The Moderating Role of Infrastructure in the Relationship of Foreign Direct Investment and Economic Growth of Developing Countries

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ABSTRACT

Developing countries are experiencing a steady decline in GDP per capita, increasing the disparity between the nations. Additionally, there has been a significant drop in foreign direct investment in these developing regions. Therefore, the study empirically assessed the impact of foreign direct investment on economic growth of 49 developing countries along with estimating the moderation role of infrastructure in developing countries from 2000 to 2022. The study utilized the pooled OLS method along with two step system GMM estimation technique for robustness. Both the methods showed that foreign direct investment had a significant positive impact on the economic growth of developing countries. The result showed that infrastructure positively moderated the relationship of foreign direct investment and economic growth as the interaction term of infrastructure and foreign direct investment was positive and significant at the 1 % level. Furthermore, the study showed that increase in trade openness, labour and infrastructure had a significant positive impact on economic growth of the developing countries, but capital accumulation had adverse relation with economic growth of developing countries. The study will be helpful for the policymakers, to consider trade openness, labour and infrastructure as part of their budgetary focus when planning their country's budget in the upcoming years.

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INTRODUCTION

The study of economic growth remains essential and engaging within economics due to its relevance in addressing key questions about economic development. Historically, economic disparities were likely smaller, but they have significantly widened over time (Acemoglu et al., 2001). Economic growth is vital for closing these gaps, as it raises living standards, creates jobs, improves education, strengthens governance, protects property rights, and attracts investment for sustained development (Victor, 2018; Griethuysen, 2010). Furthermore, it enhances state capacity and wealth, contributing to reduced inequality (United Nations University World Institute for Development Economics Research, 2021). The real GDP growth rate of developing countries has steadily declined since 2007, dropping from 8.4% to 4% by 2023, with a projected rate of 4% for 2024. In contrast, developed countries saw a smaller reduction of 1.2% over the same period, widening the gap between them (International Monetary Fund, 2023).

Foreign direct investment (FDI) plays a crucial role in influencing economic growth by facilitating resource accumulation, knowledge transfer, technology adoption, and job creation, particularly in developing countries (Almfraji &Almasafir, 2014; Nair-Reichert & Weinhold,2001). However, global FDI declined by 12% in 2022, with many smaller developing nations experiencing stagnant FDI inflows and the least developed countries witnessing a 16% decline from already low levels. Additionally, FDI flows to developing countries fell by 9% to $841 billion in 2023 (United Nations Conference on Trade and Development, 2024).

Developing countries face substantial developmental disparities compared to developed nations, characterized by poverty, limited access to vital services, and inadequate infrastructure (Myint, 1973; Alvaredo & Gasparini, 2015). FDI can significantly contribute to closing these gaps by providing capital, expertise, and advanced technology. To attract FDI, developing countries implement policies like tax incentives, regulatory reforms, and investment promotion agencies (Bazo, 2008). Assessing the effectiveness of these policies is crucial for policymakers, who rely on current empirical evidence to understand FDI's impact on economic growth and development. Demonstrating a positive economic influence can bolster investor confidence and attract additional investments, resulting in further economic advantages.

Despite the widely held belief that FDI contributes to economic growth; some studies have suggested conflicting views. Empirical evidence has shown that FDI may not always benefit host countries and could potentially have negative or insignificant effects on economic growth (Hermes & Lensink, 2003; Mencinger, 2003). For instance, Temiz and Gökmen (2014) found no significant relationship between FDI inflows and GDP growth in Turkey, while Alvarado et al. (2017) concluded that FDI did not effectively foster economic growth in Latin America, except in high-income countries. Moreover, Ang (2009) and Fry (1993) have reported negative impacts of FDI on output expansion. Consequently, the impact of FDI on economic growth remains a topic of debate among scholars, despite the general consensus on its positive effects.

Enhanced communication systems, such as improved roads and highways, reduced transaction costs and increase market accessibility, consequently attract FDI (Donaldson, 2018). Additionally, a robust infrastructure enhances the attractiveness of a country to foreign investors by reducing costs, increasing efficiency, improving market access, and signaling economic stability, thus facilitating greater inflows of FDI (Alattar et el., 2023; Khadaroo & Seetanah (2010). Studies have consistently demonstrated that developed infrastructure significantly boosts FDI inflows, as evidenced by research in Southeast Asia and Pakistan (Rehman & Noman, 2021; Rehman & Ding, 2019). Conversely, inadequate infrastructure negatively affects investment inflows, highlighting the crucial role of efficient systems like roads and highways in promoting FDI (Donaldson, 2018). This underscores the significance of infrastructure in attracting international capital (Bellak et al., 2009). According to Donaubauer et al. (2016), infrastructural improvements, including transportation, energy, communication, and finance, are pivotal in attracting FDI inflows in developing countries. Given the argument that infrastructure influences FDI inflow, there is reason to believe that it also impacts how FDI affects economic growth, given its generally positive impact on growth.

Previous research has extensively explored various factors influencing the relationship between FDI and economic growth, including education levels, trade openness, stock market development, population growth, institutional quality, urbanization, corruption, country risk rating, tax rates, and financial sophistication. However, the role of infrastructure in this

relationship remains largely unexplored. Despite theoretical arguments suggesting that infrastructure could affect the impact of FDI on economic growth, empirical investigations are lacking. This study aimed to address this gap by examining how infrastructure influences the relationship between FDI and economic growth, providing insights into economic development in developing countries (Burlea-Schiopoiu et al., 2023; Batten & Vo, 2009; Hsiao & Shen, 2003; Adeniyi et al., 2012). Infrastructure is believed to boost the productivity and efficiency of FDI by lowering costs and accelerating operations (Nihayah and Kurniawan, 2021; Donaldson, 2018). This can enhance the positive effects of FDI on economic growth. Recognizing this moderating effect assists policymakers in crafting strategies to maximize the benefits of FDI, positioning infrastructure investment as a crucial catalyst for economic development.

Previous studies have mainly focused on analysing how FDI impacts the economic growth of individual developing countries, mixed countries, or specific regions, overlooking the broader perspective of developing countries as a whole. Additionally, there is a lack of recent literature on the economic assessment of FDI on developing countries overall, with only limited studies available, such as Mejia (2023) and Borensztein et al. (1998). Given the sustained decline in real GDP and FDI across developing countries since 2008, there is an urgent need for up-to-date study on this subject. Moreover, conflicting findings from existing studies regarding the relationship between FDI and GDP decline highlight the necessity for further investigation.

Therefore, this study aimed to determine whether the decrease in FDI significantly contributes to the observed decline in GDP. The research findings aim to provide valuable insights to policymakers, assisting them in making informed decisions about economic policies and strategies. Findings of this study will benefit the policymakers of developing countries to attract more foreign direct investment and to increase economic growth in the future, by considering trade openness, labour and infrastructure as part of their budgetary focus when planning their country's budget in the upcoming years. This will eventually help the government's decision-making in moving towards higher economic growth. Understanding the moderation effect of infrastructure will help policymakers design strategies to leverage FDI more effectively, making infrastructure investment a key

driver of economic development. Therefore, the aim of this study was to explore the impact of FDI on the economic growth of developing countries along with estimating the moderation role of infrastructure in the relationship of FDI and economic growth of developing countries.

LITERATURE REVIEW

Foreign Direct Investment and Economic Growth

The advantages of FDI include productivity improvements, technology transfer, innovation, advanced management practices, technical expertise integration, workforce skill development, and global production network integration (Azman-Saini et al., 2010; Almfraji & Almsafir, 2014). Moreover, FDI directly influences economic growth by facilitating capital accumulation, integrating new inputs, and introducing foreign technologies into the host country's production processes. FDI significantly boosts economic growth by providing critical capital, creating jobs, and enhancing skills in the host country (Iritié & Tiémélé, 2023; Francis et al., 2024; Almfraji & Almsafir, 2014). Despite theoretical frameworks suggesting a positive correlation between FDI and economic growth, there is an ongoing debate about its actual impact based on empirical evidence. While some studies support its beneficial effects, others argue for potential negative impacts.

Among the research advocating for the positive influence of foreign direct investment on economic growth**,** numerous studies have concentrated on individual countries**,** such as the study by (Iritié & Tiémélé, 2023, Anwar & Nguyen, 2010; Brou & Smirnov, 2023) where Iritié & Tiémélé (2023) investigated the impact of foreign direct investment on Côte d'Ivoire's economic growth and revealed that foreign direct investment exerts a negative influence on the country's economic growth both in the short and long term. Anwar & Nguyen (2010) revealed a bidirectional causative association between foreign direct investment and economic growth in the Vietnamese context.

Brou & Smirnov (2023) indicated that while foreign direct investment positively impacts short-term economic growth in Russia, its effectiveness

in the long-term context is comparatively limited. Employing ordinary least squares (OLS) regression analysis, Kunle et al., (2014) found a positive and statistically significant relationship between foreign direct investment inflows and economic growth, suggesting that foreign direct investment acts as a catalyst for economic growth. The above studies concentrated on individual developing countries but to understand the scenario from the perspective of developing countries, the study considers developing countries as a whole.

There are a number of studies that focused on a specific region or mixed (developing and developed) countries Such as Li & Liu (2005) employed a panel dataset encompassing 84 countries, spanning the temporal domain of 1970 to 1999 and concluded that foreign direct investment and economic growth exhibit a mutually reinforcing relationship across both developed and developing economies. Nair-Reichert & Weinhold (2001) found that the connection between investment, encompassing both foreign and domestic, and economic growth in developing nations displays marked heterogeneity. Almfraji & Almasafir (2014) found that key outcome of the FDI- economic growth relationship was consistently positive, although in specific instances, it displayed negative or negligible trends.

FDI generally yielded favourable outcomes for economic growth. Noteworthy factors like human capital and financial markets played a role in shaping the relationship between foreign direct investment and economic growth. Iamsiraroj (2016) found a positive association between foreign direct investment and economic growth on 124 cross-country. Moreover, Adeniyi et al., (2012) indicated that financial sophistication is crucial for FDI to positively influence economic growth in Ghana, Gambia, and Sierra Leone, depending on the financial indicator used. However, Nigeria showed no evidence of a causal flow from foreign direct investment to growth, even with financial deepening. The paper suggests prioritizing efforts to enhance financial structures in these countries to better harness the growth-promoting effects of foreign direct investment.

Moreover, there are a few studies on developing countries as a whole such as Mejia (2023) & Borensztein et al. (1998), where Mejia (2023) considered data from 1980 to 2019 and Borensztein et al. (1998) considered data before 2000. But this study had considered data till 2022 to understand the more recent trend.

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On the other hand, there is a strand of literature that argued for the adverse influence of FDI on economic growth such as the study by Rahman (2015) found a negative correlation between money laundering and economic growth. Furthermore, Mencinger (2003) concluded a negative impact of FDI on economic growth by using panel data from 1994 to 2001 of Bangladesh. Alvarado et al. (2017) concluded that the effect of FDI on economic growth in lower-middle-income countries was negative and statistically significant based on a study of 19 Latin American countries. Ang (2009) found a negative relation between foreign direct investment and economic growth in the long run in Thailand using error correction model. For this purpose, the study collected data from 1970 to 2004. As most studies posited a positive effect, the study was also motivated to hypothesize that:

H1: Foreign direct investment positively affects economic growth

Moderation Role of Infrastructure in The Relationship of Foreign Direct Investment and Economic Growth

The relationship between infrastructure development and FDI has been a significant area of study, especially for developing economies seeking to enhance their attractiveness to foreign investors. This review summarizes key findings from several studies that analyze the impact of infrastructure on FDI inflows across different countries.

For instance, Rehman et el., (2011) found a strong positive impact of infrastructure on FDI inflows both in the short and long run. The findings highlighted the importance of infrastructure in aiding policy makers and international financial organizations in making informed decisions regarding FDI and rehabilitation activities, particularly in the context of flood-affected areas. Mat and Harun (2012) found that infrastructure had a significant and positive effect on FDI inflows in Malaysia. These findings suggested that both hard and soft infrastructure developments were crucial for attracting FDI and accelerating economic development. Khadaroo and Seetanah (2010) revealed that transport infrastructure significantly enhanced FDI attractiveness, with a positive and significant coefficient found for transport infrastructure in Mauritius and 20 African countries. Wekesa et el., (2016) examined the effects of various types of infrastructure on FDI inflows in Kenya. Using data from multiple sources, their study identified

that improved transport, communication, water, and waste infrastructure are important determinants of FDI inflows. The findings suggested that continued infrastructural development was key for Kenya to create a conducive investment climate and attract more FDI. Nihayah and Kurniawan (2021) concluded that road infrastructure and FDI positively affected economic growth, with significant impacts observed in Brunei, Malaysia, and Thailand among ASEAN countries.

The reviewed literature consistently highlights the crucial role of infrastructure in attracting FDI across various regions. On the other hand, FDI generally affects economic growth positively. Therefore, there is good reason to believe that infrastructure influences positively how FDI affects economic growth. In response to that, the study assumed that infrastructure positively moderated the relationship of FDI and economic growth and hypothesize that:

H2:   Infrastructure positively moderates the relationship of foreign direct investment and economic growth.

Theoretical Framework

Adam Smith emphasized the importance of capital accumulation as a key driver of classic economic growth, highlighting the roles of free markets, division of labor, and specialization (Smith, 2010). He also believed that a productive labor force was essential for economic success (Smith, 1937). Brewer (2010) also identified three fundamental components of the Classical Economic Growth Theory: the pivotal role of capital accumulation, the endogeneity of the labor force, and the secondary or largely ignored role of technical change. Thus, according to the basic Classic Economic Growth Theory, capital and labor are the primary drivers of growth.

One the other hand, FDI is a critical element of capital accumulation, providing financial resources, technology, management expertise, and access to international market (Iritié & Tiémélé, 2023). By facilitating the flow of these resources, FDI can significantly enhance economic growth. However, the Classical Economic Growth Theory has historically overlooked the role of FDI. Therefore, this study incorporated FDI into the Classical Economic Growth Framework to provide a more comprehensive understanding of economic development.

Moreover, FDI has been incorporated in neoclassical (Zebregs, 1998) and the Swan Growth Theory (Mahembe & Odhiambo, 2014). The Solow growth model assumes a constant, exogenous rate of technological progress, failing to capture its dynamic and variable nature (Boianovsky & Hoover, 2009). Similarly, the Neoclassical Growth Theory treats technological progress as exogenous and unexplained within the model like the Solow model (Mulder et al., 2001). In contrast, the classical model does not face these issues. Therefore, this study incorporated FDI into the Classical Growth Theory to extend.

RESEARCH METHODOLOGY

Data

The study adopted a quantitative approach to assess the hypotheses, employing a balanced panel encompassing 49 developing countries from 2000 to 2022. However, the presence of missing values for certain variables led to a reduction in the number of countries included in the estimations, aligning with the methodology of Aisen and Veiga (2013). The selection of specific countries in this study was driven by the availability of relevant data and the necessity for a balanced dataset. The study focused on 49 countries due to data constraints, consistent with the approach taken by Yang (2020), who also limited his analyses to fewer countries based on similar data limitations.

The study focused on economic growth, measured by GDP per capita, as its dependent variable. The independent variables—foreign direct investment (FDI), infrastructure (INFR), capital (CAP), labor (LAB), and trade openness (TO)—were selected based on the study's objectives, supported by both theoretical foundations and empirical findings discussed earlier. The primary variable of interest was FDI with data sourced from the World Development Indicators. The study also incorporated an interaction term between FDI and infrastructure to assess the sensitivity of the relationship between these two factors. To prevent biased results, control variables such as labor, capital, and trade openness were included. Infrastructure was proxied by electric power consumption (kWh per capita), following the approach used in Nguea's 2020 study. The detailed description of the variables is provided in Table 1.

Table 1: Summary of Variables and Sources

Variable	Description	Source	Scale
Economic Growth	GDP per capital is a measure of economic growth obtained by dividing the total gross domestic product by the population.	World Development Indicators- World Bank	Gross Domestic Product Per Capita (constant 2015 US$)
Foreign Direct investment	Foreign direct investment (FDI) inflows refer to investments from non-resident entities that aim to obtain a long-term management stake in a domestic enterprise. This includes reinvestment earnings, equity capital, and various forms of capital specified in the balance of payments.	World Development Indicators- World Bank	FDI, net inflows (BoP, current US$) (Million)
Infrastructure	Electric power consumption measures the production of power plants and combined heat and power plants less transmission, distribution, and transformation losses and own use by heat and power plants.	World Development Indicators- World Bank	Electric power consumption (kWh per capita)
Labor	The labor force comprises individuals aged 15 and above who provide their labor to produce goods and services. It includes both employed individuals and those who are unemployed but actively looking for work, as well as first-time jobseekers.	World Development Indicators- World Bank	Population aged (15 and above)
Capital	Gross fixed capital formation, expressed as a percentage of GDP, is a measure of capital. It represents the total investment in various forms of physical assets, including land, buildings, machinery, infrastructure, and residential structures, among others. The variable is adjusted for inflation using constant 2010 US dollars.	World Development Indicators- World Bank	Gross fixed capital formation (as % of GDP)
Trade openness	Trade is the sum of imports and exports of services and goods shown as a percentage share of GDP.	World Development Indicators- World Bank	Trade (as % of GDP)

Model and Variable Specification

The study mainly employed static and dynamic panel data model to analyze the hypotheses of this study. The functional form of the model was as follows:

GDP = f (FDI, INFR, TO, CAP, LAB)

Where GDP per capita and indicated the dependent variable of the study. FDI was defined as FDI, infrastructure was defined by INFR, trade openness was defined as TO, capital was defined as CAP and labor was defined as LAB.

To estimate the direct impact of FDI under static model, the study utilized the following equation:

Model 1: $LGDP = \beta_0 + \beta_1\,LFDI_{it} + \beta_2\,LINFR_{it} + \beta_3\,LTO_{it} + \beta_4 LCAP_{it} + \beta_5\,LLAB_{it} + \varepsilon_{it}$

Here, LGDP represented natural logarithm of Gross domestic product per capital, natural logarithm of FDI was represented by LFDI, LTO abbreviates for the natural logarithm of trade openness, LCAP referred to natural logarithm of capital and LAB abbreviated for the natural logarithm of labor. Moreover, LINFR abbreviated for the natural logarithm of infrastructure. The study measured economic growth using the growth of GDP per capita. GDP per capita income represents the distribution of wealth within the economy compared to the GDP growth rates (Ofoeda et al., 2022). Several studies utilized GDP per capita as a dependent variable (Boulhol et al., 2008).

To estimate the moderating role of infrastructure between FDI and economic growth, the study utilized the following equation:

Model 2: $LGDP = \beta_0 + \beta_1\,LFDI_{it} + \beta_2\,LINFR_{it} + \beta_3\,(LINFR \times LFDI)_{it} + \beta_4 LTO_{it} + \beta_5 LCAP_{it} + \beta_6\,LLAB_{it} + \varepsilon_{it}$

The variable (LINFR*LFDI) represented the interaction between the infrastructure and FDI. The expected direction and statistical significance of

the β3 parameter will offer valuable insights into the potential moderating influence of infrastructure on the relationship between foreign direct investment and economic growth.

This study utilized the pooled OLS method to examine the hypotheses, aiming to mitigate multicollinearity by combining data from multiple datasets. Pooled OLS regression helps dilute correlations between variables, minimizing standard errors for more accurate results (Teng et al., 2022). Additionally, the two-step system GMM estimation technique was employed alongside OLS to enhance result validity, offering a more realistic representation of data relationships compared to other panel data estimation techniques (Aisen & Veiga, 2013). This approach effectively captures the dynamic economic relationships among variables in the dataset, making it superior for analyzing panel data dynamics (Sajjad & Zakaria, 2018). Hence, the modified dynamic panel data model under GMM was written as follows:

$$y_{i,t} = \beta_{yi}, \text{t-1} + x'_{it}\beta + \mu_i + \varepsilon_{it}$$

The system GMM dynamic econometric model was presented as in equation (1) follows:

Model 1: $LGDP = \beta_0 + \beta_1 LGDP_{it-1} + \beta_2 LIFDI_{it} + \beta_3 LINFR_{it} + \beta_4 LTO_{it} + \beta_5 LCAP_{it} + \beta_6 LLAB_{it} + \varepsilon_{it}$

By incorporating the interaction term of FDI and infrastructure into the dynamic model of system GMM of model (2), it became:

Model 2: $LGDP = \beta_0 + \beta_1 LGDP_{it-1} + \beta_2 LIFDI_{it} + \beta_3 LINFR_{it} + \beta_4 (LINFR \times LFDI)_{it} + \beta_5 LTO_{it} + \beta_6 LCAP_{it} + \beta_7 LLAB_{it} + \varepsilon_{it}$

Where yit was the dependent variable for each country i over the period t. In the context of the study, x´it represented the matrix of independent variables for each country during the specified time period. The term μi was employed to signify the country-specific effect, while ε represented the error term. LGDP i t-1 was the lagged GDP per capita.

Furthermore, the two-step system-GMM dynamic panel estimator was employed to address econometric challenges stemming from unobserved country-specific effects and simultaneous endogeneity of explanatory variables (Aisen & Veiga, 2013). This estimation technique inherently tackled issues like autocorrelation, heteroscedasticity, and endogeneity, as noted by Ullah et al. (2018), eliminating the necessity for additional diagnostic tests.

RESULT AND DISCUSSION

Table 2: Correlation Matrix

	LGDP	LFDI	LINFR	LTO	LCAP	LLAB
LGDP	1					
LFDI	0.4836***	1				
LINFR	0.7415***	0.4082***	1			
LTO	0.1019***	-0.136***	0.3207***	1		
LCAP	0.0522*	0.3219***	0.0748**	0.1097***	1	
LLAB	-0.1409***	0.0246	-0.3213***	-0.03	-0.0093	1

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

The correlation matrix is presented in Table 2. The analysis revealed that GDP per capita (LGDP) was strongly positively correlated with infrastructure (LINFR) and moderately with foreign direct investment (LFDI), while showing a negative correlation with labor (LLAB). Infrastructure also correlated positively with LFDI and trade openness (LTO), but negatively with labor. LFDI was positively associated with capital (LCAP) and infrastructure, yet negatively with trade openness. Additionally, trade openness was positively correlated with infrastructure and capital, but negatively with LFDI. Capital showed positive correlations with LFDI and other variables except labor. Labor had a negative correlation with GDP per capita and infrastructure, with no significant associations with other variables.

Table 3: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LGDP	1,127	7.991719	0.794507	5.963785	9.561016
LFDI	1,127	21.04437	1.895931	14.86278	26.56413
LINFR	1,127	6.910771	1.219561	3.174715	8.909752
LTO	1,127	4.183941	0.473845	3.066191	5.395489
LCAP	1,127	3.084705	0.326631	0.693147	4.05543
LLAB	1,127	4.096566	0.174055	3.594569	4.481306

* $p<0.10$, ** $p<0.05$, *** $p<0.01$

The descriptive statistics is presented in Table 3. This research examined key economic variables using a dataset of 1,127 observations, revealing several notable insights. GDP per capita (LGDP) had a relatively high mean of 7.99, while foreign direct investment (LFDI) showed considerable variability with a wide range from 14.86 to 26.56. Infrastructure (LINFR) also displayed substantial variability, ranging from 3.17 to 8.91. Trade openness (LTO) and capital (LCAP) exhibited less variability, with means of 4.18 and 3.08, respectively. Labor (LLAB) had the least variability, with a narrow range from 3.59 to 4.48. These findings highlighted the significant dispersion in FDI and infrastructure levels, contrasting with the relative stability in labor metrics.

Table 4: Result of the Impact of Foreign Direct Investment on Economic Growth in Developing Countries

LGDP	OLS	TWO STEP SYSTEM GMM
LFDI	0.0787*** 7.87	0.0740*** 6.58
LINFR	0.474*** 29.25	0.151*** 3.17
LTO	-0.164*** (-4.52)	0.0265 0.71
LCAP	-0.124** (-2.51)	-0.304*** (-3.37)
LLAB	0.387*** 4.15	0.967*** 2.92
Lag. LGDP		0.694*** 8.59
_cons	2.546*** 5.82	-3.274** (-2.14)
N	1127	1078

AR2		0.205
Hansen		0.097
R^2	0.6054	

* p<0.10, ** p<0.05, *** p<0.01

The estimated result from pooled OLS and two step generalized method of moment (TWO STEP SYSTEM GMM) is shown above in Table 4 from baseline Model 1.

One of the hypotheses (H_1) and objectives of this study was to examine the impact of FDI on economic growth of developing countries. The hypothesis that FDI positively affects economic growth received a clear empirical support as the coefficient of FDI was positive at 0.01 level in both OLS and two step system GMM. The estimated coefficient implied that if there is one unit increase in FDI, the annual growth rate increased by 0.0787 as per OLS and 0.0740 as per two step system GMM. Therefore, it can be concluded that FDI had a significant positive relationship on the economic growth of developing countries. The result is similar to the study of Mejia (2023), Brou & Smirnov (2023) and Almfraji & Almsafir (2014). FDI enhances economic growth by improving productivity, transferring technology, fostering innovation, advancing management practices, integrating technical expertise, developing workforce skills, and facilitating global production network integration through capital accumulation and job creation (Smirnov, 2023; Brou & Smirnov, 2023; Azman-Saini et al., 2010; Almfraji & Almsafir, 2014; Iritié & Tiémélé, 2023; Francis et al., 2024).

Table 5: Result of The Interaction Term Between Infrastructure and Foreign Direct Investment of Developing Countries

LGDP	OLS	TWO STEP SYSTEM GMM
LFDI	-0.308*** (-6.81)	-0.252** (-1.97)
LINFR	-0.635*** (-4.97)	-0.636* (-1.78)
(LINFR* LFDI)	**0.0547*** 8.75**	**0.0421** 2.3**
LTO	-0.125*** (-3.55)	0.0683** 2.08
LCAP	-0.0636 (-1.31)	-0.0978 (-1.16)

LLAB	0.279*** 3.07	0.359** 2.34
L. LGDP		0.698*** 10
_cons	10.43*** 10.47	4.503* 1.78
N	1127	1078
AR2		0.242
Hansen		0.120
R^2	0.6307	

* p<0.10, ** p<0.05, *** p<0.01

The interaction of infrastructure and FDI is presented in Table 5 equation 2. Another hypothesis (H_2) was to explore the role of Infrastructure on the relationship of FDI and economic growth through Model 2. Moreover, the results as in Table 4 confirmed the expectation that the coefficient of LINFR *LFDI have a positive and significant impact on GDP. Since infrastructure was associated with FDI positively, it was assumed that infrastructure favorably influenced how FDI affected economic growth. This hypothesis was supported by the result of Pooled and GMM estimation because the coefficient of the interaction term of FDI and the infrastructure was 0.0547 (1% level) as per OLS and 0.0421 (5% level) as per GMM estimation method.

Therefore, it can be concluded that infrastructure moderated the relationship of FDI and economic growth positively. Furthermore, it can be concluded that the impact of FDI on economic growth was increased by the presence of infrastructure. Enhanced infrastructure, including improved roads and highways, reduces transaction costs and increases market accessibility, making a country more attractive to foreign investors by lowering costs, boosting efficiency, and signalling economic stability, thereby facilitating greater inflows of FDI (Donaldson, 2018; Alattar et al., 2023; Khadaroo & Seetanah, 2010). As it is argued that infrastructure affects FDI positively (Nihayah and Kurniawan, 2021; Brada et al., 2004) and FDI has a generally positive impact on economic growth (Smirnov, 2023; Almfraji & Almasafir,2014; Li & Liu, 2005; Anwar & Nguyen, 2010), therefore, the positive moderation role of infrastructure in the relationship of FDI and economic growth is justified.

CONCLUSION

This study empirically investigated the impact of FDI on the economic growth of 49 developing countries from 2000 to 2022, with a specific focus on the moderating role of infrastructure in the relationship of FDI and economic growth. Utilizing pooled OLS and two-step system GMM estimation techniques, the study found robust evidence that FDI significantly and positively influenced economic growth in developing countries. Furthermore, the results demonstrated that infrastructure enhanced this positive relationship of FDI and economic growth of developing countries, as indicated by the positive and significant interaction term between FDI and infrastructure. The analysis also revealed that trade openness, labor force, and infrastructure independently contributed positively to economic growth, while capital accumulation showed a negative impact.

The study provides a noble insight by estimating the moderation role of infrastructure. These findings underscore the importance of FDI and infrastructure development in fostering economic growth in developing countries. Policymakers will be encouraged to implement strategies that attract more FDI and invest in infrastructure improvements to maximize the economic benefits. The insights provide valuable guidance for developing nations seeking to enhance their economic growth through targeted investment policies and infrastructure development. Additionally, understanding the positive moderating effect of FDI will help policymakers develop strategies to optimize its benefits, highlighting infrastructure investment as a vital catalyst for economic development.

Though the study provides valuable insights, there are some limitations. Firstly, the study considered only 49 developing countries due to the unavailability of data that may provide biased result sometimes. Secondly, the study considered only developing countries but did not consider developed countries. Thirdly, the study considered only energy infrastructure as proxy of infrastructure.

Besides considering developing countries, future studies may consider developed countries and may compare between developing and developed countries to know how FDI affects economic growth from different context. Future studies may consider telecommunication infrastructure and transport

infrastructure as proxy of infrastructure to get more comprehensive insights. Moreover, future studies may consider more developing countries to get more accurate results.

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