

Dao Thi Bich Thuy; Quy Van Khuc; Manh Cuong Dong; Thuy Linh Cao

Article

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Contemporary Economics

Provided in Cooperation with:

University of Finance and Management, Warsaw

Suggested Citation: Dao Thi Bich Thuy; Quy Van Khuc; Manh Cuong Dong; Thuy Linh Cao (2024) : How does FDI matter for economic growth? Evidence from a comparative study in country groups by level of development, Contemporary Economics, ISSN 2300-8814, University of Finance and Management in Warsaw, Faculty of Management and Finance, Warsaw, Vol. 18, Iss. 4, pp. 376-390, <https://doi.org/10.5709/ce.1897-9254.544>

This Version is available at:

<https://hdl.handle.net/10419/312960>

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Primary submission: 15.10.2023 | Final acceptance: 11.03.2024

How does FDI Matter for Economic Growth? Evidence from a Comparative Study in Country Groups by Level of Development

Thi Bich Thuy Dao¹ , Van Quy Khuc¹ , Manh Cuong Dong² , Thuy Linh Cao³ 

ABSTRACT

This paper investigates the impact of FDI inflows on economic growth in groups of countries at different levels of development. The research was carried out between 2002 and 2019, encompassing a total of 138 countries. These countries were categorized by the United Nations into three groups: developed, developing, and underdeveloped countries. We use the instrumental variable two-stage least square (IV-2SLS) fixed-effect model for the estimation process, and the findings support the growth stimulus factor of FDI. However, the size of the FDI growth effect varies among country groups. FDI inflows have the largest growth effect in developing countries, followed by underdeveloped countries, and the growth effect is smallest in developed countries. Further study using the two-step system GMM estimation for a dynamic panel data model also confirms an inverted U-shaped curve for the impact of FDI inflows on growth rate of GDP per capita in country groups by level of development. Since developing countries benefit the most from FDI, they have more chances in the income catching-up process with developed countries. Having a relatively smaller size of FDI growth effect, underdeveloped countries face the danger of widening the income gap with developing countries.

KEY WORDS: FDI, economic growth, IV-2SLS.

JEL Classification: F21, O47.

¹Faculty of Development Economics, VNU University of Economics and Business, Vietnam National University, Hanoi, Vietnam

²School of Business, British University Vietnam, Hung Yen, Vietnam

³Faculty of Business, FPT University, Hanoi, Vietnam

1. Introduction

The subject of Foreign Direct Investment's (FDI's) influence on economic growth has attracted significant interest among scholars (Cicea & Marinescu, 2021). When FDI is a growth-enhancing factor, the presence of FDI would obviously foster the GDP level of the host country. Yet, the question that arises is what would be the relative size of the growth effect of FDI among countries. This question is important since it determines whether countries can rely on FDI to close the income gap among themselves. The Solow growth model (Solow, 1956)

implies income convergence. Due to diminishing returns to capital, poor countries with low levels of capital stock enjoy higher rates of return on capital and, therefore, experience higher rates of capital accumulation and faster economic growth. In this respect, countries with relatively lower capital stocks have larger chances for FDI attraction because of their relatively higher rates of return on capital. Therefore, with the assistance of FDI, low-income countries have a chance to catch up with high-income countries.

However, the contribution of FDI to economic growth is not only via capital accumulation. There

Correspondence concerning this article should be addressed to:

Thuy Linh Caoc, Faculty of Business, FPT University, Hanoi, Vietnam

E-mail: linhct4@fe.edu.vn

are several channels through which FDI stimulates economic growth; among them are channels for technology transfer, diffusion, and skill acquisition. Endogenous growth theory stresses the role of technology (Romer, 1990) and human capital (Lucas, 1988) as an engine of economic growth. FDI aids technological progress and speeds up the rate of human capital formation, further accelerating economic growth in the host country. The size of the growth impact of FDI would capture all effects that FDI has on economic growth. If FDI demonstrates a relatively larger impact on economic growth in lower-level development countries, then those countries can catch up in income level with higher-level development countries. However, if the size of the FDI growth impact is relatively larger in higher-level development countries, FDI worsens the relative income level for lower-level development countries, making them have no chance reliance on FDI in the income catching-up process.

This paper aims to investigate the relative size of the impact of FDI inflows on economic growth in countries at different levels of development. United Nations classifies countries by level of development, including developed, developing, and underdeveloped countries. Developed countries are high-income countries with high levels of human development. Developing countries are middle to high-income countries which possess an intermediate level of human development. Underdeveloped countries are characterized by their low-income levels, limited human assets, and significant economic fragility. There are extensive studies on the impact of FDI on economic growth at individual country level and groups of countries by specific level of development. However, there are few comparative studies on the impact of FDI on economic growth in country groups by level of development. Our research aims to address the existing knowledge gap by examining the magnitude of the influence of FDI inflows on economic growth across developed, developing, and underdeveloped nations. The relative size of the growth impact of FDI inflows would determine whether FDI plays an income convergence or divergence factor among these groups of countries.

The rest of the paper is organized as follows.

Section 2 provides a brief literature review on the impact of FDI on economic growth in countries by level of development. Model specification, data, and methodology are presented in Section 3, followed by results and discussion in Section 4. Section 5 presents a robustness check, and finally, the conclusion and policy implications are in Section 6.

2. Literature Review

Extensive empirical research has been conducted to examine the influence of FDI on economic growth, both at the individual nation level and within groups of countries in the same area. Nevertheless, a limited body of research examines the impact of FDI on economic growth across several country groups categorized by their level of development. And, the findings from these studies are inconclusive and yield varying outcomes.

In a direct way, FDI stimulates the economic growth of host countries via the contribution of capital. Countries need capital for their economic growth, and when the domestic capital levels are short, they can rely on foreign capital. Poor countries have relatively low capital stocks, and due to diminishing returns, the rates of return on capital in these countries are relatively high. FDI seeking high rates of return is more attracted to poor countries and fosters their economic growth. Stronger growth in poor countries helps them to close the income gap with rich countries. This income catch-up hypothesis is evident in the work of Jawaid and Raza (2012). Their study covers 129 countries which are divided into three groups including low, middle, and high income in the 2003-2009 period. The OLS estimation is used, and the result shows that the growth effect of FDI is positive in all groups. However, low-income countries have the largest size of FDI growth effect. Besides, convergence tests reveal that since the gap between actual and potential output is greater in low and middle-income countries than in high-income countries, FDI helps low and middle-income countries converge more rapidly.

In an indirect way, the growth effect of FDI works through the augmentation of the existing stock of knowledge in the host country via technology diffusion and productivity spillovers (De Mello,

1999). When the indirect FDI growth effect outweighs its direct effect, then it would not be the case that with the assistance of FDI, poor countries grow faster than the rich ones. Instead, countries that exploit more from FDI technology diffusion and productivity spillovers can experience stronger growth.

Crespo and Fontoura (2007) summarize four major channels through which FDI technology diffusion and productivity spillovers can take place – namely, labor mobility, demonstration, competition, and backward and forward linkages with local firms. In the first channel, local workers who are employed by foreign firms can get training to acquire new skills and knowledge that enable them to work with the new technologies. Those workers, once they change employment and work for local firms, can create a positive externality on workers whom they are now working with (Görg & Strobl, 2005). According to Lucas (1988), the concept of external effects of human capital pertains to the positive impacts individuals have on the productivity of others through their interactions in diverse contexts. The second channel is related to the possibility of the demonstration effect created by foreign firms. Based on closed observation of foreign firms, domestic firms can learn effective ways of doing business, management, and marketing skills and even mimic foreign technology (Blomström & Kokko, 1998; Javorcik, 2004). Görg and Strobl (2005) find that when the geographical location of domestic firms is close to multinational corporations (MNCs) and provides enough absorptive capacity, imitation and learning can occur. Induced competition is the third channel of FDI productivity spillovers. The presence of FDI pushes competitive pressure on domestic firms (Aitken & Harrison, 1999). Face with high competition from foreign firms, domestic firms are forced to find ways to increase their productivity, such as implementing advanced technology or adopting effective managerial skills. The final channel works through the linkages that foreign firms establish with local firms. In the context of backward linkages, foreign firms frequently offer technical assistance to local suppliers in order to ensure the desired quality of inputs. This assistance

encompasses various aspects such as management and personnel training, establishment of efficient production processes, implementation of inventory and quality control techniques, and other related areas (Moran, 2001). Forward linkages and productivity spillovers occur when local firms in downstream industries are able to procure superior quality intermediate inputs at a reduced cost from foreign enterprises operating in upstream industries (Markusen & Venables, 1999).

The extent to which host countries can efficiently exploit FDI depends on their absorptive capacities. The successful use of innovative technology and managerial expertise necessitates a high level of proficiency from the workforce. Workers need to have skills to understand and work with new technologies. Borensztein et al. (1998) argued that for technological spillover to be possible, the host country's stock of human capital needs to meet a certain minimum or threshold level. When human capital development in the host country can absorb and use new technologies, technology transfers from multinational corporations can positively impact the economy. Ford et al. (2008) concluded that countries with high skills gain a more noticeable impact of FDI on economic growth. In addition to human capital, infrastructure development is another determinant of the host country's technological absorptive capacity. For advanced technologies to be implemented effectively and efficiently, there is a need for reliable telecommunication, stable power, and water supply, as well as good irrigation and transport infrastructures. The presence of solid infrastructure has the potential to enhance the productive capacity of an economy, hence serving as a catalyst for FDI inflows. According to Yamin and Sinkovics (2009), the presence of a well-developed infrastructure is essential for facilitating positive spillover effects through FDI. Specifically, technology spillovers resulting from FDI are contingent upon the host country reaching a particular threshold of infrastructure development.

The growth impact of FDI is contingent upon the absorptive capacities of the host countries. To be able to reap the potential benefits associated with FDI, the host countries have to reach a certain level

of absorptive capacity, known as a development threshold (Elboiashi, 2015). Since absorptive capacity is usually associated with a country's development level (Borensztein et al., 1998), as the level of development increases, the country's absorptive capacity rises, which enables it to exploit FDI more efficiently and experience stronger economic growth. The higher FDI growth effect in a higher level of development countries is found in the study by Tintin (2012). The study consists of 125 countries, including 38 developed, 58 developing, and 29 least developed countries in the 1980-2010 period. The results obtained through the implementation of the instrumental variable two-stage least square (IV-2SLS) fixed-effect estimator indicate that FDI inflows have a more pronounced positive impact on economic growth in emerging countries compared to least developed countries. Investigating the impact of technology diffusion by US multinational corporations on productivity growth in 40 countries from 1966 to 1994, Xu (2000) found that industrialized countries have favorable outcomes from technology transfer facilitated by US multinational businesses. However, developing countries are unable to get similar benefits due to their failure to meet the minimal absorptive capacity threshold. Li and Liu (2005) took a sample of 21 developed and 63 developing countries from 1970 to 1999 and concluded that while FDI has a positive impact on economic growth in both country groups, developed countries enjoy a higher growth effect of FDI than developing countries since they have a relatively larger absorptive capacity.

In an alternative perspective, it is plausible to argue that the relationship between FDI and economic growth in developed countries may not be contingent upon the level of development. Johnson (2006) argued that developed countries have a high absorptive capacity, which provides them with great potential to reap benefits from technology leakages and spillovers. However, an already high technology level in the countries reduces the potential for further improvements from spillovers. Using a panel dataset of 22 developed and 68 developing countries in the 1980-2002 period, the author showed that FDI positively affects economic growth in developing countries,

but there is no growth effect of FDI in developed countries. According to the research conducted by Sawalha et al. (2016), it was found that FDI positively impacts economic growth in both developed and emerging economies. However, the study revealed that the extent of the growth benefit of FDI is significantly greater in emerging economies compared to developed economies. The same conclusion is reached by Tintin (2012), which showed a higher growth impact of FDI in developing countries than in developed countries.

In addition, some studies attempted to compare the growth effect of FDI for different countries or regions. Suh and Khan (2003) examined the effects of the rise in foreign direct investment inflows on the export performance of ASEAN states (AFTA) in comparison to two other prominent trade blocs, namely the Central European Free Trade Agreement (CEFTA) and the Latin American Integration Association (LAIA). The findings indicated that the impact of FDI inflows on export growth is statistically significant within the samples of countries belonging to the CEFTA and LAIA. This discovery implies that policymakers in each nation should take into account their unique circumstances and goals while attempting to attract foreign direct investment. Kherfi and Soliman (2005) investigated and compared the impact of FDI on the economic growth of two distinct regions, namely Central and Eastern Europe (CEE) and the Middle East and North Africa (MENA). Their results showed that FDI positively impacts economic growth exclusively in European Union (EU) accession nations. Conversely, the influence of FDI on growth in Middle East and North Africa (MENA) countries and non-EU accession countries was found to be adverse.

The relative size of the growth-enhancing effect of FDI among countries by different levels of development remains ambiguous, and since there are not many studies on this issue in the literature, there is ample room for discussion. This study is situated within the theoretical framework of the Solow growth model, which posits that the growth of inputs and FDI externality effect dictate the output increase. We employ the IV-2SLS fixed-effect model, which is more advanced in dealing with the

endogeneity problem. Besides, the findings of the study enrich the knowledge of the relation between FDI and economic growth by adding to the debate on the size of FDI growth effect in country groups by level of development. The study also identifies determinants of FDI inflows, which vary among groups of countries.

3. Model Specification, Data and Methodology

3.1. Model Specification

The research is situated within the context of the Solow growth model, where the production function of the economy is developed following the Cobb-Douglas form:

$$Y_t = e^{\theta FDI_t} K_t^\alpha L_t^\beta \quad (1)$$

where Y represents total output, K and L denote the economy's stock of capital and stock of labor, respectively. α and β are the factor intensities. To capture the externality effect of FDI inflows, FDI intensity which measures the relative presence of FDI inflows, is integrated into the production function. Following Azman-Saini et al. (2010), Hayatt (2019) and others, the ratio of FDI in-

flows and total output is used as a proxy for FDI intensity. The sign of θ reveals the externality impact of FDI inflows on total output. When θ takes a positive (negative) value, FDI inflows have a positive (negative) externality effect on total output. In the case of θ equal to zero, FDI inflows have no externality effect on total output.

By applying the natural logarithm to both sides of the production function, we may obtain the growth equation:

$$\ln Y_t = \alpha \ln K_t + \beta \ln L_t + \theta FDI_t \quad (2)$$

In this equation, the growth in total production is determined by the growth in stocks of physical capital and labor, as well as the change in FDI intensity. In particular, ceteris paribus, 1% increase in the stock of capital and 1% increase in the stock of labor results in $\alpha\%$ and $\beta\%$ increase in total output, respectively. Similarly, 1 unit change in FDI intensity results in $\theta\%$ change in total output with other factors remaining the same.

Based on the theoretical equation, the regression equation is written as

$$GDP_{i,t} = c + \beta_1 SPK_{i,t} + \beta_2 SLB_{i,t} + \beta_3 HMC_{i,t} + \beta_4 FDI_{i,t} + e_{i,t} \quad (3)$$

where subscript i denotes country and t denotes time

Table 1
Variables Description

Variables	Definitions	Sources
Dependent variable		
GDP	Output level: the natural logarithm of GDP level.	Penn World Table (Feenstra et al., 2015)
SPK	Stock of capital: the natural logarithm of stock of physical capital.	Penn World Table (Feenstra et al., 2015)
SLB	Stock of labor: the natural logarithm of quantity of labor which is measured by the number of employed people.	Penn World Table (Feenstra et al., 2015)
HMC	Human capital: this variable is the quality of labor force. A proxy for labor quality is the country's level of education attainment which is measured by Education index. Education index is calculated by weighting the average of mean years of schooling for adult and expected years of schooling for children. The index has score ranging from 0 to 1.0.	UNDP's Human Development Reports
FDI	FDI intensity: the ratio of net inflows of FDI and GDP (in %).	World Development Indicators (World Bank)

Table 1
Variables Description

Variables	Definitions	Sources
FDI determinant variables		
GRGDP	Market growth: the annual growth rate of GDP which is calculated as the percentage change in GDP level this year compared to previous year.	Penn World Table (Feenstra et al., 2015)
KGI	Openness: a proxy for measuring the degree of country’s openness is KOF Globalization Index published by the Swiss Economic Institute (Dreher, 2006). The index is constructed on three dimensions which are economic, social, and political globalization. Globalization is defined for this index (Gygli et al., 2018) as “the process of creating networks of connections among actors at multicontinental distances, mediated through a variety of flows including people, information and ideas, capital and goods. It is a process that erodes national boundaries, integrates national economies, cultures, technologies and governance and produces complex relations of mutual interdependence”. The index has score ranging from 0 to 100.	Penn World Table (Feenstra et al., 2015)
ROL	Rule of law: this variable measures institutional quality in aspect of rules of society including the security of property rights, enforceability of contracts, judicial effectiveness, and legal environment in which economic activity is carried out. Data on rule of law is provided by World Governance Indicators (World Bank). The indicator has score ranging from -2.5 to 2.5.	Penn World Table (Feenstra et al., 2015)
VOA	Voice and accountability: this variable measures institutional quality in aspect of democracy level that captures public participation in government selection, having a voice in government and having freedom of expression, association and media. Data on voice and accountability is provided by World Governance Indicators (World Bank). The indicator has score ranging from -2.5 to 2.5.	UNDP’s Human Development Reports
DEBT	Public debt (DEBT): this variable is the ratio of general government gross debt and GDP (in %).	World Development Indicators (World Bank)

(in year). In addition, human capital is included into the regression equation since it is well recognized that human capital has a favorable growth effect (Lucas, 1988; Mincer, 1984).

3.2. Data

The empirical study is conducted with 138 countries worldwide in the period from 2002 to 2019. According to the United Nations, countries are categorized into three groups depending on their level of development, namely developed countries (36 countries), developing countries (67 countries) and underdeveloped countries (35 countries). The period of study is mainly dictated by the availability of data. Data on world governance indicators (World Bank) has been available since 2002 and data

on stocks of capital and labor (Penn World Table) is unavailable since 2020.

3.3. Model Validation

There is potential endogeneity problem in the model. Inflows of FDI are affected by various factors then FDI variable is endogenous. With the existence of potential endogeneity, an IV-2SLS fixed-effect model is chosen for estimation. Because of the use of instrumental variable model, the estimated results are valid and accepted if the endogeneity test and the overidentification test of all instruments are passed. FDI intensity is treated as an instrumented variable in the model. Factors affecting FDI inflows vary among different groups of countries by their level

of development. Determinants of FDI are identified and included into each model in such a way that they show a significant effect on FDI inflows and the two tests which are endogeneity test and overidentification test are passed. For the developed country group, rule of law and openness are factors affecting FDI inflows. For the developing country group, determinants of FDI are market growth, rule of law, openness and public debt. For underdeveloped country group, FDI inflows are affected by public debt and voice and accountability (Table 2).

4. Results and Discussions

Table 2 presents the regression results. There are three noticeable findings from these results. First, as expected from the growth aspect, output growth is determined by capital and labor growth in all countries. Higher capital accumulation and rising labor force result in larger output growth. Besides, the quality of the workforce, as measured by the level of human capital, contributes positively significance to economic growth.

Second, determinants of FDI inflows vary among country groups. In developed countries, inflows of

Table 1

Paradox Mindset Inventory: Zones of Navigating Paradoxes

	Developed countries	Developing countries	Underdeveloped countries
Output level (GDP)			
FDI intensity (FDI)	0.003*** (0.001)	0.045*** (0.006)	0.014*** (0.003)
Stock of capital (SPK)	0.563*** (0.063)	0.619*** (0.046)	0.392*** (0.026)
Stock of labor (SLB)	0.874*** (0.100)	0.195*** (0.062)	0.850*** (0.071)
Human capital (HMC)	0.613*** (0.224)	0.484* (0.249)	0.955*** (0.234)
FDI intensity (FDI)			
Market growth (GRGDP)		0.122*** (0.033)	
Openness (KGI)	2.458*** (0.770)	0.249*** (0.060)	
Rule of law (ROL)	0.301*** (0.102)	1.916*** (0.674)	
Voice and accountability (VOA)			-2.516* (1.372)
Public debt (DEBT)		-0.024*** (0.007)	-0.043*** (0.006)
Centered R2	0.138	0.313	0.806
Endogeneity test: Chi-sq.	0.000	0.000	0.000
P-value			
Sargan test: Chi-sq. P-value	0.622	0.119	0.284
Number of observations	648	1185	620

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

FDI are attracted to countries with higher levels of openness and stronger rule of law. Grossman and Helpman (2015) claimed that globalization leads countries to specialize in activities in that they have a comparative advantage. With the endowment of a rich skilled labor force, developed countries tend to specialize in innovation activities. As a country's openness increases, developed countries become involved in deeper globalization, enabling them to focus on knowledge-intensive industries with continuous innovation in high-tech research and production of new high-tech products (Narula & Dunning, 2000). Besides, with more freedom for the international flow of high-skilled labor, developed countries can attract a larger number of foreign talents to immigrate. Developed countries become a good destination for MNCs seeking for technology invention. Not only having good access to pools of high-skilled labor, MNCs can benefit from international knowledge spillovers – the idea of external economies of scale that when the scale of industry production increases, the cost of further innovation for each firm reduces. Staats and Biglaiser (2012) also argued that foreign investors are more confident in investing in a country where the law-and-order system functions efficiently. A positive relation between the rule of law and FDI inflows is consistent with the findings of Peres et al. (2018) and Sabir et al. (2019), who concluded that stronger rule of law is a factor attracting FDI inflows to developed countries.

In emerging nations, the level of economic growth serves as a significant factor in influencing FDI. Market-seeking FDI is attracted to a country with a large market size due to a high expected domestic demand for foreign firms' products and prospects for efficient resource utilization and economies of scale exploitation (Scaperlanda & Mauer, 1969). The expansion of the economy leads to an increase in the size of the market, creating a greater number of prospects for profitable investments. Consequently, foreign corporations might experience a prosperous expansion of their businesses within the host country. Mengistu and Adhikary (2011) and Mottaleb and Kalirajan (2010), among others, supported the view that developing countries with higher GDP growth rates are more

successful in attracting FDI. There is a positive relationship between openness and inward FDI. Market-seeking FDI not only wants to serve the host country's market but also wants to export its products to other countries. Moreover, multinational corporations are motivated to distribute various production phases across different emerging countries to capitalize on the comparative advantages of the host nations. Due to the interconnectedness of global economies, foreign enterprises are required to engage in extensive import and export activities across nations, as the output generated in one country often serves as input for the manufacturing processes in another country. For this reason, FDI favors countries with more freedom in international trade. A higher level of country openness frees up international trade, investment, and international cooperation in policy-making, providing greater opportunities for the expansion of FDI in the host country.

The rule of law positively affects FDI inflows to developing countries. Establishing a physical presence in the host country, foreign investors are concerned with the security of their investments. Better protection of property rights, effective and fair court systems to assure reliable contract enforcements, and constrain arbitrary governmental decisions and policies that diminish the value of private property would provide a safer legal environment that offers higher incentives to foreign investors. This result is also confirmed by Gangi and Abdulrazak (2012), Staats and Biglaiser (2012), and Sabir et al. (2019). High public debt hinders the influx of FDI. High debt burdens create a number of vulnerabilities in economic performance and cause macroeconomic instability (Burriel et al., 2020). Ahlborn and Schweickert (2018) claimed that the private sector generally considers public debt an indicator of economic uncertainty. When sovereign debt rises, the economic outlook will deteriorate and transform into high economic uncertainty that discourages foreign investors from investing in a country. A negative impact of public debt on FDI inflows to developing countries is found in a study by Azam and Khan (2011).

In underdeveloped countries, voice and accountability negatively impact FDI – that is, FDI inflows

are more attracted to countries with lower levels of democracy. This finding is consistent with Li and Resnick (2003), who argued that stronger voice and accountability result in greater pluralism that decreases FDI inflows to the host country. In their argument, a higher level of public participation in government decision-making can weaken the oligopolistic or monopolistic positions of multinational companies, prevent host governments from offering generous financial and fiscal incentives to foreign investors, and pay more interest for local firms and, thus, indigenous businesses can find it easier to seek for protection. The generated policy outcome would reduce the multinational companies' degree of freedom in the host country. High public debt is also found to be an impediment to the inflow of FDI to underdeveloped countries. Foreign investments are distracted from countries having high debt burdens.

Third, FDI inflows has a positive and significant effect on economic growth in all country groups, and this finding supports the view of the growth-enhancing effect of FDI. The positive growth effect of FDI in developed countries is in line with other findings (among them are Li and Liu, 2005; Tintin, 2012; Sawalha et al., 2016; Gherghina et al., 2019). A majority of research on the relationship between FDI and economic growth in developing countries supported a positive FDI growth effect (Azman-Saini et al., 2010; Almfraji and Almsafir, 2014; Sinha and Sengupta, 2022). FDI spurs economic growth in less developed countries (Nantharath and Kang, 2019; Tintin, 2012).

However, the size of the FDI growth effect varies among groups of countries. Developing countries experience the largest growth effect from FDI inflows. The size of the FDI growth effect is smaller in underdeveloped countries, and in developed countries, FDI has the smallest effect on economic growth. These results are partially consistent with the findings of Tintin (2012). Our findings confirm a positive growth effect of FDI in all country groups and that developing countries have a larger growth effect of FDI than underdeveloped countries. These findings are similar to the results of Tintin (2012). However, in contrast to their findings that claimed the smallest FDI growth effect in underdeveloped countries, developed countries have a smallest

growth effect of FDI in our findings.

The effect of FDI inflows on economic growth is positive in developed countries, though the magnitude of the effect remains small. It can be observed that industrialized nations exhibit substantial quantities of physical and human capital alongside a generally advanced level of technological prowess. Consequently, these countries have limited potential to derive advantages from FDI.

There is a relatively larger growth effect of FDI inflows in developing countries than in underdeveloped countries. Since the implementation of advanced technologies in the host country is subject to the ability of local workers to handle it, the level of human capital in the host country would decide the rate of technology transfer. In underdeveloped countries, a low level of human capital causes foreign firms to have less incentive to implement knowledge-intensive technology and instead prefer to use labor-intensive technology to exploit cheap labor costs. In this case, these countries cannot gain the benefit of advanced technology brought in by FDI. With a stronger level of human capital, developing countries are more ready to absorb foreign advanced technologies. Because FDI and human capital are complementary in technological diffusion, the higher the level of human capital, the more advanced the technology that can be implemented in the host country. Moreover, compared to underdeveloped countries, the availability and quality of infrastructure in developing countries are better, facilitating technological progress in those countries.

FDI can contribute to the host country's human capital formation in direct and indirect ways. In a direct way, FDI is an effective channel for local labor training and skill acquisition. Foreign firms provide skill training for local workers to implement new advanced technologies. Besides working in foreign firms, local workers can observe and enrich their knowledge of managerial and business operation skills. More educated people can learn faster and acquire more knowledge than less educated ones. Compared to underdeveloped countries, people in developing countries have a higher education attainment. Therefore, FDI contributes to a higher rate of human capital formation in developing countries than in underdeveloped countries. Indirectly, FDI can affect people's decisions to

invest in their human capital. The implementation of advanced technologies by foreign firms would increase labor productivity and result in higher wages for skilled workers. As the return to education is higher, more people are induced to invest in education. In the case of underdeveloped countries, due to the low technological absorptive capacity, foreign firms may opt to use labor-intensive technologies to exploit cheap labor costs. Additionally, empirical data indicates the presence of foreign direct investment (FDI) driven by the pursuit of natural resources in less developed nations. This occurs when foreign corporations are incentivized to engage in investment activities to extract and utilize natural resources (Thuy, 2023). The concentration of FDI in industries with lower skill requirements leads to a rise in demand for low-skilled workers, thus resulting in higher wages for these people. The elevated earnings for low-skilled workers serve as an obstacle for individuals to pursue educational opportunities, resulting in a decline in the overall level of human capital. Dao and Khuc (2023) found that the effect of FDI on human capital formation is positive in developing countries and negative in underdeveloped countries.

Another possible interpretation for a larger FDI growth effect in developing countries is the technology gap, which plays a role in determining the rate of productivity spillovers from FDI to host countries (Colen et al., 2009). As Roy (2016) argued, the host country's ability to take advantage of spillovers from FDI depends upon the distance to the technology frontier, and the effect of FDI on productivity is lower when the technological gap is higher. A huge technological gap acts as a deterrent to the absorption of FDI spillovers and limits the transmission of advanced technologies. This idea is shared by Glass and Saggi (1998) and confirmed by Li and Liu (2005) and Malikan and Chitambara (2017). Underdeveloped countries are more relatively backward in technology than developing countries. Utoikamanu (2019) warned that the states of technology in underdeveloped countries are far behind the technology frontier, and many countries still use obsolete technologies. Huge technological gaps in underdeveloped countries impede domestic firm's capacity to absorb and adopt high

technology. In contrast, with a narrower distance to the technology frontier, developing countries enjoy higher benefits from FDI productivity spillovers and, thus a larger growth effect of FDI. Moreover, the quality of the linkages that FDI establishes with local firms is conditional on the difference in technology level. Via backward linkages, local firms produce and supply components, accessories, and auxiliary products for foreign firms. Therefore, FDI is expected to boost the supporting industries in the host country. However, since modern and advanced technology products supplied to foreign firms are demanding at each detail and component, the existence of a wide gap in technology level between local and foreign firms in underdeveloped countries makes it difficult for local firms to meet the requirements of foreign firms. Meanwhile, in developing countries, a narrower gap in technology level lessens the obstacle and therefore offers a better chance for the development of supporting industries.

5. Further study

This section examines the impact of FDI inflows on the economic growth of developed, developing and underdeveloped countries using a dynamic model. This time, an attempt is made to determine the impact of FDI inflows on the GDP per capita growth rate. The relative size of the FDI growth effect would determine whether FDI plays an income convergence or divergent factor among country groups. In the dynamic model, the growth of GDP per capita this year may depend on last year's growth or GDP per capita growth in last year has its lagged effect on this year's growth. A lagged growth of GDP per capita variable is thus incorporated into the model to capture the persistence of this behavior. Besides, including the lagged dependent variable can take into account the effect of variables not explicitly measured in the model. The regression equation is written as

$$GGC_{i,t} = c + \beta_1 GGC_{i,t-1} + \beta_2 GRK_{i,t} + \beta_3 GHMC_{i,t} + \beta_4 FDI_{i,t} + e_{i,t} \quad (4)$$

where subscript i denotes country and t denotes time in year.

Growth of GDP per capita (GGC): this variable is the annual growth rate of GDP per capita. Descrip-

tions of annual GDP per capita growth rate variable are provided in Table 1.

Growth of physical capital stock (GRK): this variable is the annual growth rate of physical capital stock. Descriptions of physical capital stock variable are provided in Table 1.

Growth of human capital level (GHMC): this variable is the annual growth rate of human capital level. Descriptions of human capital level variable are provided in Table 1.

FDI intensity (FDI): this variable is the ratio of net inflows of foreign direct investment and GDP (in %). Descriptions of net inflows of foreign direct investment variable are provided in Table 1.

Generalized Method of Moments (GMM) estimation is appropriate to use in a dynamic panel data model. GMM estimation is effective for a sample when the number of times is less than the number of identities. In this study, the number of years is 18, and the number of countries is 138. The systems GMM is chosen over the difference GMM since the system GMM moderates the poor instruments of the difference GMM by using additional moment conditions. Moreover, the GMM two-step estimator is used for it being known to be asymptotically efficient and robust to all forms of heteroskedasticity. The two-step system GMM estimation is conducted by applying *xtabond2* package in Stata program developed by Roodman (2009).

Table 1
Paradox Mindset Inventory: Zones of Navigating Paradoxes

	Coef.	Std. Err.
Lagged growth of GDP per capita (GGC-1)	0.291***	0.032
Growth of physical capital stock (GRK)	0.195***	0.053
DUMMY - Developed countries	0.269***	0.068
DUMMY - Underdeveloped countries	0.054	0.048
Growth of human capital level (GHMC)	0.113**	0.049
DUMMY - Developed countries	0.034	0.101
DUMMY - Underdeveloped countries	-0.086	0.066
FDI intensity (FDI)	0.064***	0.023
DUMMY - Developed countries	-0.069***	0.023
DUMMY - Underdeveloped countries	-0.052**	0.026
Year dummy variables	Yes	
AR(1) test (p-value)	0.000	
AR(2) test (p-value)	0.384	
Hansen test (p-value)	0.392	
Number of instruments	42	
Number of observations	2196	

Note: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Dummy variables are used to distinguish groups of developed, developing and underdeveloped countries. In the estimation results, the first-degree autocorrelation test (AR1) and the second-degree autocorrelation test (AR2) show the existence of the first-order autocorrelation but not second-degree autocorrelation. The p-value for Hansen test of overidentifying restriction justifies the validity of the instrumental variables.

Regression results are presented in Table 3. As can be seen from this table, FDI positively affects GDP per capita growth rate in developing and underdeveloped countries, with the largest size in developing countries ($\beta = 0.06$) and followed by underdeveloped countries ($\beta = 0.01$). In developed countries, FDI shows almost no growth effect. These results confirm an inverted U-shape curve for the impact of FDI on economic growth in country groups by level of development. The growth effect of FDI increases as the level of development increases and becomes saturated in developed countries. The growth effect of FDI is larger in developing countries than in underdeveloped countries. For this, FDI plays an income divergence factor when it widens the income gap between developing and underdeveloped countries. Compared to no growth effect in developed countries, a large positive growth effect of FDI in developing countries enables the countries to close the income gap with developed countries. For this, FDI plays an income convergence factor.

6. Conclusion and Policy Implications

Developing and less developed countries seek FDI to foster economic growth, hoping to catch up in income level with developed countries. Using a dataset comprising of 138 countries (36 developed, 67 developing and 35 underdeveloped countries), the IV-2SLS fixed-effect estimation results reveal an inverted U-shaped curve for the impact of FDI inflows on economic growth in country groups by level of development. The growth effect of FDI increases as the level of development rises and then decreases. The argument is that how successfully countries can gain benefits from FDI depends upon their absorptive capacities, which are influenced by the quality of the workforce, infrastructure, institutions, and the macroeconomic environment. According to the SM3D knowledge management system (Vuong et al., 2022), foreign direct

investment can strengthen host countries' absorptive ability through international working environments, disciplined practices, production standards, and international law, among other things.

Underdeveloped countries are characterized by low human and capital assets, poor infrastructure systems, and obsolete technology. With a higher level of development, developing countries are in a state of higher level of human capital, better infrastructure development and higher technology level - the conditions that make them have a relatively higher technological absorptive capacity than underdeveloped countries. Having higher absorptive capacities, developing countries can exploit FDI more efficiently and thus experience a larger growth effect of FDI than underdeveloped countries. Possessing with highest absorptive capacities, developed countries have the largest potential to benefit from FDI technology diffusion and spillovers. However, a prevalence of already high human capital and technology levels in developed countries implies there is almost no room for the countries to gain benefit from FDI. The growth effect of FDI in developed countries is found to be the smallest in size.

A relatively larger size of FDI growth effect in developing countries compared to underdeveloped countries implies that FDI assists developing countries to grow faster than underdeveloped countries. These places underdeveloped countries in the danger of exaggerating income gap with developing countries. Meanwhile, since the size of FDI growth effect is much larger in developing countries than in developed countries, developing countries can rely on the assistance of FDI to close the income gap with developed countries.

There are several policy implications drawn from this study. First, since FDI plays an important role in assisting developing countries in the income catchup process, the countries should provide more incentives and measures to attract FDI inflows. More freedom in international trade and safer legal environment will lure inward FDI to the countries. Besides, more efforts should be done to put public debt under control. The creation of a conducive environment for foreign investors to collaborate with local firms and institutions should actively encourage technology transfer and spillovers from FDI. In other words, fostering an environment rich in "cultural additivity" (Khuc, 2023; Vuong et al., 2018) is key to fostering collaboration

and innovation, which in turn helps to accelerate the transfer of technology and spillover effects from FDI. Second, underdeveloped countries should prioritize on basic human development including education and healthcare as well as infrastructure improvement. These foundational investments will lay the groundwork for increasing absorptive capacity and benefiting more from FDI. In light of the O-ring theory (Kremer, 1993), all of these factors are indispensable to make the “Big Push” and “industrialization” (Murphy et al., 1989) that contributes to a high-quality economic growth then. Besides, efforts should be made to upgrade obsolete technology and modernize industries in order to strengthen their technological absorptive capacities. Finally, for developed countries, investment efforts in research and innovation need to carry on maintaining their technological leadership. Policies to support and promote R&D activities should be actively implemented. Moreover, since developed countries already possess strong human capital and advanced technology levels, they can be selective in attracting FDI that complements their existing strengths rather than focusing solely on technology transfer.

We understand that the impact of foreign direct investment on economic growth is a complex matter that will call for more investigation in the coming years. The impact of green FDI on economic growth may thus be the first promising topic for further study. Green FDI can increasingly help host nations in achieving sustainable growth in the face of climate change and environmental pollution. More importantly, it would be worthwhile undertaking research on how poor and developing nations could lure in and select green FDI given their limited options. Another option would be to examine the effects of FDI on economic growth using a new approach (e.g., Bayesian Nonlinear Mixed-Effects). This is due to the approach utilized in this study still having limitations. From this view, future research should use better methods to provide more robust and nuanced insights into this complex relationship of the topic.

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