Economic Growth and FDI in Asia: A Panel-Data Approach

Aviral Kumar Tiwari[1]
Research scholar and Faculty of Applied Economics,
Faculty of Management, ICFAI University, Tripura,
Kamalghat, Sadar, West Tripura, 799210, Room No. 405,
India
(Email: aviral.eco@gmail.com)

and

Mihai Mutascu[2]
LEO (Laboratoire d'Economie d'Orléans) UMR6221,
Faculté de Droit d'Economie et de Gestion, University of Orléans,
Rue de Blois – B.P. 6739, 45067, Orléans,
France
(Email: mihai.mutascu@gmail.com)

Abstract: This study examines the impact of foreign direct investment on economic growth in Asian countries. We did our analysis in the panel framework for the period 1986 to 2008. We also examined the nonlinearities associated with foreign direct investment and exports in the economic growth process of Asian countries under consideration. We find that both foreign direct investment and exports enhance the growth process. In addition, labour and capital also play an important role in the growth of Asian countries. We suggest an export-led growth path particularly at the initial stage of growth and in the later period, dependence on FDI might be a feasible option.

I. INTRODUCTION

Economists, researchers and policy analysts have given considerable attention to the relationship between economic growth and foreign direct investment (FDI), especially in developing countries. It is a widely accepted argument that openness of an economy boosts economic

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[2] Corresponding author: (mihai.mutascu@gmail.com)

growth irrespective of whether an economy is developed or developing. The two dimensions of openness are free trade in goods and services, and free international capital flow, with the former further divided into exports and imports. While earlier studies have investigated export-led growth and/or import-led growth and/or capital-led growth, the present study employs a panel-data model for the period 1986-2008 for 23 developing Asian countries, in order to analyze FDI-Growth and Export-Growth nexus. The study also examines the impact of nonlinearities associated with the relationship between FDI and growth, and exports and growth. The results show that export-led growth policies are more effective for growth enhancement of developing Asian countries than FDI-led growth.

Whereas exports stimulate economic growth primarily from the demand side, they also produce efficiency gains on the supply side by way of global competition. Further, the argument to assess FDI-led growth is in line with Anwara and Nguyen (2010) who identified a number of determinants of the linkage between FDI and economic growth. In addition to that, as liberalization has different components and almost every country of the world is striving to liberalize the home economy in order to realize the gains from it, it is particulary useful to know which way of liberalization is more beneficial for the economies in terms of growth enhancement. This is because liberalization brings different kinds of social problems. For a detailed review of literature and discussion see, for example, Tiwari (2010a, 2010b) and Tiwari and Aruna (2011). In this regard, we have focused only on exports and FDI in order to analyze the "FDI – growth and export-growth" nexus in 23 developing Asian countries, using a panel-data model during the period 1986 to 2008. Further, we also attempt to examine the impact of nonlinearities associated with the relationship between FDI and growth and exports and growth. Interestingly, the study reveals that export-led growth is a better option for the growth enhancement of developing Asian countries than FDI-led growth.

Schutz (2001) defined growth as the sustained rise in quantity and/or quality of the goods and services produced in an economy. Since the 1950s, economic-growth theory has evolved rapidly as two distinct generations of models. The first generation of growth models (exogenous-growth models), inspired by the neoclassical model, with exogenous sources of long-term growth, dominated the literature until late 1960s when focus shifted to inflation and unemployment as growth determinants. The second generation of growth models (the new growth models or endogenous-growth models) advanced with the theory of Romer (1986). These models focus on economic growth rate as a result of rational and optimal agent's behaviour, and the structural characteristics of the economy and macroeconomic policy. Recently, the models developed by Lucas (1988) and Barro (1990) show that technology plays a fundamental role in the process of economic growth. Moreover, these models incorporate a new concept regarding human capital, skills and knowledge. Endogenous-growth models were recently combined with studies on the diffusion of technology in an attempt to emphasize the role played by FDI in the economy (Bashir 1999). An extensive definition of FDI is provided in 1996 by the Organisation for Economic Co-operation and Development (OECD) which states that the FDI reflects the objective of obtaining a lasting interest by a resident entity in one economy (direct investor) other than that of the investor (direct-investment enterprise). This emphasizes the role FDI plays in the development of the economy by acting as another factor input of production (Shahbaz and Rehman 2010).

The rest of the paper is organized as follows: Section II contains the literature review. Section III presents methodology, variables' description and data. Section IV shows estimation and empirical results. Section V concludes.

II. LITERATURE

Kaldor (1963) documented mechanisms that explain economic growth. Examples of these mechanisms are the growth in per-capita output and per-capita physical capital over time, constant ratio of physical capital to output over time, the constant rate of return to capital, constant share of labour and physical capital in national income, and the substantial difference in the growth rate of output per worker across countries. Similarly, Anwara and Nguyen (2010) identify several determinants of the link between FDI and economic growth. Some of these determinants are, for example, human capital, learning by doing, exports, macroeconomic stability, and level of financial development, public investment. These are in addition to those that Shahbaz and Rehman (2010) identified as determinants of economic growth, including foreign direct investment. They also reported that foreign direct investment, financial development, public investment, human capital, trade openness and inflation have positive effects on economic growth. Neuhause (2006), based on these determinants, shows that there are three main channels through which FDI can influence the technological change, improve the capital stocks and generate economic growth: (a) direct transmission (through "Greenfield Investments"), (b) indirect transmission (through "Ownership Participation"), and (c) second-round transmission (through "Technology Spillover").

Recently, the number and quality of the analyses regarding the relationship between the economic growth and FDI are prolific. In research focusing on China, Dees (1998) finds that the FDI affects Chinese growth through the diffusion of ideas. FDI presents a significant positive effect on Chinese long-term growth through its influence on technical change (this is significant only in the 1990s).

The same potential positive effect of FDI on growth, in China's case, was illustrated by Berthélemy and Démurger (2000). In a Generalized Method of Moments (GMM) approach, the authors provide new evidence on the role of human capital in Chinese provincial growth, and stress that human capital may contribute to growth by facilitating the adoption of foreign technologies. Moreover, the study shows that the direct impact of export growth disappears when both exports and foreign investment are introduced in the growth regression.

Using co-integration and an error-correction model to examine the link between FDI and economic growth in India, Chakraborty and Basu (2002) suggest that GDP in India is not caused by FDI, and the causality runs more from GDP to FDI. In the same context, Alfaro (2003) has made a sectoral panel OLS analysis, using cross-country data for the 1981-1999 period. The main results allow us to conclude that FDI in the primary sector tends to have a negative effect on growth, while investment in manufacturing has a positive one.

In Thailand's case, using data from 1970 to 1999, and the vector error correction approach, Kohpaiboon (2003) has introduced the export variable in the growth-FDI equation. He finds a unidirectional causality from FDI to GDP and shows that the impact of growth on FDI tends to be greater under an export-promotion (EP) trade regime compared to an import-substitution

(IS) regime. Balamurali and Bogahawatte (2004) also found the same results for Sri-Lanka. They emphasize that trade policy reforms (promotion of FDI and domestic investment) and restoring international competitiveness to expand and diversify the country's exports, have the potential of accelerating economic growth in the future.

In a vector autoregressive model, using seasonally adjusted quarterly data of Mexico, Brazil, and Argentina, from late 1970 to 2000, Cuadros *et al*. (2004) illustrate the same unidirectional causalities from real FDI and real exports to real GDP in Mexico and Argentina, and unidirectional causality from real GDP to real exports in Brazil. Cho (2005) has applied the panel-data causality for nine East and Southeast Asian economies (plus Indonesia), from 1970 to 2001. The results stress a strong unidirectional causality from FDI to exports among the three variables.

Hsiao and Hsiao (2006) set up a panel vector autoregressive model in the case of China, Korea, Taiwan, Hong Kong, Singapore, Malaysia, Philippines, and Thailand. Their results reveal that FDI has unidirectional effects on GDP directly and also indirectly through exports, and there exists bidirectional causality between exports and GDP for the group. Baharumshah and Thanoon (2006), by using dynamic-panel models, demonstrated the positive contribution of FDI on the growth process of East Asian economies. In other words, the countries that are successful in attracting FDI can finance more investments and grow faster than those that deter FDI.

Alfaro *et al*. (2006), using an extended dataset, found that the same amount of increase in FDI, regardless of the reason of the increase, generates three times more additional growth in financially well-developed countries than in financially poorly-developed countries. In the case of East European countries, similar results were found by Bhandari *et al*. (2007), based on a panel-GLS model. The conclusions are that an increase in the stock of domestic capital and inflow of FDI are main factors that positively affect economic growth.

Won *et al*. (2008) have analyzed the case of newly industrialized Asian economies by using panel-vector autoregressive models and show that the openness of the economy is, as manifested by exports and inward FDI, among others, the most important economic factor attributed to the rapid growth of these economies. Shahbaz *et al*. (2008) use Pakistani data after the SAP (structural adjustment program) to fix the main determinants of economic growth. The ARDL-bounds testing approach to cointegration was applied to investigate long- term relationships. The empirical evidence confirms the existence of cointegration i.e., long- term relationships exist between the variables. The impact of foreign direct investment, financial development, remittances and public investment is positive on economic growth, while trade openness and inflation slow the pace of economic growth. Moreover, in the case of Gulf Cooperation Council (GCC) countries,[3] the OLS panel approach of Faras and Ghali (2009) stress that, for most of the GCC countries, there is a weak but statistically significant causal impact of FDI inflows on economic growth.

Karimi and Yusop (2009), based on a simple OLS regression, studied Malaysia's "growth-FDI" link. According to them, there is a range of possible factors that ensures that FDI promotes or hinders economic growth. At the same time, these determinants are likely to differ between

[3] Gulf Cooperation Council is a political and economic alliance of six Middle Eastern countries: Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain, and Oman.

countries and between types of FDI and sectors of destination. The GMM estimation of Anwara and Nguyen (2010), who focused on the Vietnamese "growth-FDI" connection, showed the importance of the role of education and training. The results suggest that the impact of FDI on economic growth in Vietnam will be larger if more resources are invested in education and training, and financial market development, and also invested in reducing the technology gap between foreign and local firms.

Similar conclusions were reached by Jayachandran and Seilan (2010) in the case of India, concluding that FDI and exports are among the factors affecting economic growth. However, the reciprocal does not apply. The high or low economic growth rate does not have an effect on the presence of FDI and exports in India. Further, Wijeweera *et al*. (2010) argued that FDI inflows exert a positive impact on economic growth, however, only in the presence of highly skilled labour. Moreover, they found that corruption has a negative impact on economic growth, and trade openness increases economic growth by means of efficiency gains.

We observe that several studies have focused on the case of developing countries and for the major part, stress that FDI, adjusted to other determinants, has a significant positive effect on economic growth. However, none of these studies has analyzed the nonlinearities associated with FDI that affect the economic growth process of the host country. Therefore, we have moved ahead in this direction and have also provided the case of export-led growth or FDI led-growth.

III. DATA AND METHODOLOGY

The present study is intended to examine whether FDI has an impact on the economic growth of 23 Asian countries (see Appendix). However, we have also made an attempt to analyse the role of exports in the growth enhancement of these countries. The significance of this study lies in attempting to provide the answer of the question: is FDI-led growth better or is export-led growth better?

Further, we also examine the nonlinearity associated with the relationship between the FDI-growth and export-growth nexus. To achieve our objectives, we moved ahead in the production function framework. Suppose the factors of production and the production technology determine the level of output in an economy according to:

$$Y = f(K, L), \tag{1}$$

where Y denotes the output level (i.e., GDP per capita), K denotes the amount of capital (which is measured by Gross Capital Formation (GCF) as percentage of GDP), and L denotes the amount of labour (measured by labour force of the country). Assuming constant technology, any increase in the amount of labour and/or capital will increase the level of output in the economy. This production function is expanded according to the new growth theory by following Barro and Sala-i-Martin (1995).[4]

To this respect, Mankiw (2004) states that international trade affects economic growth and can indeed be regarded as a type of technology in that it converts non-specialized

[4] There are several channels for promoting economic growth such as encouraging domestic saving and investment, foreign investment, education, R&D and free trade.

production into specialized production. Hence, according to the new growth theory, export expansion improves economy-wide efficiency in the allocation of inputs, and leads to total factor productivity growth. From a demand-side point of view, an inward-oriented policy is not sustainable since domestic demand is limited and domestic resources may remain idle and hence, domestic economic growth cannot be enhanced.

Agosin (1999) and Boriss and Herzer (2006) illustrate that, in an outward-oriented country with free trade, exports are the engine of growth through the expansion of external demand, as a component of the aggregate demand function. On the supply-side, Grossman and Helpman (1991) demonstrate that exports can positively contribute to economic growth through different means, such as facilitating the exploitation of economies of scale, or promoting the diffusion of technical knowledge.

Therefore, production function can be expanded by adding exports (denoted by *X*) as an extra variable. Additionally, Ögütçü (2002) argues that FDI is a major catalyst for the development and the integration of developing countries in the global economy. According to Chen (1992), the positive developmental role of FDI, in general, is well documented. FDI produces a positive effect on economic growth in host countries.

One convincing argument for that is that FDI consists of a package of capital, technology management, and market access. FDI tends to be directed at those manufacturing sectors and key infrastructures that enjoy actual and potential comparative advantage. In those sectors with comparative advantage, FDI would create economies of scale and linkage effects, and raise productivity. For FDI, repayment is required only if investors make a profit and when they make profit, they tend to reinvest their profit rather than remit abroad. Another benefit of FDI is a confidence-building effect. While the local economic environment determines the overall degree of investment confidence in a country, inflows of FDI could reinforce the confidence, contributing to the creation of a robust cycle that affects not only local and foreign investment but also foreign trade and production.

Based on the results of Blömstrom *et al*. (2000), the experience of many countries suggests that a significant quantity of FDI alone is not sufficient to generate economic growth and bring economic prosperity to a host country.

Therefore, we have also added FDI in the production function to analyse its impact on economic growth. The augmented production function can be written as follows:

$$Y = f(K, L, FDI, X). \tag{2}$$

The most commonly used ways of assessing the relationship between economic growth and its determinants as mentioned in equation (2), is the static panel data models. In this study, based on the result of Dielman (1989), we have preferred the panel-data analysis technique as it has an advantage of containing the information necessary to deal with both the intertemporal dynamics and the individuality of the entities being investigated.

There are basically three types of panel-data models namely, a pooled Ordinary Least Squire (OLS) regression, panel model with random effects and panel model with fixed effects.[5]

[5] We accessed data of FDI from UNCTAD (www.unctad.org), GDP per capita from Historical Statistics of the World Economy: 1-2008, AD from Angus Maddison and other variables from World Bank Development Indicators data base of World Bank. Study period is 1986 to 2008.

Considering the extended production function of equation (2), the evaluation of a pooled OLS regression can be specified as follows:

$$Y_{it} = \beta_0 + \beta_1(K_{it}) + \beta_2(L_{it}) + \beta_3(FDI_{it}) + \beta_4(X_{it}) + \varepsilon_{it}\ , \tag{3}$$

where i denotes country, t denotes time and remainder ε_{it} is the error term which is assumed to be white noised and varies over both country and time. However, while using a pooled OLS regression, countries' unobservable individual effects are therefore not controlled. According to Bevan and Danbolt (2004), heterogeneity of the countries under consideration for analysis can influence measurements of the estimated parameters.

Further, using a panel-data model with incorporation of individual effects, has a number of benefits, for example, among others, it allows us to account for individual heterogeneity. Indeed, Serrasqueiro and Nunes (2008) and Tiwari and Kalita (2011) mentioned that developing countries differ in terms of their colonial history, their political regimes, their ideologies and religious affiliations, their geographical locations and climatic conditions, not to mention a wide range of other country-specific variables. And, if this heterogeneity is not taken into account, it will inevitably bias the results, no matter how large the sample is.

Therefore, by incorporating countries' unobservable individual effects in equation (3) the model to be estimated is as follows:

$$Y_{it} = \beta_0 + \beta_1(K_{it}) + \beta_2(L_{it}) + \beta_3(FDI_{it}) + \beta_4(X_{it}) + w_{it}\ , \tag{4}$$

where $w_{it} = \mu_i + E_{it}$ with μ_i being countries' unobservable individual effects. The difference between a polled OLS regression and a model considering unobservable individual effects, lies precisely in μ_i. When we consider the random-effect model, equation (4) will be same. However, in that case, μ_i is presumed have the property of zero mean, independent of individual observation error term ε_{it}, has constant variances σ_{ε}^2, and is independent of the explanatory variables.

However, there may be a correlation between countries' unobservable individual effects and growth determinants. If there is no correlation between countries' unobservable individual effects and growth determinants, the most appropriate way of carrying out the analysis is using a panel model of random effects. On the contrary, if there is a correlation between countries' individual effects and growth determinants, the most appropriate way of carrying out the analysis is to use a panel model of fixed effects.

To test for the possible existence of a correlation we use the Hausman test. This test tests the null hypothesis of non-existence of a correlation between unobservable individual effects and the growth determinants, against the alternative hypothesis of an existence of a correlation. If the null hypothesis is not rejected we can conclude that correlation is not relevant and therefore a panel model of random effects is the most correct way of carrying out the analysis of the relationship between economic growth and its determinants. On the contrary, if the null hypothesis is rejected, we can conclude that correlation is relevant and therefore a panel model of fixed effects is the most appropriate way to carry out the analysis of the relationship between economic growth and its determinants.

Further, unlike previous studies which have analyzed the impact of FDI and exports on

economic growth by using only the one-way error component model (i.e., either fixed effect or random effect is present in the model), we have analyzed the model in which two-way error components are present. Therefore, by expanding equation (4) to incorporate the two-way error component model, the equation becomes as follows:

$$Y_{it} = \beta_0 + \beta_1(K_{it}) + \beta_2(L_{it}) + \beta_3(FDI_{it}) + \beta_4(X_{it}) + \mu_{it}\,, \tag{5}$$

where $\mu_{it} = w_{it} + \lambda_t = \mu_i + \lambda_t + \varepsilon_{it}$, μ_i denotes the unobservable individual effect, λ_t denotes the unobservable time effect, and ε_{it} is the remainder stochastic disturbance term. Note that λ_t is individual-invariant and it accounts for any time-specific effect that is not included in the regression. For example, it could account for strike-year effects that disrupt production; oil-embargo effects that disrupt the supply of oil and affect its price; Surgeon General reports on the ill-effects of smoking; or government laws restricting smoking in public places, all of which could affect consumption behaviour. If μ_i and λ_t are assumed to be fixed parameters to be estimated, and the reminder disturbance is stochastic with ε_{it} $IID\,(0, \sigma_\varepsilon^2)$, then equation (4) represents a two-way fixed effect error component model.[6]

Similarly, nonlinearity of exports-growth relationship has also been incorporated in the model.

IV. ESTIMATION AND EMPIRICAL RESULTS

Results of panel data models have been presented in *Table 1*.

From *Table 1*, it is evident that the results of the Wald test and F-test are significant at a 1% level of significance in all panel-data models. Therefore, we can conclude that we cannot reject the null hypothesis that the explanatory variables do not explain (taken as a whole) GDP per capita and hence, the determinants selected in this study can be considered to be enough of an explanation of the economic growth determinant. Although this is true, in case of the Hausman test, we reject the null hypothesis of correlation between countries' unobservable individual effects and economic growth determinants.

This implies that for our analysis, a random-effect model is more appropriate. However, if we compare the sign and significance of coefficients associated with the respective variables, we find that results reported in models 1 and 2 are the same (except the constant term that is significant for the random-effect model, while insignificant for the fixed-effect model).

Both models, i.e. model 1 and model 2, show that FDI, exports and labour force have positive and significant impact on the economic growth of the panel countries. However, the coefficient of GFCF carries a negative sign but is highly insignificant. Further, when we examine nonlinearity of FDI by incorporating the square value of FDI and we perform the analysis based on random-effect and fixed-effect models, we find, from model 3 and 4, the same results in terms of sign and significance of the coefficients associated with variables in both cases (except the fixed-effect model labour force and constant term are significant, while in the random-effect model we do not find the same). However, the Hausman test in this

[6] In the case of a time-fixed effect model, λ_t is a time-varying intercept that captures all of the variables that affect the dependent variable and vary over time but are constant cross-sectionally, and the opposite holds in case of a time random-effect model.

Table 1: Regression Results of First Specification

Panel data Models: Dependent variable GDP per capita								
Independent variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 6	Model 7
	FE	RE	FE	RE	RE-CS: PR-FE	Two way RE	Two way RE And CSW	RE with AR(1)
FDI	80.00*** (17.1451)	77.47*** (17.1151)	72.16** (32.151)	68.99** (32.053)	-78.00** (32.1017)	69.9975** (32.52973)	69.99745** (31.24509)	19.66703 (15.61716)
D(FDI)	-------	-------	-99.14*** (22.1377)	-95.84*** (22.098)	-67.46** (20.5664)	-96.24*** (22.4216)	-96.24*** (23.689)	-24.304*** (7.981435)
FDI*FDI	-------	-------	3.224** (1.368299)	3.054** (1.36211)	6.78*** (1.2951)	3.05321** (1.382451)	3.053212* (1.641654)	0.7767105* (0.4305877)
D(FDI)*D(FDI)	----------	----------	-3.642*** (1.242249)	-3.389*** (1.23551)	-3.564*** (1.14377)	-3.4122*** (1.254283)	-3.412199** (1.367031)	-0.5623656 (.4014784)
X	77.50*** (5.2153)	81.19*** (5.011174)	72.33*** (5.469286)	78.31*** (5.1424)	46.72*** (5.5688)	77.556*** (5.265174)	77.556*** (5.553573)	30.17081*** (4.601944)
LF	1.11E-05*** (3.81e-06)	4.99E-06* (2.91E-06)	1.29E-05*** (3.93E-06)	3.91E-06 (2.67E-06)	-2.91E-06 (2.65E-06)	4.79E-06* (2.86E-06)	4.79E-06** (1.88E-06)	9.33e-07 (4.12e-06)
GCF	-14.67502 (11.305)	-11.18523 (11.22578)	-13.44261 (11.21285)	-7.883985 (11.091)	-27.019** (10.783)	-8.603529 (11.26808)	-8.603529 (11.02927)	30.3044*** (6.656886)
Constant	2319.127 (374.131)	2448.03*** (783.7958)	2408.4*** (385.7225)	2563.42 (672.788)	5156.41*** (408.3752)	2558.9*** (739.8539)	2558.9*** (701.871)	4381.65*** (857.6249)
Model summary								
R^2	0.939031	0.430405	0.946816	0.458357	0.573270	0.458075	0.458075	0.5024
Wald chi^2		395.96***						74.61***
F-test	297.37***	98.988***	292.21***	60.20***	22.89***	60.14***	60.14***	
Hausman test		10.165**		13.35**				
Fixed effect (F-test)	$F_{(22, 502)}$ = 141.00***		$F_{(22, 476)}$ = 141.74***					
Countries included	23	23	23	23	23	23	23	23
Total panel observations	529	529	529	529	529	529	529	529

Notes:

1. The Hausman test has $\chi 2$ distribution and tests the null hypothesis that unobservable individual effects are not correlated with the explanatory variables, against the null hypothesis of correlation between unobservable individual effects and the explanatory variables.
2. The Wald test has $\chi 2$ distribution and tests the null hypothesis of insignificance as a whole of the parameters of the explanatory variables, against the alternative hypothesis of significance as a whole of the parameters of the explanatory variables.
3. The F-test has normal distribution N(0,1) and tests the null hypothesis of insignificance as a whole of the estimated parameters, against the alternative hypothesis of significance as a whole of the estimated parameters.
4. ***, **, and *denote significance at 1, 5 and 10 % level of significance, respectively.
5. EF, CS, SD denotes fixed-effect, cross-section and standard deviation, respectively.
6. [----] denotes results are not computed.
7. @ denotes that model is estimated with Panel EGLS (Cross-section SUR) method.

Source: Author's calculation

case also suggests that the random-effect model is the preferred way of analysis. So, from the results of model 4, we can say that FDI and its higher inflow in the group of panel countries, contribute to higher growth.

In addition, we have analysed another model in which random effect is present but we have fixed period-specific effects, and results are reported under model 5. Model 5 reports that exports and high level of FDI will increase the growth, otherwise FDI decreases growth of the panel countries.

We also analyze the random-effect model by assuming the period-specific effect which is also random (we call it the two-way random-effect model) and we report the results under model 6. We find that in this case FDI, square of FDI, exports and labour force, are all found to have positive impact on the economic growth in the panel of countries. Further, by providing cross-section weights in the two-way random-effect model we find that results reported by model 5 are robust to the inclusion of cross-section weights.

In the final step, in model 7, we used a random-effect model with the presence of a first-order autoregressive scheme. The results of model 7 reveal that higher inflows of FDI, exports, and capital have positive and significant effect on the economic growth of our panel countries.

Further, we have proceeded to analyse the nonlinear impact of exports in the panel countries. Results of nonlinear impact analysis of exports are presented in *Table 2*.

In *Table 2*, the results of the Hausman test show that the random-effect model is an appropriate test for the analysis. The results of this model are reported under model 2. It is evident from model 2 that FDI, exports, squared exports and labour force have positive and significant impact on the economic growth of the panel countries. It also implies that when we analyse the nonlinearity in both cases i.e., exports and FDI, we find a significant and positive impact of exports only on the economic growth of panel countries. This also suggests the preference of the export-led growth hypothesis against the FDI-led growth hypothesis (a long debated topic) in our panel countries.[7]

Further, we have analyzed a model of random effect in which the period-specific effect is assumed fixed and results are reported under model 3. We find very surprising results from model 3. In this case, exports and FDI are significant with a negative coefficient, while the coefficients of the square of exports and FDI are significant with a positive sign. Further, if we compare the coefficient of exports and FDI, we find that the negative impact of FDI is much higher with respect to the negative impact of exports. Similarly, the positive impact of the square of FDI is also much higher vis-à-vis the positive impact of the square of exports.

In the final step, we have analysed a model of two-way random effect and results are reported under model 4. The two-way random-effect model confirms the findings of the one-way random-effect model, model 2; i.e., FDI, exports, squared exports and labour force have positive and significant impact on the economic growth of the panel countries.

[7] It is important to mention here that our findings are subject to the inability to isolate the effects of FDI and exports on GDP of Asian countries. As such, there is a possibility that FDI inflow might bring new and advanced technologies which might, in turn, generate the momentum of exports, and hence, enhance the growth process. However, we have been able to provide a feel for this kind of situation. Further, we offer a new area of research to advanced econometricians, to develop a model wherein the isolated impact of FDI, exports and imports, can be assessed in a general equilibrium framework. As in any economy, these variables are very interrelated, and to isolate their interaction calls for more advanced research.

Table 2: Regression Results of Nonlinearity in Exports

Panel data Models: Dependent variable GDP per capita				
Independent variables	Model 1	Model 2	Model 3	Model 4
	FE	RE	RE-CS: PR-FE	Two way RE
FDI	90.66116*** (32.13013)	84.65257*** (32.04871)	-64.73769** (30.15429)	86.23439*** (32.41097)
D(FDI)	-69.82115*** (23.49202)	-71.3812*** (23.47128)	-19.63233 (21.29783)	-71.22707*** (23.72556)
FDI*FDI	0.662905 (1.522143)	0.92136 (1.519276)	2.956818** (1.348565)	0.865526 (1.536169)
D(FDI)*D(FDI)	-1.697746 (1.361054)	-1.80206 (1.358522)	-0.294891 (1.219316)	-1.784594 (1.373612)
X	36.65306*** (10.28711)	48.8254*** (9.735619)	-18.52868* (10.06416)	46.82782*** (9.941920)
D(X)	-19.87041* (12.01144)	-22.5239* (11.98448)	4.93891 (11.26523)3	-22.09097* (12.11730)
X*X	0.22597*** (0.052021)	0.189938** (0.050768)	0.351105*** (0.04656)	0.195362*** (0.051541)
D(X)*D(X)	-0.462805 (0.80232)	-0.32252 (0.800911)	-0.16019 (0.716786)	-0.344878 (0.809725)
LF	1.63E-05*** (3.93E-06)	6.05E-06** (2.78E-06)	-2.04E-06 (2.68E-06)	7.57E-06** (3.01E-06)
GCF	-9.316265 (11.29417)	-5.27927 (11.22916)	-13.26655 (10.51317)	-6.049611 (11.36353)
C	2994.27*** (397.6006)	3102.64*** (729.7422)	6568.13*** (425.9144)	3097.551*** (828.3446)
Model summary				
R^2	0.949444	0.478494	0.622246	0.479487
F- test	277.59***	45.42***	25.187***	45.60***
Hausman test		17.65**		
Fixed effect (F-test)	$F_{(22, 473)}$ = 144.04***			
Cross-sections included	23	23	23	23
Total panel observations	529	529	529	529

Notes:

1. The Hausman test has $\chi 2$ distribution and tests the null hypothesis that unobservable individual effects are not correlated with the explanatory variables, against the null hypothesis of correlation between unobservable individual effects and the explanatory variables.
2. The Wald test has $\chi 2$ distribution and tests the null hypothesis of insignificance as a whole of the parameters of the explanatory variables, against the alternative hypothesis of significance as a whole of the parameters of the explanatory variables.
3. The F-test has normal distribution N(0,1) and tests the null hypothesis of insignificance as a whole of the estimated parameters, against the alternative hypothesis of significance as a whole of the estimated parameters.
4. ***, **, and *denote significance at 1, 5 and 10 % level of significance, respectively.
5. EF, CS, SD denotes fixed-effect, cross-section and standard deviation, respectively.

Source: Author's calculation

V. CONCLUSIONS

There has been a long debate among policy makers and economists at the national and international levels about whether FDI enhances growth in the host countries. Further, we also analysed whether dependence on export-led growth or FDI lead-growth is preferable and what is the evidence of nonlinearities associated with FDI and exports in economic growth.

In this study, we have attempted to answer these questions. We conducted an empirical analysis in the framework of a panel for 23 Asian countries by employing data from 1986 to 2008. We also incorporated a two-way effect model for the analysis, as the assumptions of fixed and random effects across countries and over time are extremely plausible. We also examined nonlinearities associated with exports and FDI in the economic growth of Asian countries. Further, as we have studied a large sample of Asian countries, we tried to minimise the country-specific heterogeneity by imposing two-way dummies, i.e., in case of two-way fixed- and random-effect models by using time-country dummies. We have also checked the robustness of our results by analysing different models. However, by imposing dummies of cultural aspects and religion we might have gotten more robust results, and an extended study in this area should incorporate these issues. There are studies which have found that cultural and religion aspects of a country have considerable impact on the economic growth on the respective countries (see, for example, Dieckmann 1996, Griffin 1999, Casson and Godley 2000, Marini 2004, Grier 1997, Blum and Dudley 2001 and Barro and McCleary 2003).

The results of our analysis show that FDI and exports enhance the growth of Asian countries and also that labour and capital help in that process. This implies that Asian countries that are moving ahead for globalization might choose to go ahead. However, when we analyzed the case of nonlinearity associated only with FDI, we find that this variable enhances growth. On the other hand, the investigation of the nonlinearity in both cases, i.e., exports and FDI, show a significant and positive impact of exports only on the economic growth of panel countries. This suggests that to achieve a higher and higher growth path, moving ahead with exports is more feasible in Asian countries. This is true, particularly for countries that do not have sufficient resources to bring more advanced technology to private homes. The more advanced technology would create an attractive environment for FDI, but would also require an extensive investment for large improvements in the country's infrastructure.

Further, there are studies that have found that FDI has a negative impact on economic growth and income distribution. Hence, we suggest an export-led growth path, particularly at the initial stage of growth, in the later period, dependence on FDI might be feasible option. This finding can be defended based on two arguments (see Afzal 2010). First, the exports-promotion incentives determine a specialization of the economy accompanied by the scale benefices. Second, the augmented exports may stimulate the country to import high-value inputs, products and technologies. By consequence, these elements may have a positive impact on the productive capacity of the economy.

REFERENCES

Agosin, M. (1999). Trade and Growth in Chile, *Cepal Review*. 68: 79-100.

Alfaro, L., A. Chanda, S. Kalemli-Ozcan, and S. Sayek (2006). How Does Foreign Direct Investment Promote Economic Growth? Exploring the Effects of Financial Markets on Linkages, Harvard Business School.

Alfaro, L. (2003). Foreign Direct Investment and Growth: Does the Sector Matter?, Harvard University, Harvard Business School.

Anwara, S. and L. Nguyen (2010). Foreign direct investment and economic growth in Vietnam, *Asia Pacific Business Review*. 16: 183–202.

Baharumshah, A. and M. Thanoon (2006). Foreign capital flows and economic growth in East Asian countries, *China Economic Review*. 17: 70-83.

Balamurali, N. and C. Bogahawatte (2004). Foreign Direct Investment and Economic Growth in Sri Lanka, *Sri Lankan Journal of Agricultural Economics*. 6: 37-50.

Barro, R. (1990). Government Spending in a Simple Model of Endogenous Growth, *Journal of Political Economy*. 98, 103-125.

Barro, R.J. and X. Sala-i-Martin (1995). *Economic Growth*. New York: McGraw-Hill.

Barro, R.J. and X. Sala-i-Martin (1995). Technological Diffusion, Convergence and Growth, NBER Working Paper Series, No. 5151.

Barro, R.J. and R.M. McCleary (2003). Religion and Economic Growth Across Countries. *American Sociological Review*. 68: 760-781.

Bashir, A.H. (1999). Foreign Direct Investment and Economic Growth in Some MENA Countries: Theory and Evidence, Prepared for the MEEA Annual Meeting in Conjunction with the ASSA, January 3-5, New York.

Berthélemy, J.C. and S. Démurger (2000). Foreign Direct Investment and Economic Growth: Theory and Application to China, *Review of Development Economics*. 4: 140-155.

Bevan, A. and J. Danbolt (2004). Testing for Inconsistencies in the Estimation of UK Capital Structure Determinants, *Applied Financial Economics*. 14: 55-66.

Bhandari, R., D. Dhakal, G. Pradhan, and K. Upadhyaya (2007). Foreign Aid, FDI and Economic Growth in East European Countries, *Economics Bulletin*. 6: 1-9.

Blömstrom, M., S. Globerman, and A. Kokko (2000). The Determinants of Host Country Spillovers form Foreign Direct Investment, CEPR Discussion Paper 2350, Washington D.C.

Boriss, S. and D. Herzer (2006). Export-Led Growth hypothesis: Evidence for Chile, *Applied Economics Letters*. 13: 319-324.

Blum, U. and L. Dudley (2001). Religion and Economic Growth: Was Weber Right? Centre Interuniversitaire de Recherche en Économie Quantitative (CIREQ), No. 05-2001.

Casson, M. and A. Godley (2000), *Cultural Factors in Economic Growth*. Series: Studies in Economic Ethics and Philosophy. Berlin and Heidelberg: Springer-Verlag.

Chakraborty, C. and P. Basu (2002). Foreign direct investment and growth in India: A cointegration approach, *Applied Economics*. 34: 1061–1073.

Chen, E.K.Y. (1992). Changing Pattern of Financial Flows in the Asia-Pacific Region and Policy Responses, *Asian Development Review*. 10:46-85.

Cho, K. (2005). Studies on Knowledge Spillovers, Trade, and Foreign Direct Investment – Theory and Empirics, Ph.D. thesis, Boulder, CO: Department of Economics, University of Colorado at Boulder.

Cuadros, A., V. Orts, and M. Alguacil (2004). Openness and Growth: Re-Examining Foreign Direct Investment, Trade and Output Linkages in Latin America, *The Journal of Development Studies*. 40: 167-192.

Dees, S. (1998). Foreign Direct Investment in China: Determinants and Effects, *Economics of Planning*. 31: 175-194.

Dieckmann, O. (1996). Cultural determinants of economic growth: Theory and evidence. *Journal of Cultural Economics*. 20: 297-320.

Dielman, T.E. (1989). *Pooled Cross-Sectional and Time Series Data Analysis*. New York: Marcel Dekker.
Faras, R. and K. Ghali (2009). Foreign Direct Investment and Economic Growth: The Case of the GCC Countries, *International Research Journal of Finance and Economics*, 29: 134-145.
Grier, R. (1997). The Effect of Religion on Economic Development: A Cross National Study of 63 Former Colonies, *Kyklos*. 50: 47-62.
Griffin, K. (1999). Culture and Economic Growth: A General Argument with Illustrations from the Islamic World, *Journal of Islamic Studies*. 10: 126-141.
Grossman, G.M. and E. Helpman (1991). *Innovation and growth in the global economy*. Cambridge: MIT Press.
Hsiao, F. and M.C. Hsiao (2006). FDI, exports, and GDP in East and Southeast Asia – Panel data versus time-series causality analyses, *Journal of Asian Economics*. 17: 1082-1106.
Jayachandran, G. and A. Seilan (2010). A Causal Relationship between Trade, Foreign Direct Investment and Economic Growth for India, *International Research Journal of Finance and Economics*. 42: 74-88.
Kaldor, M. (1963). Capital Accumulation and Economic Growth, in Proceedings of a Conference Held by the International Economics Association, in: Friedrich A. Lutz and Douglas C. Hague (eds.), *Theory of Capital*. London: Macmillan.
Karimi, M. and Z. Yusop (2009). FDI and Economic Growth in Malaysia, MPRA Paper No. 14999.
Kohpaiboon, A. (2003). Foreign Trade Regime and FDI – Growth Nexus: A Case Study of Thailand. *Journal of Development Studies*. 40: 55-69.
Lucas, R. (1988). On the Mechanics of Economic Development, *Journal of Monetary Economics*. 22: 3-42.
Mankiw, N. G. (2004). *Principles of economics*. Mason, USA: Thomson, South-Western.
Marini, M. (2004). Cultural evolution and economic growth: a theoretical hypothesis with some empirical evidence, *The Journal of Socio-Economics*. 33: 765-784.
Neuhause, M. (2006). *The impact of FDI on economic growth: an analysis for the transition countries of Central and Eastern Europe*. Heidelberg: Physica Verlag.
Ögütçü, M. (2002). Foreign Direct Investment and Regional Development: Sharing experiences from Brazil, China, Russia and Turkey, OECD Paper, Paris.
Romer, P. (1986a). Increasing Returns and Long-Run Growth, *Journal of Political Economy*. 94: 1002–1037.
Schutz, E. (2001). *Encyclopedia of Political Economy,* Edited by Phillip O'Hara, Volume 1, A-K. New York: Routledge: 241.
Serrasqueiro, Z. and P.M. Nunes (2008). Determinants of Capital Structure: Comparison of Empirical Evidence from the Use of Different Estimators, *International Journal of Applied Economics*. 5: 14-29.
Shahbaz, M. and M.M. Rehman (2010). Foreign Capital Inflows-Growth Nexus and Role of Domestic Financial Sector: An ARDL Cointegration Approach for Pakistan, *Journal of Economic Research*. 35: 207-231.
Shahbaz, M., K. Ahmad, and A.R. Chaudhary (2008). Economic Growth and Its Determinants in Pakistan, *The Pakistan Development Review*. 47: 471-486
Solow, R. (1956). A Contribution to the Theory of Economic Growth, *The Quarterly Journal of Economics*. 70: 65-94.
Swan, T. (1956). Economic Growth and Capital Accumulation, *Economic Record*. 32: 334–361.
Tiwari, A.K. (2010a). Globalization and Wage Inequality: A Revisit of Empirical Evidences with New Approach, *Journal of Asian Business Management*. 2: 173-187.
Tiwari, A.K. (2010b). Liberalization and Wage Inequality: Evidence from Indian Manufacturing Sector: A Review of Literature, *Asian Economic Review (forthcoming)*.
Tiwari, A.K. and M. Aruna (2011). Is direction of trade is responsible for wage inequality in India? An empirical verification, *Indian Journal of Economics and Business*. 10: 73-91.
Tiwari, A.K. and M. Kalita (2011). Governance and Foreign Aid in ASIAN Countries, *Economics Bulletin*. 31: 453-465.

Wijeweera, A., R. Villano, and B. Dollery (2010). Economic Growth and FDI Inflows: A Stochastic Frontier Analysis, *The Journal of Developing Areas*. 43: 143-158.
Won, Y., F. Hsiao, and D. Yang (2008). FDI Inflows, Exports and Economic Growth in First and Second Generation ANIEs: Panel Data Causality Analyses, KIEP Working Paper, 08-02: 11-86.

DATA SOURCES USED

Historical Statistics of the World Economy: 1-2008, AD from Angus Maddison.
IMF, World Economic Outlook Database, April 2009.
IMF, OECD Benchmark Definition of Foreign Direct Investment, Third Edition, Paris, 1996.
www.unctad.org.

APPENDIX

LIST OF ANALYSED COUNTRIES

No.	Country	No.	Country
1	Bahrain	13	Oman
2	Bangladesh	14	Pakistan
3	China	15	Philippines
4	China HK	16	Qatar
5	India	17	Saudi Arabia
6	Iran	18	Sri Lanka
7	Jordan	19	Syria
8	Korea Republic	20	Thailand
9	Kuwait	21	Turkey
10	Lebanon	22	United Arab Emirates
11	Malaysia	23	Vietnam
12	Myanmar		