

## Export and FDI in Asian Countries: Panel Causality Analysis

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### Abstract

*The FDI of Multinational Companies (MNCs) can be export-oriented or market-oriented, intended to capture the international or local markets respectively. Since the MNCs have better export performance than local firms, in case of export-oriented FDI, this would lead local firms to mimic foreign firms in the same way. On the other hand, the reverse causality running from exports to FDI can also exist. It is argued that FDI is attracted to countries with a higher trade potential both in terms of imports and exports. This paper investigates the causal relationship between Foreign Direct Investment (FDI) and exports in 40 Asian countries by using panel unit root tests and panel cointegration analysis for the period 1970-2010. The results show a strong causality from exports to FDI in these countries. Moreover, FDI does have significant effects on export in short- and long-run. So, the findings imply bidirectional causality between foreign direct investment and export in these countries.*

**Keywords:** Panel Unit Root, Panel Cointegration, Granger Causality, Foreign Direct Investment (FDI), MENA region countries

**JEL classifications:** F39, O40

### 1. Introduction

FDI plays a vital role in promoting export and economic growth of an economy. It is argued that FDI promotes exports of the host countries by increasing the productivity and productive capacity of the host country by increasing capital stock, transfer of technology, managerial skills and upgrading the skills of the local workforce through training. Further, FDI also increases the opportunity for the host countries to export by facilitating access to the new and large foreign markets and plays an important role as a major economic engine of globalization. For many developing countries, FDI is a vital item in their strategy for economic development. FDI helps ease the transfer of technological and business know-how that are needed for growth in these countries. Moreover, FDI increases Career Opportunities, improves labor productivity, and provides developing countries access to foreign capital. To obtain the aforementioned FDI benefits, many developing countries implemented policies and strategies aimed at promoting and attracting FDI while other countries abolished trade and investment costs, improved human capital and infrastructure facilities (Romer 1993). The inflow of FDI increased rapidly during the late 1980s and the 1990s in almost every region of the world revitalizing the long and contentious debate about the costs and benefits of FDI

inflows. On one hand many would argue that, given appropriate policies and a basic level of development, FDI can play a key role in the process of creating a better economic environment.

The theory of FDI seeks to explain the existence and growth of foreign investments. It also aims to identify the determinants of FDI flows and the impacts of such flows on the host and home country economies, as well as on world welfare. It is widely believed that FDI in host countries has a very vital role in boosting the economic growth through the employment impact, technology spillover, etc., especially in the case of developing countries. Compared to indirect investment, foreign direct investment has the potential of being a much better tool that offers sustainable economic development.

During the last decade a number of interesting studies of the role of foreign direct investment in stimulating economic growth has appeared. There are two main channels through which FDI may be growth enhancing. First, FDI can encourage the adoption of new technology in the production process through capital spillovers. Second, FDI may stimulate knowledge transfers, both in terms of labour training and skill acquisition and by introducing alternative management practices and better organizational arrangements (De Mello 1997). The developing countries having shortage of capital for their development process; the marginal productivity of capital is higher for these countries. Recently, FDI has gained renewed importance as a vehicle for transferring resources and technologies across the national border. With recognition of technological progress as the major source of economic growth, especially in the endogenous growth literature, the role of FDI has again come on the forefront. It is argued that foreign investment not only provides an initial capital inflow, which assists in the balance of payment of the host country, it is also an important mean of obtaining capital, technology, skilled management, improved marketing know-how and outlets for non-traditional exports. However, the role of FDI in promoting export is a controversial topic and basically depends upon the motive for such investment.

The focus of the paper is, therefore, to examine the relationship between FDI and exports 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

The recently literature on FDI believes that FDI's positive effect on growth depends on local conditions and absorptive capacities. Essential among these capacities is financial development. These results argued that countries should reform their domestic financial system before working on attracting FDI. Extensive literature on the determinants of FDI in developing countries clearly indicates the importance of infrastructure, skills, macroeconomic stability and sound institutions for attracting FDI flows. There is an extensive belief among policy makers that FDI generates positive productivity impacts for host countries. The main mechanisms for these externalities are the adoption of foreign technology and skill, which can happen via licensing agreements, imitation, employee training, and the introduction of new processes, and products by foreign firms; and the creation of linkages between foreign and domestic firms. These benefits, together with the direct capital financing it provides, suggest that FDI can play an important role in modernizing a national economy and promoting economic development.

As mentioned by Chowdhury and Mavrotas (2005), a large number of empirical studies on the role of FDI in host countries suggest that FDI is an important source of capital,

complements domestic private investment, is usually associated with new job opportunities and enhancement of technology transfer and spillover, human capital enhancement, and boosts overall economic growth in host countries. Technology diffusion can take place through a variety of channels that involve the transmission of ideas and new technologies. Imports of high-technology products, adoption of foreign technology and acquisition of human capital through various means are certainly important conduits for the international diffusion of technology.

Besides these channels, foreign direct investment by multinational corporations (MNCs) is considered to be a major channel for the access to advanced technologies by developing countries. MNCs are among the most technologically advanced firms, accounting for a substantial part of the world's research and development investment.

Findlay (1978) postulates that foreign direct investment increases the rate of technical progress in the host country through a 'contagion' effect from the more advanced technology, management practices, etc. used by the foreign firms. Wang (1990) incorporates this idea into a model more in line with the neoclassical growth framework, by assuming that the increase in 'knowledge' applied to production is determined as a function of FDI. MacDougall (1960) showed in his neoclassical trade model that Host countries could benefit through production expansion and positive externalities related to technology diffusion. Das (1987) showed that MNEs always benefited from setting up subsidiaries through increased profits and outputs because of their monopoly power, while the effect on profits and output of Host firms was ambiguous, depending on demand and supply elasticity. Even when Host firms did not gain in terms of profits, they did gain in terms of efficiency. Overall, the Host country was assumed to benefit from MNE activity, as prices declined due to improved technology and efficiency. Hossain and Hossain (2012) examined co-integration and the causal relationship between Foreign Direct Investment (FDI) and GDP in the both short and long run of Bangladesh, Pakistan and India over the period of 1972-2008. The results suggest that there is no co-integration between FDI and GDP in the both long and short run in Bangladesh and India. However, we find the co-integration between them in the both short and long run in Pakistan. Conversely, Granger Causality results suggest that there is no causality relationship between GDP and FDI for Bangladesh and one way or unidirectional relationship found for Pakistan and India, which means FDI caused economic output in Pakistan.

### 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 export (EXPORT) 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: We begin by testing for non-stationarity in the variables of FDI and EXPORT. 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 EXPORT. 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 EXPORT 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 rows report the panel unit root statistics for first differences of FDI and EXPORT. 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 EXPORT are unit root variables of order one, or, I (1) for short.

**Table 1: Test of Unit Roots for FDI and EXPORT**

Variables	Levin-Lin Rho-stat	Levin-Lin t-Rho-stat	Levin-Lin ADF stat	IPS ADF stat
FDI	0.38	-0.61	-0.80	-1.10
EXPORT	-0.89	-1.12	-0.84	-1.32
$\Delta$ FDI	-11.54***	-8.91***	-8.90***	-16.91***
$\Delta$ EXPORT	-12.51***	-7.98***	-9.76***	-12.09***

\*\*\*significant at 1%

### 3.2. Panel Cointegration Results

At the second step of our estimation, we look for a long run relationship among FDI and EXPORT 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 estimate is specified as follows:

$$EXPORT_{it} = \alpha_i + \delta_t + \beta_i FDI_{it} + \varepsilon_{it} \quad (1)$$

Where  $\alpha_i$  refers to country effects and  $\delta_t$  refers to trend effects.  $\varepsilon_{it}$  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  $\rho$ -tests. However, according to Perdroni (2004),  $\rho$  and PP tests tend to under-reject the null in the case of small samples. We, therefore, conclude that the variables FDI and EXPORT are cointegrated in the long run.

**Table 2: Results of Panel Cointegration test**

Statistics	
Panel v-stat	9.95***
Panel Rho-stat	-1.01
Panel PP-stat	-7.90***
Panel ADF-stat	-5.36**
Group Rho-stat	-0.72
Group PP-stat	-7.46***
Group ADF-stat	-8.02***

\*\*\*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 EXPORT, 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:

$$\Delta EXPORT_{it} = \alpha_{yi} + \beta_{yi} ECT_{i,t-1} + \gamma_{y1i} \Delta FDI_{i,t-1} + \gamma_{y2i} \Delta FDI_{i,t-2} + \delta_{y1i} \Delta EXPORT_{i,t-1} + \delta_{y2i} \Delta EXPORT_{i,t-2} + \varepsilon_{yit} \quad (2)$$

$$\Delta FDI_{it} = \alpha_{hi} + \beta_{hi} ECT_{i,t-1} + \gamma_{h1i} \Delta FDI_{i,t-1} + \gamma_{h2i} \Delta FDI_{i,t-2} + \delta_{h1i} \Delta EXPORT_{i,t-1} + \delta_{h2i} \Delta EXPORT_{i,t-2} + \varepsilon_{hit} \quad (3)$$

Where  $\Delta$  is a difference operator; ECT is the lagged error-correction term derived from the long-run cointegrating relationship; the  $\beta_y$  and  $\beta_h$  are adjustment coefficients and the  $\varepsilon_{yit}$  and  $\varepsilon_{hit}$  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  $H_0 : \gamma_{y1i} = \gamma_{y2i} = 0$  for all  $i$  in Eq. (2) or  $H_0 : \delta_{h1i} = \delta_{h2i} = 0$  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 EXPORT 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  $\gamma_{y1i} = \gamma_{y2i} = 0$  for all  $i$  in Eq. (2) or  $H_0 : \beta_{hi} = 0$  and  $\delta_{h1i} = \delta_{h2i} = 0$  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 EXPORT are significant in the FDI equation which indicates that long-run and short-run causality run from EXPORT to FDI. So, EXPORT strongly Granger-causes FDI. The interaction terms in the FDI equation are significant at 1% level. These results imply that, there is Granger causality running from EXPORT to FDI in the long-run and short run. Moreover, FDI have strong effects on EXPORT in both the short- and long-run. In other words, we find bidirectional causality between EXPORT and FDI in these countries, so that whenever a shock occurs in the system, both FDI and EXPORT would make short-run adjustments to restore long-run equilibrium.

**Table 3: Result of Panel Causality Tests**

Dependent Variable	Source of causation(independent variable)				
	Short-run		Long-run	Joint (short-run/long-run)	
	$\Delta$ GDP	$\Delta$ FDI	ECT(-1)	$\Delta$ GDP, ECT(-1)	$\Delta$ FDI, ECT(-1)
$\Delta$ GDP	-	F=6.43***	F=6.63**	-	F=8.76***
$\Delta$ FDI	F=6.86***	-	F=7.97***	F=8.94***	-

\*\*\*significant at 1%

### 3. Conclusion

The objective of this study is to examine Granger causality between FDI and exports 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 exports. 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 export. Utilizing Granger Causality within the framework of a panel cointegration model, the results suggest that there is strong causality running from export to FDI with strong feedback effects from FDI to export 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.

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