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PANEL DATA ANALYSIS OF FOREIGN DIRECT INVESTMENT AND ECONOMIC GROWTH IN DEVELOPING COUNTRIES; POLICY IMPLICATION FOR NEPAL

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Abstract

Foreign direct investment (FDI) has increased rapidly in developing countries since the 1990s. Many studies found that there is a significant relationship between FDI and economic growth. This thesis seeks to analyze the relationship between FDI and economic growth in developing countries and explore policy implications for the South Asian countries and Nepal. The study conducts panel data analyses based on a panel data set of 63 developing countries in Asia, Africa, and Latin America for the period from 1990-2015. The results of the panel data analyses, obtained by the fixed effects, random effects, difference generalized method of moment, DGMM and system generalized method of moment, SGMM estimators, show that there is a significant positive effect of FDI on economic growth. It is also found that the FDI-economic growth relationship depends on domestic macroeconomic and financial market conditions, domestic investment climate and infrastructure in host countries.

Keywords: *Economic Growth, Foreign Direct Investment, Dynamic panel data, Developing countries, Nepal.*

1. INTRODUCTION

Foreign Direct Investment (FDI) is an investment made to acquire a lasting interest in or effective control over an enterprise operating outside of the economy of the investor. FDI net inflows are the value of the inward direct investment made by non-resident investors in the reporting economy, including reinvested earnings and intra-company loans, net of repatriation of capital and repayment of loans, this is expressed as shares of GDP (UNCTAD, 2017). Some degree of equity ownership is almost always considered to be associated with an active voice in the management of an enterprise; the BPM5 suggests a threshold of 10% of equity ownership to qualify an investor as a foreign direct investor (International Monetary Fund, 2009).

FDI encourages the transfer of technology and know-how between economies, promote its products more widely in international markets, positive effect on the development of international trade, and a crucial source of capital for a range of host and home economies (Organization for Economic Co-operation (2008). FDI is a part of economic growth, prosperity, and development of the third world today. Specifically, after the 1980s, under liberalization, globalization, and privatization, most of developing and underdeveloped countries have heavily relied on foreign sources of investment. The developing countries have felt the need for foreign capital to supplement domestic resources due to the growing mismatch between their capital requirement and their saving capacity (Srivastava 2004). Foreign direct investment has been recognized as one of the critical sources of long-term sustainable economic development in developing countries (Sadia Imtiaz, 2017). There are many demand-side and supply-side factors that have affected the trend and level of FDI: market conditions, government policies, human and natural resources, institutions, pre-investment procedure, investment repatriation policies, export and import facilities, tax-free and special economic zones and so on (Nasser, 2010). FDI provides opportunities for the economic development of developing countries as FDI would facilitate competition, innovation, human capital development, and technological advancement (Nasser, 2007).

It is a challenging task for Nepal to become a middle-income country and achieve the sustainable development goals by 2030 (Ministry of Finance, Nepal, 2016). To graduate from a least developed country to become a middle-income country by 2030, Nepal needs economic growth at an annual average rate of more than 7%. A study by Andrés (2013) showed that Nepal is facing an investment gap of around 15-18 billion dollars to achieve this target. However, the 2015 earthquake brought about a loss of 7 billion dollars, and subsequent trade disruption leads to a fuel crisis (The World Bank, 2017). Total investment gap to graduate in middle income country by 2030 is more than 24 billion USD (National Planning Commission, 2017). The domestic saving rate is below 10% of GDP, and thus domestic savings alone cannot fulfill the investment gap. In the SAARC region, net FDI as a share of GDP is 1.2%, but it was merely 0.2% in Nepal. Average per capita FDI in the SAARC region is $12.1, while in Nepal it is only $1.1. Therefore, Nepal needs more foreign capital to graduate from a least developed country by 2030.

The government of Nepal set objectives regarding FDI, human resources and technologies to reduce the trade deficit (National Planning Commission, Nepal, 2017). Nepal needs to rely on FDI for its economic development since FDI could strengthen technologies and managerial and technical skills while narrowing the savings and investment gap in capital formation. In Nepal, with abundant natural resources, biodiversity, and cultural heritages, ample opportunities exist for FDI in such areas as hydroelectricity, tourism, services, and physical infrastructure (Ministry of Finance, Nepal, 2016).

FDI in SAARC and Nepal

South Asia is a rapidly growing region and home to one-fifth of the world's population. The region's economy is facing the challenges of improving the efficiency of public spending, strengthening tax administration, enhancing regulation and supervision of the financial system, modernizing monetary policy and operations, and improving macroeconomic statistics (IMF Annual report, 2017 page 24).

Table 1 reports the average annual growth rate, average yearly net FDI inflow, FDI inflow as a share of GDP, and average per capita GDP from 1990-2015 for 5 South Asian countries (Bangladesh, India, Nepal, Sri Lanka, Pakistan), developing countries, and the world.

Table 1 Average growth rate, average FDI inflow from 1990-2015

Country	Average Growth rate (%)	Average annual net FDI inflow (mill. $)	Net FDI inflow as a share of GDP (%)	Average per capita FDI ($)
Bangladesh	5.37	698.95	0.62	4.61
India	6.57	16156.92	1.15	13.43
Nepal	4.42	28.88	0.18	1.74
Pakistan	4.08	1655.29	1.15	10.89
Srilanka	5.44	519.36	1.23	26.74
SAARC	6.19	19131.53	1.26	12.93
World	2.82	1360992.79	2.33	207.18
63 Developing countries	4.10	3624.98	3.09	76.42

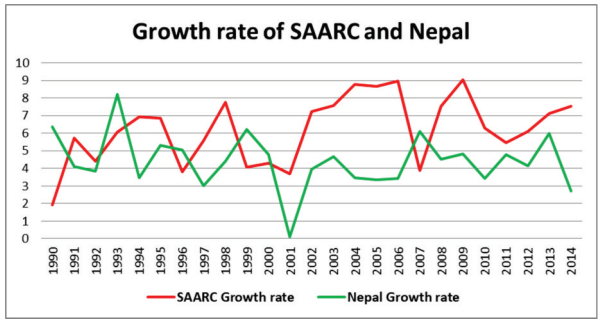
Source: The World Bank

As exhibited in table 1, the average growth rate from 1990-2015 in developing countries is higher than the world average. The average annual growth rate in the SAARC region is more than 6% (see figure 1 also); it is higher than the average growth rate of developing countries. Among SAARC countries, the average growth rate of India was the highest, while Pakistan and Nepal registered the lowest. An average growth rate of Nepal is similar to the growth rate of developing countries but is less than the growth rate of the SAARC (see figure 1 also). From 1990 to 2015, average growth rate was 6.18% in the SAARC region, while it was 4.42% in Nepal.

Average per capita FDI inflow is more than $207 in the world, whereas it is $76.42 in developing countries and $12.93 in the SAARC region. Among SAARC countries, Sri Lanka registers the highest per capita at $26.74, which is followed by India at $13.4. Meanwhile, per capita, FDI is less than $1.5 in Nepal. Net FDI as a share of GDP in Nepal is smaller than most other developing countries; it is more than 3% and 1.26%, respectively, in developing countries and the SAARC region, while it is less than 0.2% in Nepal. Among SAARC countries, Sri Lanka and India register the highest FDI inflow as a share of GDP.

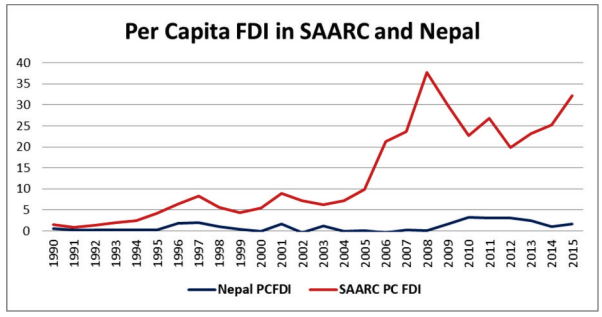
According to Figure 2, which reports the per capita FDI inflow in the SAARC region and Nepal, the SAARC region has an upward trend. However, the per capita FDI inflow in Nepal is much smaller than that in the region. The gap between the SAARC region and Nepal has been increasing since 2004. Net per capita FDI of Nepal was negative in 2002, because of the Maoist insurgency. However, it increased sharply after 2007, after the end of the Maoist insurgency. It decreased again after 2012, because of political instability.

Figure 1.
The Economic Growth rate
of Nepal and SAARC from 1990-2015



Source: The World Bank

Figure 2.
Per capita FDI inflow in Nepal and SAARC from 1990-2015



Source: The World Bank

As discussed above, Nepal has not been successful in attracting FDI, and FDI inflow was very small as compared to other countries in the SAARC region. Nepal has a lot of opportunities for FDI to accelerate the economy. The government of Nepal has introduced some policies and regulations to increase FDI. Among them are: Constitutional Provisions, FDI policy in 2014, Industrial Enterprises Act in 2016, Investment Board Act in 2012, Foreign Investment and Technology Transfer act in 1991, and Special Economic Zone in 2016. To increase FDI, the government of Nepal introduced some institutional provisions in facilitation, approval, and registration. Investment Board, Industry Department, Industrial and Investment Promotion Board were set up to take care of these institutional provisions.

With these policies, regulations and institutional provisions, the government of Nepal hopes to receive more FDI, especially from within the SAARC region, as FDI would continue to strengthen the production network of the SAARC countries (World investment report, 2017 UNCTAD, page 56). Opportunities for FDI in the areas of hydroelectricity, tourism, services, physical infrastructure, and production and processing of herbs exist in Nepal with the availability of abundant natural resources, biodiversity, and cultural heritage. The government of Nepal should design policies to attract more FDI to achieve high economic growth, where it is essential to promote investment in the private sector (Ministry of Finance, Nepal, 2016).

The primary objective of this study is to analyze the effect of FDI on economic growth in developing countries and explore the factors that would affect the effectiveness of FDI on economic growth. The study also tries to draw some policy implications for the economic development of Nepal, which is one of the least developed countries in the world. A number of studies have been conducted to analyze the relationship between FDI and economic growth. Many of them found that FDI has significant and positive effects on economic growth, but some studies found an adverse effect. Many empirical studies suggested that the relationship between FDI and economic growth depends on economic and business conditions such as political stability, human capital, infrastructure, innovative capacity, and so on. This study investigates the effects of FDI on economic growth using a panel data set of 63 developing countries in Asia, Africa and Latin America (22 countries in Asia, 26 countries in Africa and 15 Latin American and other developing countries) for a relatively longer time-period from 1990 to 2015, which is constructed by using the databases of World Bank, IMF, UNDP and UNCTAD.

This study conducts a dynamic panel data regression analysis. By using the difference and system GMM (generalized method of moments) estimators developed by Arellano and Bond (1991) and Blundell and Bond (1998) based on a dynamic panel data set, the study analyzes the effects of FDI on economic growth after controlling for some other variables which would affect economic growth. Based on the empirical results of the dynamic panel data regression analysis, it tries to draw some policy implications for the economic development of the SAARC region, particularly Nepal. To the best of the author' knowledge; there have been no studies on the effects of FDI on economic growth in Nepal.

From this dynamic panel data regression analysis, the study finds that FDI has a significant and positive effect on economic growth among developing countries after controlling for some other factors of economic

growth. The result is robust in the sense that the sign of the coefficient for FDI is positive regardless of model specifications we choose. It is also found that among other factors, infrastructure, human resources, trade openness and domestic financial market are essential for the effectiveness of FDI on economic growth.

The paper is organized as follows. Section II presents a review of empirical literature on the relationship between FDI and economic growth. Section III presents the data and the methodology used in the study, while Section IV discusses the empirical results. Finally, Section V summarizes the main findings and provides some policy implications for the development of Nepal.

II RELATED LITERATURE

According to the literature studied the relationship between FDI and economic growth, the role of FDI in developing economies has become very important because of a decline in nations' saving, conventional financing, and instability of private financial flows. FDI has seen as a remedy to the problem of resource gaps and external funding now experienced by developing nations.

Theoretical Evidence

There is a considerable body of literature emphasizing the impact of FDI on economic growth. Neo-classical models of growth, as well as an endogenous growth model, provide the basis for most of the empirical work on the FDI-growth relationship (Ozturk, 2007). New growth theory argues that technological progress is the heart of economic growth. Capital formation is defined to include investment in human capital and skill, R&D, and tangible capital which also provide the basis for economic growth. Moreover, the dependency school theory stands for the negative impact of FDI on long-run economic growth (Mebratu Seyoum, 2015).

Felipe (1999) followed the neoclassical growth theory in his empirical study and found that economic growth generally comes from two sources: Factor accumulation and total factor productivity growth. As opposed to the limited contribution that the neoclassical growth theory accredits to FDI, the endogenous growth literature points out that, FDI can not only contribute to economic growth through capital formation but also through augmentation of the level of knowledge through labor training and skill acquisition (DeMello, 1999). The empirical study of Anam, 1993 followed the endogenous growth model and found that FDI is an essential vehicle for transferring technology, contributing relatively more to growth than domestic investment. FDI enables low wage countries to improve productive efficiency by stimulating domestic research and development (Walz, 1997).

The new growth models, unlike the Solow model, assume an increasing return to scale to input. These models argue in favor of FDI affecting the level and rate of aggregate output growth, level of human capital and productivity through permanent technology and knowledge transfers and spillover and do not necessarily diminish as the economy grows (Romer 1986 and Lucas 1988). According to Dunning (1993), the impact of FDI on economic growth depends on the nature and degree of firm-specific ownership characteristics, location-specific characteristics of host countries, demand conditions, market, and the way how multinational corporations own, organize and use their resources.

On the other hand, the dependency school theory, by Stonemen (1975) and Bornschier (1980) argued that developed nations become wealthy by extracting labor and other resources from third world nations, developing countries are unable to compensate for their natural resources, and it increases poverty, and FDI will affect growth negatively in the long run.

2.2 Positive and negative view

Under the traditional framework, in general, FDI promotes economic growth endogenously through augmenting domestic capital accumulation; in doing so, it facilitates the technological transfer, which is a favorable

impact according to Ozturk (2007). One of the earliest investigations of the role of the FDI on economic growth, Findaly (1978) postulated that FDI promotes economic growth through its effect on technological transfer and progress. Other empirical studies are summarized in the following table:

Table 2: FDI and Economic Growth: Literature Survey

Studies	Sample	Period	Empirical Approach	Effect of FDI on growth
Balasubrimanyam V.N. (1996)	46 developing countries	1970-1985	OLS, Generalized Instrumental Variable Estimators	FDI has a positive impact on growth through FDI-labor (including human capital) interactions in the growth process.
Basu P., (2003)	23 developing countries	1978-1996	Panel Casualty test	There is a long-run steady state relationship between FDI and growth, and a relationship is bidirectional.
Choe J. (2003)	80 countries	1971-1995	Panel VAR model	Strong and positive correlation between growth. FDI, possible reverse relationship, which high growth attract FDI to promote GDI
Simona O. H. (2012)	7 Eastern European Countries	1993-2008	OLS, GMM, Panel cointegration and Granger casualty test	A positive effect of FDI on growth and the relationship is bidirectional between FDI and GDP.
Wang M. (2009)	12 Asian Countries	1987-1997	Random effect and weighted least Square	FDI in the manufacturing sector generate a significant positive impact growth
Reichert U. N. 2001)	24 developing countries	1971-1995	OLS, Fixed Effect, and MFR casualty test	FDI on average has a significant impact on growth.
Zhang K. H. (2001)	11 countries	1960-1997	Granger casualty, Unit root test, and cointegration	The positive impact of FDI on growth. The Impact is strong if host countries adopt liberalize policy and improve the education system.
Kasibhatla K.M. (2008)	Five countries	1970-2005	Unit root, cointegration, and VECM	The negative relationship between FDI and growth
Kingsley N. (2008)	Malaysia, Indonesia, Thailand and the Philippines	1990-2005	OLS and Seemingly unrelated regression (SUR)	FDI in 4 ASEAN countries has a negative impact on economic growth.

Kentor, (1998).	79 developed and developing countries	1938-1990	OLS	FDI has a negative impact on growth in the long run
Nolan P. (1983)	25 Firm-level data	1971-1980	Analysis of Variance	FDI would increase the inequality
Dunn C. (1975)	less developed countries	1950-1970	Panel OLS	Domestic firms may affect negatively, they would not compete with foreign firms, and it would create a monopolistic market

2.3 Conditional view

Some empirical studies have found that the impact of FDI on growth highly depends on the economic, technological, socio-political, legal conditions of the host country. The empirical study of De Mello (1997) found that cultural factors, roles of the receiving government in the economy, the protection of property rights, tax structure, the openness of the receiving country and the adequacy of the infrastructure play essential roles in the relationship between FDI and growth. The empirical study of Busse and Groizard (2003) using 84 sample countries from 1994-2003. It suggests that to generate a positive impact of FDI inflows, government first have to tackle the institutional setting and improve the regulatory quality in their countries. Another empirical study of Haji M. nor (2013) studied the role of the financial institution in the relationship between FDI and growth, using data from 11 developed and 16 emerging countries. The study found FDI has a negative impact on growth, but the relationship is significantly positive when FDI interacts with financial development.

Several other empirical studies tried to clarify which are the determinants of FDI to achieve higher rates of economic growth and welfare in a host country. Wu and Lin (2014) studied the impact of FDI in African economies and found that policy and strategy of country-specific factors determine this relationship. The empirical study of Oktay and Ahmet (2016) examined the relationship between FDI and growth with the data of 39 countries from 2000–2013 and found that to attract long-term capital movements, host countries need sufficient human capital, economic stability and free markets. Legislative regulations contribute to improving economic freedom in these countries, and a higher level of economic freedom also has more efficiency and higher growth rates. Lall and Narula (2004) examined FDI and its role in economic development and suggested that FDI cannot drive industrial growth without local capabilities. Robust local capabilities raise the possibility of attracting high-value systems and of capturing skill and technology spillovers from them; these capabilities need selective policies. Bengoa (2000) studied the relationship between FDI and growth in Latin American countries and found that there is a positive and significant correlation between FDI and growth with a minimum threshold of development associated with social capital. The contribution of FDI on economic growth is enhanced by its positive interaction with financial market development, and absorptive capacity; human capital and technology (Carp, 2012). Holding constant the level of FDI or EFPI (which the host legal environment also likely influences), countries with higher legal standards likely channel foreign investment more efficiently (Durham, 2004). Batten and Vo (2010) used two measures of FDI; inflow and stock to analyze the impact of FDI measures on growth. Their empirical result revealed that FDI stock and inflow have strong impact on growth in countries which have a higher level of educational attainment, and government size.

2.4 Empirical Study on the Role of FDI in Asian economy

The empirical studies of Choong, Yusop and Soo (2004) presented the empirical result for FDI, economic growth, and financial sector development. Their result revealed that the presence of FDI inflows creates a favorable technological diffusion in the long run only if the evolution of the domestic financial system has achieved a certain minimum level, and the well-developed financial sector can represent a source of comparative advantage for that country. Similarly, Athukorala and Wagle (2011) studied the data from 1990-2006 of ASEAN countries. Their result showed that FDI has been a significant driver of Malaysia's rapid growth and structural transformation through export-oriented industrialization over the four decades. Innovative capacity has a positive and significant effect on FDI,

Thangavelu and Yong (2009) empirically assessed the FDI on growth and financial crisis of 10 East Asian and South East Asian countries from 1992-2007. The study reveals that FDI tends to have a more significant impact on output growth than domestic capital formation. Better absorptive capacities, infrastructure, human capital, and technologies have a more significant impact on output growth of MNCs through productive spillover. Chaitanya (2009) examined the determinants of FDI and volatility in Southeast Asian economies and found that socioeconomic factors, institutional factors and political factors, and labor-related issue are significant determinants. Faruq and Peter J. (2011) empirically studied the links between FDI and manufacturing productivity from 1975-2005 of 10 Asian countries. The result confirmed physical capital investment, trade openness and large FDI inflows are positively related to the difference between manufacturing and agriculture sector. FDI inflow contributes to increasing the productivity via technological transfer, and Financial sector development.

Vogiatzoglou (2016) applied factor analysis to 10 ASEAN countries from 2003-2013 and showed that efficiency and exercise have a positive effect on FDI. Efficient regulation and macroeconomic fundamentals are essential prerequisites for receiving country, and skilled business-friendly employment regulations have a positive effect in FDI inflows. Another empirical study of Sivalogathasan and Wu, (2014) studied the impact of FDI on south Asian countries and suggested that FDI has a positive impact on growth through technical spillover and domestic innovation.

Overall, the diversity of these findings highlights the difficulty in making generalized comments on the relation between FDI and growth. There is a relative dearth of studies of this relationship under different doing business environment in developing countries. This study contributes to the further insights into this relationship by examining in more detail and extensively than other recent studies considering the role of business environment, and other financial and institutional conditions and design policy implication for Nepal.

III THEORETICAL FRAMEWORK, DATA, AND METHODOLOGY

This study analyzes the effect of FDI on economic growth by conducting several panel data regression analyses. This chapter will discuss theoretical arguments on the impact of FDI on economic growth and the data and methodology that the study uses.

Theoretical Arguments on the Effect of FDI on Economic Growth

Many empirical studies on the impact of FDI on economic growth showed that FDI would stimulate economic growth through technology transfer and spillover effects (Findlay, 1978, Chowdhary, 2006). The Harrod-Domar growth model provides the fundamental relationship between investment and economic growth. According to the model, economic growth is depending on the domestic savings ratio (domestic investment), capital-output ratio and depreciation rate. As to the effect of FDI on economic growth, Hermes (2003) suggested that FDI would enhance technological change through spillover effects of knowledge and technologies embodied in new products. FDI will not only serve to narrow the gap between domestic savings and

investment but also introduce new technologies and expertise, thereby enhancing economic growth. With FDI, total investment will be the sum of domestic investment and FDI, where domestic investment depends on GDP and internal interest rate (Gocer, 2014).

Neo-classical growth models such as the Solow growth model and endogenous growth models provide the basis for most of the empirical studies on the relationship between FDI and economic growth. The relationship has been studied by considering (1) determinants of economic growth, (2) determinants of FDI, (3) the roles of multinational firms in host countries, and (4) direction of causality between FDI and economic growth (Abdur Chowdhury, 2003). According to the Solow growth model, the growth of GDP per capita of an economy depends on the initial per capita GDP. The growth of per capita GDP relies not only on the initial per capita GDP but also some other factors. Therefore, after controlling for differences between countries regarding preferences, savings rate, technologies, and institutions, the Solow growth model expects that countries would converge in per capita GDP to the steady states, that is, poorer countries tend to grow faster than wealthier countries. One of the other essential factors is FDI since it promotes capital accumulation and increases total factor productivity through technological advancement and human capital development (Blomstrom, 1996; Felipe 1999; Kotrajaras, 2011; Zhang, 2003; DeMello, 1999; Dunning, 1993; Romer, 1986; Borenszteinn, 1998). We expect that FDI has a positive impact on economic growth.

The Data and the Description of Variables

This study uses a panel data set of 63 developing countries in Asia, Africa and Latin America (22 countries in Asia, 26 countries in Africa and 15 Latin American and other developing countries) for the period from 1990 to 2015, which is constructed by using the databases of World Bank (data.worldbank.org), IMF (data.imf.org), UNDP (hed.undp.org), UNCTAD (stats.unctad.org) and World Heritage (heritage.org). In addition to these databases, the study uses data from the database of Department of Industry of Nepal. The dataset includes data on GDP, FDI, and other independent variables.

The growth rate of GDP per capita is measured by using GDP at constant 2010 prices in US dollars obtained from the World Bank. Data on the flow of FDI have also derived from the World Bank, while data on the stock of FDI are obtained from UNCTAD. FDI stocks are presented at book value or historical cost, reflecting prices at the time when the investment was made. FDI inflow is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital. In the panel data analyses, FDI per capita is used as an explanatory variable after converting to the natural logarithm. Labor force data are obtained from the World Bank. The labor force includes people aged 15 and over who are currently employed and who are unemployed but seeking jobs. Data on (domestic) savings are also obtained from the World Bank. By taking the ratio between savings and GDP, we obtained savings ratio.

This study also considers the domestic saving rate as a share of GDP, education, inflation rate, trade openness, and financial market development as other explanatory variables. The proxy for education/human capital is the mean year of schooling; an average number of years of education received by people ages 25 and older. The inflation rate is thought to indicate economic stability, thus as another explanatory variable, the inflation rate is considered. Trade openness is measured by taking the ratio between total trade (import + export) and GDP. According to Vogiatzoglou (2016) and Alfaro (2004), the business environment is an essential determinant of the impact of FDI on economic growth. This study thus includes the capital gain tax as a proxy for the business environment. Data for these variables are obtained from the databases mentioned above.

Methodology

This study conducts several panel data regression analyses using the panel data set described above. Based on the theoretical arguments outlined above, a panel data regression model that we estimate is given by:

$$gr\_pcgdp_{it} = \alpha + \gamma_1(pcgdp_{it}) + \gamma_2(fdi\_gdp_{it}) + \boldsymbol{X}'_{it}\boldsymbol{\beta} + \alpha_i + \varepsilon_{it} \quad (1)$$

Where gr_pcgdp_{it} is the growth rate of per capita GDP in country *i* and year *t*, $pcgdp_{it}$ is per capita GDP in country *i* and year *t*, fdi_{it} is FDI per GDP (FDI/GDP) in country *i* and year *t*, $\boldsymbol{X}_{it}$ includes all other independent variables in country *i* and year *t* (domestic savings rate, inflation, trade openness, education, and so on), α_i = individual specific term and ϵ_{it} = idiosyncratic error term. Equation (1) is estimated by using the pooled OLS model, the fixed effects (FE) model and the random effects (RE) model. The following discusses these models and two tests to select an appropriate model for the analysis.

Pooled OLS Model

Consider the following panel data regression model.

$$y_{it} = \alpha + \boldsymbol{X}'_{it}\boldsymbol{\beta} + \alpha_i + \varepsilon_{it} \quad (2)$$

where y_{it} = dependent variable, $\boldsymbol{X}_{it}$= independent variables, α_i = individual-specific effects, and ε_{it} = idiosyncratic error term. In a pooled model, we assume that independent variables are exogenous. By substituting $u_{it} = \alpha_i + \varepsilon_{it}$ into the equation above, a pooled model is written as

$$y_{it} = \alpha + \boldsymbol{X}'_{it}\boldsymbol{\beta} + u_{it} \quad (3)$$

where u_{it} = idiosyncratic error term.

Fixed Effects Model

A panel data analysis enables us to control for variables that we cannot observe, such as cultural factors and account for individual heterogeneity. α_i in equation (2) takes care of this heterogeneity. In the fixed effects model, α_i in equation (2) are allowed to be correlated with the independent variables $\boldsymbol{X}_{it}$. However, we assume that the independent variables $\boldsymbol{X}_{it}$ are uncorrelated with the ideosyncratic error term ε_{it}. A fixed effects model would have been appropriate if we were interested only in the variation across time. One problem of the fixed effects model is that the model cannot be used to investigate time-invariant causes of the dependent variable.

Random Effects Model

In the random effects model, we assume that in equation (2) is random rather than fixed. That is, it is assumed that is uncorrelated with the independent variables. One advantage of the random effects model is that the model allows us to estimate the coefficients of the time-invariant independent variables. However, if the fixed effects model is appropriate, the estimates of the random effects estimator are inconsistent. The random effects model allows us to generalize the results beyond the sample used in the model.

We conduct several hypothesis tests regarding the results of the panel data regression analyses. The following discusses the Hausman test and the Breusch and Pagan Lagrangian Multiplier test.

Hausman Test

Under the null hypothesis that individual-specific effects are random, the fixed effects and random effects estimators should be similar since they are both consistent. Under the alternative hypothesis, however, these two estimators are different. The Hausman test compares the estimated coefficients of time-varying independent variables and helps to choose between the fixed effects and random effects models. The null hypothesis is that individual-specific effects are random, i.e., the appropriate model is the random effects model. If there is a statistically significant difference in the estimated coefficients between the fixed effects and random effects models (Chi-squared statistic is significantly large), we can reject the null hypothesis that the appropriate model is the random effects model. That is, the preferred model is the fixed effects model.

Breusch and Pagan Lagrangian Multiplier Test

The null hypothesis in the Breusch Pagan Lagrangian Multiplier test is that the variance across individual units (districts in our study) is zero, i.e., there is no difference across these individual units. The Breusch Pagan Lagrangian Multiplier test helps us to decide between the random effect and pooled OLS regression models. If the Chi-squared statistic is significantly large, then we can reject the null hypothesis that there is no difference across these individual units, that is, the appropriate model is the pooled OLS model. On the other hand, if we cannot reject the null hypothesis, that is, the Chi-squared statistic is minimal, the appropriate model is the random effects model.

Dynamic Panel Data Analysis

Since per capita GDP in year t should be, to some extent, related to per capita GDP in the previous years, it is reasonable to include per capita GDP in year t-1 as an independent variable. Therefore, in addition to the panel data regression analyses with the pooled OLS, fixed effects and random effects models, this study also conducts a dynamic panel data regression analysis with the following dynamic model.

$$pcgdp_{it} = \alpha + \gamma_1(pcgdp_{i,t-1}) + \gamma_2(fdi\_gdp_{it}) + \boldsymbol{X}'_{it}\boldsymbol{\beta} + \alpha_i + \varepsilon_{it} \quad (4)$$

In equation (4), all the variables are converted to the natural logarithm when necessary. To estimate this dynamic panel data regression model, a GMM (generalized method of moments) estimator developed by Arellano and Bond (1991) is used. After first-differencing the dynamic panel data regression model given above, consistent estimates can be obtained by the GMM estimator. Thus, the Arellano-Bond estimator is also called the difference GMM (generalized method of moments) estimator. This study also uses a GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998), since it is more efficient than the Arellano-Bond estimator. This GMM estimator is usually called the system GMM estimator.

Both Arellano-Bond(1991) and Blundell Bond(1998) estimators are designed for the situation with small T, large N panels, a linear functional relationship, single left-hand side variable that is dynamic, depending on its past realizations, independent variables that are not strictly exogenous (correlated with past and possibly current realization of the error), fixed individual effects, and heteroskedasticity and autocorrelation within individuals but not across them. Arellano Bond estimation starts by transforming all regressors, usually by differencing (Roodman, 2006).

Blundell Bond, 1998/ system GMM model, is an extension of the Arellano–Bond estimator that accommodates large autoregressive parameters and a large ratio of the variance of the panel-level effect to the variation of idiosyncratic error. This method assumes that there is no autocorrelation in the idiosyncratic errors and requires that the panel-level results be uncorrelated with the first difference of the first observation of the dependent variable (Blundell and Bond, 1998).

To use the dynamic panel data regression model, we need to conduct two specification tests. The following discusses these tests.

Arellano Bond Test (Test of Serial Uncorrelation of the Error Term)

To obtain consistent estimates, the dynamic panel estimators require that the error term be serially uncorrelated. The null hypothesis is that (i.e., are not correlated) for k = 1, 2, 3. If the error term is serially uncorrelated, we expect to reject the null hypothesis at order 1 (k =1) but not at higher orders (k = 2 and 3).

Sargan Test (Test of Overidentifying Restrictions)

Since a number of instrumental variables are used to estimate a fewer number of parameters in the GMM estimators, one needs to test for overidentifying restrictions. The Sargan test can do this test. The null

hypothesis is that the population moment conditions are correct (i.e., overidentifying restrictions are valid). If the Chi-squared statistic is huge and the probability of having this Chi-squared statistic is smaller than 0.05, we can reject the null hypothesis at the 5% significance level. Otherwise, we can not reject and can thus conclude that overidentifying restrictions are valid.

Hypothesis Testing

Given the theoretical arguments in Section 4.1, this study tests the following two main hypotheses based on the results of the panel data regression analyses.

(1) FDI should have a positive effect on economic growth, after controlling for other factors. Therefore, the increase in FDI would increase the growth of per capita GDP. That is, the coefficient of pcfdi is significant and expected to have a positive sign.

(2) The larger the initial per capita GDP is, the smaller the growth rate tends to be. Thus, the coefficient of pcgdp is significant and expected to have a negative sign.

In addition to these two main hypotheses, this study tests the following hypotheses: (1) domestic savings have a positive effect on economic growth; (2) inflation has an adverse impact on economic growth; (3) infrastructure as proxied by electricity has a positive effect on economic growth; (4) FDI has substantial impact on growth under improved business environment.

IV EMPIRICAL RESULTS

This chapter provides estimation results of the panel data regression analyses on the effect of FDI on economic growth. We control some other independent variables that could affect economic growth. Before discussing the results of the panel data analyses, Table 5.1 provides the correlation matrix for the dependent and independent variables included in our empirical study. In the empirical results tables 5.2 to 5.9, L_l.LPCGDP is log value of 1 year lag per capita GDP, L_PCFDI is log value of per capita FDI, L_PCFDIstk is log value of per capita FDI stock, saving_rate is domestic saving as a share of GDP, L_Pcelect is log value of per capita electricity consumption (proxy of infrastructure), L_labf is log value of total labor force, L_mnsch is log mean year of schooling, DCbyFIN is domestic credit provided by financial sectors, Capitalg.tax is capital gain tax, and trade is the ratio of total international trade (total sum of import and export) as a share of GDP.

Result of Specification Test:

Hausman Test:

Since the key consideration in choosing between a random effects and fixed effects approach is whether ai (a fixed effect which captures all unobserved, time constant factor that affects yi) and xit (Independent variables) are correlated, it is important to have a method for testing this assumption. Hausman, (1978) proposed a test based on the difference between the random effects and fixed effects estimates. Since Fixed Effect is consistent when ai and xit are correlated, but Random Effect is inconsistent, a statistically significant difference is interpreted as evidence against the random effects assumption. The null hypothesis of the Hausman test is that the preferred model is a random effect. According to the result of the Hausman test of our empirical study as shown in table 5; the prob>chi2 is less than 0.05 (almost 0 in both measures of FDI; FDI inflow and FDI stock as an independent variable), which means that fixed effect model is more appropriate than random effect model.

Breusch and Pagan Lagrangian Multiplier Test:

The breusch pegan lagrangian multiplier (LM) test helps us pick the appropriate method of a random-effects regression and a simple OLS regression. The null hypothesis in the LM test is that variances across entities are zero; the preferred model is pooled OLS. According to the LM test result in table 5; prob>chi2 is less than 0.05 (almost 0 in both measure of FDI; inflow and stock), which means that the random effect is better than the pooled OLS.

F-test:

The result of F-test shows whether there is a fixed effect in the model or not. Table 5 presents the result of the F-test. According to the result, fixed effect model is more significant than pooled OLS, under both measures of FDI: inflow and stock. P-value of F-test score under both regression methods are less than 0.0001, and F- value of fixed effect model is higher than OLS. This means that FE is preferred model to pooled OLS.

Arellano bond Test:

The result of the Arellano bond test (estat abond) reports serial correlation in the first-differenced error. Rejecting the null hypothesis of no serial correlation in the first-differenced errors at order zero does not imply model misspecification, because the first-differenced errors are serially correlated if the idiosyncratic errors are independent and identically distributed. Table 8 reports the results of Arellano bond test under DGMM and SGMM with different measures of FDI; stock and inflow. According to the result, we reject no autocorrelation of order 1 and cannot reject any autocorrelation of order 2. There is evidence that the Arellano–Bond model assumptions are satisfied in the case of both FDI measures: inflow and stock under both regression methods (DGMM and SGMM). P-value (prob>z) in first order is less than 0.05, and it is more than 0.1 in the second order in both case. Therefore, the assumptions of Arellano bond are satisfied.

Sargan Test:

Only for a homoscedastic error term does the Sargan test have an asymptotic chi-squared distribution. Arellano and Bond (1991) show that the Sargan test over rejects in the presence of heteroskedasticity. Table 8 reports the results of sargan test under different regression models; DGMM and SGMM. The output of the two-step Sargan test (Prob> chi2 is more than 0.1; almost 1.0) presents strong evidence that we cannot reject the null hypothesis; therefore, the overidentifying restrictions are valid in both model specification of FDI inflow and stock under DGMM and SGMM.

Estimation Results of 63 Developing Countries

Tables 3 and 4 present the results of the panel data regression analyses based on pooled OLS, fixed effect and random effects models, where the dependent variable is the growth rate of per capita GDP. Table 3 presents the result when the FDI variable is FDI inflow divided by GDP, while Table 4 reports the result when the FDI variable is FDI stock divided by GDP. Since according to the Breusch Pegan lagrangian multiplier test we can reject the null hypothesis that OLS is consistent, the random effect model seems to be appropriate. According to the Hausman test, we can reject the null hypothesis that individual-specific effects in equation (1) are random, meaning that an appropriate model is the fixed effects model. Therefore, we discuss the result based on the fixed effects model.

First, the coefficient of per capita GDP in the previous year is statistically significant (at the 1% level) and has a negative sign; this means that countries with larger per capita GDP tend to have smaller growth rates than

countries with lower per capita GDP. Developing countries are converging to their steady state after controlling for other independent variables (conditional convergence according to Barro and Sala-i-Martin, 1992). Second, the coefficient of the FDI variable is statistically significant (either at the 1% level or the 5% level) and has a positive sign, whether the flow FDI variable (Table 5.2) or the stock FDI variable (Table 5.3) is used. Since the estimated coefficient is 0.067 according to Table 5, the 1% increase in FDI inflow (as a share of GDP) results in a 0.067 percentage point increase in the growth of per capita GDP.

Third, the coefficient of the domestic savings rate has a positive sign. However, according to the result of the fixed effects model, it is not statistically significant. Therefore, it is not clear whether domestic savings is significantly affecting economic growth from these results. Fourth, among other independent variables, the coefficients of the labor force variable and the education variable are statistically significant. However, while the coefficient of the labor force variable has a positive sign as expected, the coefficient of the education variable has a negative sign. This may be because most developing countries still rely on labor-intensive technologies and low-skilled workers: Thus, the expansion of education has not contributed to economic growth yet. Fifth, the coefficient of domestic financial development (proxied by credit provided by domestic financial sectors) is positive and significant at 1% level of significance, whether the flow FDI variable (Table 3) or the stock FDI variable (Table 4) is used.

Tables 6 and 7 reports the results of the dynamic panel data regression analysis, which are obtained by using the Arellano Bond estimator (difference GMM estimator) and the Blundell Bond estimator (system GMM estimator). Table 6 presents the result when the FDI variable is FDI inflow divided by GDP, while Table 7 reports the result when the FDI variable is FDI stock divided by GDP. In the dynamic panel data model (equation (4)), all the variables are converted to the natural logarithm unless otherwise indicated. According to the Arellano Bond Test (Test of Serial Uncorrelation of the Error Term), there is no first-order serial autocorrelation in the error term, while according to the Sargan Test (Test of Overidentifying Restrictions), overidentifying restrictions are valid.

We now discuss the results of Table 6, in which the FDI variable is FDI inflow as a share of GDP. First, the coefficient of the FDI variable is statistically significant at the 1% level and has a positive sign in all model specifications; thus, the result is robust. In other words, the increase in FDI inflow (as a share of GDP) would raise per capita GDP, ceteris paribus. Second, the coefficient of domestic savings ratio is also statistically significant the 1% level in most model specifications and has a positive sign; this implies that the increase in domestic savings rate would increase per capita GDP, ceteris paribus. If GDP is fixed, a larger domestic savings ratio will result in domestic investment, and in turn, bring about a higher per capita GDP through capital formation.

Third, the coefficient of the infrastructure variable (proxied by per capita electricity consumption) is statistically significant at either the 1% and 5% significance level in all model specifications and has a positive sign: This means that the development of infrastructure has played an essential role in raising per capita GDP. Fourth, among other independent variables, the coefficient of the labor force variable is statistically significant in most model specifications; but the results are mixed regarding its sign: favorable in some model specifications and negative in some other model specifications. Therefore, it is unclear whether the increase in the labor force will increase per capita GDP. According to the result, as shown in table 6, the coefficient of human capital proxied by mean year of schooling is significant at 1% level of significance in all model specification, and the sign is positive. Table 6 shows significant results for some other independent variables, but their effects are negligible.

We next discuss the result of Table 7 in which the FDI variable is the stock of FDI as a share of GDP. First, the coefficient of the FDI variable is statistically significant in most, but not all model specifications, though it has a positive sign in all model specifications. Unlike FDI inflow, the result is not robust; this implies that the increase in the inflow of FDI has played a more important role than the increase in the stock of FDI on economic growth. Second, the coefficient of the domestic savings ratio is statistically significant the 1% level in

most model specifications and has a positive sign; this confirms the result using the flow of FDI as an independent variable.

Third, the coefficient of the infrastructure variable as proxied by per capita electricity consumption is statistically significant at the 1% significance level in all model specifications and has a positive sign; this again confirms the result using the flow of FDI as an independent variable. Fourth, among other independent variables, the coefficient of the labor force variable is statistically significant in most model specifications; but like the FDI flow variable case, the results are mixed regarding its sign: positive in some model specifications and negative in some other model specifications. Therefore, it is not clear whether the increase in the labor force will increase per capita GDP. Fourth, the impact of human capital proxied by mean year of schooling is similar as the result of FDI inflow; statistically significant at 1% level in the most model specification, and the sign is positive. The coefficient of domestic financial development is statistically significant at 1% level, but the sign is negative, and the scale of impact is very small.

It should be noted that the estimated coefficients of inflation and business environment are very small and almost negligible, though some coefficients are significant; this means that these variables have not exerted much impact on economic growth among developing countries. We also performed panel data regression analysis for each region (Africa, Asia, and Latin America and others), but did not find any significant or interesting results other than the result for 63 developing countries. The results of different regions validate the similar results as we discussed above.

Effects of FDI on Economic Growth under Difference Conditions

From the empirical results presented above, FDI is found to have a statistically significant and positive impact on economic growth, whether FDI is flow or stock. This section now investigates the effect of FDI on economic growth under different conditions by estimating the interaction effect of FDI with other independent variables such as domestic savings rate, infrastructure, labor force, education, domestic financial development, trade openness, and business environment. Tables 9 and 10 report results where the FDI variable is the flow of FDI divided by GDP in Table 9 and the stock of FDI divided by GDP in Table 10.

Table 9 shows that FDI inflow has a stronger impact on economic growth in countries with higher levels of infrastructure (proxied by per capita electricity consumption), education (proxied by mean year of schooling), trade openness and better developed domestic financial market. However, FDI flow has a negative impact on economic growth in countries with higher levels of domestic savings rate, labor force, and low doing business performance.

As shown in Table 10, the results are similar when the stock of FDI is used as the FDI variable. That is, the stock of FDI has a stronger impact on economic growth in countries with higher levels of infrastructure (proxied by per capita electricity consumption), education, trade openness and better developed domestic financial market, while the stock of FDI has a negative impact on economic growth in countries with higher levels of domestic savings rate, labor force, and business performance. These observations suggest that the effect of FDI on economic growth of an FDI receiving country depends very much on the condition of the country, such as infrastructure, trade openness, labor force, education and so on.

Table 3 Result of OLS, FE, and RE (FDI Inflow as a share of GDP); Growth rate as a dependent variable

GDP growth rate	OLS	FE	RE
L_l.PCGDP	-97.976***	-102.916***	-102.640***
	(1.10)	(0.54)	(0.54)
L_PCFDI	0.054	0.067***	0.075***
	(0.05)	(0.02)	(0.02)
Saving_rate	0.002	-0.000	0.003
	(0.00)	(0.00)	(0.00)
L_Pcelect	-0.453***	-0.162	-0.144
	(0.06)	(0.11)	(0.09)
L_labf	-0.003	1.111***	0.057
	(0.03)	(0.28)	(0.08)
L_mnsch	-0.272*	-1.491***	-1.220***
	(0.24)	(0.25)	(0.24)
Inflation	0.000	0.000	0.000
	(0.00)	(0.00)	(0.00)
DCbyFIN	0.004***	0.004***	0.003***
	(0.00)	(0.00)	(0.00)
Capitalg.tax	0.003	-0.010***	-0.008***
	(0.00)	(0.00)	(0.00)
Constant	6.370***	-11.758**	5.380***
	(0.73)	(5.44)	(1.60)
R-Squared	0.95	0.78	0.94

Table 4 Result of OLS, FE, and RE (FDI Stock as a share of GDP); Growth rate is the dependent variable.

GDP growth rate	OLS	FE	RE
L_l.PCGDP	-100.017***	-103.524***	-103.383***
	(1.08)	(0.54)	(0.53)
L_PCFDIstk	0.486**	0.221**	0.208**
	(0.20)	(0.10)	(0.10)
Saving_rate	0.007*	0.003	0.005
	(0.00)	(0.00)	(0.00)
L_Pcelect	-0.469***	-0.109	-0.114
	(0.06)	(0.12)	(0.10)
L_labf	-0.017	0.693**	0.060
	(0.03)	(0.29)	(0.09)
L_mnsch	-0.271*	-1.375***	-1.270***
	(0.25)	(0.24)	(0.24)
Inflation	-0.000	-0.000	-0.000
	(0.00)	(0.00)	(0.00)
DCbyFIN	0.003**	0.003***	0.003**
	(0.00)	(0.00)	(0.00)
Capitalg.tax	0.002	-0.006**	-0.005**
	(0.00)	(0.00)	(0.00)
Constant	7.049***	-5.066	5.164***
	(0.74)	(5.43)	(1.88)
R-Squared	0.92	0.87	0.93

The *t*-statistics are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% level respectively.

Table 5 Result of Specification Test (Hausman test, F-test, and LM test)

Hausman test result (FDI inflow as a share of GDP)
Test: Ho: difference in coefficients not systematic
chi2(10) = (b-B)'[(V_b-V_B) ^ (-1)] (b-B)
= 35.34
Prob>chi2 = 0.0001

Hausman test result (FDI stock as a share of GDP)
Test: Ho: difference in coefficients not systematic
chi2(10) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 24.28
Prob>chi2 = 0.0069

F-test (Dependent Variable: FDI inflow as a share of GDP)		
FE	F (11,601) = 4168.84	
	Prob > F = 0.0000	
OLS	F (11, 644) = 999.10	
	Prob > F = 0.0000	

F-test (Dependent Variable stock as a share of GDP)		
FE	F (35,600) = 1448.01	
	Prob > F = 0.0000	
OLS	F (35, 643) = 347.22	
	Prob > F = 0.0000	

Breusch and Pagan Lagrangian multiplier test for random effects (Dependent variable: FDI inflow as a share of GDP)

GDPgrowth[Countrynum,t] = Xb + u[Countrynum] + e[Countrynum,t]		
Estimated results:		
	Var	sd = sqrt (Var)
GDP growth	13.74833	3.707874
e	.1577898	.3972276
u	.6281543	.7925619
Test: Var(u) = 0		
chibar2(01) = 2998.79		
Prob > chibar2 = 0.0000		

Breusch and Pagan Lagrangian multiplier test for random effects (Dependent variable: FDI Stock as a share of GDP)

GDPgrowth[Countrynum,t] = Xb + u[Countrynum] + e[Countrynum,t]		
Estimated results:		
	Var	sd = sqrt (Var)
GDP growth	15.10302	3.886261
e	.1644895	.405573
u	.9114046	.9546751
Test: Var(u) = 0		
chibar2(01) = 3461.87		
Prob > chibar2 = 0.0000		

Table 6 Estimation result under DGMM and SGMM; FDI inflow as a Share of GDP (Per capita GDP as the dependent variable)								
Log Per capita GDP PPP 2010	DGMM	SGMM	DGMM	SGMM	DGMM	SGMM	DGMM	SGMM
L_l.PCGDP	0.906***	0.967***	0.914***	0.934***	0.925***	0.945***	0.885***	0.940***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
L_PCFDI	0.012***	0.016***	0.007***	0.010***	0.006***	0.009***	0.010***	0.012***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Saving_rate	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L_Pcelect	0.010***	0.021**	0.040***	0.041***	0.042***	0.046***	0.043***	0.027**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
L_labf	-0.045**	0.035***	-0.054***	0.014***	-0.047***	0.034**	-0.101***	0.046**
	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
L_mnsch	0.106***	0.055***	0.050***	0.068***	0.066***	0.063***	0.170***	0.071***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Inflation			0.000	-0.000***	-0.000	-0.000**	-0.000***	-0.000***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DCbyFIN					-0.000***	-0.000***	-0.000***	-0.000***
					(0.00)	(0.00)	(0.00)	(0.00)
Capitalg.tax							-0.001***	-0.001***
							(0.00)	(0.00)
Constant	1.151***	-0.226***	1.136***	0.096	0.966***	-0.219	1.801***	-0.341
	(0.25)	(0.07)	(0.14)	(0.09)	(0.23)	(0.22)	(0.32)	(0.36)
The *t*-statistics are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% level respectively.								
Table 7 Estimation result under DGMM and SGMM; FDI stock as a Share of GDP (Per capita GDP as the dependent variable)								
Log Per capita GDP PPP 2010	DGMM	SGMM	DGMM	SGMM	DGMM	SGMM	DGMM	SGMM
L_l.PCGDP	0.907***	0.961***	0.915***	0.940***	0.926***	0.952***	0.874***	0.926***

	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
L_PCFDIstk	0.003	0.011**	0.04*	0.009**	0.08**	0.011***	0.021***	0.031***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Saving_rate	0.001***	0.002***	0.001***	0.002***	0.001***	0.002***	0.002***	0.002***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
L_Pcelect	0.033***	0.022***	0.026***	0.032***	0.035***	0.040***	0.056***	0.045***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
L_labf	-0.209***	0.036***	-0.012*	0.007	-0.022**	0.010	-0.088***	0.09**
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.03)	(0.01)	(0.03)
L_mnsch	0.028***	0.052***	0.025	0.073***	0.038***	0.081***	0.093***	-0.006
	(0.01)	(0.00)	(0.02)	(0.01)	(0.01)	(0.02)	(0.03)	(0.03)
Inflation			0.000	-0.000***	-0.000	-0.000	-0.000***	-0.000***
			(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
DCbyFIN					-0.001***	-0.001***	-0.000***	-0.001***
					(0.00)	(0.00)	(0.00)	(0.00)
Capitalg.tax							-0.001***	-0.001***
							(0.00)	(0.00)
Constant	0.469***	-0.216***	0.471*	0.166	0.600***	0.317	1.694***	0.007
	(0.11)	(0.07)	(0.24)	(0.13)	(0.13)	(0.45)	(0.17)	(0.32)
The *t*-statistics are in parentheses. *, ** and *** indicate significance at 10%, 5% and 1% level respectively.								

Table 8 Result of Specification Test (Abond test and Sargan test)

Arellano Bond

Abond test for zero autocorrelation in first-differenced errors (FDI inflow as a share of GDP)		
Order	z	Prob > z
1	-4.1161	0.00
2	-.85813	0.39
H0: no autocorrelation		

Blundell Bond

Abond test for zero autocorrelation in first-differenced errors (FDI inflow Share as a share of GDP)		
Order	z	Prob > z
1	-4.0806	0.00
2	-1.2722	0.20
H0: no autocorrelation		

Sargan test of overidentifying restrictions (FDI inflow as a share of GDP)
H0: overidentifying restrictions are valid
chi2(275) = 36.82
Prob > chi2 = 1.00

Sargan test of overidentifying restrictions (FDI inflow as a share of GDP)
H0: overidentifying restrictions are valid
chi2(298) = 35.74
Prob > chi2 = 1.00

Abond test for zero autocorrelation in first-differenced errors (FDI stock as a share of GDP)		
Order	z	Prob > z
1	-3.5092	0.00
2	-1.2527	0.21
H0: no autocorrelation		

Abond test for zero autocorrelation in first-differenced errors (FDI stock as a share of GDP)		
Order	z	Prob > z
1	-4.1072	0.00
2	-1.0779	0.28
H0: no autocorrelation		

Sargan test of overidentifying restrictions (FDI stock as a share of GDP)
H0: overidentifying restrictions are valid
chi2(275) = 34.14
Prob > chi2 = 1.00

Sargan test of overidentifying restrictions (FDI stock as a share of GDP)
H0: overidentifying restrictions are valid
chi2(298) = 35.65
Prob > chi2 = 1.00

Table 9 Growth impact of FDI Inflow on economic growth under different conditions

	L_PcGDP	Saving_rate	L_Pcelect	L_labf	L_mnsch	trade	DCbyFIN	Capitalg.tax
L_l.PCGDP	-4.006***	-104.097***	-103.723***	-102.675***	-104.596***	-103.033***	-103.922***	-103.953***
	(1.14)	(1.87)	(1.88)	(1.83)	(1.86)	(1.87)	(1.85)	(1.88)
L_PCFDI	-0.341	0.096	-0.948**	2.086***	-1.230***	-0.363***	-0.468***	0.149
	(1.75)	(0.11)	(0.37)	(0.50)	(0.33)	(0.12)	(0.13)	(0.14)
FDI inflow X Interaction	0.162	-0.012***	0.126**	-0.132***	0.587***	0.003***	0.006***	-0.009**
	(0.22)	(0.00)	(0.05)	(0.03)	(0.17)	(0.00)	(0.00)	(0.00)
L_PCGDP		0.123***	0.074	-0.498	3.649***	-0.019*	0.001	-0.041
		(0.03)	(0.64)	(0.31)	(0.96)	(0.01)	(0.01)	(0.03)

Saving_rate	103.713***		0.373**	-0.009	0.014	0.006**	-0.003	-0.018**
	(1.92)		(0.16)	(0.08)	(0.25)	(0.00)	(0.00)	(0.01)
L_Pcelect	103.268***	-0.047***		-0.049	0.218	0.004	-0.002	-0.012
	(1.92)	(0.01)		(0.08)	(0.25)	(0.00)	(0.00)	(0.01)
L_labf	102.517***	-0.042***	0.191		0.087	0.006**	-0.002	-0.026***
	(1.87)	(0.01)	(0.16)		(0.24)	(0.00)	(0.00)	(0.01)
L_mnsch	104.247***	-0.045***	0.188	-0.077		0.003	0.001	-0.008
	(1.91)	(0.01)	(0.16)	(0.08)		(0.00)	(0.00)	(0.01)
trade	102.685***	-0.047***	0.280*	-0.023	0.143		-0.002	-0.017**
	(1.91)	(0.01)	(0.16)	(0.08)	(0.24)		(0.00)	(0.01)
DCbyFIN	103.375***	-0.043***	0.433***	-0.079	0.184	0.002		-0.011
	(1.89)	(0.01)	(0.16)	(0.08)	(0.24)	(0.00)		(0.01)
Capitalg.tax	103.481***	-0.038***	0.264	-0.088	0.074	0.004	-0.000	
	(1.93)	(0.01)	(0.16)	(0.08)	(0.25)	(0.00)	(0.00)	

Table 10 Growth impact of FDI Stock on economic growth under different conditions

	L_PcGDP	Saving_rate	L_Pcelect	L_labf	L_mnsch	trade	DCbyFIN	Capitalg.tax
L_l.PCGDP	-3.133	-103.447***	-104.021***	-102.815***	-104.684***	-103.953***	-105.635***	-103.482***
	(2.29)	(1.87)	(1.90)	(1.85)	(1.89)	(1.82)	(1.89)	(1.82)
L_PCFDIstk	0.756	-0.096	-0.748*	1.799***	-0.941***	-0.162	-0.436**	0.035
	(1.83)	(0.16)	(0.38)	(0.54)	(0.32)	(0.15)	(0.17)	(0.16)
FDI Stock X Interaction	-0.013	-0.011**	0.122*	-0.110***	0.490***	0.006***	0.009***	-0.018***
	(0.26)	(0.00)	(0.07)	(0.03)	(0.17)	(0.00)	(0.00)	(0.00)
L_PCGDP		0.134***	0.254	-0.508	3.782***	-0.018	-0.004	-0.053*
		(0.03)	(0.68)	(0.33)	(1.08)	(0.01)	(0.02)	(0.03)
Saving_rate	103.360***		0.341**	-0.051	-0.160	0.007**	-0.001	-0.018**
	(1.91)		(0.17)	(0.08)	(0.28)	(0.00)	(0.00)	(0.01)
L_Pcelect	103.381***	-0.046***		-0.044	0.167	0.003	-0.001	-0.013*
	(1.92)	(0.01)		(0.08)	(0.27)	(0.00)	(0.00)	(0.01)

L_labf	103.381***	-0.044***	0.172		0.086	0.006**	-0.000	-0.024***
	(1.92)	(0.01)	(0.16)		(0.26)	(0.00)	(0.00)	(0.01)
L_mnsch	104.233***	-0.045***	0.143	-0.077		0.004	0.002	-0.011
	(1.93)	(0.01)	(0.17)	(0.08)		(0.00)	(0.00)	(0.01)
trade	103.215***	-0.047***	0.160	0.053	0.233		-0.002	-0.018**
	(1.85)	(0.01)	(0.16)	(0.09)	(0.26)		(0.00)	(0.01)
DCbyFIN	104.771***	-0.041***	0.465***	-0.035	0.124	0.001		-0.011
	(1.90)	(0.01)	(0.17)	(0.08)	(0.26)	(0.00)		(0.01)
Capitalg.tax	103.481***	-0.041***	0.276*	-0.201**	-0.165	0.006**	0.004	
	(1.85)	(0.01)	(0.16)	(0.09)	(0.26)	(0.00)	(0.00)	

V CONCLUSION AND POLICY IMPLICATIONS

The primary objective of this study is to analyze the effects of FDI on economic growth and explore the factors and conditions that affect the effectiveness of FDI on economic growth. This objective was achieved by using several panel data regression methods with a panel data set of 63 developing countries for the period from 1990 to 2015, including 22 Asian, 26 African and 15 Latin America and other countries. The following sections provide a summary of significant findings and policy implications for the SAARC countries, particularly Nepal.

Summary of Major Findings

Major findings are summarized as follows. First, according to the results (by the fixed effects estimator) for all countries, countries with smaller per capita GDP in the previous year tend to grow faster than countries with higher per capita GDP; this suggests that countries are converging to their steady states after controlling for other variables affecting economic growth. Second, according to the results (by the fixed effects, difference GMM, and system GMM estimators) for all countries, except a few model specifications, FDI has a significant and positive effect on economic growth, whether a flow or stock variable measure FDI. Third, according to the results (by the fixed effects, difference GMM, and system GMM estimators) for all countries, domestic savings ratio has a significant and positive effect on economic growth, suggesting that investment financed by domestic savings has played an important role in economic development in developing countries.

Fourth, according to the results (by the difference GMM and system GMM estimators) for all countries, infrastructure (as proxied by per capita electricity consumption) has a significant and positive effect on economic growth, suggesting that infrastructure has played an important role in economic development in developing countries. Fifth, according to the results (from the DGMM and SGMM estimators), education (as proxied by mean year of schooling) has played an important role in the economic growth of developing countries. Whether measured by a flow or stock variable, FDI has a stronger impact on economic growth in countries with higher levels of infrastructure, education, trade openness, and better developed domestic financial market. On the other hand, FDI has a negative impact on economic growth in countries with higher levels of domestic savings rate, labor force, and poor doing business environment. These observations suggest that the impact of FDI on economic growth of developing countries depends very much on the economic condition of the country, such as infrastructure, domestic savings, we trade openness, labor force, natural resources and so on.

Policy Implications:

From these findings, some policy implications can be drawn for the roles of FDI in economic development. First, since FDI is found to have a significant and positive effect on economic growth, the government should develop and strengthen economic and business environment that is conducive to FDI, where FDI should be directed more to the tradable sector such as manufacturing sectors, since trade openness seems to have enhanced the effect of FDI on economic growth. The government of Nepal should design policies to attract FDI in tradable sectors to achieve the higher growth, to reduce the trade deficits, and to increase employment generation. Second, since the saving rate has a positive impact on growth. The saving rate as a share of GDP of Nepal is very small, so the government of Nepal should design effective monetary policy, and also focus on financial market development to encourage people to save more. Third, since well-developed physical infrastructure seems to have promoted the effect of FDI on economic growth, the government should allocate more funds to the development of physical infrastructure. Fourth, since the development of financial institutions and markets seems to raise the effect of FDI on economic growth, the government of Nepal should promote financial institutions development, and also should expand the network of the financial institution in every local body to attract more FDI, and to realize higher growth.

Fifth, since the size of labor force, seems to have affected negatively to the effect of FDI on economic growth, and education has affected positively to the effect of FDI on economic growth, the government should raise the level of education by expanding basic education and promoting vocational education. The government of Nepal should focus on the institutional capacity of technical and vocational educational institutions and

should also expand vocational education and training centers at the local level. It should also try to mitigate the educational mismatch between employers and employees by providing vocational training programs. Finally, the government should improve its institutional capacity to reduce unnecessary costs and time associated with the business. The government of Nepal should design the policy to improve the business environment and also focus on the institutional strengthening for effective implementation of a one-door policy to administer FDI. Some policy means to attract FDI include the establishment of special economic zones, the introduction of one-stop government, and tax facilities.

Conclusions:

It is a well-accepted argument in the developing economics literature that FDI plays an important role in the growth of developing countries. This empirical study contributes to the FDI literature, as it explicitly treats host countries' conditions and FDI impact on economic growth in developing countries and policy implication for Nepal.

The estimated result confirms the hypothesis that FDI can promote the economic growth of host countries. Moreover, FDI will generate more growth impact if host countries have appropriate economic and institutional conditions such as high education level, efficient physical infrastructure, trade liberalization, domestic financial market development, and improved doing business environment in developing countries. To generate the positive impact of FDI (inflow and stock) on economic growth developing countries should have some prerequisites or absorptive capacities. However, we do not find the evidence to support our hypothesis that the FDI has a substantial positive impact on growth if host countries have higher domestic saving, higher labor force, and economic stability.

This research study seeks to further our knowledge of the FDI and growth in developing economies and policy implication for Nepal. Better knowledge about the importance of FDI to fulfill the investment gap and economic growth of developing countries is crucial for devising strategies to promote long-term policies. Because of time, knowledge and resource constraints, we left many factors that can affect this relationship such as foreign exchange rate, migration, political stability, etc.

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