in the domestic market, employee training, international production networks, and access to markets (Alfaro, Chanta, Kalemlı-Ozcan & Sayek, 2004: 90) that lead to economic growth finally. However, evidence in the existing empirical literature on the causal relationship between FDI and economic growth is rather inconclusive. Most of these studies conducted traditional causality tests, using single time series or panel data (Nair-Reichert & Weinhold, 2001: 154), while we used Bayesian econometrics approach to analyze.

The questions of research are whether FDI influences on economic growth in the host countries? And if the answer is yes, how strong is impact of FDI on the selected countries' economic growth in long-term compared to domestic investment? It's expected that FDI has a positive significant impact on the selected countries' economic growth and leads to more growth than the domestic investment.

2. Literature

2.1 Global FDI Trends 2000-2010

Like over the 90s and specially last two years of that, FDI continues to expand rapidly in 2000, enlarging the role of international production in the world economy, so that FDI flows reached record levels in that year. Developed countries remained the prime destination of FDI, accounting for more than three-quarters of global inflows.

Developing countries' share in world FDI flows declined for the second year in a row, to 19 per cent and the 49 least developed countries (LDCs) remained marginal in terms of attracting FDI, with 0.3 per cent of world inflows in 2000 (UNTCAD, 2001: 1).

Global foreign direct investment (FDI) flows declined sharply in 2001. This reversal reflects two factors: the slowing of economic activity in major industrial economies and a sharp decrease in their stock market activity. To the extent that the events of 11 September 2001 exacerbated this slowdown, they may also have contributed to the further decline in FDI (UNTCAD, 2003: 4).

Global FDI inflows declined in 2002 for the second consecutive year. Facing diminished FDI inflows, many governments accelerated the liberalization of FDI regimes. Asia is one of the most rapidly liberalizing host regions (UNTCAD, 2003).

Global inflows of foreign direct investment (FDI) declined in 2003 for the third year. This was prompted again by a fall in FDI flows to developed countries (UNTCAD, 2004: 1). Also, the structure of FDI has shifted towards services (UNTCAD, 2004: 15).

Led by developing countries, global FDI flows resumed growth in 2004 (UNTCAD, 2005: 1). In 2005, developing and transition economies gain ground as home countries (UNTCAD, 2006: 105). This upsurge in FDI reflects a greater level of cross-border mergers and acquisitions (M & As), especially among developed countries. It also reflects higher growth rates in some developed countries as well as strong economic performance in many developing and transition economies (UNTCAD, 2006).

Global FDI reached a new record high in 2007, reflecting the fourth consecutive year of growth (UNTCAD, 2008: 3).

More, developing and transition economies absorbed half of global FDI flows in 2009 (UNTCAD, 2010: 1).

Global foreign direct investment (FDI) flows rose moderately to \$1.24 trillion in 2010, but were still 15 per cent below their pre-crisis average. This is in contrast to global industrial output and trade, which were back to pre-crisis levels. For the first time, developing and transition economies together attracted more than half of global FDI flows. In contrast, FDI inflows to developed countries continued to decline (UNTCAD, 2011: 1). In 2010, half of the top 20 host economies were from developing and transition economies, compared to seven in 2009 (UNTCAD, 2011: 3).

2.2 Impact of FDI on Economic Growth

The theoretical foundation for empirical studies on FDI and growth derives from either neo-classical models of growth or endogenous growth models (Nair-Reichert & Weinhold, 2001: 154). Neoclassical growth theory indicates that FDI is plausibly an engine of growth because it enhances capital formation and employment augmentation, promotes manufacturing exports, carries critical resources such as new technologies, managerial skills and knowledge flows, and results in spillover effects (Hong, 2011: 772).

Micro studies at the firm level suggest that the impact of FDI on growth may depend on many factors. Harrison (1994) cites case study evidence in Morocco and Venezuela, which indicate that firms with foreign equity participation are more productive than domestic firms and have higher productivity growth. However, she finds that in Venezuela the productivity of domestic competitors was hurt because the presence of multinational enterprises (MNEs) decreased their market share (Nair-Reichert & Weinhold, 2001: 154).

Macro-empirical analysis of the effects of FDI on growth is largely based on the single equation time averaged cross-section estimation approach, with or without instrumental variables (Nair-Reichert & Weinhold, 2001: 155). Borensztein, De Gregorio & Lee (1998) motivated the empirical work by a model of endogenous growth, in which the rate of technological progress is the main determinant of the long-term growth rate of income. They tested the effect of foreign direct investment (FDI) on economic growth in a cross-country regression framework. The results suggest that FDI is an important vehicle for the transfer of technology, contributing relatively more to growth than domestic investment. However, the higher productivity of FDI holds only when the host country has a minimum threshold stock of human capital. Thus, FDI contributes to economic growth only when a sufficient absorptive capability of the advanced technologies is available in the host economy. Also they stated: "The results suggest that the beneficial effects on growth of FDI come through higher efficiency rather than simply from higher capital accumulation" (Borensztein, et al., 1998: 134). In the other research, Makki and Somwaru (2004) examined data from 66 developing countries. Results of the study suggest that FDI, trade, human capital, and domestic investment are important sources of economic growth for developing countries. It is discovered that there is a strong positive interaction between FDI and trade in advancing economic growth. Results also show that FDI

stimulates domestic investment. The contribution of FDI to economic growth is enhanced by its positive interaction with human capital and sound macroeconomic policies and institutional stability.

By studying a summary of the previous researches, we conclude that FDI impacts on growth in two ways: 1) directly, by decreasing in capital stock with inwards foreign investment and 2) indirectly, with spillover effects.

Previous studies conducted in Iran, have used the classical methods of econometric, while we used Bayesian econometric which takes into account the previous information to obtain more reliable results.

3. Analytical Framework

The theoretical and conceptual elegance of the Bayesian approach has made it an attractive one for many decades (Koop, 2003: 6). The Bayesian approach is honest and rigorous about precisely how such non-data information is used. Furthermore, if prior information is available, it should be used on the grounds that more information is preferred to less. In addition, Bayesians have developed non-informative priors for many classes of model. That is, the Bayesian approach allows for the use of prior information if you wish to use it. However, if you do not wish to use it, you do not have to do so (Koop, 2003: 6).

The production model we used as a base model to investigate how FDI affect growth, is based on aggregate production function (APF). In recent years in macroeconomics area, many researchers; for example Campos and Kinoshita (2002), Oteng-Abayie & Frimpong (2006), and Kohpaiboon (2003) have utilized standard model of aggregate production function to survey influences of FDI flows on growth.

Our data analysis is modelled in an aggregate production function framework. The standard APF model has been extensively used in econometric studies to estimate the impacts of FDI inflows and trade on growth. The APF assumes that, along with “conventional inputs” of labour and capital used in the neoclassical production function, “unconventional inputs” like FDI and trade may be included in the model to capture their contribution to economic growth. The APF model has been used by. Following, the general APF model to be estimated is derived as:

$$Y_t = A_t K_t^\alpha L_t^\beta \quad (1)$$

Where Y_t denotes the aggregate production of the economy (real GDP per capita) at time t and A_t, K_t, L_t are the total factor productivity (TFP), the capital stock and the stock of labour, respectively (Oteng-Abayie & Frimpong, 2006: 2080).

Based on the theoretical literature, FDI stimulates economic growth by improving technology and productivity (Loko & Diouf, 2009: 5). Some empirical studies confirm positive productivity spillover from FDI (Salim & Bloch, 2009: 1861).

Globalization or the degree of openness to the global economy is another important factor in recent years. Contacts with foreign producers in the form of openness to international trade prepares the ground for technological upgrading and productivity improvement (Andersson, 2001, 705). Harrison (1996), Tybout and Westbrook (1995), Chand (1999), Pavcnik (2002), Fernandes (2007) and Amiti and Konings (2007) show a positive effect of trade openness on productivity (Paul & Marks, 2009: 105).

Human capital has also been to be a leading factor in explaining economic growth (Kabir Hassan, 2003), as the relationship between human capital and productivity growth have been confirmed in many researches (BenHabib & Spiegel, 1994; Wei & Hao, 2011; Lee, 2005; Teixeira & Fortuna, 2010; Fischer, Scherngell & Reismann, 2009; Rodgers & Neri, 2007). Well-developed human capital leads to an improvement in productivity, and an increase in the growth rate and investment ratio (Kabir Hassan, 2003).

According to what was mentioned above, we suppose that productivity is a function of FDI, openness, human capital, and other exogenous factors (C_t). So it can be noted:

$$A_t = f(C_t, FDI_t, OP_t, HC_t) = C_t FDI_t^{b_1} OP_t^{b_2} HC_t^{b_3} \quad (2)$$

Then, we combine equations (2) with (1) and write it as a logarithmic equation:

$$LY_t = c + b_1 LFDI_t + b_2 LOP_t + b_3 LHC_t + \alpha LK_t + \beta LL_t + \varepsilon_t \quad (3)$$

To estimate the above model, following indices were used:

FDI: Refers to Net foreign direct investment in constant 2000 U.S Million Dollars.

OP: Openness is obtained from sum of exports and imports divided by “gross domestic production” (Per cent).

L: To meet the International Labour Organization (ILO) definition, population of the labour force above 15 years old (in Millions) is considered.

Y: Refers to "gross domestic production" according to constant U.S. Million dollars.

K: We used "Gross fixed capital formation" (formerly gross domestic fixed investment) to measure the capital stock that has been used in numerous previous studies (Barro, 1999; Balasubramanyam, Salisu & Sapsford, 1996; Kohpaiboon, 2003). Data are in constant 2000 U.S. Million dollars.

HC: Empirical studies used different measures for "human capital". Kabir Hassan (2003) selected human capital in the form of secondary and higher education, Whereas Abel, Dey and Gabe (2012) and Sterlacchini (2008) choose higher education as the human capital measure. Researchers affirmed that correlations exist across countries between economic growth rates and schooling enrolment rates including enrolment in higher education (B. Aziz, Khan & Sh. Aziz, 2008). In this research, we determined rate of enrolment in higher education due to its high importance for production in the sample countries. This rate is obtained from total number of students divided by total population of higher education age group.

The sign of the constant elasticity coefficient α , β , b_1 , b_2 , and b_3 reflect the influence of each variable on economic growth and all expected to be positive. In addition, in the above equation, c is a constant parameter and ε_t is the white noise error term including factors which influence on economic growth, but are not included in the above model.

4. Method

As statistical population, 30 countries that were generally successful in attracting foreign direct investment were selected. Also these countries had higher than average income level based on World Bank report. The countries have been investigated include: Argentina, Azerbaijan, South Africa, Jordan, Armenia, Indonesia, Iran, Brazil, Belarus, Bulgaria, Pakistan, Panama, Peru, Thailand, Turkey, Tunisia, China, Russia, Romania, Singapore, Chile, Saudi Arabia, South Korea, Malaysia, Mexico, Lebanon, Poland, India, Venezuela, and Vietnam. The data gathering period is 2000-2010. The data on labour force has obtained form International Labour Organization, and data associated with FDI, form UNCTAD data bank and another variables data extracted from World Bank.

5. Results and Discussion

5.1 Estimation Results Based on Prior Non-Informative Function

In non-informative model, estimation results are merely obtained according to data, and no expectations and weights are included.

Table 1. Estimation results based on non-informative prior function

Explanatory Variables	Posterior Distribution of the Parameters	Standard Deviation	Probability	%95 Posterior density interval	
				Upper bound	Lower bound
Intercept	1.0295	0.6575	0.9422	2.3268	-0.2679
FDI	0.1097	0.0502	0.9844	0.2088	0.0106
Openness	-0.2045	0.0610	0.0008	-0.0841	-0.3249
Human capital	-0.0637	0.0630	0.1518	0.0606	-0.1880
Domestic investment	0.9830	0.0684	1.0000	1.1179	0.8481
Labour force	-0.0894	0.0495	0.0357	0.0083	-0.01871

Since foreign investment is defined as a set of cheap capital, management efficiency, advanced technology, and access to international markets, it is expected that its effect on growth is positive. As can be seen in table 1, FDI has a positive significant effect on economic growth, and also its accuracy of probability is higher than all of the variables except domestic investment. It can be explained that promotion of management level by joint ventures, and promotion of technology by transferring it to other production sectors, leads to increased efficiency and productivity of local firms and hence economic growth.

Despite the predictions, the coefficient of three variables openness, human capital, and labour force is non-significant and negative, that implies on insignificantly of these on our sample economic growth. To explain why human capital and labour force, we can say that economic structure of these countries is such that they can not take enough advantage of their educated workforce. Although these countries do a vast investment but, they are unable to earn the adequate "real income". In other words, the labour productivity is lower than "real wage" in these countries.

Andersen and Babula (2008) argue that the link between openness and productivity growth relates to the ability of countries to gain productivity growth through trade liberalization. In reply to insignificance of relationship between openness and growth in this research, it can be said that lack of complementary inputs (Andersen & Babula, 2008) emphasis on imports rather than exports, tariff and non-tariff barriers, and legal and politics conditions is the reason in most of these countries.

5.2 Estimation Result Based on Prior Informative Function

Compared to the results of prior non-informative function, the results of prior informative function are somewhat different so that two variables Human capital and labour force become positive. In addition, the impact of FDI on economic growth has been enhanced.

According to the theoretical basis, the coefficient of all variables: domestic investment, FDI and Human capital is positive so that among these variables, the highest coefficients are respectively belong to domestic investment, FDI and human capital. Two variables FDI and domestic investment are statistically significant and have a high Probability of occurrence in the model. But the variable human capital is not significant which indicates effect of this variable on growth, is inconsiderable. This result has been confirmed in the studies of Kabir Hassan (2003) about Middle East and North Africa countries (MENA), and Pahjola (2000).

Table 2. Estimation results based on informative prior function

Explanatory Variables	Posterior Distribution of the Parameters	Standard Deviation	Probability	%95 Posterior density interval	
				Upper bound	Lower bound
Intercept	0.0900	0.2772	0.6303	0.6368	-0.4568
FDI	0.2061	0.0690	0.9979	0.3423	0.0699
Openness	-0.1362	0.0889	0.0617	0.0392	-0.3116
Human capital	0.0570	0.0857	0.7515	0.2261	-0.1121
Domestic investment	0.8205	0.0883	1.0000	0.9948	0.6463
Labour force	0.0509	0.0634	0.7938	0.1759	-0.0741

5.3 Estimation Results According to "Posterior Odds Ratio" and "Model Probability"

Two other Indices used in the Bayesian econometrics are Posterior odds ratio and Model probability. Values of these indices for each variable are shown in the table 3.

Table 3. The probability ratio of posterior function and the model probability

Explanatory Variables	Posterior odds ratio	Model probability
Intercept	0.9830	0.4957
FDI	0.1027	0.0931
Openness	1.4138	0.5857
Human capital	2.6616	0.7269
Domestic investment	0.0000	0.0000
Labour force	32.9706	0.9706

The column “Posterior odds ratio” indicates values of likelihood probability function of a model which lacks a particular variable to value of likelihood probability function of the main model. The higher value implies on better efficiency of “without the particular variable-model” than the main model that indicates effectlessness and insignificance of the given variable in the main model. As can be seen, this ratio for FDI and domestic investment, is very low that implies on importance of these variables in economic growth of the selected countries. The column “Model probability” indicates probability of a model which lacks a particular variable. The lower value of a variable in the column implies on greater importance of the variable in the main model. Hence, the result of this index highlights the importance of FDI in economic growth of the selected countries (after domestic investment).

6. Conclusion

We investigated impacts of FDI on the host countries’ economic growth. Results implied on positive significant of two variables i.e., FDI and domestic investment on the selected countries’ economic growth. Although, some problems in business environment, human capital weakness, and lack of appropriate economic structure and environment lead to inability of host countries’ local firms in the use of the spillover effect associated with FDI, and thus, it reduces impact of FDI compared to domestic investment. Moreover, by including minimum of theoretical expectations, and previous studies results, it can be seen that the influence of human capital and labour force on the selected countries’ economic growth is positive.

Legal and political constraints on international trade, direct control of imports, tariff and non-tariff barriers, economic structure, size of government, and non-compliance/infringement of copyrights could be mentioned as the reasons of insignificance of openness.

Suggestions of this research are elimination of legal and politics constraints on international trade, balance between import and export (Manni, Siddiqui & Afzal, 2012), investment in human resource training/education to take advantage of the opportunities created by the FDI, and identifying and giving priority to the key productive sectors which are more amenable to attract FDI. In addition, the host countries should invest in research and development (R&D) activities to enhance technological abilities that lead the economy to growth.

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