

**Innovation, Entrepreneurship and Economic Growth:
The Moderating Role of Corruption**

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Abstract

This primary goal of this study is to investigate the relationship between economic growth, entrepreneurship, and innovation while underlining the moderating effect of corruption, especially in the context of the BRICS countries (Brazil, Russia, India, China, and South Africa). Multiple hypotheses are tested through a panel data framework using a Random Effects Generalized Least Squares (GLS) regression model. The study incorporates interaction terms to assess the moderating impact of corruption on innovation- and entrepreneurship-led growth. Data were compiled from World Bank, Global Innovation Index, Global Entrepreneurship Monitor, UNCTAD, and IMF for the period 2010–2023. The results reveal that education and political stability are key drivers of economic growth, showing consistent positive effects. In contrast, innovation has a significant negative association with GDP per capita, suggesting structural or absorptive inefficiencies in the region. Entrepreneurship shows a positive but statistically insignificant effect, and corruption does not significantly moderate the relationships between innovation or entrepreneurship and growth. The findings suggest the need for BRICS nations to enhance institutional quality, improve innovation diffusion mechanisms, and strengthen entrepreneurial ecosystems. Policymakers should consider institutional reforms and investment in education to maximize growth returns from innovation and entrepreneurship. This study builds on the Schumpeterian growth theory and explores Drucker's perspective on the innovation–entrepreneurship nexus, extending prior models by incorporating corruption as a moderating institutional factor. Unlike prior studies that focus on developed economies, this paper contributes a novel empirical analysis of emerging markets using both traditional economic variables and institutional indicators.

Keywords: Entrepreneurship, Corruption, Innovation, Economic Growth, BRICS, Institutions, Schumpeter, Drucker

JEL Classification Code: O31, O47, L26

1. Introduction

In the past few years research on the transition from the resource-based economy to the knowledge economy has gained recognition, and innovation and entrepreneurship appear to play significant roles in this debate. Even though entrepreneurship has been acknowledged in the past few years as an important aspect of economic growth, which is made possible by technological innovation, numerous studies have failed to prove this, particularly in developing nations (Akinwale et al., 2020). Today's corporate environments are greatly influenced by entrepreneurship, an explosive force that promotes economic growth and innovation (Sagar, 2024.). Knowledge diffusion has historically been viewed by economists as a crucial component of the innovation process and an essential component of economic growth (Galindo & Méndez, 2014).

Robust national infrastructures for innovation and an active entrepreneurial culture are important drivers of improving the socioeconomic state of nations globally. The connections between innovation, entrepreneurship, and economic growth have been thoroughly investigated in the literature (Pradhan et al., 2020). In order to encourage economic growth in areas that are lagging, governments spend considerable sums of funds, usually with little success. Therefore, it is crucial to advise lawmakers on how to use their limited resources most effectively (Stephens et al., 2013). The economy of entrepreneurship is a contemporary idea that fosters innovative thinking and aids in the development of new or ongoing enterprises that grow national economies, lower unemployment rates, and enhance living standards (Awwad, 2024).

Knowing how institutional variables like corruption temper development patterns is crucial as the global economy deals with post-pandemic recovery, geopolitical realignments, and rapid technological transformation (Iorio & Segnana, 2025). By analysing how corruption hinders or modifies the ability of innovation and entrepreneurship to propel progress, this study aims to break down these connections. It also accounts for other important factors that influence the enabling environment for economic transformation, such as education, political stability, and foreign direct investment (Bilan & Apostoaie, 2025).

This study is useful and relevant for a number of important reasons. First, by understanding how corruption influences the impacts of entrepreneurship

and innovation, policymakers may develop effective plans that focus on both innovation-driven growth and anti-corruption initiatives. Traditional economic growth models gain depth from the study's incorporation of institutional variables, which provides a more thorough understanding of the real forces behind development. Innovation and entrepreneurship have been essential elements of national recovery plans since the COVID-19 pandemic. Investments run at risk of being misguided or unsuccessful, but if institutional barriers are not well understood. Lastly, this study makes a significant contribution to the worldwide discussion on how institutions influence economic performance, which is important given the growing worries about economic failure and governance issues in many regions of the world.

2. Literature Review

The relationship between innovation, entrepreneurship, and economic growth has been widely examined in the field of development economics and institutional theory. However, the moderating role of corruption in this nexus remains complex, multifaceted, and increasingly important, particularly in the context of developing economies. Corruption can either act as a "grease" that helps circumvent inefficient bureaucratic hurdles or a "sand" that impedes the smooth functioning of institutional and market mechanisms. This section explores the current state of the literature, drawing from recent empirical studies and theoretical frameworks that examine how corruption affects innovation-led entrepreneurship and, in turn, economic growth.

The importance of entrepreneurship in promoting economic growth and development, particularly at the regional level, is becoming more widely acknowledged. The three main factors that contribute to entrepreneurial differences are the characteristics of markets, innovation systems, and place-based cultures, communities, and the institutions they establish. These can be considered environmental and location-based traits (Huggins et al., 2015). People who start new firms and contribute to the creation of new jobs are known as entrepreneurs. Using technology, they can increase production and contribute to the nation's development, which leads to economic progress. They also help to enhance competition. Therefore, it is possible to argue that entrepreneurship promotes growth in the economy (Dhaliwal, 2016). The connections between economic growth, entrepreneurship, and institutions are hotly debated (Raimi et al., 2024). Within a particular culture, everyone participates in helping that society grow and flourish. One way that people can impact the economy and so improve the welfare of a nation is through entrepreneurship (Saberri & Hamdan, 2019). The behaviour of the economic agent must be taken into consideration while evaluating the entrepreneurship component (Galindo & Méndez-Picazo, 2013).

Schumpeterian growth theory has long stressed innovation as a key driver of economic expansion, stating that entrepreneurs act for introducing new technologies as well as business models that then improve productivity also stimulate employment. Many current experimental analyses have confirmed this claim. Saleem et al. (2024) found that, for instance, it is shown that effective governance systems encourage innovation and entrepreneurship, then these activities significantly increase GDP in the regions of the Middle East and North Africa (MENA) area. A meta-analysis was performed by Ugur (2024). It was likewise detailed. Institutional quality does highly affect the effect although entrepreneurship influences long-term growth in a positive way for this analysis's conclusion.

The primary force behind economic growth, in Schumpeter's view, is the entrepreneur, whose job it is to innovate. Investment in new information broadens the range of technological opportunities and improves one's capacity for forward-thinking, according to classical views. Therefore, it is possible to define entrepreneurial activity as the activity that involves the identification, assessment, and misuse of opportunities within a clearly defined framework. The way in which these opportunities are found and taken advantage of is related to the institutional setup of the nation or the individual (Shrivastava & Shrivastava, 2013).

Researchers studying international business are now examining the causes, traits, models, and theories of corruption as well as how it relates to legal frameworks and firm-level results as a result of globalization. Because it causes unfair competition, corruption is a worldwide issue that may either help or impede the adoption of international economic policies. Digital transformation adds to its complexity, which can both encourage new risks and act as a barrier to corruption (Iorio & Segnana, 2025). Countries had to seek to take risks by starting new businesses or working to renew and develop existing ones due to the increasing competition in the business environment and the significance for developing an innovative culture within the company in order to guarantee its survival and their continued existence. This is the origin of so-called entrepreneurship, which encourages innovation and ingenuity (Ward and Rashak, 2021).

Between the "grease-the-wheels" and "sand-in-the-wheels" theories, the literature on corruption's impact on innovation and entrepreneurship is still split. According to the former, organizations may be able to operate more easily in strict regulatory regimes by avoiding administrative hurdles caused by corruption. In their analysis of 48 developing nations between 2008 and 2016, Abd Rashid et al. (2023) discovered that while corruption does make it easier to enter markets with inadequate laws, it does so at the expense of

greater initial and ongoing transaction costs. Their results imply that although corruption could temporally encourage entrepreneurship, it eventually decreases company performance and market efficiency.

On the other hand, empirical research like that of Bai et al. (2024), who looked at executive-level corruption in Chinese companies, supports the "sand-in-the-wheels" viewpoint. Their research showed a strong inverse association between firm-level innovation and corruption, which was made worse by financial limitations. Corruption restricted innovation output by taking managerial focus and funds away from effective R&D initiatives. Although corruption has a negative impact on innovation, Kabadurmuş and Sylwester (2022) noted that this effect is less pronounced in competitive settings, suggesting that market competition may operate as a safeguard against institutional inefficiencies.

3. Hypotheses

An empirical study has been developed for the case of the BRICS countries—Brazil, Russia, India, China, and South Africa—for the years 2010–2023, taking into consideration the earlier analysis.

H1: *Innovation has a positive impact on economic growth.*

H2: *Entrepreneurship positively influences economic growth.*

H3: *Corruption negatively moderates the relationship between innovation and economic growth.*

H4: *Corruption negatively moderates the relationship between entrepreneurship and economic growth.*

H5: *FDI, political stability, and education positively affect economic growth.*

4. Research Data and Methodology

Data is sourced from the World Bank, Global Innovation Index, Global Entrepreneurship Monitor, UNCTAD, and IMF for the BRICS countries Brazil, Russia, India, China, and South Africa for the years 2010 to 2023. The variables used in this research study dependent variable economic growth and can be measured by GDP per capita growth (annual %), independent variables is Innovation Index, Entrepreneurship Index and can be measured by TEA, new business density and information and communication technologies, R&D expenditure respectively, the moderator is used in this study is Corruption Perceptions Index (CPI), the study also include some Control Variables which are FDI inflows (% of GDP), Political Stability Index, Education level. Generalized Least Squares (GLS) for cross-section heteroskedasticity and Panel Least Squares for fixed country-specific effects is used in this research study. The main issue this study attempts to answer is, how much does corruption moderate the effect of innovation and entrepreneurship on economic growth, and how is this relationship influenced by other economic

and institutional factors like foreign direct investment, political stability, and education.

Table 1: Variables And Their Description

Variable Name	Measure (How It's Quantified)	Source (Where the Data Comes From)
Innovation	Information and communication technologies (ICTs) R&D expenditure (% of GDP)	Global Innovation Index, World Bank
Entrepreneurship	Total Early-Stage Entrepreneurial Activity TEA New business density (new registrations per 1,000 people aged 15-64)	Global Entrepreneurship Monitor (GEM), World Bank
Economic Growth	GDP growth rate (%) GDP per capita (constant USD)	World Bank, IMF
Corruption (Moderator)	Corruption Perceptions Index (CPI)	Transparency International
Political Stability	Political Stability Index (Percentile Rank)	World Governance Indicators (WGI), World Bank
Foreign Direct Investment (FDI)	FDI inflows as % of GDP	UNCTAD, World Bank
Education Level	School enrollment, tertiary (gross)	World Bank, UNESCO

A moderated multiple regression (MMR) model is specified to investigate the conditional effects of corruption on the relationships between innovation, entrepreneurship, and economic growth while adjusting for political stability, education, and foreign direct investment (FDI) to empirically test the proposed hypotheses. The definition of the model is:

$$GDP\ Growth = \beta_0 + \beta_1(Innovation) + \beta_2(Entrepreneurship) + \beta_3(Corruption) + \beta_4(Innovation*Corruption) + \beta_5(Entrepreneurship*Corruption) + \beta_6(FDI) + \beta_7(Political\ Stability) + \beta_8(Education) + \varepsilon$$

5. Result and Discussion

To better understand the characteristics of the dataset and the distribution of variables included in the analysis, descriptive statistics were calculated for all key variables: GDP per capita, innovation, entrepreneurship, corruption, political stability, education, and foreign direct investment (FDI). Table 1 presents the number of observations, means, standard deviations, minimum and maximum values for each variable.

Table 2: Descriptive Statistics for Study Variables

Variable	Obs	Mean	Std. Dev	Min	Max
Dv1gdpperc~s	70	8027.39	4046.88	1347.52	15941.45
Ivinnov1gi~s	70	53.46	19.57	20.00	99.00
iventrenbd	70	4.57	3.62	0.08	12.78
m1cpirank	70	91.04	23.22	61.00	141.00
pscv	70	27.24	10.20	10.90	48.82
edu	70	44.54	21.18	16.58	84.52
fdicvofgdp	70	2.08	1.49	-1.76	9.66

Source: Authors Computation

The dependent variable in the study is GDP per capita (current US\$), which serves as a proxy for economic growth. The average GDP per capita in the sample is approximately \$8,027, with values ranging from \$1,347 to over \$15,941. This wide dispersion suggests a significant disparity in income levels across the observed countries, likely to reflect a sample that includes both emerging and advanced economies. Innovation is measured using an index (such as the Global Innovation Index or ICT performance indicators), with a mean value of 53.46. The observed range spans from 20 to 99, indicating substantial variation in innovation capacity across countries. This suggests the presence of both low- and high-performing innovation systems within the sample.

Entrepreneurship is represented by new business density or a similar metric, with an average of 4.57 and a wide range from 0.08 to 12.78 businesses per 1,000 people. These figures highlight the disparity in entrepreneurial activity, which is critical in evaluating its impact on economic development. Corruption is measured using the Corruption Perceptions Index (CPI) rank, where higher values denote greater perceived corruption. The mean CPI rank is 91.04, ranging from 61 (lower corruption) to 141 (higher corruption). The inclusion of this variable enables the study to examine how institutional quality, particularly the prevalence of corruption, moderates the effects of innovation and entrepreneurship on economic growth.

Political stability is incorporated as a control variable and has a mean score of 27.24, suggesting that the countries in the sample, on average, experience moderate levels of political stability. Political stability is a key institutional factor that can influence both innovation and investment decisions. Education, proxied by the percentage of enrollment in secondary or tertiary education, has an average value of 44.54%, with values ranging from 16.58% to 84.52%. This variation is expected to influence economic growth through human capital development. Foreign Direct Investment (FDI) inflows as a percentage of GDP average 2.08%, with some countries experiencing negative inflows and others receiving up to 9.66%. FDI is a well-established contributor to growth through technology transfer, innovation spillovers, and capital accumulation.

5.1. Correlation Analysis

In order to investigate the connections among the model's primary variables, a Pearson correlation matrix was generated (Table 2). This analysis provides preliminary insight into the strength and direction of linear associations among the dependent variable (GDP per capita) and the independent, moderating, and control variables.

Table 3: Correlation Matrix for Study Variables

Variable	dv1gdpperc ~s	ivinnov1gi ~s	iventrenb d	m1cpir ank	psev	edu	fdicvo fgdp
dv1gdpperc~s	1.0000						
ivinnov1gi~s	-0.8292	1.0000					
iventrenbd	0.2099	-0.2688	1.0000				
m1cpirank	0.2758	-0.2145	-0.3796	1.0000			
psev	0.2719	-0.3871	0.4648	-0.5460	1.0000		
edu	0.7406	-0.6336	-0.0926	0.5608	-0.2010	1.0000	
fdicvofgdp	0.0330	0.0535	-0.0358	-0.1949	0.094	-	1.0000
						0.0238	

Source: Authors Computation

The correlation matrix provides preliminary evidence supporting the theoretical framework of this study. GDP per capita is significantly related to education, corruption, political stability, and innovation, aligning with institutional and endogenous growth theory. However, some unexpected directions in correlation—particularly the negative sign between innovation

and GDP—highlight the need for further econometric testing and potentially, rescaling or transformation of select variables.

5.2. Assessment of Multicollinearity

To determine whether multicollinearity existed among the independent variables, a Variance Inflation Factor (VIF) test was performed before generating the regression model. For every variable in the model, the VIF values are shown in Table 3. As shown, the highest VIF value is associated with Innovation Index (VIF = 3.48), followed by Education (VIF = 2.97), and Political Stability (VIF = 2.75). All other variables, including Corruption (CPI Rank) (VIF = 2.40), Entrepreneurship (VIF = 1.42), and FDI (% of GDP) (VIF = 1.08), fall well below the commonly accepted thresholds.

Table 4: VIF Variance Inflation Factor

Variable	VIF	1/VIF
ivinnov1gi~s	3.48	0.287588
edu	2.97	0.336346
pscv	2.75	0.363519
m1cpirank	2.40	0.417200
iventrenbd	1.42	0.702503
fdcvofgdp	1.08	0.926168
Mean VIF	2.35	

Source: Authors Computation

These results are consistent with the general econometric guideline that VIF values below 5 indicate no significant multicollinearity problem (Gujarati & Porter, 2009). More conservative thresholds (e.g., VIF < 10) are also well respected in this case. Therefore, it can be confidently stated that multicollinearity does not pose a threat to the reliability or interpretability of the regression estimates in this study. The relatively low mean VIF of 2.35 further reinforces the stability of the model and indicates that the included explanatory variables—despite being theoretically related (e.g., education and innovation)—contribute unique and non-redundant information to the analysis. This supports the use of moderated multiple regression, allowing for robust estimation of both main and interaction effects without the risk of coefficient inflation due to inter-variable correlation.

To examine the impact of innovation and entrepreneurship on economic growth and to evaluate the moderating role of corruption, a Random Effects Generalized Least Squares (GLS) model was estimated using panel data from five country groups across 70 observations. The dependent variable is GDP per capita (current US\$). The key explanatory variables include innovation and entrepreneurship, with corruption operationalized

both as a direct effect (CPI rank) and through interaction terms: Innovation \times Corruption (innoictcorrup) and Entrepreneurship \times Corruption (enternbdcorru). Control variables include political stability, education, and foreign direct investment (FDI). An overall R-squared of 0.8039 indicates that the model has significant explanatory power, explaining approximately 80.4% of the variation in GDP per capita. The model's combined statistical significance is confirmed by the Wald chi-square test ($\chi^2 = 250.06, p < 0.001$).

Table 5: Regression Results for GDP per Capita

Dv1gdppercapi~s	Coefficient	St. Err.	z	P. z	[95%conf.	Interval]
ivinnov1giiicts	-83.91839	22.01177	-3.81	0.000	-127.0607	-40.77611
iventrenbd	81.98	76.44	1.07	.283	-67.83326	231.7914
m1cpirank	10.10	15.59	0.65	.517	-20.44822	40.64768
enternbdcorrup	0.95	1.02	0.93	.351	-1.046658	2.950249
innoictcorrup	0.20	0.14	1.47	.141	-.0668878	.4693422
psev	80.37	37.48	2.14	.032	6.911173	153.8214
edu	95.78	31.18	3.07	.002	59.09382	132.473
fdicvofgdp	170.40	85.00	2.00	.046	-154.9581	495.7495
_cons	3083.85	3346.16	0.92	.357	-3474.508	9642.211
R-squared	0.2624					
Wald chi2(8)	250.06					
Number of Obs	70					

Innovation shows a significant negative effect on GDP per capita ($\beta = -83.92, z = -3.81, p < 0.001$). This finding contradicts the conventional expectation that innovation leads to higher economic growth. A possible explanation lies in the type or measurement of innovation used—perhaps focusing more on inputs or frameworks than on actual economic output. Additionally, in less developed contexts, innovation may not yet be fully commercialized or absorbed into the broader economy. Therefore, H1 is not supported.

Entrepreneurship shows a positive but statistically insignificant effect on GDP per capita ($\beta = 81.98, p = 0.283$). This indicates that, although

entrepreneurship may contribute to growth, the effect is not strong or consistent enough across the panel sample to yield statistical significance.

Variability in the quality of entrepreneurial ventures and regulatory environments across countries could explain this result. H2 is not supported. The direct effect of corruption, proxied by the CPI rank (*m1cpirank*), is positive but insignificant ($\beta = 10.10$, $p = 0.517$), suggesting that corruption alone does not significantly determine growth. The focus, however, is on its moderating role. The interaction term Innovation \times Corruption (*innoictcorrup*) is positive but not statistically significant ($\beta = 0.201$, $p = 0.141$). While the direction of the coefficient suggests that corruption may soften the negative effect of innovation on economic growth (i.e., a *grease-the-wheels* effect), the lack of significance implies that this interaction is not strong enough to confirm a moderate effect. Hence, H3 is not supported. Similarly, the interaction term Entrepreneurship \times Corruption (*enternbdcorru*) is positive and insignificant ($\beta = 0.952$, $p = 0.351$). This result does not support the hypothesis that corruption weakens the positive influence of entrepreneurship on growth. In fact, the positive coefficient suggests the opposite direction, albeit without statistical support. Therefore, H4 is also not supported.

Among the control variables, Political Stability shows a positive and statistically significant effect on GDP per capita ($\beta = 80.37$, $p = 0.032$), supporting the argument that stable political institutions foster economic development by reducing uncertainty and enhancing investor confidence. Education has a strong positive and highly significant effect ($\beta = 95.78$, $p < 0.001$), reinforcing its central role in promoting human capital accumulation and long-term economic productivity. FDI (% of GDP) is positive but not statistically significant ($\beta = 170.40$, $p = 0.305$). While this suggests a potential contribution of capital inflows to growth, the inconsistency of FDI impacts across countries (depending on absorptive capacity and sectoral focus) may explain the lack of significance. Thus, H5 is partially supported: political stability and education significantly affect economic growth, while FDI does not show a statistically significant effect in this model.

6. Conclusion of Empirical Findings

The purpose of this study was to investigate how corruption may moderate the relationship between entrepreneurship, innovation, and economic growth in the BRICS countries between 2010 and 2023. Using panel data and a moderated multiple regression model, critical variables were investigated, including innovation and entrepreneurship as predictors, corruption as moderator, and FDI, education, and political stability as control variables. Contrary to classical and Schumpeterian growth ideas, the results demonstrate that innovation significantly hampered economic growth

(Schumpeter, 1934; Galindo & Méndez, 2014). This might be because innovative inputs don't result in economic output, particularly in poor countries where innovation ecosystems and commercialisation channels aren't as developed (Ugur, 2024; Saleem et al., 2024).

Economic growth and entrepreneurship had a positive but statistically insignificant connection, indicating that the BRICS countries' contributions to entrepreneurship varied (Dhaliwal, 2016; Huggins et al., 2015). This is consistent with other research showing that the kind and caliber of entrepreneurial activity, especially whether it is motivated by necessity or opportunity, has a significant impact on the economy (Saberri & Hamdan, 2019). Contrary to previous beliefs about its "grease-the-wheels" or "sand-in-the-wheels" impacts, corruption did not significantly attenuate the benefits of either innovation or entrepreneurship (Abd Rashid et al., 2023; Bai et al., 2024). The heterogeneous and context-dependent character of corruption's institutional role was confirmed by the lack of statistical significance of interaction coefficients, despite their suggestion of possible moderating behavior (Kabadurmuş & Sylwester, 2022).

Political stability and education were two of the control factors that significantly and favorably affected GDP per capita. By lowering uncertainty and promoting the development of human capital, these institutional characteristics are critical to long-term economic growth, according to a wealth of research (Galindo & Méndez-Picazo, 2013; Bilan & Apostoaie, 2025). On the other hand, the lack of statistical significance in FDI inflows may be due to differences in the BRICS's sectoral investment priorities and absorptive ability (Pradhan et al., 2020).

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