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Article

Impact of foreign direct investment on economic growth in developing countries: The role of institutional quality

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Abstract: This paper empirically examines the impact of institutional quality on FDI-driven economic growth in 135 developing countries from 1996–2020. Given that improved institutions lower business costs, reduce uncertainty, and attract FDI inflow, the study hypothesizes that enhancing institutional quality will likely foster higher economic growth in developing countries through FDI. We apply dynamic and static panel estimation techniques for this investigation. The research employs six measures of institutional quality from the World Governance Indicators (WGI) and their interaction with FDI inflow to identify key institutional quality indicators for developing countries. Results indicate a positive and significant effect of FDI on economic growth in developing countries. Moreover, enhancements in three specific institutional quality indicators—government effectiveness, regulatory quality, and the rule of law—strengthen FDI's impact on economic growth. The study also underscores the greater significance of institutional quality in driving FDI-led economic growth in developing countries, compared to its limited impact on all countries. Ultimately, the study recommends that policymakers in developing countries devise effective strategies to enhance government effectiveness, regulatory quality, and the rule of law to expedite economic growth through FDI.

Keywords: FDI; institutional quality; economic growth; FDI led growth; system GMM

1. Introduction

Foreign direct investment (FDI) is an investment made by a foreign entity to gain controlling ownership in a local business. Over the last few decades, particularly for many developing countries, FDI has turned into a vital source of external capital. The insertion of FDI can boost economic growth, particularly in developing countries. Another important factor for economic growth is institutional quality. Better quality institutions might encourage economic growth by attracting new FDI and by increasing the effective implementation and success rate of FDI-led projects. The objective of this study is to empirically examine the impact of institutional quality in promoting economic growth through FDI in developing countries[1]. Particularly, the study strives to determine which traits of institutional quality are more important for accelerating economic growth through FDI.

The share of FDI in total capital flows has increased noticeably over the past two decades. According to the UNCTAD report of 2020, FDI inflows to developing economies accounted for 72% of global FDI in 2020 [1]. FDI inflow distinctly differs between developed and developing countries and notable variations also exist within developing nations themselves. Developing countries, often constrained by limited access to domestic capital and technology, rely more heavily on FDI as a primary source of external capital, whereas developed countries tend to have

stronger domestic financial markets and institutional support. Furthermore, within developing nations, FDI inflows vary substantially due to differences in institutional quality, regulatory frameworks, and political stability, all of which significantly influence investor confidence and FDI effectiveness. Thus, enhancing institutional quality is critical for maximizing the benefits of FDI in driving sustainable growth. Authors such as Alfaro [2], Javorcik [3], and Yimer [4] argued that FDI can stimulate economic growth for developing countries by bringing in foreign capital, new technology, know-how, improved managerial and marketing skills, and horizontal and vertical knowledge spillover benefits, which developing countries lack. Osei and Kim [5] find that policymakers adopt various initiatives such as lowering entry barriers, opening new sectors suitable for foreign investment, and providing various investment incentives, such as import duty exemptions and tax holidays, to encourage foreign investment in their jurisdictions.

Empirical evidence regarding the nexus between FDI and growth shows that the benefits of FDI vary across countries and sectors. Many authors including Awad and Ragab [6], Ibrahim and Acquah [7], Kitonyo and Kathanje [8], Osei and Kim [5], and Qureshi et al. [9] identified that FDI's impact on economic growth depends on various factors such as financial development, institutional quality, human capital development, and democracy of the host economy. Among these factors, this study investigates the role of institutional quality on the FDI-growth nexus in developing countries. The study focuses on institutional quality as the quality of institutions differs substantially in developing countries which may influence FDI inflow to countries and the successful implementation of FDI-led projects. The study examines six aspects of institutional quality and suggests areas where developing countries need to improve to achieve FDI-led economic growth.

Findings from several empirical literature including Ajide et al. [10], Aziz [11], and Qureshi et al. [9] imply that robust institutional quality may be a prerequisite for developing countries to achieve economic growth. Institutional quality is critical for developing countries because it shapes the environment for FDI to drive sustainable growth. Traditional growth factors often fall short in these regions due to weak institutions, which increase transaction costs, uncertainty, and project risks. Our study highlights that strong institutional traits—such as government effectiveness, regulatory quality, and rule of law—enhance FDI’s impact on economic growth. This targeted focus provides policymakers with actionable insights to maximize FDI benefits through improved institutional quality. Institutional quality should stimulate FDI-led economic growth, as the successful implementation of projects financed by FDI depends on robust institutional quality in the host countries. If institutional quality is high in a country, more projects are likely to succeed, and FDI can contribute to economic growth. Based on this hypothesis, the study performs a conditional analysis to empirically examine how institutional quality affects FDI-led economic growth in developing countries. It also investigates, among different institutional quality indicators, which factors are most critical in boosting FDI-led economic growth.

This study primarily applies the two-step Generalized Method of Moments (GMM) panel estimation method developed by Arellano and Bond [12], Blundell and Bond [13], and Roodman [14] for its analysis, using annual panel data from

1996 to 2020 in 120 developing countries. The list of countries is included in Appendix A. To measure institutional quality, this research uses six indicators from the World Governance Indicators (WGI): Government effectiveness, regulatory quality, rule of law, control of corruption, political stability, and voice and accountability. The study applies conditional analysis and uses the interaction of each indicator with FDI as a separate explanatory variable to identify which institutional quality indicators significantly affect economic growth through FDI.

The results reveal that FDI positively and significantly affects economic growth in developing countries. The conditional analysis finds that the interaction of FDI with three specific institutional quality indicators—government effectiveness, regulatory quality, and the rule of law—has a significant positive impact on FDI-led economic growth in developing countries. Furthermore, this study finds that the interaction of institutional quality indicators with FDI is more significant in developing countries than in the all-country case. The findings suggest that policymakers in developing countries should target these three specific indicators of institutional quality—government effectiveness, regulatory quality, and the rule of law—and take necessary actions to improve these aspects.

This study makes several contributions to the existing body of knowledge. First, while most previous literature such as Guenichi and Omri [15], and Sabir et al. [16] focuses on either the role of institutional quality or FDI in influencing economic growth, our study uniquely examines how specific aspects of institutional quality moderate the impact of FDI on economic growth in developing countries;second, it identifies the specific aspects of institutional quality that are essential for FDI-led growth in these regions,among the six institutional quality indicators from the World Governance Indicators database, our findings show that government effectiveness, regulatory quality, and the rule of law are the most significant;third, we used the Generalized Method of Moments (GMM) to address endogeneity issues, thereby enhancing the robustness of our results;lastly, the study explores potential mechanisms through which institutional quality can influence FDI-led economic growth in developing countries.

The remainder of this paper is organized as follows. Section two reviews theoretical framework and existing literature concerning FDI, economic growth and institutional quality; Section three discusses measurement of institutional quality, data, and methodology; Section four discusses empirical results; and section five concludes with a summary of findings and recommendations.

2. Literature review and theoretical framework

Researchers have analyzed the relationship between FDI and economic growth from various perspectives. While some studies such as Barro and Sala-i-Martin [17], Borensztein et al. [18], Bruno et al. [19], and Ibrahim and Acquah [7]) find a significant impact of FDI on economic growth, other studies like Azman-Saini et al. [20], and Carkovic and Levine [21] do not find such relation. This section reviews the literature on FDI and economic growth, the relationship between institutional quality and growth, and the role of institutional quality in influencing FDI-led economic growth.

Studies identify several ways FDI affects economic growth. Bohle and Regan [22], Findlay [23], Lin and Saggi [24], and Rodriguez-Clare [25] argue that FDI stimulates economic growth primarily through technology transfer and human capital development. FDI often brings new technology to host countries and improves the skills of local workers through training. Adopting improved technology promotes innovation, replaces outdated production mechanisms, and enhances productivity. In addition, FDI improves human capital through training by foreign experts, increasing labor productivity and contributing to higher economic growth. Amighini et al. [26] find that FDI can also drive economic growth through increased capital accumulation. Due to low domestic savings, FDI recipient countries often lack the capital investment needed to support economic growth. FDI inflows allow these countries to increase investment, thereby fostering higher growth.

Studies focuaing on endogenous growth theory such as Aghion and Howitt [27], and Romer [28,29] emphasize that technological improvement and innovation are the primary reasons for sustained economic growth. Barro and Sala-i-Martin [17] and Grossman and Helpman [30] using the endogenous growth model as a theoretical framework, show that FDI benefits local firms through positive spillover effects from technology transfer, which boosts productivity and growth. Aghion and Howitt [27], and Gherghina et al. [31] argue that technological improvement and innovation are the main drivers of sustained economic growth. Other studies including Barro and Sala-i-Martin [17], and Lucas [32] suggest that if innovation drives economic growth, FDI plays a significant role in accelerating development.

Some contrarian studies show that FDI does not have a strong influence in economic growth. Carkovic and Levine [21] argue that FDI does not have a significant or independent effect on growth, implying that FDI does not always accelerate economic growth. Azman-Saini et al. [20], analyzing 85 countries using panel methodology, found that FDI inflows do not necessarily positively impact economic growth. Balasubramanyam et al. [33] find that FDI is more important for economic growth in export-promoting countries, suggesting that the impact of FDI varies across countries, with those having better trade policies often experiencing FDI-led growth. Failing to identify a positive relationship between FDI and economic growth, Durham [34] suggests that the effects of FDI depend on the absorptive capability of host countries. Anwar and Nguyen [35] indicate that the impact of FDI on growth is more significant when more resources are invested in education and training to reduce the technological gap between local and foreign enterprises. Berger and Ragoussis [36], Borensztein et al. [18], Chaudhury et al. [37], and Gomes and Veiga [38] find that FDI contributes to increased production when there is sufficient capacity to absorb echnology in receiving countries. Ahmad et al. [39], Anwar and Nguyen [40], and Liu et al. [41] show that FDI strengthens linkages with local firms, enhancing export capacity.

Siddiqui and Ahmed [42] and Shittu et al. [43] find that unfavorable institutions negatively affect economic growth, while Aparicio et al. [44] argue that institutions can enhance the positive effect of opportunity entrepreneurship on growth. Butkiewicz and Yanikkaya [45] find that developing countries with democratic institutions experience superior growth performance. However, they argue that the relationship between growth and democratic institutions depends on the estimation

technique used in the analysis. Raju et al. [46] examine the impact of governance on economic development using data from South Asian countries and find a positive effect of governance. Abdelbary and Benhin [47], studying Arab countries from 1995 to 2014, suggest that governance positively affects human capital and growth. Acemoglu et al. [48], Acemoglu and Robinson [49], and Rodrik [50] also show that strong institutions play a crucial role in ensuring effective macroeconomic policy implementation, leading to economic growth and improving citizens' quality of life.

Various studies have explored the role of institutional quality in attracting FDI inflows, with most highlighting its positive effect. Several researchers such as Ammu et al. [51], Gastanaga et al. [52], and Jung [53] find that institutional quality influences FDI inflows and the successful implementation of FDI-financed projects. Poor institutional quality often increases uncertainty, discouraging foreign investors and negatively affecting FDI inflows. Aspoor institutions raise the cost of doing business, the effectiveness of FDI-led projects is often low in countries with weak institutional frameworks. Foreign investors also face adaptation costs when adjusting their strategies to local institutions. Better institutional quality—such as efficient contract enforcement, property rights protection, low corruption levels, and political stability—reduces adaptation costs and encourages FDI inflows. Bénassy‐Quéré et al. [54] identify three reasons poor institutions discourage investors: They raise costs, lower productivity, and increase vulnerability to uncertainty.

Many studies including Addison and Heshmati [55], Becchetti and Hasan [56], Casella [57],Loree and Guisinger [58], Noorbakhsh et al. [59], and Saidi et al. [60] show that governance and economic freedom have become more significant determinants of FDI inflows. Dunning [61] argues that institutional factors are important determinants of FDI, as multinational companies (MNCs) shift from market- and resource-seeking motives to efficiency-seeking ones. Daude and Stein [62] show that poor institutional quality—such as weak contract enforcement, lack of property rights protection, expropriation risk, high corruption, and political instability—hinders FDI inflows by raising business costs. Bisson [63] and Wernick et al. [64] similarly find that improvements in institutional quality significantly and positively affect FDI.

Though numerous studies have explored the role of institutional quality in growth and FDI inflows, how institutional quality affects FDI-led growth has not been extensively examined. The successful implementation of FDI-financed projects depends on strong institutional quality in host countries. Since better institutions lower business costs and reduce uncertainty, the impact of FDI should be stronger in countries with high institutional quality. If institutional quality is strong, more projects are likely to succeed, allowing FDI to contribute more to growth. Qureshi et al. [9], examining the impact of FDI and corruption on growth in 54 countries from 1996 to 2018, found that control of corruption has an inverse relationship with FDI and growth. Ajide et al. [10] analyze Sub-Saharan African countries from 1996 to 2010 and find that weak governance hampers growth. However, they did not focus on whether institutional quality can induce FDI-led growth. Azam et al. [65] found that institutions play a bigger role in lower-middle income countries.

Many studies have examined the relationship between FDI and growth and between FDI and institutional quality separately. However, whether institutional

quality can induce FDI-led growth remains underexplored. Unlike many studies that treat FDI and institutional quality as isolated factors, ours integrates these elements, examining how institutional quality interacts with FDI to facilitate growth. For instance, the Sabir et al. [16] study highlights institutional quality's effect on attracting FDI, while our study goes further to assess how institutional quality moderates FDI's impact on economic growth. This emphasis on the interaction between FDI and institutional quality addresses not only FDI attraction but also how institutional quality enhances FDI's growth benefits once it is present. Guenichi and Omri [15] used a threshold model focused on the level of institutional quality required to boost FDI effects, rather than identifying specific institutional factors that drive growth through FDI. In contrast, our study pinpoints which institutional improvements are most beneficial, providing actionable insights for policymakers in developing countries.

This study investigates the tripartite relationship in developing countries, asking whether FDI can accelerate growth through institutional quality. It contributes to the literature in several ways. First, it examines FDI's impact on growth in developing countries using six alternative institutional quality indicators as control variables. Second, it assesses the conditional relationship between FDI and institutional quality in achieving growth by interacting FDI with each category of institutional quality variables. Finally, it investigates whether this conditional relationship changes in an all-country scenario.

3. Data and methodology

This study uses Equation (1) to analyze the impact of FDI inflow on economic growth in developing countries. Following Ajide et al. [10], Osei and Kim [5], and DoanVan [66] this study includes gross capital formation, government expenditure, broad money, inflation, and institutional quality as relevant control variables in Equation (1). The study applies the system-GMM method developed by Arellano and Bond [12], Blundell and Bond [13], and Roodman [14] for the analysis to address possible endogeneity issues.

$$GDPPCGR_{it} = a + \beta_1 GDPPCGR_{it-1} + \beta_2 FDI_{it} + \beta_3 LOGGDPPC_{it-n} + \beta_4 GCF_{it} + \beta_5 GOV_{it} + \beta_6 M2_{it} + \beta_7 INF_{it} + \beta_8 IQ_{it} + e_{it} \quad (1)$$

In Equation (1), the real GDP growth per capita ($GDPPCGR_{it}$) is the dependent variable. As per the system-GMM requirement, $GDPPCGR_{it-1}$ is used as an explanatory variable in Equation (1). Foreign Direct Investment (FDI_{it}) inflow as a percentage of GDP is the primary independent variable. This study includes initial value of the log of real GDP per capita($LOGGDPPCt-n$), gross capital formation as a percentage of GDP (GCF), government expenditure as a percentage of GDP (GOV), broad money as a percentage of GDP ($M2$), inflation rate (INF), and institutional quality index (IQ) as other control variables. In Equation (1), the term $i$indicates country, and term t indicates time while e_{it} is the error term[2]. Appendix B shows the complete list of variables and their sources.

The initial value of the log of per capita GDP ($LOGGDPPCt-n$) provides information about the size of an economy and how growth performance might differ

due to these size differences. This log value reflects the initial size of economies and captures the tendency for growth rates to converge across countries. The expected sign of the coefficient is negative, suggesting convergence—indicating that smaller economies tend to grow at a faster rate than larger economies, and vice versa. Gross fixed capital formation is a proxy measure of domestic investment, and high fixed capital formation usually contributes positively to accelerating economic growth. So, this study expects a positive coefficient for this variable. Increased government expenditure raises aggregate demand and increases consumption, leading to increased production and rapid growth. However, if not used efficiently or if corruption exists, government expenditure may hamper economic growth. So, the expected sign might be positive or negative as found by Kutasi and Marton [67], and Osei and Kim [5]. Broad money measures the money supply to an economy. According to the Keynesian view, increasing the money supply should positively affect economic growth. Inflation reduces the purchasing power of the people. When the inflation rate is high, the cost of living increases, which leads to a deceleration in economic growth. So, similar to the findings of Osei and Kim [5], the expected coefficient sign is negative.

Countries with a more robust institutional quality might attract foreign investment, participate in foreign trade and utilize physical and human capital more efficiently, resulting in better growth performance. So, in line with Aparicio et al. [44], this study expects a positive coefficient for the institutional quality variable.

Successful implementation of the FDI's projects often depends on robust institutional quality in the host countries, ultimately contributing to economic growth. This study applies conditional analysis as specified in Equation (2) to assess how institutional quality influences FDI in stimulating economic growth. In Equation (2), this study uses the interaction of FDI with indicators of institutional quality as a separate independent variable. A significant positive coefficient of the interaction term suggests that improvement in institutional quality promotes GDP growth through FDI. The other specifications in Equation (2) are similar to Equation (1).

$$GDPPCGR_{it} = a + \beta_1 GDPPCGR_{it-1} + \beta_2 FDI_{it} + \beta_3 LOGGDPPC_{it-n} + \beta_4 GCF_{it} + \beta_5 GOV_{it} + \beta_6 M2_{it} + \beta_7 INF_{it} + \beta_8 IQ_{it} + \beta_9 FDI * IQ_{it} + e_{it} \quad (2)$$

In system GMM, as designed by Arellano and Bond [12] and Blundell and Bond [13], lagged levels of endogenous variables are used as instruments for their differenced forms, and lagged differences of endogenous variables are used as instruments for their levels. Roodman [14] also highlights that instruments that come from outside the model and are assumed to be exogenous with respect to the endogenous variables. In our analysis, we used internal instruments for our key endogenous variables: The lagged dependent variable (lagged GDP growth per capita), foreign direct investment (FDI), and the interaction term between FDI and institutional quality. These variables are the primary focus of our study, and we hypothesize that they are endogenous within the model. These variables were treated as GMM-style instruments to address potential endogeneity arising from feedback effects. For external instruments, we treated variables such as government

expenditure, inflation, and institutional quality as exogenous, using them as standard instruments in the IV option in xtabond2. We believe these variables are important but determined outside the model, and therefore do not introduce endogeneity. To ensure robustness, we also ran additional tests where some of these variables were treated as GMM-style instruments. Our findings in this study remained consistent in this robustness check, supporting the validity of our instrumental variable choices.

The study also uses the static fixed-effect panel analysis as an additional check. The use of the fixed-effect method allows the assessment of whether the dynamic model's findings alsoapply in a simplified static scenario. In the fixed-effect analysis, the study does not use the lag value of the dependent variable as an independent variable. Moreover, it includes country and time intercepts to adjust for the country and time-specific fixed effects. The other control variables of Equation (1) and (2) also apply to the fixed-effect analysis.

3.1. Measurement of institutional quality

According to Cavallo et al. [68], institutional quality is defined as the sum of bureaucracy, corruption, government stability, investment profile, and law and order. The study uses six indicators of institutional quality from the World Bank's World Governance Indicators (WGI) database developed by Kaufmann et al. [69]. It includes a set of institutional quality variables constructed using a wide variety of cross-country surveys and polls of experts. Kaufmann et al. [69] categorize institutional quality into six broad groups, each representing a different aspect of institutions in a country. These are government effectiveness, regulatory quality, the rule of law, control of corruption, political stability and absence of violence, and voice and accountability.

Government effectiveness indicates the quality of bureaucracy, the competence of civil servants, the quality of public service provision, the credibility of the government's commitments to policies, and the independence of civil servants from political pressures. Regulatory quality assesses unfriendly market policies and the power of excessive government regulation such as price controls and inadequate bank supervision. The rule of law considers issues such as the effectiveness and predictability of the judicial system, the enforceability of contracts, and perceptions of incidence of crime. Control of corruption measures different aspects of corruption, bribes, and illegal activities of bureaucrats in providing licenses and permits. Political stability and absence of violence indicate the government's ability to stay in office and measure the risk of removal of government violently and illegally. Finally, the voice and accountability indicator measures the political process, civil rights, and the ability of citizens to control government actions, such as media independence.

In their study, Kaufmann et al. [70] describe that these indicators are constructed based on several hundred variables obtained from 31 different data sources, capturing governance perceptions reported by survey respondents, non-governmental organizations, commercial businesses, information providers, and public sector organizations worldwide. These data sourcesare combined to create the six aggregate indicators using a statistical methodology known as an unobserved components model. A vital feature of the methodology is that it standardizes the data

from these very diverse sources into comparable units, then construct an aggregate indicator of governance as a weighted average of the underlying source variables, and constructs margins of error that reflect the unavoidable imprecision in measuring governance. It is necessary to consider these margins of error when making comparisons across countries and over time. The World Bank constructs and reports these indicators, ensuring that all the indicators have zero mean and unit standard deviation. These indicators take values between −2.5 and +2.5, and larger values of a dimension indicate a higher level of institutional quality.

3.2. Variables and descriptive statistics

Table 1 shows the descriptive statistics of the variables for developing countries from 1996 to 2020. The number of observations is different for the variables indicating that the dataset is an unbalanced panel database. Except lag of log GDP per capita and indicators of institutional quality, all other variables are in percentage form.

Table 1. Descriptive statistics of the variables for developing countries.

Variables	Observation	Mean	Std. deviation	Minimum	Maximum
GDP growth per capita (GDPPCGR)	3219	2.249	6.579	−62.378	140.367
Foreign Direct Investment (FDI)	3013	4.149	6.856	−37.155	161.824
Lag of log GDP per capita (LOGGDPPC t-n)	118	7.687	0.991	5.234	9.930
Gross capital formation (GCF)	2731	23.679	9.386	−2.424	79.401
Government expenditure (GOV)	2718	15.702	10.277	0.911	147.733
Inflation (INF)	2845	10.927	83.611	−18.109	4145.110
Broad money (M2)	2972	46.001	34.151	2.857	336.959
Control of corruption (CCORRUP)	2252	−0.539	0.594	−1.910	1.850
Govt. effectiveness (GOVT_EFF)	2240	−0.546	0.600	−2.480	1.270
Political stability (POLSTAB)	2230	−0.431	0.877	−3.180	1.420
Regulatory quality (REGULQ)	2239	−0.519	0.642	−2.630	1.240
Rule of law (RULE)	2255	−0.566	0.606	−2.010	1.410
Voice and Accountability (VOICEA)	2253	−0.420	0.787	−2.310	1.460

The analysis uses 25 years of unbalanced annual panel data from 1996 to 2020 of all developing countries. The study uses data from World Development Indicators (WDI) and World Governance Indicators (WGI) of the World Bank. GDP growth per capita is the dependent variable in the study, while annual FDI inflow to a country as a percentage of GDP is the primary independent variable. Appendix B contains the definition of all the variables and their sources.

3.3. Correlation matrix and other statistical tests

Table 2 shows the correlation matrix of the variables. The correlations among the variables seem to be low to moderate. Since the correlation seems moderate, the study assumes that the multicollinearity problem is not a significant issue for the analysis. Due to the lack of space in the correlation matrix, the study only reports the

rule of law as a proxy of institutional quality. The correlation of other variables with other indicators of institutional quality is almost similar to the rule of law.

Table 2. Correlation matrix of the variables.

Variables	GDPPCGR	FDI	LOGGDPPC t-n	GCF	GOV	INF	M2	IQ
GDPPCGR	1.000							
FDI	0.084	1.000						
LOGGDPPC t-n	0.017	0.004	1.000					
GCF	0.235	0.244	0.228	1.000				
GOV	−0.086	0.086	0.120	0.123	1.000			
INF	−0.016	0.013	−0.046	−0.012	−0.070	1.000		
M2	0.062	−0.014	0.333	0.238	0.128	−0.149	1.000	
IQ	0.099	0.028	0.331	0.206	0.248	−0.184	0.372	1.000

This study performs several other statistical tests before doing the empirical analysis. First, the study examines the stationary properties of the variables. Because of the unbalanced panel database with missing values, this research applies Fisher-type panel unit root tests with Phillips-Perron criteria to check the stationarity properties of the variables. The results confirm that almost all the variables are stationary at level. This study also performs static panel regression as an additional check. It conducts the Hausman [71] test to identify the appropriate static model. The test result supports using the fixed-effect method over the random effect method, as the null hypothesis of applicability of the random effect model is rejected at a 1% significance level. The study then tests the requirement of inserting a time dummy and includes both country and time effect in the fixed-effect regression. Moreover, the study conducts the modified Wald test and finds heteroscedasticity in the data. It uses the Huber/White robust standard errors to address the problem of heteroscedasticity. In the system-GMM analysis, the study also ensures that the statistical requirements of the system-GMM method are satisfied.

4. Empirical results and discussion

4.1. Impact of FDI on GDP growth for developing countries

This section analyzes the impact of FDI on economic growth in developing countries using the two-step system-GMM method. **Table 3** demonstrates the results. As shown in the five columns of **Table 3**, this study uses different control variables to examine FDI's impact on economic growth.

Table 3. Impact of FDI on GDP growth for developing countries (two-step system-GMM).

Variables	(1)	(2)	(3)	(4)	(5)
	Dependent Variable: GDP growth per capita				
GDPPCGRt-1	0.129	0.131	0.099	0.094	0.089
	(0.133)	(0.156)	(0.201)	(0.179)	(0.198)
FDI	0.138***	0.140***	0.183**	0.167***	0.175**
	(0.041)	(0.052)	(0.073)	(0.062)	(0.068)
LOGGDPPC t-n	−0.558***	−0.629***	−0.585**	−0.529**	−0.545**
	(0.168)	(0.178)	(0.253)	(0.234)	(0.267)
GCF	0.098***	0.096***	0.083**	0.091***	0.086**
	(0.027)	(0.033)	(0.038)	(0.034)	(0.033)
GOV		−0.028*	−0.084**	−0.111**	−0.115**
		(0.017)	(0.039)	(0.044)	(0.050)
INF		−0.018***	−0.053		−0.044
		(0.003)	(0.046)		(0.048)
RULE			0.988*	1.071*	1.097*
			(0.587)	(0.562)	(0.609)
M2				0.003	0.003
				(0.012)	(0.013)
Constant	3.384	4.551	6.068	5.500	6.062
	(1.399)	(1.390)	(2.430)	(2.236)	(2.581)
Observations	2466	2207	1570	1612	1519
Diagnostic tests					
Number of countries	118	112	89	90	87
Number of instrument	46	48	40	40	41
AR1	0.014	0.029	0.085	0.044	0.062
AR2	0.682	0.788	0.971	0.241	0.316
Hansen J statistics	0.057	0.051	0.094	0.064	0.085

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

In **Table 3**, after controlling for different control variables, the study finds that FDI has a significant and positive impact on GDP growth. In columns one, two, and four, the coefficient is significant at 1% level, while in columns three and five, the coefficient is significant at 5% level. The significant positive coefficients suggest that FDI inflow stimulates economic growth in developing countries. The results support the findings of Barro and Sala-i-Martin [17], and Grossman and Helpman [30] indicating that FDI inflow can stimulate productivity and growth through capital accumulation, knowledge spillover to local firms, and human capital improvements.

Among the other control variables, the initial value of log GDP per capita, gross capital formation, government expenditure, and the rule of law significantly impact GDP growth. The negative coefficient of the lag value of log GDP per capita supports the convergence idea. Gross capital formation has significant positive coefficients in all the model specifications, which suggest that an increase in domestic private investments helps in stimulating economic growth which is alligned

with the findings of Emmanuel and Andrew [72]. Government expenditure has significant negative coefficients in all cases. Kutasi and Marton [67] identify that Government expenditures are not efficiently used in many developing countries due to corruption. This lack of efficiency might explain the negative impact on GDP growth in our study. Lastly, the rule of law, a proxy for institutional quality, has a significant positive effect supporting the idea that improvement in institutional quality help boosts GDP growth in developing countries. Acemoglu et al. [48], Acemoglu and Robinson [49], and Nguyen et al. [73] found similar results in their studies.

At the bottom of **Table 3**, the study reports the diagnostic tests for the system-GMM method. In all the model specifications, the number of countries is greater than the number of instruments. To obtain consistent estimates, this study addresses the validity of the instruments by conducting two specification tests. The Arellano-Bond [12] test examines whether the idiosyncratic error terms are serially correlated. The test is performed for the first-differenced errors with the null hypothesis of no first-order serial correlation and no higher-order serial correlation. If the error term in levels is serially uncorrelated, this implies that the error term in first differences has negative first-order serial correlation but no second-order or higher-order serial correlation. The AR (1) statistic in **Table 3** rejects the null hypothesis of no first-order serial correlation in first differences, but the AR (2) statistic cannot reject the null hypothesis of no second-order serial correlation. So, this serial correlation tests suggests that the models in **Table 3** are appropriately specified. The second test is the Hansen test of over identifying restrictions which examines the orthogonality conditions of the instrumental variables with a null hypothesis that instruments as a group are exogenous. The Hansen J statistics values in **Table 3** show that this null hypothesis cannot be rejected at the 5% level[3]. Thus, these diagnostic test statistics indicate that the models can be applied with some minor over-identification issues.

4.2. Impact of FDI on GDP growth, through different measures of institutional quality

This is one of the important analyses of this study. This study uses six institutional quality indicators from the World Governance Indicators (WGI) of the World Bank, which include government effectiveness, regulatory quality, the rule of law, control of corruption, political stability, and voice and accountability. **Table 4** analyzes the impact of FDI on economic growth in developing countries for different indicators of institutional quality. **Table 4** uses the same control variables as **Table 3**, but in the case of the rule of law indicator, the study uses alternative indicators of institutional quality in each column of **Table 4**. The study again applies the two-step system GMM method for this analysis.

In **Table 4**, the study finds that FDI significantly affects economic growth for all the indicators of institutional quality. From columns 1 to 6, FDI has significant positive coefficients. Though all the institutional quality indicators have positive coefficients, only government effectiveness, regulatory quality, and the rule of law coefficients are significant. These significant positive coefficients indicate that improving these three aspects of institutional quality should help developing

countries achieve economic growth. Nguyen et al. [73] also find a positive impact of institutional quality on economic growth. This study contributes to the existing literature by identifying the three specific dimensions of institutional quality which are crucial for developing countries. Improvement in government effectiveness, the rule of law, and control of corruption should significantly improve economic growth in developing countries.

Among the other control variables, this exercise finds that the initial value of log GDP per capita, gross capital formation, and government expenditure are significant determinants of economic growth. The results are also similar to **Table 3**.

Table 4. Impact of FDI on GDP growth through different measures of institutional quality for developing countries.

	(1)	(2)	(3)	(4)	(5)	(6)
Variables	**Govt. effectiveness**	**Regulatory quality**	**Rule of law**	**Control of corruption**	**Political stability**	**Voice &Account.**
	Dependent Variable: GDP growth per capita					
GDPPCGRt-1	0.084	0.085	0.090	0.082	0.087	0.087
	(0.200)	(0.203)	(0.198)	(0.199)	(0.203)	(0.203)
FDI	0.176**	0.172**	0.175**	0.173**	0.175**	0.174**
	(0.070)	(0.067)	(0.068)	(0.068)	(0.069)	(0.068)
LOGGDPPC t-n	−0.664**	−0.558*	−0.545**	−0.508**	−0.450*	−0.469*
	(0.268)	(0.288)	(0.267)	(0.252)	(0.251)	(0.254)
GCF	0.084**	0.098***	0.086**	0.085**	0.092**	0.094**
	(0.033)	(0.037)	(0.033)	(0.034)	(0.035)	(0.037)
GOV	−0.109**	−0.101**	−0.115**	−0.128**	−0.095**	−0.097**
	(0.046)	(0.045)	(0.050)	(0.051)	(0.044)	(0.044)
M2	−0.001	0.004	0.002	0.003	0.006	0.006
	(0.012)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
INF	−0.043	−0.042	−0.044	−0.044	−0.048	−0.045
	(0.046)	(0.047)	(0.048)	(0.047)	(0.048)	(0.046)
IQ	1.278***	0.619**	1.097*	1.046	0.0306	0.213
	(0.455)	(0.515)	(0.609)	(0.466)	(0.311)	(0.445)
Constant	7.090	5.216	6.062	5.902	4.078	4.278
	(2.492)	(2.446)	(2.581)	(2.338)	(1.953)	(2.073)
Observations	1519	1519	1519	1519	1519	1519
Diagnostic tests						
No. of countries	87	87	87	87	87	87
No. of instruments	41	41	41	41	41	41
AR1	0.066	0.070	0.062	0.066	0.067	0.067
AR2	0.317	0.307	0.316	0.295	0.328	0.325
Hansen J statistics	0.103	0.084	0.085	0.088	0.083	0.080

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.3. Impact of FDI on GDP growth through institutional quality in developing countries

The study analyzes how institutional quality affects economic growth through

FDI by adopting conditional analysis. This is also an important analysis of this study. Balasubramanyam et al. [33], Daude and Stein [62], and Wernick et al. [64] found that institutional quality significantly and positively affects FDI while FDI significantly and positively impacts GDP growth. Hence, this study analyzes the conditional relationship between FDI and every single institutional quality index. This section analyzes the interaction of FDI with six different institutional quality indicators separately using the system-GMM method. The results suggest that three institutional quality indicators, i.e., government effectiveness, regulatory quality, and the rule of law, significantly influence GDP growth through FDI.

Table 5 shows the results of the interaction of FDI with the three institutional quality indicators, which significantly boosts economic growth in developing countries. The results indicate that improvement in government effectiveness, regulatory quality, and the rule of law stimulates economic growth through FDI. Interaction of FDI with government effectiveness and the rule of law are significant at 10% level, while interaction with regulatory quality is significant at 5% level. In all three cases, the coefficients for FDI and its interaction with institutional quality indicators are significant with a positive sign. The positive coefficients of the interaction terms suggest that if institutional quality improves, then FDI is more effective in accelerating GDP growth.

Table 5. Impact of FDI and institutional quality interaction on economic growth in developing countries.

	(1)	**(2)**	**(3)**
Variables	**Govt. effectiveness**	**Regulatory quality**	**Rule of law**
	Dependent Variable: GDP growth per capita		
GDPPCGRt-1	−0.004	0.001	0.025
	(0.176)	(0.165)	(0.143)
FDI	0.408**	0.351**	0.336***
	(0.181)	(0.144)	(0.112)
LOGGDPPC t-n	−1.575	0.206	−0.609
	(1.254)	(0.999)	(0.736)
GCF	0.064	0.075	0.107**
	(0.048)	(0.067)	(0.043)
GOV	−0.198*	−0.119**	−0.144
	(0.106)	(0.060)	(0.109)
M2	−0.018	0.019	0.004
	(0.032)	(0.020)	(0.028)
INF	−0.026	−0.070*	−0.044
	(0.071)	(0.041)	(0.042)
GOVT_EFF	4.449		
	(6.655)		
FDI* GOVT_EFF	0.277*		
	(0.149)		
REGULQ		−4.159	
		(5.230)	

Table 5. (*Continued*).

Variables	(1)	(2)	(3)
	Govt. effectiveness	**Regulatory quality**	**Rule of law**
	Dependent Variable: GDP growth per capita		
FDI* REGULQ		0.256**	
		(0.124)	
RULE			−0.360
			(6.838)
FDI*RULE			0.263*
			(0.152)
Constant	17.94	−2.389	5.647
	(15.71)	(9.492)	(12.39)
Observations	1519	1519	1519
Diagnostic tests			
Number of countries	87	87	87
No. of instruments	72	72	72
AR1	0.078	0.058	0.035
AR2	0.146	0.161	0.116
Hansen J statistics	0.363	0.160	0.274

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 5 also demonstrates the net effect of FDI on growth using interaction terms. For government effectiveness, the net effect (0.408 + 0.277 ×govt_eff.) suggests that for higher values of government effectiveness, GDP growth through FDI is higher. The net effect of FDI for regulatory quality (0.351 + 0.256 × regulq) and the rule of law (0.336 + 0.263 × rule) also indicate that improving institutional quality significantly increases GDP growth.

The study also examines the interaction of FDI with the other three institutional quality indicators. Appendix C shows that the interaction of FDI with control of corruption, political stability, and voice and accountability does not significantly affect GDP growth in developing countries.

The study finds that FDI accelerates economic growth in developing countries, mainly through improvements in government effectiveness, regulatory quality, and the rule of law. So, the research contributes by identifying the specific institutional qualities which need to be improved to enable FDI-induced economic growth in developing countries.

4.4. Comparing the effect of institutional quality on FDI-led GDP growth in different countries

This section compares the impact of institutional quality in influencing GDP growth through FDI in developing countries and all countries. **Table 6** shows the conditional relationship between FDI and institutional quality and its impact on GDP growth in these two groups of countries.

Table 6. The impact of institutional quality on FDI-led GDP growth in different countries using system-GMM method.

Variables	(1)	(2)
	Developing countries	**All countries**
	Dependent Variable: GDP growth per capita	
GDPPCGRt-1	0.025	0.062
	(0.143)	(0.136)
FDI	0.336***	0.152**
	(0.112)	(0.061)
LOGGDPPC t-n	−0.609	−3.030**
	(0.736)	(1.462)
GCF	0.107**	0.095**
	(0.043)	(0.047)
GOV	−0.144	−0.250**
	(0.109)	(0.121)
M2	0.004	−0.032
	(0.028)	(0.020)
INF	−0.044	−0.016
	(0.040)	(0.041)
RULE	−0.360	7.019*
	(6.838)	(3.727)
FDI*RULE	0.263*	0.021
	(0.152)	(0.047)
Constant	5.647	31.08**
	(12.39)	(14.57)
Observations	1519	2117
Diagnostic tests		
Number of countries	87	120
No. of instruments	72	72
AR1	0.035	0.022
AR2	0.116	0.051
Hansen J statistics	0.274	0.119

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Column 1 in **Table 6** demonstrates the conditional relationship in developing countries, while column 2 shows the effect for all countries. For both cases, this research uses the rule of law to measure institutional quality and its interaction with FDI as another explanatory variable. Similar to **Table 5**, column 1 of **Table 6** also shows that the interaction coefficient is positively significant with FDI, suggesting that improving the rule of law should help FDI stimulate economic growth in developing countries. However, column 2 of **Table 6** shows that the interaction coefficient between FDI and institutional quality is insignificant for all-country scenarios. This comparison suggests that the role of institutional quality is more significant in developing countries. The finding holds for the alternative measures of

institutional quality. The results between these two groups of countries might differ due to the inclusion of high-income countries in the sample. The all-country scenario includes the high-income countries which already have better institutional quality than developing countries, and further improvement of institutional quality may not contribute to achieving FDI-led GDP growth. That may be why the conditional relationship is insignificant in all-country scenarios. Since developing countries have scope to improve their institutional quality, FDI seems to be more effective in enhancing GDP growth with improvement in institutional quality. The study also finds that institutional quality and FDI inflow/FDI stock is positively correlated suggesting that institutional quality can boost growth by accumulating more foreign resources to work with.

4.5. Additional checks

In our analysis, we used the lagged dependent variable (lagged GDP growth per capita), foreign direct investment (FDI), and the interaction term between FDI and institutional quality as our internal instruments, while treating government expenditure, initial log GDP per capita, inflation, gross capital formation, and institutional quality as exogenous instruments. To ensure robustness, we also ran additional tests where some of these exogenous variables were treated as GMM-style instruments. Our findings remained consistent in this robustness check, supporting the validity of our instrumental variable choices.

This section also analyzes the impact of FDI on economic growth in developing countries using the static fixed-effect method. In most cases, the results are similar to the findings of the system-GMM method.

Appendix D investigates the impact of FDI on GDP growth using the fixed-effect method[4]. We find a significant and positive FDI coefficient, but the coefficient becomes insignificant after incorporating all control variables. This result slightly differs from the system-GMM result, where FDI has a significant coefficient even after adjusting for all control variables. Since the GMM method addresses serial correlation and endogeneity problems, this study prefers the system-GMM result.

Appendix E demonstrates the role of FDI on GDP growth using six different measures of institutional quality and applying fixed effects method. The results indicate a significant positive coefficient for all institutional quality indicators. In the system-GMM analysis in **Table 4**, this study finds that only three institutional quality indicators, i.e., government effectiveness, regulatory quality, and the rule of law, have a significant positive impact on GDP growth.

Despite minor differences, both the system-GMM method and the fixed-effect method identify that improving government effectiveness, regulatory quality, and the rule of law helps stimulate economic growth through FDI in developing countries. In **Table 5**, using the system-GMM method, the study finds that the interaction of FDI with government effectiveness, regulatory quality, and the rule of law significantly increase FDI-led economic growth. Appendix F performs a similar analysis using the fixed-effect method and finds the three variables significant. Appendix C and Appendix G examine interactions of FDI with the other three institutional quality indicators using the system-GMM method and fixed-effect method, respectively. In

the system-GMM method, the other three institutional quality indicators have an insignificant impact in developing countries. However, the fixed-effect method finds that the control of corruption and voice and accountability variables are also significant.

Appendix H demonstrates the results of institutional quality on FDI-led GDP growth in different countries using the fixed-effect method. The results suggest that the interaction of FDI with the institutional quality variable significantly affects GDP growth in developing countries but not in all-countries case. The study finds similar results using the system-GMM method in **Table 6**.

The system-GMM results mostly hold in the fixed-effect exercise as well. The study finds that institutional quality has a significant role in accelerating GDP growth through FDI in developing countries.

5. Conclusion

This study investigates the impact of FDI inflow on accelerating economic growth in developing countries under the system-GMM and fixed-effect methods. Using six different indicators of institutional quality developed by Kaufmann et al. [69], it also examines the role of institutional quality in influencing FDI-led growth. This study uses annual panel data from 1996–2020 for 135 developing countries. The results using the GMM method indicate that FDI positively and significantly affects economic growth in developing countries. However, under the fixed-effect method, this study finds insignificant impact of FDI on economic growth in developing countries. Since the GMM method addresses serial correlation and endogeneity problems, this study prefers the system-GMM result. The study also finds that improvement in three specific institutional quality indicators, i.e., government effectiveness, regulatory quality, and the rule of law, enhances the effect of FDI on economic growth in developing countries.

In addition, this study finds that the role of institutional quality is more significant for developing countries and does not have a significant impact on economic growth in the all-country case. The results between these two groups of countries might differ due to the inclusion of high-income countries in the sample. The all-country scenario includes the high-income countries which already have better institutional quality than developing countries, and further improvement of institutional quality may not contribute to achieving FDI-led GDP growth. This may be why the conditional relationship is insignificant in all-country scenarios. Since developing countries have scope to improve their institutional quality, FDI seems to be more effective in enhancing GDP growth with improvement in institutional quality.

The study's findings are primarily in line with previous literature such as Guenichi and Omri [15], and Sabir et al. [16], that emphasizes the positive role of FDI and institutional quality in stimulating economic growth. This study mainly contributes to the existing literature by identifying the positive impact of institutional quality in supporting FDI-led growth in developing countries. It also identifies the specific three areas of institutional quality (government effectiveness, regulatory

quality, and the rule of law) that are more important for developing countries in promoting economic growth through FDI.

The study has some important policy implications. As the study finds a positive role of FDI in increasing GDP growth in developing countries, developing countries should formulate effective strategies to attract more FDI inflow to their country. Since studies find that FDI stimulates economic growth through technological improvement, innovation, and human capital development, developing countries must ensure that FDI-led projects bring these improvements to the host countries. This study finds that FDI is more effective in affecting economic growth when host countries have better institutional quality. Since better institutions reduce the cost of doing business and uncertainty, improvements in institutional quality are likely to benefit developing countries in achieving higher economic growth through FDI.

The study finds that improvement in government effectiveness, regulatory quality, and the rule of law has the most significant positive impact on economic growth through FDI. So, the study also prescribes that policymakers of developing countries aim to focus on these three specific institutional quality indicators. By ensuring better government effectiveness, regulatory quality, and the rule of law, developing countries can better utilize FDI and achieve higher economic growth.

This study has certain data limitations and offers scope for future research. The sample period includes years affected by economic crises, which may have influenced FDI inflows and growth outcomes, potentially impacting the generalizability of our findings. However, we did not analyze these structural breaks and instead focused on examining the long-run relationship. Additionally, we suggest that future research could explore more granular institutional indicators and examine the effects of FDI on economic growth across different regions and economic conditions within developing countries.

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Notes

1 The World Bank's income categories are used to classify countries into four groups: High-income, upper-middle-income, lower-middle-income, and low-income countries. Upper-middle-income, lower-middle-income, and low-income countries are labeled as developing countries. The list of countries organized by income groups is presented in Appendix A.

2 The system GMM estimations in this study include year dummies to control for time fixed effects. In Equation (1), α also captures this time dummy.

3 At a 10% significance level, the Hansen statistics show some over-identification problems.

4 We also conducted the exercise using a random effects model and found similar results to the fixed effects model. We do not report the random effects results in this manuscript. Since the system GMM method better addresses endogeneity issues and is superior to both the fixed-effects and random-effects methods, we primarily base our inferences on the system GMM model.

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Appendix A

I. List of countries included in the sample

ii. Low income countries

Afghanistan, Burkina Faso, Burundi, Central African Republic, Chad, Congo Democratic Republic, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Liberia, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Somalia, South Sudan, Sudan, Syrian Arab Republic, Tajikistan, Togo, Uganda, Yemen, Rep.

iii. Lower middle-income countries

Algeria, Angola, Bangladesh, Benin, Bhutan, Bolivia, Cabo Verde, Cambodia, Cameroon, Comoros, Congo, Cote d'Ivoire, Djibouti, Egypt, El Salvador, Eswatini, Ghana, Honduras, India, Kenya, Kiribati, Kyrgyz Republic, Lao PDR, Lesotho, Mauritania, Micronesia, Moldova, Mongolia, Morocco, Myanmar, Nepal, Nicaragua, Nigeria, Pakistan, Papua New Guinea, Philippines, Sao Tome, Senegal, Solomon Islands, Sri Lanka, Tanzania, Timor-Leste, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Zambia, Zimbabwe.

iv. Upper middle-income countries

Albania, American Samoa, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Grenada, Guatemala, Guyana, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kosovo, Lebanon, Libya, Malaysia, Maldives, Marshall Islands, Mexico, Montenegro, Namibia, North Macedonia, Paraguay, Peru, Russian Federation, Samoa, Serbia, South Africa, St. Lucia, St. Vincent and the Grenadines, Suriname, Thailand, Tonga, Turkey, Turkmenistan, Tuvalu, Venezuela.

Appendix B

Table B1. Variables and data sources.

Variables	Measurement	Source
GDP per capita (GDPPC)	GDP per capita is gross domestic product divided by midyear population. Data are in constant 2010 U.S. dollars.	World development indicators (WDI), WB
GDP growth per capita (GDPPCGR)	Annual percentage growth rate of GDP per capita based on constant 2010 U.S. dollars.	
Foreign Direct Investment (FDI)	Foreign direct investment includes the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital. FDI inflow represents net inflows (new investment inflows less disinvestment) in the reporting economy from foreign investors. FDI net inflow is shown as a percentage of GDP.	
Initial Log GDP per Capita ($LOGGDPPCt - n$)	Log of GDP per Capita for countries for the initial year (1996). This variable is used to test conditional convergence and provides information about the size of an economy and how growth performance might differ due to these initial size differences.	
Gross capital formation (GCF)	Gross capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. It is shown as a percentage of GDP.	
Government expenditure (GOV)	Government expenditure includes all government current expenditures for purchases of goods and services. It is shown as a percentage of GDP.	
Broad money (M2)	Broad money is the sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper. It is shown as a percentage of GDP.	
Inflation rate (INF)	Inflation is measured by the consumer price index. It reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services.	
Government effectiveness (GOVT_EFF)	Perceptions of the quality of public services, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Country's score ranging from approximately −2.5 to 2.5.	World Bank, Worldwide governance indicators (WGI)
Regulatory quality (REGULQ)	It captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Country's score ranging from approximately −2.5 to 2.5.	
Rule of law (RULE)	Perceptions of the extent to which agents have confidence in and abide by the rules of society. Country's score ranging from approximately −2.5 to 2.5.	
Control and corruption (CCORRUP)	Perceptions of the extent to which public power is exercised for private gain. Country's score ranging from approximately −2.5 to 2.5.	
Political stability and absence of violence (POLSTAB)	Perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Country's score ranging from approximately −2.5 to 2.5.	
Voice and accountability (VOICEA)	Perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, and a free media. Country's score ranging from approximately −2.5 to 2.5.	

Appendix C

Table C1. Impact of FDI and institutional quality interaction on economic growth in developing countries using alternative indicators for institutional quality.

Variables	(1)	(2)	(3)
	Control of corruption (CCORRUP)	**Political stability (POLSTAB)**	**Voice and accountability (VOICEA)**
	Dependent Variable: GDP growth per capita (GDPPCGR)		
GDPPCGRt-1	0.049	0.006	0.092
	(0.131)	(0.179)	(0.174)
FDI	0.260**	0.109**	0.170***
	(0.107)	(0.050)	(0.064)
LOGGDPPC t-n	−1.104	−0.634	−0.488
	(0.686)	(0.649)	(0.544)
GCF	0.067	0.089**	0.084*
	(0.065)	(0.037)	(0.045)
GOV	−0.396*	−0.158*	−0.159**
	(0.210)	(0.080)	(0.069)
M2	−0.020	0.004	0.004
	(0.031)	(0.014)	(0.016)
INF	−0.018	−0.027	−0.030
	(0.059)	(0.034)	(0.042)
CCORRUP	8.795		
	(6.492)		
FDI*CCORRUP	0.199		
	(0.148)		
POLSTAB		1.148	
		(2.052)	
FDI*POLSTAB		−0.013	
		(0.096)	
VOICEA			2.507
			(3.860)
FDI*VOICEA			−0.004
			(0.091)
Constant	20.300*	7.464	6.620
	(11.640)	(6.964)	(5.685)
Observations	1519	1519	1519
Diagnostic tests			
Number of countries	87	87	87
No. of instruments	72	72	72
AR1	0.023	0.082	0.041
AR2	0.058	0.137	0.274
Hansen J statistics	0.166	0.239	0.429

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix D

Table D1. Impact of FDI on GDP growth for developing countries using the fixed-effect method.

Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	Dependent Variable: GDP growth per capita					
FDI	0.170**	0.033*	0.037*	0.031	0.021	0.028
	(0.076)	(0.018)	(0.020)	(0.021)	(0.019)	(0.021)
LOGGDPPC t-n		−3.880***	−4.154***	−5.735***	−6.150***	−6.479***
		(0.618)	(0.698)	(1.090)	(1.284)	(1.364)
GCF		0.135***	0.114***	0.107***	0.123***	0.115***
		(0.026)	(0.028)	(0.035)	(0.035)	(0.034)
GOV			−0.073	−0.161	−0.162	−0.210
			(0.075)	(0.139)	(0.111)	(0.140)
INF			−0.021***	−0.059**		−0.043
			(0.003)	(0.029)		(0.028)
RULE				1.148	1.107	1.228
				(0.969)	(0.913)	(1.015)
M2					0.023	0.028
					(0.018)	(0.020)
Constant	1.821***	28.660***	32.560***	47.260***	48.710***	52.230***
	(0.311)	(4.694)	(5.279)	(8.310)	(9.221)	(10.01)
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2987	2468	2208	1571	1613	1520
R-squared	0.029	0.065	0.084	0.090	0.094	0.101
Number of countries	132	118	112	89	90	87

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix E

Table E1. Impact of FDI on GDP growth in developing countries using alternative indicators of institutional quality.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Govt. effectiveness	**Regulatory quality**	**Rule of law**	**Control of corruption**	**Political stability**	**Voice and accountability**
	Dependent Variable: GDP growth per capita					
FDI	0.018	0.013	0.012	0.015	0.015	0.015
	(0.019)	(0.018)	(0.019)	(0.019)	(0.020)	(0.019)
LOGGDPPC t-n	−8.571***	−8.883***	−9.019***	−8.899***	−8.748***	−8.410***
	(1.692)	(1.775)	(1.818)	(1.675)	(1.666)	(1.574)
GCF	0.096***	0.098***	0.099***	0.095***	0.092***	0.093***
	(0.034)	(0.033)	(0.033)	(0.032)	(0.033)	(0.032)
GOV	−0.169	−0.177	−0.168	−0.173	−0.170	−0.171
	(0.140)	(0.141)	(0.137)	(0.137)	(0.137)	(0.135)
INF	−0.036	−0.033	−0.036	−0.036	−0.031	−0.035
	(0.027)	(0.027)	(0.027)	(0.027)	(0.027)	(0.026)
M2	−0.001	0.004	0.004	0.007	−0.001	0.004
	(0.020)	(0.021)	(0.021)	(0.021)	(0.019)	(0.020)
IQ	1.115*	1.423**	2.242**	2.165***	1.218**	2.617***
	(0.646)	(0.703)	(1.034)	(0.729)	(0.487)	(0.861)
Constant	65.530***	67.710***	69.310***	68.520***	66.840***	64.760***
	(12.010)	(12.770)	(13.250)	(11.990)	(11.820)	(11.160)
Time Dummy	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1520	1520	1520	1520	1520	1520
R-squared	0.183	0.185	0.190	0.190	0.192	0.197
Number of countries	87	87	87	87	87	87

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0$.

Appendix F

Table F1. Impact of FDI and institutional quality interaction on economic growth in developing countries using the fixed-effect method.

Variables	(1)	(2)	(3)
	Govt. effectiveness (GOVT_EFF)	**Regulatory quality (REGULQ)**	**Rule of law (RULE)**
	Dependent Variable: GDP growth per capita		
FDI	0.116**	0.142**	0.162
	(0.045)	(0.063)	(0.098)
LOGGDPPC t-n	−8.585***	−8.870***	−8.956***
	(1.691)	(1.733)	(1.780)
GCF	0.089**	0.083**	0.096***
	(0.037)	(0.038)	(0.035)
GOV	−0.175	−0.188	−0.178
	(0.142)	(0.142)	(0.138)
INF	−0.037	−0.035	−0.034
	(0.027)	(0.028)	(0.028)
M2	−0.002	0.001	−0.001
	(0.020)	(0.020)	(0.021)
GOVT_EFF	0.753		
	(0.664)		
FDI*GOVT_EFF	0.106**		
	(0.044)		
REGULQ		0.658	
		(0.673)	
FDI* REGULQ		0.169***	
		(0.061)	
RULE			1.439
			(0.986)
FDI*RULE			0.188*
			(0.111)
Constant	65.630***	67.730***	68.640***
	(12.060)	(12.580)	(13.030)
Time Dummy	Yes	Yes	Yes
Observations	1520	1520	1520
R-squared	0.187	0.198	0.200
Number of countries	87	87	87

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix G

Table G1. Impact of interaction of FDI with other three institutional quality indicators on GDP growth in developing countries using the fixed-effect method.

Variables	(1)	(2)	(3)
	Control of corruption (CCORRUP)	**Political stability (POLSTAB)**	**Voice and accountability (VOICEA)**
	Dependent Variable: GDP growth per capita		
FDI	0.153**	0.054	0.081***
	(0.068)	(0.034)	(0.026)
LOGGDPPC t-n	−9.099***	−8.780***	−8.576***
	(1.741)	(1.671)	(1.593)
GCF	0.103***	0.095***	0.102***
	(0.034)	(0.033)	(0.034)
GOV	−0.184	−0.176	−0.189
	(0.139)	(0.134)	(0.137)
INF	−0.034	−0.031	−0.032
	(0.028)	(0.028)	(0.027)
M2	0.002	−0.004	0.004
	(0.021)	(0.020)	(0.021)
CCORRUP	1.274*		
	(0.691)		
FDI*CCORRUP	0.197*		
	(0.111)		
POLSTAB		0.819	
		(0.514)	
FDI*POLSTAB		0.102	
		(0.082)	
VOICEA			1.964**
			(0.773)
FDI*VOICEA			0.158*
			(0.0813)
Constant	69.550***	67.020***	65.750***
	(12.490)	(11.950)	(11.370)
Time Dummy	Yes	Yes	Yes
Observations	1520	1520	1520
R-squared	0.200	0.201	0.211
Number of countries	87	87	87

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix H

Table H1. The impact of institutional quality on FDI-led GDP growth in different countries using the fixed-effect method.

Variables	(1)	(2)
	Developing countries	**All countries**
	Dependent Variable: GDP growth per capita	
FDI	0.162	0.042*
	(0.098)	(0.021)
LOGGDPPC t-n	−8.956***	−7.938***
	(1.780)	(1.482)
GCF	0.096***	0.085***
	(0.035)	(0.028)
GOV	−0.178	−0.158
	(0.138)	(0.117)
INF	−0.034	−0.045*
	(0.028)	(0.027)
M2	−0.001	−0.017
	(0.021)	(0.011)
RULE	1.439	1.715**
	(0.986)	(0.812)
FDI*RULE	0.188*	0.0355
	(0.111)	(0.023)
Constant	68.640***	66.880***
	(13.030)	(12.020)
Time Dummy	Yes	Yes
Observations	1520	2119
R-squared	0.200	0.199
Number of countries	87	120

Standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.