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ECONOMIC GROWTH AND FDI IN ASIA: A PANEL DATA APPROACH

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Abstract
This study is an attempt to examine the impact of foreign direct investment on economic growth in Asian countries. We did our analysis in the panel framework during 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 growth process. In addition, labour and capital also play an important role in the growth of Asian countries. Further, nonlinearity effects show that export-led growth is a better option of growth enhancing in Asian developing countries compared with foreign direct investment-led growth.

Key words: Growth, FDI, Connection, Effects, Panel analysis

JEL classification: O40, F21, F43, C23

1. Introduction

The relationship between economic growth and foreign direct investment (FDI) has generated a great attention among economists, researchers and policy analysts over time particularly regarding matters pertaining to developing countries. In this regard, we attempt to analyze the "FDI - growth" nexus in 23 developing Asian countries, using a panel data model. We also try to analyse the nonlinearity associated with FDI in affecting growth.
In the literature the term "growth" is very debatable. Even if the definitions are different from one author to another, more or less, the content is the same: sustained increase of real per

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capita income. Schutz (2001) defined the growth as the sustained rise in quantity and/or quality of the goods and services produced in an economy. Since 1950s, the economic growth theory has evolved rapidly as two distinct generations of models. The basis of these groups of theory is the acquisition of Solow (1956) and Swan (1956) models, which state that growth depends on the savings rate, population growth and technological progress.

The first generation of growth models (exogenous growth models), inspired by the neoclassical model, with exogenous sources of long-term growth dominated the literature in the field until the 60s of the last century and round 1970 the attention was focused on the inflation and the 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). This group of models focuses 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 the technology plays a fundamental role in the process of economic growth. Moreover, these models incorporate a new concept regarding human capital, skills and knowledge. Bashir (1999) says that "endogenous" growth models were recently combined with studies on the diffusion of technology in an attempt to emphasize the major role played by FDI in the economy. An extensive definition of FDI is provided by OECD (1996) which states that the foreign direct investment 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 emphasis on the role the FDI plays in the development of the economy by acting as another factor input of production.
The rest of the paper is organized as follows: Section 2 illustrates the main acquisitions of the literature in the field regarding the relationship between economic growth and FDI; Section 3 presents the methodology of analysis, the variables' description and data; Section 3 shows the estimation and empirical results; and the last section comprises the conclusion.

2. Literature

Kaldor (1963) documented a number of mechanisms that explain the process of economic growth. For example, the growth in the 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 is nearly constant, 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 linkage between FDI and economic growth. For example, human capital, learning by doing, exports, macroeconomic stability, level of financial development, public investment and other determinants. 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 (trough "Greenfield Investments"); (b) indirect transmission (trough "Ownership Participation") and (c) second-round transmission (trough "Technology Spillover").

In the last years, the number and quality of the analyses regarding the relationship between the economic growth and FDI are prolific. In a research focusing on China, Dess (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 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. More, the paper show that the direct impact of exports 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 Granger caused by FDI, and the causality runs more from GDP to FDI. In the same note, Alfaro (2003) has made a sectorial panel OLS analysis, using cross-country data, for the 1981-1999 periods. The main results allow us that FDI in the primary sector tend to have a negative effect on growth, while investment in manufacturing a positive one.

In the 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 growth impact of 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 as for case of Sri Lanka. The co-integration-tests applied emphasise that a better trade policy reforms (promotion of foreign direct investment 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 and analysis in the case of 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.

For the same group of countries, Hsiao T. and Hsiao M. (2006) set up a panel vector autoregressive model. Their results reveal that FDI has unidirectional effects on GDP directly and also indirectly through exports, and there also 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 data set, 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, the similar acquisitions were founded by Bhandari et al. (2007), based on a panel GLS models. The conclusions illustrate that an increase in the stock

of domestic capital and inflow of foreign direct investment are main factors that positively affect economic growth in these.

Won et al. (2008) focused their analysis on the case of Asian newly industrializing economies. The panel vector autoregressive models made show that the openness of the economy, as manifested by exports and inward FDI, among others, is the most common economic factor attributed to the rapid growth of the Asian newly industrializing economies. More, in the case of Gulf Cooperation Council (GCC) countries, 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 the Malaysia's growth-FDI case. According to the authors, there is a range of possible factors that ensure that FDI promotes or hinders economic growth. In the same time, these determinants are likely to differ between countries and between types of FDI and sectors of destination. The GMM estimation of Anwara and Nguyen (2010), focused on the Vietnam connection "growth-FDI", valorised the rule of the education and the training in this case. The results suggest that the impact of foreign direct investment on economic growth in Vietnam will be larger if more resources are invested in education and training, financial market development and in reducing the technology gap between the foreign and local firms.

The similar conclusions were reached by Jayachandran and Seilan (2010) in the case of India. According to these authors, FDI and exports represent one of the factors affecting economic growth. The high or low economic growth rate does not have an effect on the presence of FDI and exports in India. We can mention also the recent OLS panel study (45 countries over the period 1997 to 2004) of Wijeweera et al. (2010). The main conclusions show that FDI inflows exert a positive impact on economic growth only in the presence of highly skilled labour. More, corruption has a negative impact on economic growth and trade openness increases economic growth by means of efficiency gains.

Finally, we can observe that several studies are focused on the case of developing countries and the major part of them stress that FDI, adjusted to other determinants, have a significant positive effect on economic growth. However, none of the study has analyzed the nonlinearities associated with FDI that affects the economic growth process of the hosted country. Therefore, we have moved ahead in this direction and also we provide the case of export lead growth or FDI led growth.

3. Data and methodology

The present study is intended to examine whether FDI has an impact on the economic growth of the Asian countries. Further, we also attempt to examine the nonlinearity associated with the relationship between FDI-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)[2].

To this respect, Mankiw (2004) stresses that international trade affects economic growth and can indeed to be regarded as a type of technology in that it converts non-specialized 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; hence, domestic economic growth cannot be enhanced.

Agosin (1999) and Boriss and Herzer (2006) illustrate that, in an outward-oriented country with free trade, the 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 the 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, Ogutucu (2002) argues that the Foreign Direct Investment (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 profit and when they make profit, they tend to reinvest their profit rather than remit abroad. Another benefit of FDI is 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 virtuous cycle that affects not only local and foreign investment but also foreign trade and production.

Based on the results of Blomsttrom 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 in a host country.

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

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

$$Y = f(K, L, FDI, X) \quad (2)$$

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, base on the result of Dielman (1989), we have preferred 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[3].

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

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

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 not controlled therefore; 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) shows 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:

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

where $w_{it} = \mu_i + \varepsilon_{it}$, 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 the equation 4 will be same however in that case μ_i is presumed to be having the property of zero mean, independent of individual observation error term ε_{it}, has constant variances σ_ε^2, and independent of the explanatory variables.

[3] 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.

However, there may be 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 analysis is using a panel model of random effects. On the contrary, if there is correlation between countries' individual effects and growth determinants, the most appropriate way of carrying out analysis is using a panel model of fixed effects.

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

Further, unlike previous studies which have analyzed the impact FDI and exports on economic growth by using only 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 the equation 4 to incorporate two-way error component model; the equation becomes as follows:

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

where $u_{it} = w_{it} + \lambda_t = \mu_i + \lambda_t + \varepsilon_{it}$, 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 stochastic with $\varepsilon_{it} \sim IID(0, \sigma_\varepsilon^2)$, then equation 4 represents a two-way fixed effect error component model[4].
Similarly, nonlinearity of exports-growth relationship has also been incorporated in the model.

4. Estimation and empirical results

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

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

Table 1: Regression results of first specification

Panel data Models: Dependent variable GDP per capita								
Independent variables	Model 1 FE	Model 2 RE	Model 3 FE	Model 4 RE	Model 5 RE-CS: PR-FE	Model 6 Two way RE	Model 6 Two way RE And CSW	Model 7 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***	
F-test		95.25***						
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

From Table 1, it is evident that the results of the Wald test and F test are significant at 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 explanatory of the economic growth determinant. Though is 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 model 1 and 2 are same (except the constant term that is significant for the of random effect model, while is 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 negative sign but is highly insignificant. Further, when we examined nonlinearity of FDI by incorporating square value of FDI and we perform the analysis based on random effect and fixed effect model 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 random effect we do not find the same). However, Hausman test in this case also suggests that the random effect model is 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.

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

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

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

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*	-22.5239*	4.93891	-22.09097*

	(12.01144)	(11.98448)	(11.26523)3	(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				

In Table 2, the results of Hausman test show that the random effect model is appropriate 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 significant and positive impact of exports only on the economic growth of panel countries. This also suggests the preference of export-led growth hypothesis against FDI-led growth hypothesis, a long debated topic in our panel countries.

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 negative coefficient, while the coefficients of square of exports and FDI are significant with positive sign. Further, if we compare the coefficient of exports and FDI we find that negative impact of FDI is much higher with respect to the negative impact of exports; similarly, positive impact of square of FDI is also much higher vis-à-vis to the positive impact of square of exports.

In the final step we have analysed a model of two-way random effect and results are reported under model 4. Two-way random effect model confirms the findings of 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.

5. Conclusions

There has been long debate among policy makers and economists in national and international level whether FDI enhances growth in the host countries. Further, there has been also a long debated topic that dependence on exports led growth or FDI lead growth is preferable and what if there is evidence of nonlinearities associated with FDI and exports in the economic growth.

In this study we have attempted to answer these questions. We conducted the empirical analysis in the framework of a panel for 23 Asian countries by employing data from 1986 to 2008. We incorporated a two-way effect also 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.

We find that FDI and exports enhances the growth of Asian countries and also labour and capital help in that process. When we analyzed the case of nonlinearity associated only with FDI, we find that this variable enhances growth, but when we analyse the nonlinearity in both cases i.e., exports and FDI, we find significant and positive impact of exports only on the economic growth of panel countries. This also suggests the preference of export-led growth hypothesis vis-à-vis FDI-led growth hypothesis.

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