Impact of FDI on Economic Growth in Developing Countries: Role of Human Capital

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Economic theory proposes that FDI is one of the primary driving forces for stimulating growth (Barro and Sala-i-Martin 1995). Researchers still debate whether the interpretation of the direct effect of FDI on economic growth is inconclusive, whereas the significance of the absorptive capacity of host countries is commonly emphasized (e.g., Borensztein, De Gregorio, and Lee 1998; De Mello Jr. 1999; Alfaro *et al.* 2004; Makki and Somwaru 2004; Gönel and Aksoy, 2016). Such uncertainty may be the result of ignoring the effect of certain conditioning variables. This study aims to empirically explore whether FDI contributes to economic growth and whether the effect varies with the human capital development level in a panel data set of 70 developing economies from 1980 to 2015. The study employs the General Methods of Moments estimation instrumental variable technique to deal with the endogeneity issue. The empirical investigation shows that human capital threshold exists above which FDI exhibits a positive impact and below where it shows a detrimental effect on economic growth. Findings may help policymakers in selected developing countries to take advantage of the increasing international investment by considering domestic human capital development level.

Keywords: FDI, Human capital development level, Economic growth, Developing countries, System GMM

JEL classification: O10, O47, F14

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I. Introduction

Foreign direct investment (FDI) is one of the most important features of the contemporary globalization trend (Bajo-Rubio *et al.* 2010). This debate has held a distinct status in view of current variations in the structure and direction of FDI in developing countries. After an approximately 4% annual decrease from 1980 to 1985, FDI's share to developing countries has increased significantly. During the late 1980s, FDI increased by 17% annually in developing countries. In 1993, a total of US$70 billion FDI was allocated to developing countries, and the value of FDI inflows increased by 125% in the first three years of the decade (Lal 1998). A prevalent belief among policymakers that FDI enriches the yield of host nation and boosts economic growth exists. Swati Mehta (2018) and Kim (2011) state that developed countries benefit more because of their openness than developing economies. However, this belief explains the fact that FDI delivers direct investment funding and generates constructive externalities by accepting imported technology and skills. The three previous decades have witnessed huge FDI inflows in developing countries. Global inflows have increased from US$55 billion to US$1800 billion between 1980 and 2017 (United Nations Conference on Trade and Development [UNCTAD] report 2017). Therefore, this extraordinary increase in FDI inflows has inspired policymakers and researchers to explore the empirical relationships between FDI growth in the host country (Su Chang Yang *et al.* 2018). Macro experiential literature has discovered weak support for an

exogenous optimistic influence of FDI on economic growth. Borensztein (1998) and Xu (2000) show that FDI brings technology, which translates into more growth only when host countries have a minimum threshold of human capital stock.

Although relative theories and evidence about FDI's positive economic growth effect for developing countries exist, additional empirical evidence must confirm this belief, particularly in the context of developing countries. Furthermore, the total FDI effect on a country's economic growth seems to depend on certain conditional variables, which generate the marginal effect of FDI. Moreover, few literature has confirmed the conditionality effect of FDI. For instance, Borensztein (1998) find that FDI merely positively correlates with economic growth in countries with sufficiently high human capital. Bunchier, Chase-Dunn, and Robinson (1978) conclude that FDI poses a negative impact on the growth of developing countries. Fry (1993) agrees to this finding and reports that in 11 countries, FDI tends to exert a negative impact on growth. De Mello (1999) conclude that FDI exhibits a positive effect on OECD countries but shows a negative effect on non-OECD countries. In a panel study of 36 developing countries, Agosin and Machado (2005) reveal that FDI poses no positive effect on economic growth, especially in Latin America. Carkovic and Levine (2005) criticize previous studies on the effect of FDI on growth. They conclude that FDI shows no robust increase of growth. Herzer (2012) examines the effect of FDI on economic growth in 44 developing countries by implementing the GETS methodology to identify country-specific factors (*e.g.*, primary export dependence). In addition, a negative effect on growth is reported along with large cross-country differences. Johnson (2006) reports that FDI accelerates growth in developing countries but not in developed countries.

By using a panel data set of 70 selected developing countries from 1980 to 2015, the current study identifies the effect of FDI on economic growth. The mechanism in this research emphasizes the role of human capital development level as a conditional variable in enabling FDI to promote growth. Hence, findings of the study suggest that the selected countries benefit from FDI when their domestic human capital development level reaches a threshold. We also test the same mediator FDI effect in developing countries to improve the robustness of the conclusion.

The remainder of the paper is structured as follows: Section II briefly

reviews the recent literature, whereas Section III sets out the model specification and empirical methodology. Section IV reports the details and discusses the robustness of the results, whereas Section V presents the conclusion.

II. Literature Review

The world economy has become globalized over the last three decades. FDI has grown faster than many other economic activities. The fast growth in FDI has opened new opportunities for developing countries to participate in world production. Endogenous growth models stress the diffusion of innovations as a determinant, whereas openness policies can play an important role in the process of attracting FDI (Grossman and Helpman 1991; Barro and Sala-i-Martin 1996). In the theoretical model, FDI is generally considered a channel for technology transfer from developed countries to developing countries (Balasubramanyam *et al.* 1996; Borensztein *et al.* 1998) as it is introduced in Romer's (1990) model framework. However, Borensztein *et al.*'s (1998) model succeeds in introducing FDI as a main determinant of economic growth but fails to account for the endogeneity of such an investment. Many authors have concentrated on empirical literature, which focuses on the impact of FDI on economic growth in developing countries. Ariyo (1998) studies the investment trend and its impact on African economic growth over the years. He finds that only private domestic investments consistently contributed to the raising GDP growth rates during the period 1970–1995.

On the contrary, the relationship between FDI and growth may be complex and inconclusive across developing countries. For example, Shimma Hanafy *et al.* (2018) use the General Methods of Moments (GMM) panel estimations and find that the effect of FDI on economic growth does not depend on a minimum threshold level of human capital. Voka (2015) uses data over the period 1994-2010 to test the long-term relationship and a Granger-causality of FDI and economic growth in Albania. He finds a negative relationship between FDI and economic growth, which opposes economic theory. This finding is deemed interesting in the context of FDI to economic growth. Gjini (2013) analyzes 12 CEE countries to investigate the impact of FDI on growth by using panel data (1996-2010). He concludes that FDI in CEE countries negatively affects economic growth.

At present, certain researchers have introduced conditional effect by employing different variables to investigate the FDI-growth relationship. Ndiaye (2016) argue that FDI directly contributes to economic growth through new technologies and indirectly by improving financial institutions. Blomstrom *et al.* (1994) report that FDI tends to exert a positive impact on economic growth conditioned by a threshold level of income per capita. De Mello (1999) investigate the impact of FDI on capital accumulation, GDP, and total factor productivity growth in a sample of OECD and non-OECD countries by using time series and panel data over the period 1970-1990. He concludes that the positive impact of FDI on economic growth depends on the degree of complementarity and substitution between FDI and domestic investment level.

Although huge empirical literature on FDI-economic growth relationship exists, empirical outcomes remain inconclusive. Using cross-country growth regressions, certain studies find a positive direct effect of FDI on economic growth (Li and Liu 2005; Lensink and Morrissey 2006), whereas other studies reveal no significant direct impact of FDI on economic growth (Borensztein, De Gregorio, and Lee 1998; Alfaro 2003; Alfaro *et al.* 2004; Carkovic and Levine 2005; Herzer, Klasen, and Nowak-Lehmann 2008). Herzer (2012) shows that FDI, on average, has a negative impact on economic growth with large differences in the effect across countries. Neaime and Marktanner (2009) and El-wassal (2012), who examine the impact of FDI on economic growth in Arab countries, conclude that FDI has no, or only very limited, direct effect on economic growth. On the basis of a panel of 50 African countries, Gui-Diby (2014) reveals that FDI tended to exert a negative impact on the economy between 1980 and 1994 and a positive impact from 1995 to 2009. In distinction to a direct impact of FDI, the significance of the absorptive capacity of host countries, that is, the level to which they can accept and adopt newly available technologies, has been a central finding in many empirical studies on FDI-growth effect (*e.g.*, Borensztein, De Gregorio, and Lee 1998; De Mello Jr. 1999; Durham 2004; Makki and Somwaru 2004; Fillat and Woerz 2011; Gönel and Aksoy 2016). Using human capital as an indicator for absoptive capacity, Borensztein, De Gregorio, and Lee (1998) reveal in a cross-country analysis that FDI only boosts economic growth in developing countries when a minimum threshold of human capital exists in the host economy. Although certain studies find support for a conditional

effect of FDI depending on human capital (*e.g.*, Xu 2000; Li and Liu 2005), several other studies reject this conditional effect (e.g., Alfaro *et al.* 2004, 2009; Carkovic and Levine 2005; Lensink and Morrissey 2006; Herzer, Klasen, and Nowak-Lehmann 2008; Herzer 2012). Furthermore, this hypothesis is rejected by El-wassal (2012) in the context of Arab countries and Gui-Diby (2014) in that of African countries. A second possible source of absorptive capacity lies in the nature of interaction between foreign and local firms (De Mello Jr. 1999; Makki and Somwaru 2004).

In summary, the existing literature has a great contribution in the field but exhibits certain limitations. First, vast literature empirically explores the FDI-growth linkage but ignores the conditional effect. Second, in most previous studies (Blomstrom *et al.* 1994; De Mello 1999; Ndiaye 2016), the threshold level of income per capita, domestic investment level, and financial development level have been used as conditional variables to examine the FDI-growth relationship. However, these levels do not explain human capital development level as a conditional variable to explore the impact of FDI on economic growth in developing countries. Third, previous literature implies that the identification strategies need further improvements to reduce endogeneity problems. Finally, studies concerning developing countries on this topic are insufficient for policymakers to promote the FDI–growth strategy. Our empirical evidence indicates that human capital development level plays a critical role in economic growth through FDI. By using econometric specifications and including an interactive term between FDI and human capital development level, this study determines whether FDI exerts a robust and positive impact on economic growth in our selected sample countries.

III. Methodology

A) Model Design

Our model is based on the assumption that FDI contributes to economic growth by regarding human capital development level as a conditional or mediator variable. To the best of our knowledge, this study is the first empirical attempt to explore the causal link between FDI and economic growth in developing countries by using human capital development level as a conditional or mediator variable. The

empirical investigation conducted in this study is based on the system GMM estimator established for dynamic models. This study covers an unbalanced panel dataset of 70 developing countries over the period 1980–2015.

Considering the simple Cobb-Douglas version of the aggregate function, Equation (1) below is our basic model. Following the concept of Borensztein *et al.* (1998) and similar studies, we use FDI, which only refers to net inflows, that is, the foreign direct investment into the host country.

$$\ln y_{it} = \alpha + \beta \ln y_{it\text{-}1} + \partial X_{it} + \lambda_i + \mu_t + \psi_{it} \tag{1}$$

where i refers to the country (i = 1,…N), and t denotes the time period (t = 1,…T). Dependent variable $\Delta\ln(y)_{it}$ is the log difference of average growth rate of per capita GDP (1980-2015) for country i and time-period t; Δ is the difference operator; and $\Delta\ln(y)_{it\text{-}1}$ is the lag of the dependent variable, which represents the initial conditions. X_{it} is a vector of control variables assumed to affect the average growth rate of per capita GDP. The main explanatory variable is fdi, which is taken as a net inflow (inflows–outflows), whereas $gfcf$ presents gross fixed capital formation. l is the labor growth rate, $fdpvt$ presents the financial development as a private sector credit over GDP; *inf* denotes inflation as measured by the GDP deflator to capture the effect of macroeconomic stability on GDP growth. *hc* is used as a proxy of human capital taken from the Penn World Table (version, 9.0) of average years of schooling and returns to education, where ($fdi_{it} * \ln hc_{it}$) represents an interactive term between trade FDI and human capital development level; α, β, and δ are the parameters and vectors of parameters to be estimated. λ_i represents country-specific effects, μ_t refers to period specific effects, and ψ_{it} is the error term. All of the variables cited are employed with their natural logarithm.

$$\begin{aligned}\Delta \ln (y)_{it} = {} & \beta_0 + \beta_1 \ln (y)_{it-1} + \beta_2 \ln fdi_{it} + \beta_3 \ln hc_{it} + \beta_4 \ln l_{it} \\ & + \beta_5 \ln pvct_{it} + \beta_6 \ln \inf_{it} + \beta_7 \ln gfcf_{it} + \beta_8 \ln topen_{it} \\ & + \beta_9 \left(\ln fdi_{it} * \ln hc_{it}\right) + \lambda_i + \mu_t + \psi_{it}\end{aligned} \tag{2}$$

From Equation (3), we can obtain the total FDI-growth conditional effect of human capital by two coefficients, β_2 and β_9, through the partial differentiation of $\Delta\ln(y)_{it}$ as follows:

$$\frac{\partial \ln y_{it}}{\partial \ln fdi} = \beta_2 + \beta_9 \ln hc. \tag{3}$$

B) Data Illustration

We estimate our model on a panel data set of 70 developing countries over the period 1980-2015. The countries covered in this study are selected depending on the data availability (for the list of countries, see Appendix A). Table 1 describes the variables that we use. Much of the data, including GDP, physical capital formation, labor growth rate, financial development, and inflation, are taken from the World Bank's World Development Indicators database. Data on trade openness and FDI are obtained from UNCTAD. Data on human capital (schooling years and returns to education) are taken form the Penn World version, 9.0. Table 1 shows the variable description and the basic statistics of all variables.

TABLE 1
DEFINITION, SOURCES, AND SUMMARY STATISTICS OF ALL VARIABLES

Variables	Source	Minimum	Mean	Maximum
Average growth rate of per capita GDP	WDI	−3.19	1.89	9.35
Years of schooling and returns to education (PWT version 9)	PWT	1.017	2.351	4.519
FDI, net inflows as a % of GDP	UNCTAD	−5.28	2.878	43.246
Physical capital formation as a % of GDP	WDI	−0.319	19.325	198.645
Labor growth rate as a % of total population age (15-64)	WDI	−0.151	1.941	4.521
Private credits as a percentage of GDP	WDI	0.589	41.723	201.356
Inflation rate	WDI	0.381	11.514	235.583
Trade openness (import plus export) as a share of GDP	UNCTAD	17.441	42.293	178.119

C) Identification Strategy

The current debate on FDI–growth relationship with regard to empirical disputes, which confront the estimation of growth models,

is further explained by Wacziarg (2009), Lefort *et al.* (1996), Dollar and Kraay (2004), and Darku (2018). Their conclusion indicates that the system GMM estimator is an appropriate econometric technique to reduce endogeneity problems, but the estimator tends to overestimate the convergence rate in panel data growth models. The system GMM estimator can reduce the potential endogeneity of explanatory variables through internal instruments. Many studies have employed the lagged values of the corresponding explanatory variables as internal instrument variables (IVs). Hence, we follow Doytch *et al.* (2011), Melnyk *et al.* (2014), Gui-Diby (2014), Fetahi (2015), Darku (2018) and other similar studies to estimate our dynamic growth model by using the system GMM estimator. Taking advantages of this empirical method, our study explores the impact of FDI on economic growth by using time lagged IVs.

The most replicated approach in growth accounting literature that estimates a dynamic panel data model in the first GMM-difference estimator has been proposed by Arellano and Bond (1991) to eliminate the unobserved effect. Equation (1) can be transformed into the first difference equation.

$$\begin{aligned}(\ln y_{it} - \ln y_{it-1}) = \alpha + \beta(\ln y_{it-1} - \ln y_{it-2}) + \partial\left(X_{it} - X_{it-1}\right) \\ +(\tilde{\lambda}_i - \tilde{\lambda}_i) + (\psi_{it} - \psi_{it}).\end{aligned} \tag{4}$$

The concept of GMM-difference is to take the first differences of the basic growth equation that remove the source country-specific effects. To reduce the endogeneity and simultaneity bias, the levels of explanatory variables are lagged for two and further periods. In this study, three lagged periods are used as instruments. However, Blundell and Bond (1998) indicate that when explanatory variables are persistent, the lagged level of right hand-side variables becomes a weak instrument for the variables in differences. Thus, by adding the level Equation (1) into the difference equation, the system GMM estimators are particularly useful to explain country-specific effects and preserve the cross-country dimension of the data (Arellano and Bover 1995; Blundell and Bond 1998).

Explicitly, the system GMM estimators control for the potential endogeneity of all explanatory variables by using the instrumented variables. To use these additional instruments, we need the identifying assumption that the first difference of explanatory variables is not

correlated to such variables; the correlation is assumed to be constant over time. When the moment conditions are valid, Blundell and Bond (1998) show that in Monte Carlo simulations, the system GMM estimators perform better than GMM-difference estimators. We test the validity of the moment conditions by using the conventional test of over-identifying restrictions proposed by Sargan/Hansen J-test (1958). We also investigate the null hypothesis that the error term is not second-order serially correlated. The system-GMM procedure has several advantages in analyzing the economic growth model. By taking a first difference to remove an unobserved time-invariant country-specific effect, this procedure has eliminated the bias caused by any omitted variable that is constant over time (Bond *et al.* 2001).

IV. Results and Discussion

In this section, we initially report the results of the impact of FDI on GDP growth by using OLS and fixed effect method. Subsequently, a GMM estimator is applied to check the robustness of the findings of these conventional methods. Table 2 reports the results for interpretation.

A) Results of the Basic Model

In Table 2, Column (1) describes the OLS regression results. The coefficient of FDI is statistically significant with a negative sign, which means that the direct impact of FDI on economic growth is negative. This result is consistent with the majority of existing literature (Adams 2009; Calvo *et al.* 1996; Moosa 2002; Yabi 2010; Kurtishi-Kastrati 2013; Melnyk *et al.* 2014; Gui-Diby 2014). Columns (2) and (3) represent the results of the fixed effect method and follow the findings of Harrison (1996) and Wacziarg and Welch (2008). A systematic choice between fixed and random effect models is guided by performing the Hausman test. The test result shows that the fixed effect model is preferred for our study. Column (2) presents the results of the fixed effect method without the interaction term, whereas the coefficient of FDI indicates a negative sign. Column (3) shows that the coefficient of interactive term between FDI and human capital development level exhibits a positive sign and is significant at 1% level, thereby indicating that FDI in a host country needs coordination with human capital development

TABLE 2
OLS, FIXED EFFECT AND SYSTEM GMM YEARLY DATA RESULTS OF THE IMPACT OF FDI ON ECONOMIC GROWTH

$\Delta \ln y_{it}$	(1)	(2)	(3)	(4)	(5)
	OLS	FE	FE	GMM	GMM
$\ln y_{t-1}$				−0.068**	−0.093***
				(0.030)	(0.027)
$\ln fdi$	−0.096**	−0.108*	−0.536***	−0.139*	−0.486**
	(0.085)	(0.082)	(0.140)	(0.121)	(0.201)
$\ln hc$	0.676***	0.602**	1.890**	0.338**	0.461***
	(1.193)	(1.182)	(1.208)	(1.991)	(1.591)
$\ln l$	0.167*	0.139**	0.100**	0.835***	0.871***
	(0.205)	(0.199)	(0.195)	(0.309)	(0.222)
$\ln pvct$	0.011**	0.010**	0.006**	0.020*	0.013
	(0.031)	(0.031)	(0.031)	(0.021)	(0.017)
$\ln inf$	−0.128	−0.129	−0.163**	−0.122	−0.070
	(0.082)	(0.083)	(0.081)	(0.105)	(0.054)
$\ln gfcf$	0.390***	0.387**	0.345**	1.233***	1.111***
	(0.253)	(0.255)	(0.250)	(0.333)	(0.182)
$\ln open$	0.070**	0.248**	0.303***	0.217**	0.137**
	(0.168)	(1.589)	(1.563)	(0.157)	(0.116)
$\ln fdi * \ln hc$			0.419***		0.311***
			(0.163)		(0.226)
Constant	3.331	1.108	1.573	2.214***	3.624***
	(2.330)	(0.082)	(2.121)	(1.162)	(1.332)
Observations	2,270	2,270	2,270	2,270	2,270
R-squared	0.513	0.532	0.641		
Number of countries		70	70	70	70
Hausman test P-Value		0.000	0.001		
K. P. LM				163.256***	162.589***
K.P. Wald F				265.861	198.587**
Number of instruments				67	65
Hansen J-test				15.895	18.914
P- Value				0.712	0.787
AR(1) test				−1.115	−1.261
P-Value				0.092	0.103
AR(2) test				1.854	1.954
P-Value				0.343	0.314

Note: Robust standard errors in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. K.P. LM = The Kleibergen-Paap LM test for under-identification, K.P. Wald F = The Kleibergen-Paap Wald F test for weak identification, and Hansen J = The Hansen J-test for over identification for all IVs. First-order AR (1) and second-order-serial correlation AR (2) are the Arellano and Bond test. This note also applies to Table 3.

level to improve economic growth in selected developing countries. That is, developing countries must improve their domestic human capital development level to take full advantage of FDI. This finding reveals that the total positive impact of FDI-growth is caused by human capital development level as a conditioning variable.

Existing literature suggests that endogeneity problems still merely rely only on fixed effect method results. The FDI measure may be correlated with the residuals of the equation. Unobserved factors or country characteristics may also affect FDI-growth relationship. For example, FDI promotes knowledge spillover effect and stimulates economic growth; however, certain countries with high growth rate likely employ FDI, owing to certain advanced technologies or products. This phenomenon may create identification problems and potentially biased estimators (Cavallo and Frankel 2008). In addition, potentially omitted variables that are likely correlated with FDI and real growth are present (Bernard *et al.* 2017). Therefore, we use system GMM estimators to evaluate our dynamic model and deal with endogeneity problems. Columns (4) and (5) report the results without and with interaction terms, respectively.

Blundell and Bond (1998), Arellano and Bover (1995), and Arellano and Bond (1991) develop a system GMM estimator, which offers an appropriate approach to overcome endogeneity problems. The two-step GMM estimator is reliable when regressors' lagged values are found valid instruments. This study uses two time-period (years) lags to estimate the results. On the basis of Equation (3), which is mentioned in Section III, A we calculate a threshold value of human capital development level above where the impact of FDI on GDP growth becomes positive by using Sys-GMM, which is a more sophisticated estimation technique than the fixed effect method. Column (4) in Table 2 reports the results without interaction terms by using Sys-GMM. FDI coefficient shows a negative sign with magnitude −0.139, which is statistically significant at 10% level, thereby indicating that the correlation between FDI and GDP growth is weak. Several studies reveal inconclusive outcomes on the debate of FDI-growth nexus in developing countries (Shah *et al.* 2012; Agbloyor *et al.* 2014; Gui-Diby 2014). By contrast, Column (5) indicates that the coefficient of the interactive term ($\ln fdi * \ln hc$) shows a positive sign and is statistically significant at 5% level. The positive coefficient of the interactive term between FDI and human capital development level (years of schooling and returns

to education) indicates that the impact of FDI on GDP growth is only positive if the levels of years of schooling and returns to education are higher than the threshold 1.563 ($-0.486 + 0.311 \ln hc$). Table 1 shows that this threshold value is lower than the average value (2.351) of years of schooling and returns to education of the whole sample. This result suggests that FDI likely boosts GDP growth for most countries in our sample. Meanwhile, the impact of FDI on GDP growth is found to be negative for the countries that fall behind this threshold. Thus, they must take precautions regarding human capital development level to reap the full advantage of FDI. The threshold value located in the range of observations reveals that the human capital development level of 61 out of 70 countries is above the threshold for a few years. However, selected developing countries exhibit human capital development level value below this threshold during the whole observation period. Therefore, they are still catching-up to take advantage of the positive FDI-growth effect.

The results obtained are robust for the countries that exhibit higher years of schooling and returns to education than the threshold value. Therefore, countries which invest more on education in a given year than the threshold value of the entire sample experience have a positive impact on GDP growth through FDI. On the contrary, countries with an education level below this threshold cannot experience a positive impact on GDP growth through FDI. Thus, the results hold true regardless of the employed model specifications and estimation techniques. The conclusions derived from the interactive effect of FDI human capital development level need coordination to enhance GDP growth in sample countries, thereby supporting the idea that skilled and well-educated people can make the best use of resources through international investment (Darku 2018). In sum, the beneficial impact of an increase in FDI on GDP growth is large when the investment on human capital accumulation is strong. We also find that an increase in years of schooling and returns to education is associated with a large GDP growth rate. This result is consistent with theoretical models, which suggest that the effect of FDI on growth may depend on the human capital development level in sample countries.

The results for most control variables include broad expected signs. The coefficients of the lagged dependent variable show a negative sign and are significant for both model specifications (Columns 5 and 6), thereby supporting the idea of conditional convergence (Mankiw *et al.*

1992). The coefficients of labor growth rate exhibit expected signs, that is, positive and statistically significant in all models because developing countries are commonly characterized as labor-intensive. The size and growth rate of labor are considered important to growth, given their impact on economic activities, such as creation and production of large markets for goods and services (Alfaro *et al.* 2004; Busse and Groizard 2008). Our findings are also consistent with Agbloyor *et al.* (2014), who report that labor growth drives consumer spending and consequently economic growth. The coefficients of financial development exhibit positive signs and are statistically insignificant because the financial development variable is private sector credit. This finding is consistent with the conventional view that financial development is positively associated with GDP growth (King and Levine 1993; Beck et al. 2000). However, the same finding is inconsistent with the study of Jeong and Soyoung Kim (2018), who report that the financial deepening measured by private credit tends to decrease economic growth covering 174 countries for the period 1960-2013. The coefficients of inflation are found to be negative and statistically significant for most of the models. This result is consistent with the studies of Temple (1999b) and Rousseau and Wachtel (2002). Moreover, this finding suggests that inflation tends to exert a negative impact on GDP growth because it is often a sign of macroeconomic instability and mismanagement. By contrast, certain theoretical studies report that moderate inflation is favorable to economic growth (*e.g.*, Darku 2018). The coefficients of fixed capital investment are positive and statistically significant for almost all equations. This result is in line with the study of Haq and Luqman (2014), who determine the strong association between capital stock and GDP growth in nine Asian developing countries over the period 1972-2012 on the basis of the dynamic panel growth model. The coefficients of trade openness index are positive and statistically significant in all the estimated models. This result implies that trade openness promotes economic growth in developing countries, thereby supporting the findings of Omri and Kahouli (2014) and Sakyi *et al.* (2014).

To account for the validity of IVs, we conduct three tests and report corresponding statistics—K.P. LM test for under-identification, K.P. Wald F test for weak identification, and the Hansen J-test for over identification—for all IVs. Table 2 presents these econometric specification tests, which support the validity of the IVs with statistical significance. For the Hansen J-test of over identification, Columns

(5) and (6) display valid instruments. At the bottom of Table 2, the Sargan/Hansen J-test of over identification shows that the additional instruments associated with system GMM estimators are valid and do not reject the specification of null hypothesis. Moreover, the test of AR (1) is rejected, whereas AR (2) cannot be rejected, thereby indicating that the hypothesis that the residuals are not serially correlated at the second order is satisfied. In addition, to avoid the over-fitting problem caused by too many instruments, the set of instrumental variables is kept lower than the number of cross-sections. Our empirical analysis is subject to endogeneity issues given that FDI and certain control variables are jointly endogenous with respect to growth (Nistor *et al.* 2018). This endogeneity issue may rise as economic growth level increases (Glaeser *et al.* 2004). Furthermore, part of this concern can be overcome solely by trying various alternative exercises, in which the number of lags for contemporaneous variables (apart from the endogenous variable) is extended as much as possible. Therefore, the number of instruments remains lower than the number of cross-sections (Nistor *et al.* 2018).

In sum, the results reveal that FDI-growth effect is conditional to the human capital development level in selected developing countries. Our calculations indicate that the total effect of FDI on economic growth is positive for countries with human capital development level above the threshold value. Human capital development level, as a conditional variable, influences FDI-growth effect. Moreover, the conditional FDI-growth effect provides an explanation to the debate in literature, fills the gap in theoretical research, and provides empirical evidence for the conflict in FDI-growth effect. Furthermore, the results outline that FDI is further beneficial for selected developing countries, which are well-endowed with human capital. The government of developing countries should focus on developing the domestic human capital level to take full advantage of FDI inflows.

The marginal effect in Equation (3) changes with the human capital development level. Thus, we must use a plot to interpret the results, following the concept of Brambor *et al.* (2006). Figure 1 reports the marginal effect of FDI on GDP growth in relation to the human capital development level. The dotted lines represent the 95% confidence interval, which allows us to determine the conditions wherein FDI exhibits a statistically significant effect on GDP growth. Moreover, FDI tends to exert a significant negative impact on GDP growth when human capital

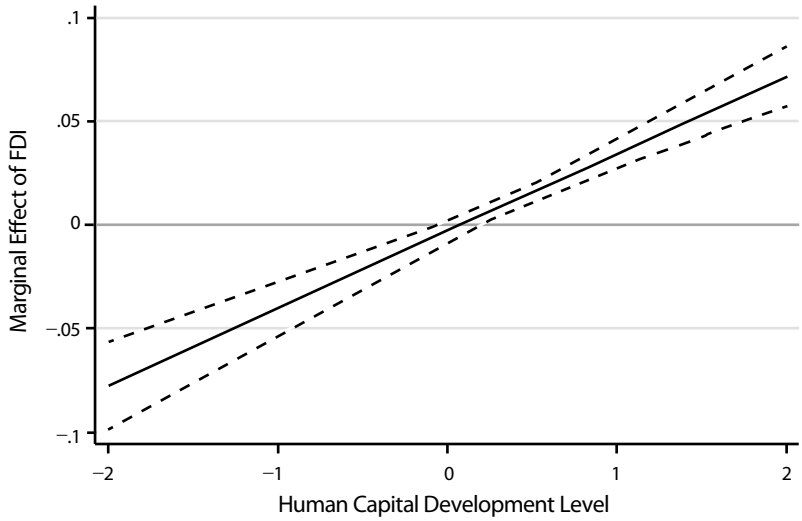

Figure 1
Marginal effect of FDI on GDP growth considering the human capital development level

development level takes a lower value than the threshold value (1.563). The impact of FDI tends to be positive and significant when a country's human capital development level exceeds the threshold value (1.563). That is, these findings indicate that when a country's human capital development level is below this threshold, FDI has a negative impact on GDP growth. By contrast, FDI tends to exert a positive impact on GDP growth only when the country experiences human capital development level higher than this threshold. Appendix B illustrates the marginal effect and the significance of interaction at mean, minimum, and maximum levels.

B) Robustness Check

We consider the long-term effects pointed out by Beck and Levine (2004) to estimate regressions with average variables. Given that GDP growth is cyclical, we split our sample into non-overlapping five-year periods (1980~1984, 1985~1989, 1990~1994…, 2011~2015) for each country. To check the robustness of our basic results, we use four-year averaged data following the assumption that annual growth rates can vary considerably due to the cyclical variation of GDP growth that may appear large in an-

TABLE 3
ROBUSTNESS; OLS, FIXED EFFECT AND SYSTEM GMM, FIVE-YEARS AVERAGE DATA RESULTS OF THE IMPACT OF FDI ON ECONOMIC GROWTH

$\Delta \ln y_{it}$	(1)	(2)	(3)	(4)	(5)
	OLS	FE	FE	GMM	GMM
$\ln y_{t-1}$				−0.058*	−0.067***
				(0.034)	(0.021)
lnfdi	−0.029	−0.046*	−0.040**	−0.147**	−0.489*
	(0.156)	(0.065)	(0.064)	(0.097)	(0.412)
lnhc	0.206**	0.248*	0.248**	0.482**	0.850
	(0.196)	(0.193)	(0.193)	(0.223)	(1.035)
lnl	0.177	0.286*	0.286*	0.504***	0.574***
	(0.183)	(0.171)	(0.171)	(0.138)	(0.103)
lnpvct	0.107	0.096	0.096	0.007**	0.016**
	(0.088)	(0.087)	(0.087)	(0.013)	(0.010)
lninf	−0.204	−0.156	−0.156	−0.036	−0.108
	(0.132)	(0.129)	(0.129)	(0.115)	(0.074)
lngfcf	0.037*	0.044*	0.054*	0.770**	0.813***
	(0.022)	(0.022)	(0.022)	(0.313)	(0.234)
lnopen	0.246	0.394	0.354	0.150***	0.801***
	(0.065)	(0.260)	(0.260)	(0.248)	(0.205)
lnfdi*lnhc			0.286*		0.331*
			(0.171)		(0.303)
Constant	3.819	5.931**	5.561**	2.214***	3.624***
	(2.445)	(2.664)	(2.664)	(1.162)	(1.332)
Observations	454	454	454	454	454
R-squared	0.425	0.439	0.567		
Number of countries		70	70	70	70
Hausman test P-Value		0.000	0.001		
K. P. LM				126.589***	169.243***
K.P. Wald F				458.526	328.214**
Number of instruments				66	69
Hansen J-test				28.884	27.695
P- Value				0.625	0.724
AR(1) test				−1.608	−1.604
P-Value				0.107	0.108
AR(2) test				−1.107	−1.214
P-Value				0.268	0.224

nual data and mislead growth estimation (Islam 1995). Thus, we find the robust and consistent results with our basic findings by using four-year

averaged data. The direct impacts of FDI and human capital development level are evaluated on the basis of β_2 and β_3 respectively. We expect that the cross effect of FDI and human capital development level positively correlates with GDP growth.

Following the calculation of threshold value using the five-year averaged data according to Equation (3), which employs system GMM estimators, we compute the threshold value for human capital development level. Column (6) in Table 3 shows that the threshold value for the years of schooling and returns to education requires 1.477 (−0.489 + 0.331 lnhc) years for FDI to generate a positive impact. This result is consistent with Aw, Chung, and Roberts (2000) who emphasize the role of international knowledge and technology diffusion through international investment. They argue that potential benefits related to international opening activity include knowledge spillovers, which play a significant role in growth process, particularly for developing countries. Table 1 indicates that this threshold value is lower than the average value of years of schooling and returns to education over the whole sample (2.351), thereby suggesting that FDI likely boosts GDP growth for most of the countries in our sample. The impact of FDI on GDP growth is found to be negative for the countries that fall behind this threshold. Therefore, these countries should further invest in education to reap the full advantage of FDI.

V. Conclusion

The recent globalization and integrated world economy have significantly increased FDI flows. Developing countries have persistently faced issues related to FDI performance. Empirical literature provides mixed results regarding the impact of FDI on economic growth in developing countries. The current study fills the gap in literature by analyzing the relationship between FDI and economic growth with human capital development level as a conditioning variable in selected developing countries. This research concludes that human capital development level is a significant conditioning variable for the FDI-growth relationship. FDI promotes the growth of an economy well-endowed with human capital development. Therefore, developing economies that aim to follow the pace of economic growth should initiate to develop their human capital development level to compete favorably in the world economy.

A dataset with 70 developing countries over the period 1980~2015 is used in this research. System GMM estimators are employed to deal

with endogeneity problems. To make the conclusion robust, we test the model by using five-year averaged data, following the assumption that annual growth rates can vary considerably due to the cyclical variation of GDP growth that may appear large in yearly data and mislead growth estimation (Islam 1995). Consistent results are obtained which confirm our basic findings. In summary, our empirical findings indicate that human capital development level is an important conditioning variable to promote economic growth through FDI for selected developing countries. Policymakers must consider the conditional effect to promote growth and take advantage of the integrated world economy. Although other channels in this context may be present, considering non-linearities and threshold panel regressions can be meaningful and thus can be a productive area for future research.

Appendix

Appendix Table 1
List of Sample Countries

Sub-Saharan Africa (40)		Latin America and Caribbean (16)	South and East Asia (14)
Angola	Madagascar	Argentina	Bangladesh
Benin	Malawi	Belize	Cambodia
Bolivia	Mali	Brazil	China
Botswana	Mauritania	Chile	India
Burkina Faso	Mauritius	Colombia	Korea, Rep.
Burundi	Mozambique	Costa Rica	Malaysia
Cameroon	Namibia	Ecuador	Nepal
Cabo Verde	Niger	El Salvador	Pakistan
Central Africa	Nigeria	Honduras	Papua New Guinea
Chad	Rwanda	Mexico	Philippines
Congo	Senegal	Nicaragua	Singapore
Côte d'Ivoire	Sierra Leone	Panama	Sri Lanka
Congo D. R	South Africa	Paraguay	Thailand
Djibouti	Swaziland	Peru	Vietnam
Gabon	Togo	Uruguay	
Gambia	Uganda	Venezuela	
Ghana	Zambia		
Guinea	Zimbabwe		
Guinea-Bissau	Lesotho		
Kenya	Liberia		

APPENDIX TABLE 2
MARGINAL EFFECT OF FDI THROUGH HUMAN CAPITAL DEVELOPMENT LEVEL FROM EQUATION (3) USING SYS-GMM

$$\frac{\partial \ln y_{it}}{\partial \ln fdi} = \beta_2 + \beta_9 \ln hc$$

	Mean	Maximum	Minimum
FDI	1.821	2.015	1.013

Notes: The specifications engaged to calculate the marginal effect of human capital development level are from the raw dataset (mean, maximum, and minimum).

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