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# The Impact of FDI on Economic Growth in Emerging and Developing Economies: The Role of Institutional Quality and Technology Diffusion

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ABSTRACT

Foreign direct investment (FDI) has long been considered as a key determinant of economic growth, particularly within emerging and developing economies. This study provides an empirical investigation into how institutional quality and technology diffusion influence the relationship between FDI and economic growth in 136 emerging and developing economies from 2000 to 2023. The central hypothesizes are that sound governance and technology diffusion, by lowering business costs and reducing uncertainty, can attract more FDI and ultimately foster economic growth. Implementing a robust panel dynamic estimation technique (GMM-system), the study uses the six indicators of institutional quality from the Worldwide Governance Indicators (WGI) and an additional overall composite index of governance. The findings confirm a positive and significant net effect of FDI on economic growth. In particular, the study identified that enhancements in rule of law and internet diffusion—as a proxy for the diffusion of technology—significantly strengthen FDI's positive impact on economic growth in emerging and developing economies. The priority policy recommendations are for policymakers in these countries to implement policies that improve the overall governance climate—particularly the rule of law—and foster technology diffusion to enhance the growth benefits derived from FDI inflows.

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# 1. Introduction

Foreign direct investment (FDI) can significantly foster the development of countries, their industrialization, the absorbency capacity of technology, and the integration of economies into global value chains [1-3].

This study aims to empirically investigate the role of institutional quality and technology diffusion in promoting economic growth through FDI, particularly in developing countries. A key objective is to identify which specific traits of countries' governance climate are most critical for accelerating the FDI-led growth. The significance of this nexus is underscored by the growing share of FDI in global capital flows.

According to [4], developing and emerging economies accounted for 70% of global FDI inflows. However, their distribution is highly uneven between developed and developing economies, and especially within the latter. This variation is largely attributable to significant differences in countries' governance climate and technology diffusion, which both contribute to shaping investor confidence and the FDI effectiveness [5,6]. By enhancing institutional quality—which can be effectively measured by the governance climate index [7]—is paramount for maximizing FDI's contribution to economic growth over time.

For instance, numerous scholars have investigated the FDI-growth nexus [e.g., 8-13], contend that, among growth determinants, FDI stimulates economic performance by introducing foreign capital, new technologies, managerial expertise, and knowledge spillovers—assets often scarce in developing countries.

In response, policymakers should implement measures like lowering entry barriers and offering tax incentives to attract more investments [14]. Nevertheless, empirical evidence indicates that the benefits of FDI are not uniform but are instead contingent on host-country conditions, including institutional quality [15-18].

This study focuses specifically on institutional quality and technology diffusion as a moderating factor in FDI-growth nexus. According to [19-21] sound institutions should be a prerequisite for growth. In developing countries, where traditional growth factors can be hampered by unsound institutions that increase transaction costs and uncertainty, the governance climate becomes especially critical.

Recently [22], have investigated the conditional role of governance in the FDI-growth nexus across different developing and emerging economies. By using GMM-system and static panel methods, these authors confirm that FDI positively impacts growth. They further establish that the moderating role of institutions is uniquely significant for developing countries. Furthermore [23], have also found that both technology diffusion and FDI independently boost economic complexity, used as a proxy for development.

Their GMM estimates also confirm the vital roles of institutional quality. Public investments in networking and digitalization can lead economic growth. Digital links can increase productivity and reduce transactional or communication costs across individuals and firms in different countries.

FDI inflows act as a potent channel that amplifies the positive impact of technology. In this study the internet diffusion was used as a proxy variable for technology diffusion within a society. The digital economy has become a main driving force of global economic growth, industrial transformation, and technological revolution.

However, its development across countries remains uneven [4,24]. Business facilitation and digital government solutions can promote FDI inflows and contribute to creating a more transparent and efficient institutional and business environment. For instance, online services and information portals, contributing to the digitalization of public offices, can significantly reduce bureaucratic costs in emerging and developing economies, too.

This study highlighted that governance—particularly the rule of law—and technology diffusion can significantly enhance FDI's impact on economic growth, finally offering policymakers actionable insights.

Therefore, the research hypothesizes are that higher institutional quality and technology diffusion can facilitate FDI-led growth, as the success of foreign investors depends on a sounder institutional and business environment and a lower technological gap in the host country. To test these hypothesis, the study employed a conditional analysis, examining how institutional quality and technology diffusion can affect the FDI-growth nexus, identifying the most impactful institutional indicators.

Methodologically, this empirical investigation applied the two-step Generalized Method of Moments system (GMM-system) in panel dynamic estimation technique [25-27] to annual data from 136 emerging and developing economies [28], over the period 2000–2023, aggregated and clustered according to the International Monetary Fund's (IMF) geographical classification—for which data with sufficient completeness are available—and representing 88% of the sample universe. The full list of countries is provided in Appendix A at the Table A.1.

Institutional quality was measured through three governance dimensions and using the six indicators[1] from the Worldwide Governance Indicators (WGI). Additionally, an overall composite governance indicator by [7] was implemented.

The analysis involves interacting each of these indicators with FDI to determine which ones significantly influence economic growth through FDI. The use of the internet as a proxy for technology diffusion has also been used as a further interaction term with FDI [30-32].

The results confirm that FDI has a positive and significant effect on growth in emerging and developing economies. In particular, the conditional analysis revealed that the interaction of FDI with the rule of law and the internet diffusion—as a proxy for the diffusion technology—shown a significant positive net impact on FDI-led economic growth. Therefore, finding suggests that policymakers in emerging and developing economies should prioritize improving governance climate and technology diffusion.

Finally, the study contributes to the existing body of literature on emerging and developing economies in several ways. First, the study uniquely examines how specific aspects of institutional quality moderate the impact of FDI on growth. Second, it highlights the most significant institutional traits for FDI-led growth from the six WGI indicators. Third, the use of the GMM-system addresses potential endogeneity, bolstering the robustness of the findings. Finally, the study explores the mechanisms through which institutional quality and technology diffusion influences FDI-led growth.

The remainder of the work is structured as follows: Section 2 reviews the existing body of literature; Section 3 details the data, methodology, and estimation technique; Section 4 presents and discusses the empirical results; and Section 5 repots concluding remarks and contribution, policy implications, limitations and suggestions.

## 2. Literature Review

### 2.1. The Role of Institutional Quality

Researchers have extensively analyzed the relationship between Foreign Direct Investment (FDI) and economic growth, yielding diverse perspectives. For instance, while some studies, such as [16,33-35] find a significant positive impact of FDI on growth, others like [36,37] find no such independent relation.

[1] According to [29: 4]: (a) political governance includes (i) voice and accountability (VA), and (ii) political stability/absence of violence (PS); (b) economic governance includes (iii) government effectiveness (GE), and (iv) regulatory quality (RQ); (c) institutional governance includes (v) rule of law (RL), and (iv) control of corruption (CC).

This section reviews the literature on FDI and growth, the link between institutional quality and growth, and finally, the role of institutional quality in influencing FDI-led economic growth. Studies identify several channels through which FDI can affect economic growth. Authors such as [38-41] argue that FDI primarily stimulates growth through technology transfer and human capital development. The introduction of new technology promotes innovation, replaces outdated production mechanisms, and enhances productivity.

Furthermore, training provided by foreign experts improves the skills of local workers, increasing labor productivity [42]. also find that FDI drives growth through increased capital accumulation, allowing countries with low domestic savings to boost investment. This view is supported by endogenous growth theory.

For [43], innovation drives growth and FDI plays a significant role in accelerating development. Scholars like [44-47] emphasize technological improvement and innovation as the primary drivers of sustained growth. Whitin the endogenous growth framework [33,48] show that FDI benefits local firms through positive technology spillovers, which boost productivity and growth [49]. Find that FDI is more impactful in export-promoting countries.

However, the empirical evidence is not unanimous. Contrarian studies show that FDI's influence is not always strong. For [36], FDI does not exert a significant or independent effect on growth. Even for [37], FDI inflows do not necessarily have a positive impact. This result suggests that the benefits of FDI are contingent on other factors. In fact [50], suggests the effects depend on the host country's absorptive capacity, and [51] argue that when a developing country faces a technology gap with developed countries, the role of the government should be to intervene.

For instance [52], indicate that the impact of FDI is more significant when more resources are invested in education to reduce the technological gap. This is echoed by [34,53-55] who find that FDI boosts production only when the host country has sufficient capacity to absorb the new technology. Studies like [56-58] also show that FDI can strengthen linkages with local firms and enhance export capacity.

The empirical literature firmly establishes the importance of institutions for growth [59,60]. Developing countries with democratic institutions can experience superior growth [61], though the relationship depends on the estimation technique. Institutional quality can enhance the positive effect of entrepreneurship [62], but unsounded institutions negatively affect economic growth [63,64]. For instance [65,66], have found a positive effect of governance on development in South Asian and Arab countries, respectively.

Some authors, among them [67-69], showed that sound institutions are crucial for effective policy implementation and growth. Indeed, a well-structured body of literature has explored the role of institutional quality in relation to the FDI-growth nexus. Particularly, studies have highlighted that the rule of law—in the form of property rights protection and labor market regulation—is pivotal in explaining growth [70], as well as cultural traits [71]. In other words, sound governance can provide an effective set of incentives contributing to economic growth and contrasting the structural inertia within socioeconomic systems [72]. On the contrary, a risky and unsound institutional and business environment can constrain outcomes [73].

For instance, recent researchers, such as [74,75], have found that institutional quality influences both FDI inflows and the success of FDI-financed projects. Poor institutional quality increases uncertainty and business costs, discouraging investors, while better institutions—evidenced by efficient contract enforcement, property rights protection, low corruption, and political stability—reduce adaptation costs and encourage FDI.

Various studies confirm that governance and economic freedom are significant determinants in attracting FDI [76-79]. For [80], institutional factors are key determinants as multinationals shift to efficiency-seeking motives, and [81] showed that poor institutions hinder FDI by raising business costs, a finding supported by [82,83].

Although numerous studies have explored the role of institutional quality in growth and in attracting FDI separately, the question of how institutional quality directly affects FDI-led growth has been less examined. The successful implementation of FDI-financed projects depends on strong host-country institutions, which lower business costs and reduce uncertainty. Therefore, the impact of FDI should be stronger where institutional quality is high. For instance [17,19-21], found links between governance, FDI, and growth, they did not focus specifically on whether institutional quality induces FDI-led growth. In particular [84], find that institutions play a critical role in lower-middle income countries. More recently [85], focusing on emerging and developing economies in South and Southeast Asia highlights the key role of absorptive capacity and institutional quality in the FDI-growth nexus.

## 2.2. The Role of Technology Diffusion

While a wide body of literature has established connections between technology diffusion and growth, rooted in the seminal work by [86] on absorptive capacity, the specific role of technology diffusion as a moderating force in the relationship between FDI and economic growth remains an under-explored topic in emerging and developing countries.

A growing body of evidence suggests that technology diffusion acts as a significant catalyst. Studies by [87-89] show that the diffusion of internet and mobile phone penetration positively impacts economic growth through FDI. This is supported by findings of a positive relationship between various forms of technology diffusion—including internet, broadband, and telephone services—and economic growth [90,91], but caution is advised since [92], for instance, note that excessive technology diffusion may paradoxically limit growth, especially in emerging and developing economies. However, the transformative potential of FDI, facilitated by technology diffusion, is evident in the economic trajectories of countries like China, India, South Korea, and Malaysia, where it has significantly contributed to industrial diversification and enhanced production capabilities [93-95].

Crucially, empirical research indicates that technology diffusion itself induces FDI inflows through several key mechanisms [96,97]. Technology diffusion can expand educational opportunities, particularly in receptive fields, through online platforms, digital libraries, and virtual laboratories [98,99].

This result is corroborated by [100], which found that e-learning platforms and digital educational resources have significantly expanded access to quality education, particularly in remote and underserved areas. This creates a larger pool of skilled labor, a key factor for foreign investors. The proliferation of Massive Open Online Courses (MOOCs), for instance, has democratized access to world-class education, directly improving labor quality and attracting FDI [101,102].

Furthermore, technology diffusion can facilitate efficient on-the-job training, raising the overall human capital threshold and creating an adaptable workforce capable of managing advanced technologies [103-105].

Technological skills development promotes a dynamic ecosystem of innovation and start-ups, which attracts foreign investors seeking new ideas and partnerships [106]. Technology diffusion is a fundamental enabler for advanced manufacturing technologies such as robotics, 3D printing, and the “Internet of Things” [107-109]. The adoption of these Industry 4.0 technologies in emerging and developing economies like Malaysia, Vietnam, and India has attracted substantial FDI into high-tech manufacturing [110,111]. By enabling smart factories and automated systems that rely on data analytics and machine learning, technology diffusion significantly boosts production efficiency and quality, making host countries prime targets for high-value FDI [106,112].

Concluding, technology is not merely a driver of growth, but represents a critical moderating infrastructure that enhances a country's ability to attract and productively utilize FDI, therefore accelerating economic development.

### 2.3. Research Gap

The study also addresses these gaps in economic literature. Unlike many studies that treat FDI and institutional quality in isolation, it integrates these elements to examine how institutional quality and technology diffusion interact with FDI to facilitate growth.

This study investigates the tripartite relationship in developing countries, asking whether FDI and technology diffusion can accelerate controlling for the institutional quality. It contributes to the literature by, first, examining FDI's impact using six alternative institutional quality indicators as control variables. Second, it assesses the conditional relationship between FDI and institutional quality by interacting FDI with each institutional variable. Finally, it investigates whether technology diffusion conditional to FDI contribute to growth in emerging and developing economies.

## 3. Data and Methodology

### 3.1. Measurement of Institutional Quality

Institutional quality as a proxy of countries' governance is a multifaceted concept [72,73]. According to [29: 4], governance encompasses three dimensions, and it is defined as "the traditions and institutions by which authority in a country is exercised. This includes: (a) the process by which governments are selected, monitored, and replaced—political governance; (b) the capacity of the government to effectively formulate and implement sound policies—economic governance; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them—institutional governance". Therefore, to operationalize this concept, the study utilized six comprehensive indicators from the World Bank's Worldwide Governance Indicators (WGI) database and developed by [113], with surveys starting from 1996.

These indicators are particularly relevant because they are constructed from a wide array of cross-country surveys and expert polls and identify the three governance dimensions through six basic indicators: (i) voice and accountability (VA) measures the extent to which citizens can participate in selecting their government, as well as the freedoms of expression, association, and the media; (ii) political stability/absence of violence (PS) indicates the likelihood of political instability and politically motivated violence, including terrorism, reflecting the government's ability to remain in office by constitutional means; (iii) government effectiveness (GE) reflects the quality of public and civil services, the credibility of government policy commitments, and the degree of its independence from political pressures; (iv) regulatory quality (RQ) assesses the government's ability to formulate and implement sound, market-friendly policies and regulations, avoiding excessive controls that hinder private sector development; (v) rule of law (RL) captures perceptions of confidence in and adherence to societal rules, including the effectiveness of the judiciary, the enforceability of contracts, and the prevalence of crime; and (vi) control of corruption (CC) measures the extent to which public power is exercised for private gain, including various forms of corruption, bribery, and illicit practices.

The methodology behind these indicators, detailed in [29], involves aggregating several hundred variables from different data sources worldwide. Using an unobserved components model, the methodology standardizes these diverse data sources into comparable units. A key feature is the construction of margins of error, which acknowledge the inherent imprecision in measuring governance and are essential for making careful cross-country and over-time comparisons. More recently [7], has provided evidence for an effective

aggregation of the six governance indicators into a comprehensive composite index. Higher scores for each of governance indicators indicate superior levels of institutional quality.

## 3.2. Model Specification and Estimation Technique

This study employs Eq. (1) below to analyze the impact of FDI inflows (FDI) on economic growth measured by per-capita GDP growth rate (GDPgr) in emerging and developing economies.

The model included: (i) gross capital formation (GCF), as a proxy for domestic investment, and a high level of this is expected to positively influence to economic growth [114]; (ii) government expenditure (GEX), while increased government spending can raise aggregate demand and stimulate growth, it may hamper growth if used inefficiently or in corrupt environments [14,115]; (iii) inflation (INF) measured by the GDP deflector, high inflation erodes purchasing power, increases living costs, and decelerates economic growth [14]; (iv) broad money (M2), which reflects the money supply, and it is expected to have a positive effect on economic growth from a Keynesian perspective [116]; technology diffusion (ITC) measured by the internet penetration into a society, this variable is expected to have a positive impact on growth performance [23]; (v) and several institutional quality variables (IQ) as control factors, sound institutions are expected to attract investment and improve resource efficiency, leading to better growth performance [62,117].

In addition, per-capita GDP at purchasing power parities (PPP), more suitable for international comparisons, with one order of lags ($GDP_{t-1}$) was included to capture the initial size of an economy and to test for conditional convergence, as low- and middle-income economies tend to grow more rapidly than high-income economies to catch up over time. Country-region-dummies and time-dummies were also included to account for idiosyncratic and time-specific fixed effects.

The basic form of the model is the following in Eq. (1):

$$\begin{aligned} \mathrm{GDPgr}_{it} = {} & \alpha_i + \beta_1 \mathrm{GDPgr}_{it-1} + \beta_2 \mathrm{FDI}_{it} + \beta_3 (\mathrm{FDI} \times \mathrm{IQ})_{it} + \beta_4 (\mathrm{FDI} \times \mathrm{ICT})_{it} + \beta_5 \mathrm{T}_i + [\boldsymbol{Z}: \beta_6 \mathrm{GDP}_{it-1} + \\ & \beta_7 \mathrm{GCF}_{it} + \beta_8 \mathrm{GEX}_{it} + \beta_9 \mathrm{M2}_{it} + \beta_{10} \mathrm{INF}_{it} + \beta_{11} \mathrm{ICT}_{it} + \beta_{12} \mathrm{IQ}_{it} + \beta_{13} \mathrm{D}_i] + \varepsilon_{it} \,. \end{aligned} \quad (1)$$

The dependent variable is $GDPgr_{it}$. Consistently with the GMM framework, the lagged value of this ($GDPgr_{it-1}$) was included as a further explanatory variable. Finally, $\alpha_i$ is the constant term controlling for country-specific and unobserved effects; $T_i$ is a set of dummy variables controlling for time-related shocks; $D_i$ is a set of dummy variables controlling for geographical and group-specific effects[2]; and $\varepsilon_{it}$ is the country-specific and time-variant error term in the regressions. The set of variables $\boldsymbol{Z}$ encompassed exogenous regressors that instrumented the endogenous variables for the robust estimates.

To assess how institutional quality and technology diffusion influence the effectiveness of FDI in stimulating growth, the study employed a conditional analysis, as specified by interaction terms.

Further model specifications introduce interaction terms between FDI and the institutional quality indicators, and FDI and technology diffusion variable. Significant positive coefficients for these interaction terms would suggest that improvements in institutional quality variables enhance the growth benefits derived from FDI inflows.

The GMM estimators effectively address dynamic endogeneity, which is a pivotal concern in growth studies. Therefore, the primary inferences are based on the GMM estimation technique with an instrumental approach. Especially, the GMM-system estimator, designed by [25,26], addresses endogeneity by using

[2] The IMF geographical aggregation of emerging and developing economies was used. Dummy variables were included in the models excluding one to avoid the "dummy-trap" and the related multicollinearity. Additionally, net oil-producing and -exporting countries, such as OPEC ones, show highest per-capita GDP levels and thereby were considered by introducing a dummy.

internal instruments. As [27] argued, this method uses lagged levels of endogenous variables as instruments for their first-differenced equations and lagged differences as instruments for the level equations.

Prioritizing, the key endogenous variables treated as instruments are the lagged dependent variable, FDI, and its interaction terms with institutional quality and technology diffusion. While the remaining variables are treated as exogenous regressors.

In the first control stage, all regressors are endogenous and interaction terms are not included, controlling for institutional quality indicators. Finally, in the second robust control stage, only FDI and the interaction terms are endogenous, while all other variables act in the models as exogenous regressors, controlling for institutional quality indicators.

The estimates at the first control stage are shown and discussed in Appendix A at the Table A.2. The estimates at the second control stage, with only the interaction terms found to be significant, are shown below, while the others are presented in Appendix A at the Table A.3.

This order of controls allowed us to identify robust and significant institutional quality variables, supported by the validity of the chosen instruments. In fact, the key statistical requirements of the GMM-system method are satisfied, including tests for autocorrelation and the validity of instruments, which are reported alongside the regression results. The statistical software used in the analysis was the latest released version of the open-source package gretl.

Although the GMM-system is consistent with an unbalanced panel, a balanced panel was obtained by consistently integrating the few missing data for time-series from the UNCTAD dataset, also controlling for anomalous data. Alternatively, missing data were integrated with mean values, where possible, otherwise by an appropriate linear interpolation. This data pretreatment allows for avoiding the loss of information and degrees of freedom in the models due to missing observations. Therefore, considering only missing or anomalous data, based on the completeness of the panel, the dataset reliability is 96%.

In addition, to ensure the stability of a time-series with reasonable certainty, non-overlapping averages of the data were performed every five time-units, thus obtaining a series of five time-points, with the last point encompassing the residual three units.

## 3.3. Descriptive Statistics and Correlation Matrix

This study employed 24 years of balanced annual panel data from 2000 to 2023 for a sample of emerging and developing economies, then reduced to five time-points. In Table 1, there is the complete list of variables, their main descriptive statistics, and descriptions.

The data are primarily sourced from the World Bank's World Development Indicators (WDI) and Worldwide Governance Indicators (WGI) databases. The dependent variable is the annual percentage growth rate of GDP per capita.

The pivotal independent variable is Foreign Direct Investment (FDI), measured as net inflows as a percentage of GDP. The other regressors are also expressed in percentage form, except for the initial lag of log GDP per capita and the institutional quality indicators. All variables were transformed in logarithms. Table 2 presents the correlations among the key variables. These correlations are generally not very high and moderate, suggesting that multicollinearity should not pose a significant concern for the analysis. The correlation among the partial governance indicators is not shown due to the obvious multicollinearity.

**Table 1.** Main descriptive statistics and descriptions of the variables.

| Variables | Main Statistics | | | Descriptions |
|---|---|---|---|---|
| | $\mu$ | $\sigma_w$ | $\sigma_b$ | |
| Per-capita GDP growth (GDPgr) | 2.140 | 2.999 | 1.869 | The annual percentage growth rate of per-capita GDP. (%, WDI-WB) |
| Per-capita GDP (GDP) | 12,896 | 5,293 | 16,316 | Gross domestic product divided by midyear population. (PPP, current international $, WDI-WB) |
| Foreign Direct Investment (FDI) | 4.521 | 3.986 | 3.979 | Net inflows in the reporting economy from foreign investors. (% GDP, WDI-WB) |
| Gross Capital Formation (GCF) | 24.561 | 5.344 | 6.818 | Outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. (% GDP, WDI-WB) |
| Government Expenditure (GEX) | 15.374 | 2.866 | 5.095 | All government current expenditures for purchases of goods and services. (% GDP, WDI-WB) |
| Broad Money (M2) | 51.787 | 12.846 | 32.415 | Sum of currency outside banks, all demand deposits, savings, and foreign currency deposits of resident sectors, bank and traveler's checks, and other securities. (% GDP, WDI-WB) |
| Inflation (INF) | 7.889 | 9.290 | 6.955 | Inflation is expressed as a GDP deflator. (%, WDI-WB) |
| Technology Diffusion (ICT) | 31.581 | 25.284 | 17.536 | The proportion of individuals using the internet, calculated by dividing the total number of in-scope individuals using the internet by the total population. (%, WDI-WB) |
| Governance Climate (GC) | 0.450 | 0.024 | 0.091 | An overall composite index effectively encompassing all six governance indicators. (Ranging from approximately 0 to 1, author's elaboration based on WGI-WB) |
| Voice and Accountability (VA) | -0.308 | 0.213 | 0.756 | The perceptions of the extent to which citizens are able to participate in selecting their government, as well as freedom of expression, and a free media. (Ranging from approximately −2.5 to 2.5, WGI-WB) |
| Political Stability/Absence of Violence (PS) | -0.292 | 0.349 | 0.830 | The perception of the likelihood of political instability and/or politically-motivated violence, including terrorism. (Ranging from approximately −2.5 to 2.5, WGI-WB) |
| Government Effectiveness (GE) | -0.355 | 0.226 | 0.660 | The perception of the quality of public services, policy formulation and implementation, and the credibility of the government's commitment. (Ranging from approximately −2.5 to 2.5, WGI-WB) |
| Regulatory Quality (RQ) | -0.310 | 0.231 | 0.646 | The perception of the ability of the government to formulate and implement effective policies and regulations promoting private sector. (Ranging approximately from −2.5 to 2.5, WGI-WB) |
| Rule of Law (RL) | -0.377 | 0.199 | 0.671 | The perception of the extent to which people and agents have confidence in and abide by the rules |

| | | | | |
|---|---|---|---|---|
| | | | | of society.<br>(Ranging from approximately −2.5 to 2.5, WGI-WB) |
| Control of Corruption (CC) | -0.366 | 0.217 | 0.684 | The extent to which public governance is exercised for private interest.<br>(Ranging from approximately −2.5 to 2.5, WGI-WB) |

**Table 2.** Correlation matrix.

| | GDPgr | GDP | FDI | GCF | |
|---|---|---|---|---|---|
| GDPgr | 1.000 | | | | |
| GDP | -0.111*** | 1.000 | | | |
| FDI | 0.206*** | -0.023 | 1.000 | | |
| GCF | 0.218*** | 0.113*** | 0.237*** | 1.000 | |
| GEX | -0.137*** | 0.141*** | 0.073* | 0.026 | |
| M2 | -0.052 | 0.267*** | 0.044 | 0.188*** | |
| INF | -0.073* | -0.067* | -0.041 | -0.132*** | |
| ICT | -0.151*** | 0.534*** | 0.010 | 0.085** | |
| GC | 0.011 | 0.421*** | 0.183*** | 0.182*** | |
| VA | 0.010 | 0.005 | 0.182*** | -0.012 | |
| PS | 0.019 | 0.369*** | 0.224*** | 0.242*** | |
| GE | 0.048 | 0.525*** | 0.121*** | 0.217*** | |
| RQ | 0.029 | 0.478*** | 0.129*** | 0.106*** | |
| RL | -0.019 | 0.465*** | 0.136*** | 0.214*** | |
| CC | -0.026 | 0.461*** | 0.136*** | 0.201*** | |

| | GEX | M2 | INF | ICT | GC |
|---|---|---|---|---|---|
| GEX | 1.000 | | | | |
| M2 | 0.174*** | 1.000 | | | |
| INF | -0.108*** | -0.084** | 1.000 | | |
| ICT | 0.200*** | 0.489*** | -0.078** | 1.000 | |
| GC | 0.228*** | 0.380*** | -0.254*** | 0.401*** | 1.000 |
| VA | 0.142*** | 0.201*** | -0.173*** | 0.210*** | 0.779*** |
| PS | 0.219*** | 0.219*** | -0.209*** | 0.287*** | 0.838*** |
| GE | 0.189*** | 0.471*** | -0.240*** | 0.460*** | 0.906*** |
| RQ | 0.145*** | 0.380*** | -0.271*** | 0.423*** | 0.885*** |
| RL | 0.232*** | 0.423*** | -0.236*** | 0.393*** | 0.952*** |
| CC | 0.281*** | 0.368*** | -0.222*** | 0.379*** | 0.919*** |

Note: (***) significance at $\alpha$=0.01; (**) significance at $\alpha$=0.05; (*) significance at $\alpha$=0.10.

## 4. Results and Discussion

This section presents the core contribution of the study by dissecting the role of specific institutional dimensions and the technology diffusion in the FDI-growth nexus. The analysis employs the six Worldwide Governance Indicators (WGI) and an overall composite governance indicator as measures of the institutional quality, substituting each into the model while maintaining the same set of control variables and using the two-step GMM-system estimation.

In Table 3, the models yield a robust and significant finding. While FDI maintains a statistically significant and positive effect on economic growth across all models, the impact of the institutional quality indicators varies markedly and is grasped by interaction terms.

The coefficient for $GDPgr_{t-1}$ is positive and highly significant. This result outlines the dynamic nature and convergent effect of growth along the countries' development-paths.

Among all models, only three shown significant interaction terms for (FDI×GC), (FDI×RL), and (FDI×ICT). This indicates that improvements specifically in these three areas are directly associated with higher growth performances in emerging and developing economies, aligning with a broader economic literature.

Therefore, enhancing countries' governance climate, overall, and strengthening legal frameworks and contract enforcement—rule of law[3]—particularly, as well as fostering technology advancement, are pivotal factors in emerging and developing economies in achieving superior economic performance.

The negative interaction coefficients indicate that emerging and developing economies discount delays in their development-path, although net effects yet act as multipliers on FDI's impact. In other words, the marginal effect of FDI on growth is smaller in countries with lower institutional quality and technology diffusion.

This means that FDI inflows continue to positively contribute to economic growth in emerging and developing economies. In fact, the coefficients for FDI and ICT are significant in the three models. These results indicate that FDI inflows and technology serve as significant stimulus for economic growth. Therefore, findings support the view that FDI and technology diffusion can enhance growth through channels, such as physical capital accumulation, knowledge spillovers, and improvements in human capital formation.

Knowledge and technology diffusion could result changes that can trigger a virtuous or vicious circle between increased income inequality and economic growth. For instance, higher inequality might determine under-investment in human capital in emerging and developing economies, increasing further inequality within countries. This means that technological advancement might lead to further socioeconomic concerns about employment and wages.

Therefore, the type of trigged technological progress may influence growth, impacting income inequality within emerging and developing economies. While access to digital technologies has increased significantly, the skills needed to use them effectively may remain unchanged in these countries.

For governance climate, the average net effect through the interaction term is (-0.218×GC) + 0.478 = 0.179*** (0.014), suggesting that for lower values of governance climate, GDP growth through FDI is lower. In particular, the average net effect of FDI for rule of law is (-0.041×RL) + 0.211 = 0.135*** (0.012), and for technology diffusion is (-0.012×ICT) + 0.167 = 0.120*** (0.015), also indicating that lower institutional quality and technology diffusion significantly contribute to decrease GDP growth.

Finally, the analysis provided the model's diagnostic tests that confirm the validity of the GMM-system estimation. The number of countries always exceeds the number of instruments, and the key specification tests are satisfied. The Arellano-Bond test for autocorrelation rejects the null of no first-order serial correlation but fails to reject the null of no second-order serial correlation, which is the desired outcome for consistent estimation.

Furthermore, the Hansen test of over-identifying restrictions does not reject the null hypothesis of instrument exogeneity at the 5% significance level, indicating that the instruments as a group are valid, albeit with some minor over-identification concerns for the models showed in Appendix A. This suggests that, albeit the instrument set is valid, results must be interpreted with this caution in mind.

In conclusion, the study concludes that FDI accelerates economic growth in emerging and developing economies primarily through its interaction with institutional traits and technology diffusion. In these countries policymakers should prioritize sound governance climate—particularly the rule of law—and technology diffusion to accelerate the growth benefits derived from foreign investment.

[3] More specifically, the rule of law is an indicator of the extent to which people and agents have confidence in and abide by the rules of society in which they live, the quality of contract enforcement, property rights, and justice, as well as the likelihood of crime, violence, and repression.

**Table 3.** GMM-system models at the robust second control stage.

| | Governance Climate (GC) | Rule of Law (RL) | Technology Diffusion (ICT) |
|---|---|---|---|
| | GDPgr | | |
| Exogenous: | GCF, GEX, M2, INF, ICT, IQ, Fixed-effects (D) | | |
| $GDPgr_{t-1}$ | 0.366*** | 0.396*** | 0.426*** |
| | (0.097) | (0.088) | (0.069) |
| FDI | 0.477** | 0.211** | 0.167** |
| | (0.239) | (0.103) | (0.077) |
| FDI×IQ | -0.218* | -0.041* | |
| | (0.131) | (0.024) | |
| FDI×ICT | | | -0.012* |
| | | | (0.007) |
| Constant | 1.845*** | 1.849*** | 1.766*** |
| | (0.296) | (0.276) | (0.251) |
| Time-effects (T) | Yes | Yes | Yes |
| Standard error | 0.207 | 0.207 | 0.209 |
| Wald Test | 45.76 | 51.74 | 56.74 |
| (p-value) | (0.000) | (0.000) | (0.000) |
| AR(1) Test | -2.944 | -3.039 | -3.221 |
| (p-value) | (0.003) | (0.002) | (0.001) |
| AR(2) Test | 0.520 | 0.683 | 0.879 |
| (p-value) | (0.603) | (0.495) | (0.380) |
| Hansen Test | 23.10 | 24.94 | 28.90 |
| (p-value) | (0.187) | (0.127) | (0.050) |
| Instruments | 25 | 25 | 25 |
| Units | 136 | 136 | 136 |
| Observations | 544 | 544 | 544 |

Note: (***) significance at $\alpha$=0.01; (**) significance at $\alpha$=0.05; (*) significance at $\alpha$=0.10.

# 5. Conclusions

## 5.1. Concluding Remarks and Contribution

This study empirically investigated the impact of FDI inflows on economic growth in emerging and developing economies, with a specific focus on the moderating role of institutional quality and technology diffusion. Analyzing annual panel data from 136 countries over the period 2000–2023, the research employed the GMM-system estimation technique to address endogeneity concerns.

The findings indicate that FDI has a positive and significant effect on economic growth in emerging and developing economies. The study identified that this growth-enhancing effect of FDI is significantly affected by the quality of host-country institutions and technology diffusion. Specifically, improvements in the governance climate, overall, and the rule of law, in particular, were found to significantly influence the impact of FDI on economic growth. This suggests that in these countries there is a margin for institutional reforms and improvements involving the institutional and business environment [118,119].

Finally, the main contribution of the study to economic literature lies in moving beyond establishing a general link between institutions, growth, and technology diffusion. Particularly, it provided granular, actionable evidence by pinpointing the specific institutional traits that are most critical for harnessing the benefits of FDI. While the findings align with prior literature, such as [22,23] on the importance of FDI,

institutions, and technology, this research specifically shows how these three aspects act as synergistic conduits for FDI-led growth.

## 5.2. Policy Implications

The results offer clear guidance for policymakers in emerging and developing economies. Governments should continue to devise and implement effective strategies to attract FDI, given its confirmed role as a catalyst for growth. To maximize the developmental returns from FDI, policy efforts must be strategically directed toward enhancing governance climate—in particular the rule of law—and digital and technological investments.

Technological progress, although a key determinant of successful performance, requires the support of high-quality institutions to be implemented effectively and generate economic growth. Investment in human and organizational capital, incentivizing tax policies, enhancing intellectual property rights and the rule of law, last but not least, fostering a financial system capable of supporting growth of the most innovative enterprises, are only some of the policies that sound governance could implement. Therefore, technological progress can effectively translate into higher growth rates if adequately supported by sound development policies [70].

By prioritizing structural reforms, emerging and developing countries may reduce business costs and uncertainties, ultimately improving their institutional and business environment, thereby not only attracting more FDI but also ensuring that it translates into higher and more sustainable economic growth.

Therefore, ITC adoption strategies involving investment in professional education and digital skills development are recommended. Policymakers across emerging and developing economies must create an enabling environment to ensure more ICT diffusion. For instance, sector liberalization policies could be adopted to attract more foreign investment and improve competition in the sector. This would place countries in an advantageous position to benefit from FDI inflows and ICT diffusion.

## 5.3. Limitations and Suggestions

This study is not without limitations. The sample period includes years of economic crises, which may influence FDI and growth patterns, though the analysis focused on long-run relationships.

Future research could explore more granular, sub-national institutional indicators and conduct comparative analyses of the FDI-institution-growth nexus across different regions or economic structures within the developing world.

Furthermore, the number of internet users as a proxy for technology diffusion in a society is not uncommon in studies about economic growth, the digital economy, and technology diffusion, as it measures the agents' overall access to information and communication technology.

However, it remains an indirect proxy for the absorption capacity of technologies impacting firms' productivity in an industry. Future research could use complementary or more specific indicators, such as mobile broadband subscriptions and, in particular, the number of registered patents and brands, which are strictly related to a sounder and more developed rule of law.

# Appendix A

**Table A.1** – Emerging and developing economies by IMF geographical aggregation and OPEC countries.

| Emerging and Developing Economies (#136) | | |
|---|---|---|
| **East Europe (#14)** | | |
| Albania | Hungary | Russia |
| Belarus | Moldova | Serbia |
| Bosnia and Herzegovina | Montenegro | Ukraine |
| Bulgaria | North Macedonia | Turkey |
| Poland | Romania | |
| **North Africa, Middle East, and Central Asia (#27)** | | |
| Afghanistan | Iraq | Oman |
| Algeria | Jordan | Pakistan |
| Armenia | Kazakhstan | Qatar |
| Azerbaijan | Kuwait | Saudi Arabia |
| Bahrain | Kyrgyzstan | Sudan |
| Djibouti | Lebanon | Tajikistan |
| Egypt | Libya | Tunisia |
| Georgia | Mauritania | United Arab Emirates |
| Iran | Morocco | West Bank and Gaza |
| **South-East Asia (#22)** | | |
| Bangladesh | Malaysia | Solomon Islands |
| Bhutan | Maldives | Sri Lanka |
| Brunei Darussalam | Mongolia | Thailand |
| Cambodia | Myanmar | Tonga |
| China | Nepal | Vanuatu |
| Fiji | Papua New Guinea | Vietnam |
| India | Philippines | |
| Indonesia | Samoa | |
| **Sub-Saharan Africa (#42)** | | |
| Angola | Eswatini | Namibia |
| Benin | Gabon | Niger |
| Botswana | Gambia | Nigeria |
| Burkina Faso | Ghana | Rwanda |
| Burundi | Guinea | Sao Tome and Principe |
| Cabo Verde | Guinea-Bissau | Senegal |
| Cameroon | Kenya | Seychelles |
| Central African Republic | Lesotho | Sierra Leone |
| Chad | Liberia | South Africa |
| Comoros | Madagascar | Tanzania |
| Congo, Dem. Rep. | Malawi | Togo |
| Congo, Rep. | Mali | Uganda |
| Cote d'Ivoire | Mauritius | Zambia |
| Equatorial Guinea | Mozambique | Zimbabwe |
| **Latin America and Caribbean (#31)** | | |
| Antigua and Barbuda | Dominica | Nicaragua |
| Argentina | Dominican Republic | Paraguay |
| Aruba | Ecuador | Peru |
| Bahamas | El-Salvador | St. Kitts and Nevis |
| Barbados | Grenada | St. Lucia |
| Belize | Guatemala | St. Vincent and the Grenadines |
| Bolivia | Guyana | Suriname |
| Brazil | Haiti | Trinidad and Tobago |
| Chile | Honduras | Uruguay |
| Colombia | Jamaica | |
| Costa Rica | Mexico | |

| OPEC Countries (#11) | | |
|---|---|---|
| Algeria | Iran | Nigeria |
| Congo | Iraq | Saudi Arabia |
| Equatorial Guinea | Kuwait | United Arab Emirates |
| Gabon | Libya | |

**Table A.2** – GMM-system models at the first control stage, all endogenous regressors.

| | GC | VA | PS | GE | RQ | RL | CC |
|---|---|---|---|---|---|---|---|
| | GDPgr | | | | | | |
| $GDPgr_{t-1}$ | 0.276*** | 0.284*** | 0.289*** | 0.280*** | 0.389*** | 0.288*** | 0.273*** |
| | (0.068) | (0.070) | (0.069) | (0.066) | (0.096) | (0.068) | (0.070) |
| $GDP_{t-1}$ | -0.078*** | -0.057*** | -0.065*** | -0.091*** | -0.074*** | -0.068*** | -0.076*** |
| | (0.021) | (0.016) | (0.018) | (0.020) | (0.020) | (0.020) | (0.020) |
| FDI | 0.019 | 0.026 | 0.022 | 0.022 | 0.021 | 0.024 | 0.022 |
| | (0.023) | (0.022) | (0.022) | (0.021) | (0.023) | (0.022) | (0.022) |
| GCF | 0.106 | 0.109 | 0.097 | 0.100 | 0.113 | 0.104 | 0.100 |
| | (0.085) | (0.086) | (0.089) | (0.081) | (0.085) | (0.085) | (0.084) |
| GEX | -0.119** | -0.116** | -0.114** | -0.110** | -0.105** | -0.112** | -0.126** |
| | (0.048) | (0.052) | (0.050) | (0.044) | (0.047) | (0.047) | (0.048) |
| M2 | -0.003 | 0.007 | 0.012 | -0.014 | -0.002 | 0.001 | -0.006 |
| | (0.041) | (0.045) | (0.044) | (0.040) | (0.041) | (0.043) | (0.041) |
| INF | -0.052 | -0.060 | -0.054 | -0.050 | -0.048 | -0.059 | -0.057 |
| | (0.052) | (0.053) | (0.057) | (0.047) | (0.053) | (0.052) | (0.051) |
| ICT | -0.004 | 0.001 | 0.001 | -0.010 | -0.005 | 0.001 | -0.004 |
| | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | (0.021) | (0.020) |
| IQ | 0.658* | 0.048 | 0.060 | 0.242** | 0.153 | 0.073 | 0.133** |
| | (0357) | (0.067) | (0.058) | (0.095) | (0.098) | (0.068) | (0.057) |
| Constant | 2.648*** | 3.146*** | 3.186*** | 3.229*** | 3.095*** | 3.239*** | 3.377*** |
| | (0.534) | (0.414) | (0.401) | (0.392) | (0.416) | (0.397) | (0.407) |
| Time-effects (T) | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Fixed-effects (D) | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Standard error | 0.191 | 0.193 | 0.193 | 0.191 | 0.192 | 0.193 | 0.191 |
| Wald Test | 157.1 | 177.7 | 154.8 | 148.7 | 155.3 | 167.3 | 156.0 |
| (p-value) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| AR(1) Test | -3.129 | -3.134 | -3.122 | -3.139 | -3.115 | -3.155 | -3.138 |
| (p-value) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| AR(2) Test | 0.717 | 0.693 | 0.689 | 0.651 | 0.734 | 0.702 | 0.758 |
| (p-value) | (0.474) | (0.486) | (0.491) | (0.515) | (0.463) | (0.483) | (0.448) |
| Hansen Test | 12.20 | 12.53 | 12.52 | 11.90 | 11.93 | 12.54 | 12.06 |
| (p-value) | (0.143) | (0.129) | (0.129) | (0.156) | (0.154) | (0.129) | (0.148) |
| Instruments | 26 | 26 | 26 | 26 | 26 | 26 | 26 |
| Units | 136 | 136 | 136 | 136 | 136 | 136 | 136 |
| Observations | 544 | 544 | 544 | 544 | 544 | 544 | 544 |

Note: (***) significance at $\alpha$=0.01; (**) significance at $\alpha$=0.05; (*) significance at $\alpha$=0.10.

In Table A.2, the growth persistence effect is confirmed by the strong positive effect of the lagged per-capita GDP growth rate ($GDPgr_{t-1}$).

Across all models that control for various factors, FDI exhibits a positive effect on GDP per capita growth, although it is not statistically significant. While theoretically in line with expectations, FDI results show that they may not have a large direct impact on growth, thereby supporting the use of interaction terms and the instrumental variables in the modelling. This result may be due to structural imbalances or disparate allocation of benefits from FDI in emerging and developing economies. In other words, this indeterminate effect of FDI may result from heterogeneity across countries.

The results for the control variables, such as lagged per-capita GDP, gross capital formation, government expenditure, and institutional quality variables, also conform to theoretical expectations and prior empirical work. The initial level of per-capita GDP ($GDP_{t-1}$) shows a significant negative coefficient, providing evidence for conditional convergence of growth, when low- and middle-income economies tend to grow faster than high-income ones. Gross capital formation (GCF), as a proxy for national investment, shows a positive effect across all models, underlining the importance of domestic capital for growth—although it is not statistically significant—since increased capital formation boosts infrastructure development and productive capacity. Conversely, government expenditure (GEX) shows a significant and negative coefficient across all specifications, which can be explained by inefficiencies and potential corruption in public spending in many emerging and developing countries. In other words, higher GEX is linked to slower economic performance, and this points out the crucial role of not only the scale but also the type of allocation of public spending and the institutional quality in fostering economic growth.

The institutional quality variables (IQ), such as the governance climate (GC), the governance effectiveness (GE), and the control of corruption (CC), show significant and positive impacts, reinforcing the established view that sounder institutions are crucial in stimulating superior economic performance in emerging and developing economies, particularly considering the government's commitment and the contrast to bribery.

Finally, the effects of the other control variables, although not statistically significant, remain consistent with the earlier empirical results. One possible explanation for this insignificance is that countries can have divergent inflation rates (INF), broad money (M2), and above all, different macroeconomic frameworks with peculiar structural imbalances. While the effect of technology diffusion is practically zero and not statistically significant in these model specifications, this result may depend on the different resource allocation and endowments across countries, ultimately emphasizing the key role of applying new technology as influenced by the level of accumulated knowledge.

**Table A.3** – GMM-system models at the robust second control stage, other IQ indicators.

| | VA | PS | GE | RQ | CC |
|---|---|---|---|---|---|
| | GDPgr | | | | |
| Exogenous: | $GDP_{t-1}$, GCF, GEX, M2, INF, ICT, IQ, Fixed-effects (D) | | | | |
| $GDPgr_{t-1}$ | 0.447*** | 0.389*** | 0.418*** | 0.434*** | 0.389*** |
| | (0.094) | (0.088) | (0.086) | (0.089) | (0.096) |
| FDI | 0.103 | 0.247* | 0.188* | 0.168 | 0.183* |
| | (0.154) | (0.127) | (0.102) | (0.120) | (0.101) |
| FDI×IQ | -0.012 | -0.039 | -0.036 | -0.028 | -0.028 |
| | (0.034) | (0.030) | (0.028) | (0.029) | (0.023) |
| Constant | 1.816*** | 1.806*** | 1.824*** | 1.780*** | 1.876*** |
| | (0.258) | (0.271) | (0.267) | (0.267) | (0.300) |
| Time-effects (T) | Yes | Yes | Yes | Yes | Yes |
| Standard error | 0.210 | 0.208 | 0.208 | 0.210 | 0.207 |
| Wald Test | 58.40 | 49.34 | 51.92 | 51.77 | 45.18 |
| (p-value) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| AR(1) Test | -3.248 | -3.072 | -3.077 | -3.218 | -2.999 |
| (p-value) | (0.001) | (0.002) | (0.002) | (0.001) | (0.003) |
| AR(2) Test | 0.904 | 0.642 | 0.808 | 0.803 | 0.639 |
| (p-value) | (0.366) | (0.521) | (0.419) | (0.422) | (0.523) |
| Hansen Test | 34.10 | 26.92 | 30.18 | 29.49 | 29.19 |
| (p-value) | (0.012) | (0.081) | (0.036) | (0.043) | (0.046) |
| Instruments | 25 | 25 | 25 | 25 | 25 |
| Units | 136 | 136 | 136 | 136 | 136 |
| Observations | 544 | 544 | 544 | 544 | 544 |

Note: (***) significance at $\alpha$=0.01; (**) significance at $\alpha$=0.05; (*) significance at $\alpha$=0.10.

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## Conflicts of Interest

The authors declare no conflict of interest.

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