FDI as a Main Determinant of Economic Growth: A Panel Data Analysis

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ABSTRACT

FDI is as an important vehicle for economic development as far as the developing nations are concerned. It has a key impact on country's trade balance, increasing labor standards and skills, transfer of technology and innovative ideas, skills and the general business climate. This study analyzes the inflows of FDI as key factor on economic growth with panel data for the time period, 1991-2010. Three different models like FEM, REM, and PCSE were used for the analysis. GDP growth as a dependent variable, regressed with 6 different independent variables such as real GDP per capita in the year 1971, Population, Secondary school attainment in the year1971, Savings, Inflows of FDI, Inflation. To check the properties of panel data FEM and REM test are applied. To address the problem of heteroscedasticity, Modified Wald test for group wise heteroscedasticity in fixed effect regression test is used; Wooldridge test for autocorrelation in panel is used to identify the auto-correlation. PCSE method in GLS estimation was applied to remove the presence of multicollinearity, autocorrelation and heteroscedasticity in panel data set. Empirical results by Generalized Least Square (GLS) estimation show that Population, education factor(Secondary school attainment) and

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savings are positively related with growth rate of the country, that means these are main components for economic development where as inflation and real GDP per capita are negatively related with the growth rate of the country. An inflow of FDI is a key factor for economic development. Here both inflows of FDI and GDP growth are positively related to each other, i.e. if FDI inflows coming to the country that leads to increase the economic growth and upper middle economies countries are highly correlated with GDP growth rate of the country than any other economies in the world.

Keywords: Foreign Direct Investment (FDI), Fixed Effect Model (FEM), Random Effect Model (REM), Panels Corrected Standard Errors (PCSE), Gross Domestic Product (GDP), Generalizes Least Square (GLS)

Introduction

During the past two decades, foreign direct investment (FDI) has become increasingly important in the developing world, with a growing number of developing countries succeeding in attracting substantial and rising amounts of inward FDI. Economic theory has identified a number of channels through which FDI inflows may be beneficial to the host economy. Economic growth is the increase in the amount of the goods and services produced by an economy over time. It is conventionally measured as the percent rate of increase in real gross domestic product, or real GDP. Yet, the empirical literature has lagged behind and has had more trouble identifying these advantages in practice. Most prominently, a large number of applied papers have looked at the FDI-GDP growth nexus, but their results have been far from conclusive. Notwithstanding this absence of any robust conclusions, and somewhat surprisingly, most countries continue to vigorously pursue policies aimed at encouraging more FDI inflows.

Foreign Direct Investment (FDI)

FDI is a type of investment that involves the injection of foreign funds in to an enterprise that operates in a different country of origin from the investor. It is as an important vehicle for economic development as far as

the developing nations are concerned. The important effect of FDI is its contribution to the growth of the economy. It has an important impact on country's trade balance, increasing labor standards and skills, transfer of technology and innovative ideas, skills and the general business climate. It also provides opportunity for technology transfer and up-gradation, access to global managerial skills and practices, optimal utilization of human capabilities and natural resources, making industry internationally competitive, opening up export markets, access to international quality goods and services and augmenting employment opportunities. It plays an important role in the process of globalization during the past two decades. The rapid expansion in FDI by multinational enterprises (MNEs) since the mid-eighties may be attributed to significant changes in technologies, greater liberalization of trade and investment regimes, and deregulation and privatization of markets in many countries including developing countries like India. Capital formation is an important determinant of economic growth. While domestic investments add to the capital stock in an economy, it also plays a complementary role in overall capital formation and in filling the gap between domestic savings and investment. At the macro-level, it is a non-debt-creating source of additional external finances. At the micro-level, FDI boost output, technology, skill levels, employment and linkages with other sectors and regions of the host economy.

Review of Literature

The review of literature is a body of text that aims to review the critical points of current knowledge including substantive findings as well as theoretical and methodological contributions to a particular topic. The present review of literature consists of both review of theories and empirical studies, as discussed in the following subsections.

Review of Theoretical Studies

David Ricardo (1817) argued that trade benefits to a country because if one could buy a good more cheaply from abroad, it meant that there was more profitable work to be done here. In economics, the theory of comparative cost advantage refers to the ability of a person or a country to produce a particular good or service at a lower opportunity cost. Even if one country is more efficient in the production of all goods than

other, both countries will still gain by trading with each other. Based on comparative advantage, classical economists emphasized the productivity aspect of the investment and ignored the income aspect, i.e. demand, while Keynes attached importance to income generation. Harrod-Dommar (1950) focuses on the dual role of investment. One hand, new investment generates income and effective demand. On the other, it increases productivity capacity of the economy by expanding capital stock. The theory says that the economic growth depends on the amounts of labor and capital. More physical capital generates economic growth. Net investment leads to more capital accumulation, which generates higher output and income. Then higher level of income allows higher level of saving. The neoclassical economist Solow (1956) highlights the savings or investment ratio as important determinant of short-run economic growth. Technological progress, though important in the long-run, is regarded as exogenous to the economic system. Endogenous growth theory Romer (1980) holds that investment in human capital; innovation and knowledge are significant contributors to the economic growth. The theory also focuses on positive externalities and spillover effects of a knowledge-based economy which will lead to economic development. The endogenous growth theory also holds that policy measures can have an impact on the long-run growth rate of an economy.

The Modern Theory of international trade has been advocated by Bertil Ohlin. Ohlin has drawn his ideas from Heckscher General Equilibrium Analysis. Hence, it is also known as Heckscher-Ohlin Theory. The Heckscher-Ohlin theorem (1967) states that countries which are rich in labor will export labor intensive goods and countries which are rich in capital will export capital intensive goods. The product life cycle Venon (1966) argued that, when a new product is introduced in developed country it requires highly skilled labor to produce. As the product become popular it can produce by developing countries, where MNEs will shift the production in order to take advantage of availability of cheap labor. In the bargain, the developed countries will get access to the technology to produce new goods.

Human capital is also the main source of growth in several endogenous growth models as well as one of the key extensions of the neoclassical growth model. Since the term 'human capital' refers principally to workers'

acquisition of skills and know-how through education and training, the majority of studies have measured the quality of human capital using proxies related to education (e.g. school-enrolment rates, tests of mathematics and scientific skills, etc.). A large number of studies have found evidence suggesting that educated population is the key determinant of economic growth. Innovation and research and development (R&D) activities can also play a major role in economic progress increasing productivity and growth. This is due to increasing use of technology that enables introduction of new and superior products and processes. This role has been stressed by various endogenous growth models and strong relation between innovation and economic growth.

FDI has recently played a crucial role of internationalizing economic activity and it is a primary source of technology transfer and economic growth. This major role is stressed in several models of endogenous growth theory. The empirical literature examining the impact of FDI on growth has provided more-or-less consistent findings affirming a significant positive link between the two (see Hermes and Lensink, 2000; Lensink and Morrissey, 2006). The role of FDI seems to be country specific, and can be positive, negative, or insignificant depending on the economic, institutional, and technological conditions in that particular economy (Li and Liu, 2004).

Empirical Review

A study by Grosse (1988), deals with the MNEs and economic growth in Venezuela. The country has a sufficiently large internal market to attract manufacturing firms. Data from micro- level analysis based on firm data finds that FDI appears to offer net benefits to the host country that either would not be available from other sources or would be more costly to obtain through alternative vehicles.

The study perform by Kevin H. Zhang (2006), identifies possible channels through which FDI may affect both positive and negatively in the Chinese economy over period 1992-2004 and finds that FDI seems to promote economic growth. The positive growth effect seems to rise over time and to be stronger in coastal than inland regions. The marginal product of foreign capital is larger than that of domestic capital. Tsai (1994), focuses some popular hypothesis of demand side determinants of FDI and the

study the influence of FDI on economic growth in the host countries. The study covers two time periods (1975-78 and 1983-86) finds that FDI is the main source of economic growth. In seventies, rate of export growth promotes economic growth but domestic saving is responsible for economic growth in eighties.

Balasubramanyam et al. (1996), defines the role FDI plays in the growth process in the context of developing countries characterized by different trade policy regimes. This paper uses cross section data relating to 46 developing countries and find that the growth enhancing effect of FDI is stronger in countries that pursue an export promotion policy than in those following an import substitution one. Nair-Reichert & Weinhold (2001), find that the effect of FDI on growth could display quite heterogeneous behavior in a panel of 24 developing countries over 25 years. The study to analyze the dynamic relationship between FDI and economic growth. There is a causal relationship between investment (both foreign and domestic) and economic growth in developing countries is highly heterogeneous, while domestic investment seems to be strongly correlated with economic growth.

Alfaro (2003) shows that FDI vary greatly across in the primary, manufacturing and services sectors. This study is an empirical analysis of 47 countries for the period of 1981-99 in 47 countries. This paper finds that FDI flows into the different sectors of the economy (namely primary, secondary and services) exert different effects on economic growth.FDI flows in to the primary sector tend to have negative effects on economic growth, whereas FDI inflows in the manufacturing sector a positive one and in the service sector the impact is ambiguous.

Makki & Somwaru (2004), study the role of FDI and trade in promoting economic growth across developing countries and the interaction among FDI, trade and economic growth. They examine data from 66 developing countries over the last three decades and find that FDI, trade, human capital and domestic investment are important sources of economic growth for the developing counties. FDI stimulates domestic investment and the contribution of FDI to economic growth is enhanced by its positive interaction with human capital, sound macroeconomic policies and institutional stability.

A study by Li & Liu (2004), is FDI influence on economic growth based on a cross country panel of data of 84 countries over the period 1970-99. Both single equation and simultaneous equation system techniques are applied to examine this relationship. They find that FDI not only directly promotes economic growth in both developed and developing countries by itself.

Chowdhury & Mavrotas (2006), Relates foreign direct investment and economic growth and discuss the causal relationship between FDI and economic growth. In this paper, they use the data from Chile, Malaysia and Thailand. The empirical finding based on the Toda-Yamamoto causality test suggests that it is GDP that causes FDI in Chile and not vice versa. But in case of Malaysia and Thailand, there is strong evidence of a bi-directional causality between GDP and FDI.

Archana et al. (2007), study the qualitative shift in the FDI inflows in India during the bold new policy on economic front makes the country progress in both quantity and the way country attracted FDI. The study reveals that India is not only cost-effective but also hot destination for R&D activities. The study also finds out that R&D as a significant determining factor for FDI inflows for most of the industries in India. The software industry is showing intensive R&D activity, which has to be channelized in the form of export promotion for penetration in the new markets. The study also reveals strong negative influence of corporate tax on FDI inflows.

The study by Banga (2006), discusses the export-diversifying impact of foreign direct investment in the India. The empirical results in the post-liberalization period show that FDI from the US has led to diversification of India's export, both directly and indirectly. However, Japanese FDI has no significant impact on India's exports.

Objective of the Study

The main objective of this paper is to analyze the major determinants of Economic growth in the world, such as real GDP per capita, Population, human capital (secondary school attainment), Savings, inflows of FDI, inflation and determine which is more significant than others.

Econometric Modeling and Data Sources

The study attempts to empirically investigate the determinant of economic growth. It includes FDI inflow as a percentage of GDP as the dependent variable to determine economic growth. Based on the review of both theoretical and empirical studies, the relationship between FDI and economic growth is correlated for population growth, initial per capita GDP, people's saving, inflation and initial human capital. Therefore the basic specification of the model as follows:

$$GDPGR_I=\beta_1 RGDP_{71} + \beta_2 POP_i + \beta_3 SSA_{71} + \beta_4 SAV_i + \beta_5 IFDI_i + \beta_6 INF_i + \varepsilon$$

where, GDPGR is the real GDP Growth of the country, $RGDP_{71}$ is the real GDP per capita in 1971, POP_i is the Population growth, SSA_{71} is the level of secondary school attainment in 1971, SAV is the saving as percentage of GDP, INF is the inflation of country and IFDI is the inflows of FDI as a percentage of GDP. The data set used covers 62 countries over the period 1991-2010. The different countries data are collected from the World Bank's World Development Indicators (WDI) database.

Empirical Result

Table 1: Descriptive Statistics (1991-2010)

Variable	*Obs*	*Mean*	*Std. Dev.*	*Min*	*Max*
GDPGR	1240	3.505	3.880	-50.248	35.224
$RGDP_{71}$	1240	6.349	1.220	4.054	8.587
POP	1240	1.467	1.105	-7.533	11.181
SSA_{71}	1240	42.398	29.206	1.107	101.859
SAV	1240	19.637	8.750	-24.004	75.340
IFDI	1240	2.974	4.743	-29.229	52.052
INF	1240	17.918	158.304	-23.479	4523.698
D1	1240	0.355	0.479	0	1
D2	1240	0.258	0.438	0	1
D3	1240	0.387	0.487	0	1

Source: Calculated by Author.

In this section, the estimation of empirical result for this paper is discussed. The descriptive statistics is the discipline of quantitatively

describing the main features of a data. Descriptive statistics are distinguished from inferential statistics (or inductive statistics), in that descriptive statistics aim to summarize a sample, rather than use the data to learn about the population that the sample of data is thought to represent. The above descriptive tables reveal that the average GDP growth rate varies in between –50.248 to 35.224 with standard deviation 3.880. The average inflows of FDI from the rest of world are 2.974. It varies from –29.229 to 52.052 in these twenty (1991-2010) years. The inflation is crucial condition of the economy, here the average inflation rate was 17.918 and it varies from –23.479 to 4523.698. The variation is more in inflation in case of other variable in this period. Education plays an important role in path of economic development. The above table shows that the average rate of educational attainment (secondary-level) is 42.398 and it varies from 1.107 to 101.859 in this period. The average savings of people is 19.697 and lies between –24.004 to 75.340, etc. in the next table represents the correlation between the variables.

Table 2: Correlation Table (1991-2010)

	GDPGR	RGDP71	POP	SSA71	SAV	IFDI	INF	D1	D2	D3
GDPGR	1									
RGDP71	–0.224	1								
POP	0.286	–0.489	1							
SSA71	–0.202	0.897	–0.529	1						
SAV	0.098	0.041	–0.139	0.116	1					
IFDI	0.075	0.050	–0.054	0.079	0.074	1				
INF	–0.022	–0.029	0.033	–0.055	–0.047	–0.035	1			
D1	–0.223	0.800	–0.491	0.839	0.057	0.088	–0.064	1		
D2	0.133	–0.070	0.096	–0.195	0.093	–0.003	0.066	–0.437	1	
D3	0.100	–0.723	0.396	–0.649	–0.140	–0.084	0.004	–0.589	–0.469	1

Source: Calculated by Author.

To know the effect of FDI on various economies (various regions) countries I introduced three Dummy variables. The total 62 cross

country, I divided in four categories by income group that are low income economies, the lower middle income economies, the upper middle income economies and high income economies. So defines this I use three dummy variables and the lower income economies are the benchmark of my study. The detail classifications of the four groups are in appendix of the study.

The new model using dummy variable as:

$$GDPGR_i = \beta_1 RGDP_{71} + \beta_2 POP_{i+} \beta_3 SSA_{71} + \beta_4 SAV_i + \beta_5 IFDI_i + \beta_6 INF_i + D_1 + D_2 + D_3 + \varepsilon$$

Here D_1 =1 for the high income economies and taking 0 for otherwise, D_2 equal to 1 is the upper middle income economies and 0 for otherwise and D3 equal to 1 for the lower middle income economies and 0 for rest of the country. The results of dummy variable are in the Table 3 gives more clear information about the different group of countries.

Table 3 shows the results of the model with the dummy variables. I use three models in this analysis. First, I use fixed effect and then random effect models to know the random effect between the explanatory variable over the dependent variables that GDP growth rate in STATA-11 Software. After that to address the problem of heteroscedasticity, multicollinearity and auto correlation in the data, I use several methods like Wooldridge test for autocorrelation in panel data, modified Wald test for group wise heteroscedasticity in fixed effect regression model etc. After applied both FEM and REM models, I found that the heteroscedasticity available in the data. Then to avoid the entire problem in the panel data I applied PCSE model to get reliable result. But due to the high multicollinearity in the dummy variable D_3 which was set for the lower middle income economies is omitted from the final analysis. So according to PCSE model inflow of FDI, Savings and Population of the country are highly significant with GDP growth of the country in this time period (1991-2010). It indicate that Population, education factor(Secondary school attainment) and savings are positively related with growth rate of the country, that means these are main components for economic development where as inflation and real GDP per capita are negatively related with the growth rate of the

country. An inflow of FDI is a key factor for economic development. Here both inflows of FDI and GDP growth are positively related to each other, i.e. if FDI inflows coming to the country that leads to increase the economic growth. Here upper middle economies countries are highly correlated with GDP growth rate of the country than any other economies in the world.

Table 3: Estimation of Result Using Dummy Variable (1991-2010)

Variable	*I*	*II*	*III*
RGDP71	1.056 (0.91)	–.614** (–2.36)	–0.664** (–2.34)
POP	1.078*** (7.56)	0.948*** (8.00)	0.910*** (3.21)
SSA	NA	0.015 (1.33)	0.016* (1.67)
SAV	0.086*** (4.30)	0.055*** (4.05)	0.049*** (3.81)
IFDI	0.073*** (2.97)	0.068*** (3.03)	0.066*** (3.05)
INF	–0.001 (–1.24)	–0.001 (–1.11)	–0.001* (–1.80)
D1	NA	0.001 (0.02)	0.038 (0.07)
D2	NA	0.938** (2.50)	0.974*** (3.27)
Constant	–6.688 (–0.91)	3.874*** (2.86)	4.304** (2.44)
Model	FEM	REM	PCSE
Hausman	9.8		
BP	3.32		
Cross sec depend:	30.435		
Colinearity	0.634		
Heteroscedasticity	3659.66		
Observation	1240		

Source: Calculated by Author. Note: ***, ** and * are represents 1%, 5% and 10% significance level respectively; bracket value of first, second and third model indicates t-value, z-value and again z-value respectively.

Findings and Conclusion

The study gives an insight in between the FDI and economic growth. From various literatures I concludes that FDI is playing a significant role in the growth of the economy and suggest that FDI is an important source of capital, compliments domestic private investment associated with new job opportunities and enhancement of technology transfer and boosts overall economic growth in host countries.

The empirical investigation finds that impact of FDI inflows on GDP growth is highly significant. If the inflows of FDI to the country increase it will help to increase capital formation and will fill the gap between domestic savings and investments. If saving increases it will increase the investment as well as capital formation in the host country and the production will increase. It leads to increase the exports in the country for which the host country will gain more foreign currency from the rest of the world. Finally it will help to increase per capita income and standard of living.

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Appendix: Classification of Country Groups

Developed Economies

Austria, Bahamas, Canada, Denmark, Finland, France, Greece, Hungary, Iceland, Ireland, Italy, Japan, Malta, Netherland, New Zealand, Norway, Portugal, Spain, Sweden, United states, United Kingdom.

Upper Middle Economies

Botswana, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Jordan, Malaysia, Panama, Peru, Suriname, Thailand, Turkey, Venezuela.

Lowe Middle Economies

Cote d'lvoire, Egypt, El Salvador, Fiji, Ghana, Honduras, India, Indonesia, Lesotho, Morocco, Nicaragua, Pakistan, Papua New Guinea, Paraguay, Philippines, Senegal, Sri lanka, Sudan, Swaziland, Syrian Arab Republic.

Low Income Economies

Benin, Kenya, Mali, Niger, Rwanda.

Random-effects GLS Regression

Variable	*Coef*	*Std. Err.*	*z*	*P*>|*z*|
RGDP71	0.614	.260	–2.36	0.018
POP	0.948	.118	8.00	0.000
SSA	0.015	.011	1.33	0.184
SAV	0.056	.013	4.05	0.000
IFDI	0.068	.023	3.03	0.002
INF	–0.001	.001	–1.11	0.266
Constant	3.874	1.353	2.86	0.004
D1	0.009	.607.374	0.02	0.987
D2	0.938	.375	2.50	0.012
D3	omitted	NA	NA	NA