Foreign Direct Investment and Economic Growth in Asian Countries: A Causality Analysis

Mohsen Mehrara¹*, Maysam Musai², Abbas Rezazadeh Karsalari³

¹ Faculty of Economics, University of Tehran, Tehran, Iran
² Faculty of Social Sciences, University of Tehran, Tehran, Iran
³ Department of Management, Islamic Azad University, Tafresh Branch, Tafresh, Iran.

This paper investigated the causal relationship between Foreign Direct Investment (FDI) and GDP in 40 Asian countries by using panel unit root tests and panel cointegration analysis for the period 1970-2010. The results showed a strong causality from economic growth to investment in these countries. Moreover, FDI had significant effects on GDP in short- and long-run. So, the findings imply bidirectional causality between foreign direct investment and economic growth in these countries. FDI in these countries has been an important source of capital complementing the domestic private investment, being usually associated with new job opportunities and enhancement of technology transfer and spillover, human capital (knowledge and skill) enhancement, boosting overall economic growth in host countries.

© 2014 Caspian Journal of Applied Sciences Research. All rights reserved.

Keywords: C12; C33; E21; F43

1. Introduction

The effect of FDI in stimulating economic growth is one of the controversial issues in the development literature. In the standard Solow type growth model, FDI enables host countries to attain investment that exceeds their own domestic saving and increases capital formation. According to this theory, the potential beneficial effect of FDI on output growth is confined to the short run. In the long run, given the decreasing marginal returns to physical capital, the recipient economy could converge to the stable state growth rate as if FDI had never taken place leaving no permanent impact on the growth of the economy (De Mello, 1999).

Since the 1980s country barriers to foreign investment have given way to countries actively seeking FDI instead of discouraging it. Governments now compete with each other to win more investment from foreign companies. Herein, it is vital to perception what factors attract FDI, a subject much studied in international business, and to understand the increasingly important role of communications and knowledge in this global competition for FDI. In order to successfully restructure their economies to lure foreign investors and ultimately to get and sustain competitive advantages, policy makers need to better understand what makes a market attractive to foreign companies.

FDI has been seen as an effective channel to transfer technology and boosting growth in developing countries. Within the framework of the neo-classical models (Solow, 1956), the effect of the FDI on the economic growth was constrained by the existence of diminishing returns in the physical
capital. Therefore, FDI could only exert a level effect on the output per capita, but not a rate effect. In other words, it was unable to alter the growth rate of output in the long run. Therefore, a group of economists did consider FDI as a drive engine of growth by mainstream economics. In the context of the New Theory of Economic Growth, however, FDI may affect not only the level of output per capita but also its rate of growth. This literature has developed several arguments that explain why FDI may potentially increase the growth rate of per capita income in the host country. It is argued that FDI facilitates the use and exploitation of local raw materials, introduces modern techniques of management, eases the access to novel technologies, foreign inflows allow financing current account deficits, finance flows in form of FDI do not generate repayment of principal and interests, increases the stock of human capital via on the job training, and stimulates the investment in research and development.

The focus of the paper is, therefore, to examine the relationship between FDI and economic growth in sample 40 Asian countries for the period 1970-2010. The direction of causality between these two variables is examined by utilizing a cointegration and error correction modeling framework. The paper is organized in four sections. Section 2 reviews the relevant literature. Section 3 discusses the methodology, data and empirical results of the study. Section 4 concludes.

2. Literature Review

FDI can play an important role in economic growth in developing countries by generating more benefits to the host economies rather than filling the short-term capital deficiency problems. FDI can transfer technologies and its spillovers affect domestic firms, which may make them more competitive and of a higher standard to that necessary to compete with foreign firms and products. FDI can also bring positive externalities to the economy such as teaching and labour management opportunities from MNCs. These may then be made generally available in the economy, and lead to an increase in the standards of production. Modern economic growth theories demonstrate that FDI plays an important role in transferring technological progress and in making new ideas for determining economic growth rate (Grossman and Helpman 1994; Barro and Sala-I-Martin 1995). FDI is also seen as the most important channel in which advanced technologies can be transferred to developing economies (Findlay 1978; Blomstrom 1991). On the other hand, empirical literature on the growth effects of FDI provides mixed evidence. Generally, FDI can promote economic growth in any ways (Herzer et al. 2008). Some investigators believe that the impacts of FDI on economic growth are expected to be twofold (De Mello 1999; Kim and Seo 2003). First, FDI can affect economic growth through capital accumulation by introducing new goods and foreign technology. This view comes from exogenous growth theory view. Then, FDI can enhance economic growth through augmenting a stock of knowledge in the host country by technology transfer. This view comes from the viewpoint of endogenous growth theory. Therefore, FDI, theoretically, can play a crucial role in economic growth through raising capital accumulation and technological spillovers or progress (Herzer et al. 2008). Chakraborty and Basu (2002) showed the two-way relationship between annual FDI inflows and economic growth for India, applying a structural cointegration model with vector error correction mechanism. They found that FDI was positively affected by GDP and negatively affected by the share of import duty in total tax revenue, though they could not find a reverse causality, as FDI did not affect GDP. Furthermore, they found the technology transfer brought in by FDI to be labour displacing, creating excess labour supply and reducing unit labour costs.

Employment creation and the effect on wages are other important effects analyzed in most theoretical models. Since FDI is investment leading to local production and thus employment, it is generally seen as having a positive effect on employment, training and wages. According to the Neoclassical Trade Theory, FDI increases welfare through a larger capital stock and increased employment (MacDougall, 1960). Mundell (1957) showed that factor mobility created by international factor price differentials substituted for goods trade and led to factor price equalization on the goods and factor markets, with relative prices equal to the value in free trade equilibrium. Streeten (1969) showed that foreign investment also led to the creation of direct and indirect employment, the training of workers, the creation of new skills, and the provision of management, the training of local managers and an increase in domestic wages. Ullah et al (2009) investigated
Exported-growth by time series econometric techniques over the period of 1970 to 2008 for Pakistan. In their paper, the results reveal that export expansion leads to economic growth. They also checked whether there is uni-directional or bidirectional causality between economic growth, real exports, real imports, real gross fixed capital formation and real per capita income. The traditional Granger causality test suggests that there is uni-directional causality between economic growth, exports and imports. On the other hand Granger causality through vector error correction was checked with the help of F-value of the model and t-value of the error correction term, which partially reconciles the traditional Granger causality test. Pradhan (2009) studied relationship between foreign direct investment (FDI) and economic growth in the five ASEAN countries namely, namely Indonesia, Malaysia, Philippines, Singapore and Thailand over the period 1970-2007. The empirical analysis is based on cointegration and causality test, both at the individual level and panel level. The results confirm that foreign direct investment and economic growth are cointegrated at the panel level, indicating the presence of long run equilibrium relationship between them.

3. Data and Empirical Results

We apply a two variable model to examine the causal relationship between FDI and GDP. Data used in the analysis are annual time series during the period 1970-2010 on (logarithm of) real Foreign Direct Investment (FDI) and real GDP (GDP) in constant 2005 prices in local currency units for 40 Asian countries. The data are obtained from Asian Development Bank (ADB) and World Development Indicators (WDI) 2010, published by the World Bank. The choice of the starting period was constrained by the availability of data. The countries considered in this study are Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyz Republic, Pakistan, Tajikistan, Turkmenistan, Uzbekistan, China People's Rep. of, Hong Kong; China, Korea Rep. of, Mongolia, Bangladesh, Bhutan, India, Maldives, Nepal, Sri Lanka, Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Philippines, Singapore, Thailand, Viet Nam, Fiji Islands, Kiribati, Marshall Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Vanuatu, Australia, Japan, New Zealand.

To test the nature of association between the variables while avoiding any spurious correlation, the empirical investigation in this paper follows the three steps (Rezazadeh Karsalari et al, 2012): We begin by testing for non-stationarity in the variables of FDI and GDP. Prompted by the existence of unit roots in the time series, we test for long run cointegrating relation between variables at the second step of estimation using the panel cointegration technique developed by Pedroni (1995, 1999). Granted the long run relationship, we explore the causal link between the variables by testing for granger causality at the final step.

3.1. Panel unit roots results

The panel data technique referred above has appealed to the researchers because of its weak restrictions. It captures country specific effects and allows for heterogeneity in the direction and magnitude of the parameters across the panel. In addition, it provides a great degree of flexibility in model selection. Following the methodology used in earlier works in the literature we test for trend stationarity of the variables of FDI and GDP. With a null of non-stationary, the test is a residual based test that explores the performance of four different statistics. Together, these four statistics reflect a combination of the tests used by Levin-Lin (1993) and Im, Pesaran and Shin (1997). While the first two statistics are non-parametric rho-statistics, the last two are parametric ADF t-statistics. Sets of these four statistics have been reported in Table 1.

The first three rows report the panel unit root statistics for FDI and GDP at the levels. As we can see in the table, we cannot reject the unit-root hypothesis when the variables are taken in levels and thus any causal inferences from the series in levels are invalid. The last three rows report the panel unit root statistics for first differences of FDI and GDP. The large negative values for the statistics indicate rejection of the null of non-stationary at 1% level for all variables. It may, therefore be concluded that the variables of FDI and GDP are unit root variables of order one, or, I(1) for short.
3.2. Panel cointegration results

At the second step of our estimation, we look for a long run relationship among FDI and GDP using the panel cointegration technique developed by Pedroni (1995, 1999). This technique is a significant improvement over conventional cointegration tests applied on a single country series. While pooling data to determine the common long run relationship, it allows the cointegrating vectors to vary across the members of the panel. The cointegration relationship we estimated is specified as follows:

\[ FDI_{it} = \alpha_i + \delta_t + \beta_i GDP_{it} + \epsilon_{it} \] (1)

Where \( \alpha_i \) refers to country effects and \( \delta_t \) refers to trend effects. \( \epsilon_{it} \) is the estimated residual indicating deviations from the long run relationship. With a null of no cointegration, the panel cointegration test is essentially a test of unit roots in the estimated residuals of the panel. Pedroni (1999) refers to seven different statistics for this test. Of these seven statistics, the first four are known as panel cointegration statistics; the last three are group mean panel cointegration statistics. In the presence of a cointegrating relation, the residuals are expected to be stationary. These tests reject the null of no cointegration when they have large negative values except for the panel-v test which reject the null of cointegration when it has a large positive value. All of these seven statistics under different model specifications are reported in Table 2. The statistics for all different model specifications suggest rejection of the null of no cointegration for all tests except the panel and group \( R^- \) tests. However, according to Perdroni (2004), \( R^- \) and PP tests tend to under-reject the null in the case of small samples. We, therefore, concluded that the variables FDI and GDP are cointegrated in the long run.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI</td>
<td>0.38</td>
<td>-0.61</td>
<td>-0.80</td>
<td>-1.10</td>
</tr>
<tr>
<td>GDP</td>
<td>-1.81</td>
<td>-1.61</td>
<td>-1.77</td>
<td>-0.89</td>
</tr>
<tr>
<td>ΔFDI</td>
<td>-11.54***</td>
<td>-8.91***</td>
<td>-8.90***</td>
<td>-16.91***</td>
</tr>
<tr>
<td>ΔGDP</td>
<td>-11.01***</td>
<td>-9.29***</td>
<td>-8.23***</td>
<td>-15.51***</td>
</tr>
</tbody>
</table>

***Significant at 1%

3.3. Panel causality results

Cointegration implies that causality exists between the series but it does not indicate the direction of the causal relationship. With an affirmation of a long run relationship among FDI and GDP, we test for Granger causality in the long run relationship at the third and final step of estimation. Granger causality itself is a two-step procedure. The first step relates to the estimation of the residual from the long run relationship. Incorporating the residual as a right hand side
variable, the short run error correction model is estimated at the second step. Defining the error term from equation (1) to be $ECT_{it}$, the dynamic error correction model of our interest is specified as follows:

$$
\Delta GDP_{it} = \alpha_{yi} + \beta_{yi}ECT_{it} t-1 + \gamma_{y1i}\Delta FDI_{it} t-1 + 
\gamma_{y1i}\Delta FDI_{it} t-2 + \delta_{y1i}\Delta GDP_{it} t-1 + \epsilon_{yit}
$$

(2)

$$
\Delta FDI_{it} = \alpha_{hi} + \beta_{hi}ECT_{it} t-1 + \gamma_{yi2i}\Delta FDI_{it} t-1 + 
\gamma_{yi2i}\Delta FDI_{it} t-2 + \delta_{h1i}\Delta GDP_{it} t-1 + \delta_{h2i}\Delta GDP_{it} t-1
+\epsilon_{hit}
$$

(3)

Where $\Delta$ is a difference operator; $ECT$ is the lagged error-correction term derived from the long-run cointegrating relationship; the $\beta_{yi}$ and $\beta_{hi}$ are adjustment coefficients and the $\epsilon_{yit}$ and $\epsilon_{hit}$ are disturbance terms assumed to be uncorrelated with mean zero.

Sources of causation can be identified by testing for significance of the coefficients on the lagged variables in Eqs (2) and (3). First, by testing $H_0: \gamma_{yi} = \gamma_{yi2i} = 0$ for all $i$ in Eq. (2) or $H_0: \delta_{hi} = \delta_{h2i} = 0$ for all $i$ in Eq. (3), we evaluate Granger weak causality. Masih and Masih (1996) and Asafu-Adjaye (2000) interpreted the weak Granger causality as ‘short run’ causality in the sense that the dependent variable responds only to short-term shocks to the stochastic environment.

Another possible source of causation is the ECT in Eqs. (2) and (3). In other words, through the ECT, an error correction model offers an alternative test of causality (or weak exogeneity of the dependent variable). The coefficients on the ECTs represent how fast deviations from the long run equilibrium are eliminated following changes in each variable. If, for example, $\beta_{yi}$ is zero, then GDP does not respond to a deviation from the long run equilibrium in the previous period. Indeed $\beta_{yi} = 0$ or $\beta_{hi} = 0$ for all $i$ is equivalent to both the Granger non-causality in the long run and the weak exogeneity (Hatanaka, 1996).

It is also desirable to check whether the two sources of causation are jointly significant, in order to test Granger causality. This can be done by testing the joint hypotheses $H_0: \beta_{yi} = 0$ and $\gamma_{yi} = \gamma_{yi2i} = 0$ for all $i$ in Eq. (2) or $H_0: \beta_{hi} = 0$ and $\delta_{hi} = \delta_{h2i} = 0$ for all $i$ in Eq. (3). This is referred to as a strong Granger causality test. The joint test indicates which variable(s) bear the burden of short run adjustment to re-establish long run equilibrium, following a shock to the system (Asafu-Adjaye, 2000).

The results of the F test for both long run and short run causality are reported in Table 3. As is apparent from the Table, the coefficients of the ECT and GDP are significant in the FDI equation which indicates that long-run and short-run causality run from GDP to FDI. So, GDP is strongly Granger-causes FDI.

Moreover, the interaction terms in the FDI equation are significant at 1% level. These results imply that, there is Granger causality running from GDP to FDI in the long-run and short-run. Moreover, FDI have strong effects on GDP in both the short- and long-run. In other words, we find bidirectional causality between GDP and FDI in these countries, so that whenever a shock occurs in the system, both FDI and GDP would make short-run adjustments to restore long-run equilibrium.

<table>
<thead>
<tr>
<th>Table 3: Result of Panel Causality Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
</tr>
<tr>
<td>----------------------------------------</td>
</tr>
<tr>
<td><strong>Source of causation (independent variable)</strong></td>
</tr>
<tr>
<td><strong>Short-run</strong></td>
</tr>
<tr>
<td><strong>Long-run</strong></td>
</tr>
<tr>
<td><strong>Joint (short-run/long-run)</strong></td>
</tr>
<tr>
<td><strong>$\Delta GDP$</strong></td>
</tr>
<tr>
<td><strong>$\Delta FDI$</strong></td>
</tr>
<tr>
<td><strong>$\Delta GDP$, $ECT(-1)$</strong></td>
</tr>
<tr>
<td><strong>$\Delta FDI$, $ECT(-1)$</strong></td>
</tr>
<tr>
<td><strong>$\Delta GDP$</strong></td>
</tr>
<tr>
<td><strong>$\Delta FDI$</strong></td>
</tr>
<tr>
<td><strong>$\Delta GDP$, $ECT(-1)$</strong></td>
</tr>
<tr>
<td><strong>$\Delta FDI$, $ECT(-1)$</strong></td>
</tr>
<tr>
<td><strong>$F=7.81^{</strong>*}$**</td>
</tr>
<tr>
<td><strong>$F=5.21^{</strong>}$**</td>
</tr>
<tr>
<td><strong>$F=7.31^{</strong>*}$**</td>
</tr>
<tr>
<td><strong>$F=5.10^{</strong>}$**</td>
</tr>
<tr>
<td><strong>$F=8.51^{</strong>*}$**</td>
</tr>
<tr>
<td><strong>$F=7.91^{</strong>*}$**</td>
</tr>
</tbody>
</table>

***Significant at 1%

**Significant at 5%
4. Conclusion

The objective of this study is to examine Granger causality between FDI and income for 40 Asian countries over the period 1970-2010. The panel integration and cointegration techniques are employed to investigate the relationship between the variables: FDI and GDP. The empirical results indicate that we cannot find enough evidence against the null hypothesis of unit root. However, for the first difference of the variables, we rejected the null hypothesis of unit root. It means that the variables are I(1). The results show that there is a long-run relationship between FDI and GDP. Utilizing Granger Causality within the framework of a panel cointegration model, the results suggest that there is strong causality running from GDP to FDI with strong feedback effects from FDI to GDP in the Asian countries. So, the policy makers should make environment attractive to FDI by decreasing the cost of doing business and developing the infrastructures like power, roads, education and so on. Providing the higher political stability in the countries and increasing the war on corruption are some other recommendations.

Acknowledgements

The authors would like to acknowledge the financial support of university of Tehran for this research under the grant number 4401012/1/21.

References

Journals:


Books: