

Institutional Quality, Human Capital, and Economic Growth: Evidence from a Panel of Developing Countries

HICHAM GOUMRHAR

*Ibnou Zohr University-Agadir, Morocco **

SAFAE AKODAD

*Mohammed V University of Rabat, Morocco **

This paper examines the combined impact of human capital and institutional quality on economic growth, using data from a panel of 62 developing countries between 2000 and 2020. Addressing heterogeneity and endogeneity using Panel-Corrected Standard Errors and dynamic System-GMM estimations, the results demonstrate that both education and institutional have a positive impact on economic growth, whether measured in aggregate or disaggregated forms.

A key finding is the complementary interaction between human capital and institutional. Education significantly promotes growth in upper-middle- and high-income countries with strong institutions, but has a weak or even negative effect in low-income countries with weak governance, suggesting the presence of institutional thresholds.

These results emphasise the vital role of institutions, such as property rights, political stability, regulatory quality, bureaucratic efficiency and corruption control, in enabling human capital to generate sustainable growth. The study underscores the need to align education policies with institutional reforms in developing economies.

Keywords: Institutions, Human capital, Economic growth, Development, Panel data

JEL Classifications: B25, O47, C31

1 Introduction

The role of institutions in shaping the relationship between human capital and economic growth has become a central question in the fields of development and transition economics. The origins of this debate can be traced back to the seminal contribution of Solow (1956), whose growth accounting framework demonstrated that capital accumulation alone cannot fully explain economic growth, leaving a substantial unexplained component, commonly referred to

*Gourmhar: Corresponding author: hichamkgourmhar@gmail.com; Akodad: s.akodad@gmail.com

© 2026 Hicham Goumrhar and Safae Akodad. Licensed under the Creative Commons Attribution - Noncommercial 4.0 Licence (<http://creativecommons.org/licenses/by-nc/4.0/>). Available at <http://rofea.org>.

as the Solow residual, attributed to technological progress. Subsequent developments in endogenous growth theory have sought to explain this residual by emphasizing the roles of human capital, innovation, and knowledge accumulation. More recently, the institutional literature, notably North (1990) and Acemoglu et al., (2001), has further extended this perspective by arguing that economic performance depends critically on the quality of institutions, which shape the incentives and conditions under which human capital can effectively contribute to sustained growth.

Education is widely recognised as a fundamental driver of productivity and innovation, and is considered to be a key component of human capital. However, the efficacy of this approach is contingent upon the prevailing institutional environment. The development of robust and inclusive institutions is conducive to the accumulation of knowledge, primarily by ensuring the security of property rights, facilitating equitable access to education, and mitigating distortions such as corruption and political instability. Conversely, weak institutions may divert human capital towards unproductive or rent-seeking activities, thereby reducing its contribution to growth (North, 1990; Hall and Jones, 1999; Acemoglu et al., 2001).

This paper contributes to the existing literature by empirically examining the interaction between institutional quality and human capital in a sample of 62 developing countries over the period 2000–2020. The analysis draws on data from Barro and Lee (2021) and Kaufmann et al. (2010). Using both Panel-Corrected Standard Errors (PCSE) and dynamic System-GMM estimations, the study investigates the conditional nature of education-led growth within different institutional contexts. In contrast to the existing literature, this paper explicitly focuses on the complementarity between institutional quality and human capital and examines how this relationship varies across income groups.

The central research question is: To what extent does institutional quality shape the growth effects of human capital in developing countries? The objective is to move beyond the debate on whether institutions or human capital matter more, and instead, to identify the conditions under which they act as mutually reinforcing drivers of economic growth.

This study adopts a positivist paradigm and relies on quantitative methods. It follows a hypothetico-deductive approach based on the formulation of hypotheses that are then tested against observed data. This methodological framework allows for the identification and quantification of the impact of institutions on the relationship between human capital and economic growth, while ensuring an objective interpretation of the results.

In light of the above, the paper is organized into three main sections. The first section provides a concise review of the theoretical and empirical literature, with the aim of clarifying the research topic and positioning the study within the literature on the institutions-human capital-growth nexus. The second section presents the methodological framework and research design adopted in this study. The third section provides the empirical analysis, focusing on the estimation, interpretation, and discussion of the relationship between institutions (both

aggregated and disaggregated), human capital, and economic growth, using recent econometric techniques.

2 Literature Review

The identification of the determinants of economic growth remains a contentious issue. Since the seminal work of A. Smith (1776), numerous economists have focused on the concept of growth. The Harrod-Domar model (Domar 1946; Harrod 1939) was the first formalised economic growth model, paving the way for other modern growth models, particularly Solow's (1956), which introduced the concept of technical progress as a long-term exogenous growth factor. Moreover, the advent of endogenous growth theories is indicative of a conceptual evolution in the growth process, primarily attributable to novel approaches initiated in the context of the Lucas (1988) and Romer (1986, 1990) models, which situate human capital at the core of this process.

The integration of economic motivations induced by education and the impact that the accumulation of knowledge can have on growth and economic development has been a key highlight of endogenous growth models. These models have primarily emphasised the human capital factor as a necessary, if not sufficient, condition for sustained growth (see Romer, 1986; Lucas, 1988; Mankiw, Romer and Weil, 1992; Barro and Sala-i-Martin, 1995; Islam, 1995).

However, an analysis of the growth and development phases of different countries, particularly developing ones, reveals divergences. This is despite the fact that these models have added yet another brick to the foundation of growth theory. This has led to the necessity to consider additional variables, notably institutional ones, in order to provide a substantial justification for the unexplained discrepancies. In this regard, the new institutional economics (NIE) considers institutions to be endogenous variables in the process of economic growth (North, 1993; Williamson, 2000). Consequently, the institutions that engender a conducive environment are pivotal to growth, insofar as they fulfil an effective role in the organisation of transactions and the stimulation of investment. In his seminal work, North (1990) offers a comprehensive definition of institutions, characterising them as "the rules of the game in a society, or, more formally, the humanly devised constraints that shape human interactions." Consequently, they structure incentives in human exchanges, whether political, social, or economic" (North, 1990; p. 3).

From this standpoint, the seminal works of Mauro (1995), Knack and Keefer (1995) were among the first to utilise pertinent indicators to gauge institutional quality. Subsequent empirical studies have been developed on the basis of institutional variables, including democracy (Barro, 1997), political instability (Alesina and Perotti, 1996), property rights (Clague et al., 1996), and good governance (Rodrik, 1999). A substantial corpus of research has corroborated the impact of institutional quality on the correlation between human capital

and economic growth. Indeed, the extant theoretical foundations and empirical work clearly affirm the role of institutional quality in the process of human capital accumulation, and consequently its effect on growth (Acemoglu et al., 2014; North, 1990, 1993; Romer, 1986). Recent evidence indicates that institutional effects frequently manifest as non-linear phenomena. Acquah et al. (2023) demonstrate that threshold effects are present, indicating that the positive and significant impact of institutional quality on growth is only realised once a minimum institutional level has been attained.

While early growth theories placed emphasis on capital accumulation and technical progress, contemporary research highlights the complementary yet distinct roles of human capital and institutional quality: The concept of human capital, which is primarily shaped by education and skill development, has been demonstrated to directly enhance productivity and foster innovation. In contrast, institutions are responsible for establishing the framework that determines the efficiency of human capital investment. This is achieved through the assurance of equitable access to education, the protection of property rights, and the cultivation of an environment conducive to innovation and entrepreneurship. In the absence of robust institutions, even substantial investments in human capital may not result in sustainable growth, as evidenced by cases where corruption, political instability, or ineffective governance impede the effective utilisation of skilled labour.

A system characterised by the presence of good institutions has the capacity to contribute directly and indirectly to the creation of conditions that are conducive to the accumulation of human capital. Conversely, a quality education system has the capacity to contribute to the establishment of good institutions. The study by Mauro (1998) demonstrated, on the basis of empirical evidence, that corruption has a detrimental effect on expenditure in the domains of education and health. This assertion is further substantiated by the findings of Martinez et al. (2005), which demonstrate that corruption, in addition to its direct impact on economic growth, exerts an indirect influence on the accumulation of human capital. Additionally, institutions wield considerable influence over enrolment rates through democratic processes. The presence of a democratic system fosters the development and promotion of human capital accumulation through the implementation of public policies that prioritize educational initiatives (Kaufmann, 2001; Saint Paul and Verdier, 1993). In this regard, Dianda et al. (2025) further demonstrate that economic freedom exerts differentiated effects on human capital: while certain dimensions, such as openness to trade, may foster education and skills accumulation, others, like deregulated labor markets, can exacerbate inequalities in access to education.

Nana Kuindja et al. (2020) examine the role of human capital in the relationship between institutional quality and financial development in Sub-Saharan African countries over the period 2000–2018. Using dynamic panel estimations based on the Generalized Method of Moments (GMM) for a sample of 36 countries, the authors show that institutional quality alone is not sufficient to promote financial development. Their findings highlight the importance of

complementing governance reforms with investments in human capital, as both act as key drivers of financial development. In this context, corruption, particularly in public procurement processes, remains a major constraint, often involving the misappropriation of public funds and the misuse of public assets. These challenges underline the need for effective public policies and increased competition among financial institutions, supported by stronger human capital development, to improve access to finance and support economic development in the region.

Wandeda et al. (2021) analyze the impact of institutional quality on economic development in Sub-Saharan African countries over the period 2006-2018. Using a dynamic panel approach based on the Generalized Method of Moments (GMM), they show that institutional quality has a positive and significant effect on economic development. However, the magnitude of this effect varies across countries, depending on geographic conditions and resource endowments. These findings suggest that strengthening institutions, particularly those that support democratic governance, civil liberties, and citizen participation, can play a key role in promoting sustainable development in the region.

Using panel data for the period 1996–2018, Ouedraogo et al. (2022) highlight the important role of institutional quality in human capital development. Their empirical results show that improvements in government effectiveness, control of corruption, and political stability significantly enhance access to primary, secondary, and tertiary education, particularly for girls and women, across Sub-Saharan African countries.

Danta and Rath (2024) show that institutional quality and human capital play a key role in fostering innovation, particularly in Asian economies. Their findings indicate that countries with strong institutions and effective human capital development strategies are more likely to achieve sustained innovation and economic dynamism. Similarly, Bethencourt and Perera-Tallo (2024) emphasize the importance of public services, especially education and health systems, in enhancing human capital productivity and strengthening institutional effectiveness.

Recent empirical research focusing on Sub-Saharan Africa provides additional insights into the joint role of human capital and institutional quality in shaping development outcomes. Adeleye (2023) investigates the interaction between these two factors and their impact on income inequality in the region. The findings reveal that while human capital accumulation alone does not always guarantee equitable outcomes, its interaction with strong institutional frameworks significantly reduces inequality levels. This result suggests that effective institutions are essential in channeling the benefits of education and skills development towards broader social inclusion, thereby mitigating the persistence of structural disparities across African economies.

A more recent study by Ofori et al. (2024) of 43 African countries covering the period 2005-2020 employs a System GMM estimation to assess the combined effects of human capital development and institutional quality on inclusive growth. The analysis underscores a nuanced dynamic: although human capital exerts a positive effect on inclusive growth, the presence of

weak or poor-quality institutions has the potential to offset or even neutralize this impact. Conversely, the presence of robust governance mechanisms serves to amplify the contribution of education and skills to inclusive development. This underscores the importance of aligning institutional reforms with investments in human capital to achieve sustainable and inclusive growth trajectories in the African context.

The interaction between human capital and institutional quality highlights the need for a dual approach to economic development. Education enhances individual capabilities and fosters technological progress, while institutions provide the enabling environment that allows these capabilities to translate into sustained economic outcomes. Evidence suggests that the combined implementation of inclusive education policies and strong governance frameworks, including the rule of law, is associated with higher and more equitable economic growth across countries. These findings underscore the importance for policymakers of adopting a holistic strategy that integrates investments in human capital with institutional reforms to promote long-term prosperity.

The dynamic relationship between human capital and institutional quality remains a key determinant of economic growth. While early economic theories emphasized capital accumulation and technological progress, recent research highlights the role of strong institutions in enhancing the returns to education. Empirical evidence further shows that high-quality institutions not only encourage human capital investment but also ensure its efficient use, thereby supporting long-term economic growth.

3 Data and Methodological Approach

3.1 Theoretical Analysis Model

We build our theoretical model of analysis on Islam (1995) and apply panel data estimates, which control country-specific effects more effectively than cross-sectional data. The model developed by Islam (1995) is a modified version of the neoclassical growth model, augmented by the inclusion of human capital as in Mankiw, Romer and Weil (1992).

Based on the Cobb-Douglas production function as in MRW in which production is the endogenous variable (Y_t) depending on the labor factor (L), technical progress (A), physical capital (K) and human capital (H):

$$Y_t = K_t^\alpha H_t^\beta (A_t L_t)^{1-\alpha-\beta} \quad (1a)$$

we express the level of output and the stocks of physical and human capital per effective work unit in the following form:

$$y_t = k_t^\alpha h_t^\beta \quad (1b)$$

with: $y_t = Y_t/(A_t L_t)$; $h_t = H_t/(A_t L_t)$ and $k_t = K_t/(A_t L_t)$

The economy converges to the following steady state:

$$\begin{cases} k^* = \frac{s_k^{1-\beta} s_h^\beta}{n+g+\delta}^{1/(1-\alpha-\beta)} \\ h^* = \frac{s_h^{1-\alpha} s_k^\alpha}{n+g+\delta}^{1/(1-\alpha-\beta)} \end{cases} \quad (2a)$$

$$(2b)$$

where: g is the exogenous rate of technical progress ; n : rate of demographic growth ; δ : rate of depreciation of physical capital and s_h and s_k represent the fraction of income invested in human and physical capital, respectively.

Substituting the steady-state values of physical and human capital into the production function does not directly yield the empirical specification. Instead, following MRW (1992), we derive the steady-state relationship by log linearizing the model around its equilibrium¹. This leads to the following expression for steady-state income per effective worker:

$$\ln(y_t) = \ln A(0) + g_t + \frac{\alpha}{1-\alpha-\beta} \ln(s_h) + \frac{\beta}{1-\alpha-\beta} \ln(s_k) - \frac{\alpha+\beta}{1-\alpha-\beta} \ln(n+g+\delta) \quad (3)$$

Islam (1995) estimates this equation using panel data in order to control for individual effects between countries. In Solow's (1956) model, (A) stands for technical progress and any other variable that may influence factor productivity. Following the institutional literature, notably North (1990) and Acemoglu et al., (2001), assume that institutional quality is a key determinant of productivity. Therefore, we introduce (Z) as a proxy for institutions affecting (A). Thus, we obtain the following equation:

$$\begin{aligned} \ln(y_{it}) - \ln(y_{it-1}) &= \mu_i + \beta_1 \ln(y_{it-1}) + \beta_2 \ln(Sh_{it}) + \beta_3 \ln(Sk_{it}) - \beta_4 \\ &\ln(n+g+\delta)_{it} + \beta_5 \ln(Z_{it}) + \eta_t + \varepsilon_{it} \end{aligned} \quad (4)$$

with y_{it} : real per capita income; y_{it-1} : the initial value of real per capita income; s_k, s_h : investment rates in physical and human capital; g, n and δ : are, respectively, the rate of exogenous technical progress, the rate of demographic growth and the rate of depreciation of physical capital; β_j are parameters; μ_i and η_t : represent specific individual and temporal effects.

¹ A detailed derivation of this equation can be found in MRW (1992, Section II) and Islam (1995), who extends the framework to panel data in order to control for country-specific effects.

3.2 Empirical Analysis Model: Data and Variables

The data used in this study are annual and cover the period 2000-2020 for a sample of 62 developing countries, with a good representation of African countries, particularly sub-Saharan Africa. As a result, we have an overall sample of 1302 observations, which we have then grouped into three sub-samples, according to the income level of the countries, on the basis of the World Bank definition: low-income developing countries, lower-middle-income countries and upper-middle-income and high-income countries. The purpose of this breakdown is to detect the differentiated effect that human capital, through education, and the quality of institutions could have on economic growth in each group of countries. In addition, the countries selected are those for which data was available and regular throughout the period. Thus, we observed all individuals on the same date, with no missing observations (cylindrical model).

In addition, given the structure of the data and the underlying tests (correlation analysis for multicollinearity; Pesaran (2015) test for cross-sectional dependence; unit-root tests (IPS) for stationarity; Westerlund (2007) and Pedroni (1999, 2004) panel cointegration tests), we use the Panel-Corrected Standard Errors (PCSE) estimator. This model has the advantage of being able to cope with problems relating to: *(i)* the correlation of residuals, known as contemporaneous correlation (that is residuals correlated across countries during the same period), Robert and Franzese (1996); *(ii)* the variance of errors (unit level heteroskedasticity), (Bailey and Katz (2011)). Problems that may involve inefficient coefficient estimates with inconsistent standard errors.

In addition, and in order to better control the endogeneity problems from which most variables in panel data suffer, particularly in the case of analyses of growth models, we have also used instrumental variable methods, in particular the method of generalized moments (GMM) of Arellano and Bond (1991) in dynamic panels. The use of dynamic models, and even autoregressive models, makes it possible to take better account of the staggered effects of growth-promoting policy decisions, which often do not have immediate effects on the economy. Our empirical estimation model had developed as follows:

$$\begin{aligned} \text{Ln}(GDPPC_{it}) = & \beta_0 + \beta_1 \ln(GDPPC_{it-1}) + \beta_2 \ln(GFCF_{it}) + \beta_3 \ln(Educ_{it}) + \\ & \beta_4 \ln(FDI_{it}) - \beta_5 \ln(n + g + \delta)_{it} + \beta_6 \ln(institution_{it}) \\ & + \beta_7 (Institut_{it} \times Hum_{it}) + \alpha_i + \eta_t + \mu_{it} \end{aligned} \quad (5)$$

where α_i and η_t are the specific individual and temporal effects. μ_{it} is the residual of the model. $GDPPC_{it}$ is GDP per capita, measure used in the work of (Islam (1995); Nasreen and Anwar (2015)), in purchasing power parity (PPP) at constant prices, base 2017 in logarithm (from the PWT database, version 10.0). $GDPPC_{it-1}$ is the lagged value of GDP/capita. $GFCF_{it}$

is gross fixed capital formation, expressed as a percentage of GDP, serves as a proxy for physical capital and is drawn from the World Bank database (WDI, 2021). We deploy population growth rates (15-64 years) calculated from total population data available in (*PWT, V.10*), as a measure of n . However, following *MRW* (1992), we take $g + \delta$ equal to 0.05 and assume that this value is the same for all countries and all years. Thus, the variable $n + g + \delta$ is obtained by adding 0.05 to population growth (Islam, 1995).

For our variables of interest, we used the average number of years of schooling as a measure of human capital (Barro and Lee, 2021).² This measure is widely used in the literature, notably in the studies of (Barro and Sala-i-Martin (1995), Barro (1997; 2001), Benhabib and Spiegel (1994), Gundlach (1996), Islam (1995), Krueger and Lindahl (2001)). As for the quality of institutions, it was approached by the six institutional indicators (Acemoglu et al. (2014), Nasreen et al. (2015)), with reference to the work of Kaufmann et al. (2010): Voice and accountability; political stability; Government effectiveness; Regulatory quality; Rule of law; Control of corruption (Global Governance Indicators, 2021). We enrich this specification by including additional control variables, such as foreign direct investment (FDI) net inflows as a percentage of GDP (WDI, 2021). $Institut_{it} \times Hum_{it}$ is the interactive term between investment in human capital and the quality of institutions (Uddin, M.A., et al. (2020)). A positive coefficient implies the existence of a complementarity effect between the two components.

4 Results and Discussions

We present estimates for the entire sample (62 developing countries), then for each country category.³ Concerning our institutional variables, we draw inspiration from the study by Kaufmann, Kraay and Mastruzzi (2007), which emphasizes both the individual and aggregate assessment of institutional quality. Accordingly, we first examine the effects of six institutional indicators separately, as they capture distinct dimensions of governance.

We then construct a composite index, named *institute_index*, to provide an overall measure of institutional performance. Prior to aggregation, it is imperative that each variable undergoes a process of normalization to ensure the comparability of data across dimensions. The

² "...Education level is clearly a stock variable and it takes into account the total amount of formal education received by the working population" (L. Wößmann, 2003, p.245).

³ Upper-middle and high-income developing countries (28): Albania, Argentina, Armenia, Bahrain, Brazil, Cambodia, Chile, China, Colombia, Dominican Republic, Ecuador, Indonesia, Jamaica, Jordan, Kazakhstan, Kuwait, Malaysia, Maurice, Mexico, Namibia, Panama, Peru, South Africa, Sudan, Thailand, Tunisia, Turkey, Uruguay.

Lower-middle income developing countries (24): Bolivia, Cameroon, Congo. Rep., Ivory Coast, Egypt. Arab Rep., El Salvador, Ghana, Guatemala, Haiti, Honduras, India, Mauritania, Mongolia, Morocco, Nepal, Nicaragua, Pakistan, Philippines, Algeria, Benin, Senegal, Tanzania, Ukraine, Vietnam.

Low-income developing countries (10): Bangladesh, Central African Republic, Gabon, Kenya, Mali, Mozambique, Niger, Rwanda, Uganda, Zimbabwe.

composite index is subsequently computed as the average of the six normalized indicators, assigning equal weights to each component in line with Kaufmann et al. (2007), as no a priori assumption is made regarding their relative importance. This synthetic measure facilitates the capture of the overall quality of institutions and the provision of a comprehensive assessment of governance and institutional performance. In addition, prior to the estimation process, the results of the primary tests conducted to assess the model's robustness and selection are presented. (Table 1).

The results in Table 1 show that the Fisher and Hausman tests report a statistic with a probability of less than 5 percent, allowing us to accept the alternative hypothesis of the presence of specific effects with the presence of a correlation between the said effects and the explanatory variables in the model. Similarly, the Breusch Pagan and modified Wald tests indicate a probability (<0.05), which confirms the presence of heteroscedasticity in the residuals in our case. Furthermore, the tests for normality and autocorrelation of the errors (*Skewness and Kurtosis tests and Wooldridge test*) reveal a statistic (>1.96), which proves that the errors do not obey a normal distribution with significant autocorrelation of the residuals.

Analysis of the correlation matrix, which is a relevant tool for assessing the possible presence of multicollinearity, indicates that the correlations between the independent variables are relatively low (generally between -0.4 and 0.4). However, although pairwise correlations are relatively low, institutional indicators capture closely related dimensions of governance and may generate multicollinearity when included jointly. Therefore, we estimate separate specifications to isolate their individual effects⁴.

Table 1. Robustness tests and model choice

<i>Fisher test</i>	126.52 (0.000)
<i>Hausman test (test cross-section random effects)</i>	243.18 (0.000)
<i>Breusch Pagan test</i>	12661.59 (0.000)
<i>Modified Wald test</i>	30366.78 (0.000)
<i>Chi2 Normality test (Skewness and Kurtosis tests)</i>	16.01 (0.0003)
<i>Error Autocorrelation Test (Wooldridge Test)</i>	119.197 (0.000)
<i>Pesaran test (Cross-sectional dependence)</i>	33.482 (0.000)
<i>Im, Pesaran and Shin, IPS (Unit root test for stationarity)</i>	0.4626 (0.678)
<i>Hadri test (for stationarity)</i>	21.4659 (0.000)
<i>Pedroni residual cointegration test (Panel ADF-statistic)</i>	-2.5941 (0.0047)

Source: compiled by the authors using Stata 18.0 and Eviews 12. The reported values correspond to the econometric test statistics, while the values in parentheses (.) indicate the associated probabilities (p-values).

⁴ To avoid problems of multi-collinearity, we estimated the model for each institutional variable separately using stepwise regression (Hocking, 1976).

Analysis of the relationship between the variables reveals a number of measurement problems, in particular the problem of cross-sectional dependence (p-value of the Pesaran test <0.05), the problem of non-stationarity (the IPS test indicates a value greater than 5 percent).⁵ In addition, analysis of the Pedroni cointegration test suggests the existence of a cointegrating relationship between the variables (the alternative hypothesis H1 is accepted). This indicates that there is a long-term link between these variables, which therefore justifies the use of the Panel - Corrected Standard Errors (PCSE) estimator.

Our investigations (Table 2) reveal, firstly, a positive and significant impact of our variables of interest, notably the quality of institutions and human capital via education, on GDP per capita for the sample as a whole. We note that a unit increase in education and institutional quality is explicitly associated with an increase of 1.28 points and 0.56 points respectively in GDP per capita (see model 1, table 2). This finding implies that a high number of years of schooling and a favorable institutional environment could contribute to the economic performance of developing countries. This result corroborates those of Bhattacharyya (2009); Dias and Tebaldi (2012); Mamoon and Murshed (2009), and Akther and al (2019).

Similarly, the estimation results indicate that each institutional indicator exerts a positive and significant effect on economic growth. As reported in Table 2 (Models 2-7), the coefficients associated with institutional variables, such as voice and accountability, government effectiveness, regulatory quality, and control of corruption, are positive and statistically significant for developing countries over the period 2000–2020. These findings remain robust after addressing potential endogeneity concerns (see Table 3).

Overall, the results suggest that institutional quality plays a key role in enhancing productivity and, consequently, in driving long-term economic growth in developing economies. This evidence is consistent with previous studies, including Acemoglu et al. (2014), Bhattacharyya (2009), Dawson (1998), and Nasreen and Anwar (2015).

Good quality institutions help to protect property rights, enforce contracts and provide a stable and predictable political, legal and regulatory environment. They can also have an effect on improving education, reducing inequality and lowering public consumption, which could increase economic growth (Helliwell, 1992; Tavares and Wacziarg, 2001). Similarly, for businesses, a fair and transparent environment allows them to plan better, innovate and invest for the future with confidence (Acemoglu et al. 2003; Knack and Keefer, 1995; Rodrik, 1999; 2000; Stein and Daude, 2007). Conversely, low-quality institutions can lead to more corruption, inefficiency and discouragement of investment (Gupta et al., 1998; 2001; Reinikka and Svensson, 2005; Rogers, 2008).

⁵ The Hadri test also corroborates this finding, with a p-value of less than 0.05. All our variables are stationary in first difference I (1), which led us to also test for cointegration.

Table 2. Estimates for the entire sample (Estimate Panel-Corrected-Standard-Errors PCSE)

Dependent variable: logarithm of GDP per capita PPP (constant prices, base 2017)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\ln(\text{GFCF}_{it})$	0.254*** (0.039)	0.342*** (0.045)	0.278*** (0.046)	0.218*** (0.033)	0.249*** (0.035)	0.180*** (0.036)	0.282*** (0.043)
$\ln(\text{FDI}_{it})$	0.013 (0.015)	0.019 (0.017)	-0.0006 (0.014)	-0.0007 (0.014)	-0.015 (0.015)	0.006 (0.015)	0.007 (0.016)
$\ln(\text{Educ}_{it})$	1.286*** (0.062)	1.469*** (0.080)	1.452*** (0.070)	1.168*** (0.052)	1.288*** (0.064)	1.339*** (0.064)	1.362*** (0.076)
$\ln(\text{POP}_{it})$	0.0005 (0.004)	-0.022*** (0.004)	0.013* (0.007)	-0.040*** (0.004)	-0.010** (0.004)	-0.01*** (0.004)	-0.006 (0.004)
$\text{Institut_Index}_{it}$	0.568*** (0.018)	--	--	--	--	--	--
Var1_instit_{it}	--	0.177*** (0.014)	--	--	--	--	--
Var2_instit_{it}	--	--	0.210*** (0.027)	--	--	--	--
Var3_instit_{it}	--	--	--	0.597*** (0.011)	--	--	--
Var4_instit_{it}	--	--	--	--	0.495*** (0.016)	--	--
Var5_instit_{it}	--	--	--	--	--	0.505*** (0.011)	--
Var6_instit_{it}	--	--	--	--	--	--	0.503*** (0.018)
Constant	5.669*** (0.183)	4.919*** (0.238)	5.116*** (0.211)	6.084*** (0.141)	5.618*** (0.181)	5.830*** (0.175)	5.461*** (0.214)
Nbr of obs.	1214	1214	1214	1214	1214	1214	1214
Nbr of groups	60	60	60	60	60	60	60
R-squared	0.655	0.586	0.592	0.684	0.653	0.659	0.656
Wald chi2	3115.32	3067.64	4105.52	4388.62	2515.99	3605.62	2408.01
Prob > chi2	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' calculations using Stata 18.0; Note: * coefficient significant at 10 percent; ** coefficient significant at 5 percent; *** coefficient significant at 1 percent; (.) : corrected standard deviations. Var1_instit: Voice and Accountability; Var2_instit: Political Stability and Absence of Violence/Terrorism; Var3_instit: Government Effectiveness; Var4_instit: Regulatory Quality; Var5_instit: Rule of Law; Var6_instit: Control of Corruption; Institut_Index: synthetic index of institutional variables.

Thus, the exodus of skilled human capital intensifies in countries that are politically unstable, bureaucratic, have a highly corrupt system and whose government does not provide its services transparently and efficiently (Kaufmann and Hellman, 2001; Martinez et al. 2005).

Furthermore, to address the endogeneity issues affecting specific variables in our model, notably our variables of interest, namely, education and institutional quality, we employed methodologies rooted in instrumental variables. More specifically, we utilized the generalized method of moments (GMM) approach pioneered by Arellano and Bond (1991) within the

framework of dynamic panels. The results of the endogeneity tests indicate a p-value of less than 5 percent for the residual associated with the "education" variable, confirming the presence of endogeneity in this equation. A similar result is obtained for institutional quality (see annex).

An additional finding is that the coefficient on the interaction term between institutional quality and the average years of schooling, a proxy for human capital, is positive and statistically significant for our sample. This result remains robust after controlling for potential endogeneity. [Table 3](#) introduces the interaction terms between these variables, both aggregated and disaggregated: $Institut_{it} \times Hum_{it}$. Thus, the result obtained supports the idea that additional investments in human development would have a more significant positive impact on economic growth in developing countries in the presence of functional and good quality institutions, since these investments tend to contribute to productive and socially useful activities (Ofori et al. [2024](#)). A system with good quality institutions and a politically stable environment can contribute directly and indirectly to creating favorable conditions for human capital accumulation (Adeleye, [2024](#)). Conversely, a high-quality education system can help to enshrine the principles and practice of good governance (Adams-Kane and Lim [2009](#); Castello, [2008](#); Campos and Nugent [1998](#); Dias and Tebaldi [2012](#); Gwartney et al. [2006](#)).

Similar conclusions were reached for Latin America, where the long-run dynamics of growth since the 19th century have been closely tied to institutional development and its interaction with human capital accumulation (Zaman, [2025](#)). Our results also confirm that corruption remains a major impediment to both institutional effectiveness and the productive use of human capital. In weak governance environments, corruption reduces the efficiency of public spending in education and health, undermining long-term growth. Recent empirical evidence corroborates this finding, showing that corruption directly hampers human capital accumulation in developing countries (Dianda, [2025](#)).

A relevant extension would be to compare the effect of the quality of institutions and education on economic growth, taking into account the level of GDP per capita of the country. The aim would be to detect the differentiated effect that these variables could have on economic growth in each group of countries, under the hypothesis that "(...) countries with a higher GDP per capita thus display better results in in terms of education levels, real wages, average height, life expectancy and more democratic institutions" (OECD, [2018,p.24](#)). This is an interesting avenue to explore further also the idea that a high level of both institutional quality and human capital stock is important to reap the benefits of their positive impact on economic growth, under the so-called 'conditional convergence' effect.

Table 3. Estimates of the interactive term for the whole sample (Dynamic System Generalized Method of Moments d'Arellano and Bond 1991, System-GMM)
Dependent variable: logarithm of GDP per capita PPP (constant prices, base 2017)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(GDPPC_{it-1})	0.958*** (0.018)	0.968*** (0.021)	0.957*** (0.020)	0.950*** (0.019)	0.951*** (0.017)	0.957*** (0.018)	0.962*** (0.018)
ln (GFCF_{it})	0.061 (0.038)	0.074* (0.040)	0.058 (0.039)	0.068* (0.038)	0.049 (0.037)	0.058 (0.039)	0.059 (0.040)
ln (FDI_{it})	0.014*** (0.004)	0.014*** (0.005)	0.014*** (0.004)	0.014*** (0.004)	0.014*** (0.004)	0.014*** (0.004)	0.014*** (0.004)
ln (POP_{it})	-0.025 (0.029)	-0.040 (0.030)	-0.024 (0.026)	-0.031 (0.031)	-0.017 (0.027)	-0.019 (0.028)	-0.020 (0.029)
ln (Educ_{it})	0.084** (0.032)	0.066* (0.034)	0.079** (0.031)	0.088*** (0.032)	0.079*** (0.027)	0.096*** (0.033)	0.088*** (0.031)
Institut_Index_Hum_{it}	0.011** (0.005)	--	--	--	--	--	--
Hum_Var1_instit_{it}	--	0.022* (0.011)	--	--	--	--	--
Hum_Var2_instit_{it}	--	--	0.011* (0.008)	--	--	--	--
Hum_Var3_instit_{it}	--	--	--	0.032** (0.016)	--	--	--
Hum_Var4_instit_{it}	--	--	--	--	0.036*** (0.011)	--	--
Hum_Var5_instit_{it}	--	--	--	--	--	0.031* (0.017)	--
Hum_Var6_instit_{it}	--	--	--	--	--	--	0.043*** (0.017)
Nbr of obs.	1161	1161	1161	1161	1161	1161	1161
Nbr of groups	60	60	60	60	60	60	60
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Arellano and Bond Auto Correlation Test AR(1)	Z= -2.75 Prb > z = 0.006	Z= -2.75 Prb > z = 0.006	Z= -2.73 Prb > z = 0.006	Z= -2.79 Prb > z = 0.005	Z= -2.72 Prb > z = 0.007	Z= -2.75 Prb > z = 0.006	Z= -2.75 Prb > z = 0.006
Arellano and Bond Auto Correlation Test AR(2)	Z= -0.75 Prb > z = 0.453	Z= -0.90 Prb > z = 0.368	Z= -0.78 Prb > z = 0.437	Z= -0.90 Prb > z = 0.368	Z= -0.88 Prb > z = 0.381	Z= -0.79 Prb > z = 0.431	Z= -0.90 Prb > z = 0.370

Source: Authors' calculations using Stata 18.0; Note: * coefficient significant at 10 percent; ** coefficient significant at 5 percent; *** coefficient significant at 1 percent; (.): robust standard deviations; with Institut_Index: synthetic index of institutional variables. Var1_instit: Voice and Accountability; Var2_instit: Political Stability and Absence of Violence/Terrorism; Var3_instit: Government Effectiveness; Var4_instit: Regulatory Quality; Var5_instit: Rule of Law; Var6_instit: Control of Corruption; Institut_Index: synthetic index of institutional variables.

Table 4 reports the estimation results by country group, with a particular focus on the role of human capital, institutional quality, and their interaction in explaining economic growth.

Table 4. Model estimates by country group (*PCSE and System-GMM estimators*)

Dependent variable: logarithm of GDP per capita PPP (constant prices, base 2017)

Variables \ Country	Low-income developing countries		Lower-middle income developing countries		Upper-middle income and high-income developing countries	
	PCSE	GMM	PCSE	GMM	PCSE	GMM
ln(GDPPC_{it-1})	---	0.952*** (0.048)	---	0.926*** (0.032)	---	0.941*** (0.023)
ln (GFCF_{it})	0.680*** (0.101)	0.053 (0.0483)	0.095* (0.054)	-0.048 (0.050)	0.320*** (0.066)	0.090*** (0.033)
ln (FDI_{it})	0.006 (0.023)	0.003 (0.008)	0.048*** (0.018)	0.016*** (0.005)	0.060** (0.025)	0.013*** (0.005)
ln (POP_{it})	-0.033* (0.017)	-0.007 (0.016)	-0.008*** (0.000)	-0.0617** (0.035)	-0.147*** (0.031)	-0.103** (0.039)
ln (Educ_{it})	0.124 (0.212)	0.073 (0.04)	0.933*** (0.057)	0.016** (0.006)	0.966*** (0.065)	0.027*** (0.005)
Institut_Index_{it}	-0.391*** (0.131)	-0.056 (0.036)	0.078** (0.078)	0.122** (0.050)	0.467** (0.023)	0.007*** (0.002)
Constant	----	0.205* (0.113)	6.383*** (0.171)	0.615** (0.303)	6.454*** (0.289)	0.288*** (0.115)
Nbr of obs.	208	198	449	431	557	532
Nbr of groups	10	10	23	23	27	27
R-squared	0.972	---	0.356	---	0.486	---
Wald chi2	5909.34	---	695.34	---	3845.95	---
Prob > chi2	0.000	---	0.000	---	0.000	---
Prob > F	----	0.000	----	0.000	----	0.000
Arellano and Bond Auto Correlation Test AR(1)	---	Z= -1.59 Prb> z = 0.113	---	Z= -1.88 Prb> z = 0.061	---	Z= -3.42 Prb > z = 0.001
Arellano and Bond Auto Correlation Test AR(2)	---	Z= 0.12 Prb > z = 0.904	---	Z= 0.36 Prb > z = 0.720	---	Z= -1.86 Prb > z = 0.064

Source: Authors' calculations using Stata 18.0; Note: * coefficient significant at 10 percent; ** coefficient significant at 5 percent; *** coefficient significant at 1 percent; (.): robust standard deviations; Institut_Index: synthetic index of institutional variables.

The findings reveal that both education and institutional quality exert a positive and statistically significant effect on GDP per capita growth in upper-middle- and high-income developing countries, with stronger effects observed as the level of development increases. In contrast, for low-income countries, these variables appear to have no significant impact, suggesting that the growth-enhancing role of human capital remains limited in contexts characterized by weak institutional environments.

These results highlight the importance of the initial levels of development in shaping the effectiveness of education and governance. Countries at more advanced stages of development tend to benefit more from human capital accumulation, as they are equipped with institutional frameworks that enable a more efficient allocation and utilization of skills and knowledge. In

this regard, we find a significant and positive direct effect of human capital, through education, as well as institutional quality on GDP per capita growth in high-income and upper- and lower-middle-income developing countries, with a stronger impact observed as the level of development increases (columns 3 and 5). By contrast, low-income countries exhibit a non-significant effect of these variables, suggesting that they are still unable to keep pace with the economic dynamism observed elsewhere and remain constrained by institutional, political, and socio-economic weaknesses. Overall, these findings imply that higher levels of development are associated with better education and stronger institutional quality, leading to a more pronounced contribution to economic growth, thereby supporting the hypothesis of convergence in human capital and institutional characteristics as countries develop.

Table 5. Interactive term estimates by country group (*PCSE and System-GMM estimators*)

Dependent variable: logarithm of GDP per capita PPP (constant prices, base 2017)

Variables \ Country	Low-income developing countries		Lower-middle income developing countries		Upper-middle income and high-income developing countries	
	PCSE	GMM	PCSE	GMM	PCSE	GMM
ln(GDPPC_{it-1})	---	0.965*** (0.039)	---	0.922*** (0.034)	---	0.941*** (0.024)
ln (GFCF_{it})	0.680*** (0.101)	0.052 (0.048)	0.110** (0.050)	0.029 (0.040)	0.281*** (0.066)	0.093*** (0.034)
ln (FDI_{it})	0.006 (0.023)	0.004 (0.007)	0.075*** (0.019)	0.015*** (0.005)	0.044** (0.017)	0.013*** (0.005)
ln (POP_{it})	-0.049 (0.056)	0.0001 (0.014)	-0.066*** (0.024)	-0.126* (0.061)	-0.148*** (0.031)	-0.117** (0.034)
ln (Educ_{it})	0.124 (0.212)	0.052 (0.049)	0.818*** (0.063)	0.137*** (0.051)	1.236*** (0.049)	0.028*** (0.005)
Institut_Index_Hum_{it}	-0.030 (0.018)	0.003 (0.008)	-0.012 (0.006)	0.072 (0.050)	0.048*** (0.002)	0.002** (0.001)
Constant	5.509*** (0.351)	0.206* (0.114)	6.551*** (0.135)	0.539* (0.304)	5.985*** (0.271)	0.286*** (0.111)
Nbr of obs.	208	198	449	431	557	532
Nbr of groups	10	10	23	23	27	27
R-squared	0.600	---	0.363	---	0.469	---
Wald chi2	1085.78	---	534.50	---	3758.22	---
Prob > chi2	0.000	---	0.000	---	0.000	---
Prob > F	----	0.000	----	0.000	----	0.000
Arellano and Bond Auto Correlation Test AR(1)	---	Z= -1.59 Prb> z = 0.112	---	Z= -1.88 Prb > z = 0.06	---	Z= -3.42 Prb > z = 0.001
Arellano and Bond Auto Correlation Test AR(2)	---	Z= 0.09 Prb > z = 0.931	---	Z= 0.31 Prb > z = 0.754	---	Z= -1.85 Prb > z = 0.064

Source: Authors' calculations using Stata 18.0; Note: * coefficient significant at 10 percent; ** coefficient significant at 5 percent; *** coefficient significant at 1 percent; (.): robust standard deviations; Institut_Index_Hum: interactive term measuring the complementarity between the quality of institutions and education.

On the other hand, [Table 5](#) further investigates the interaction between human capital and institutional quality. The results provide strong evidence of a complementary relationship between these two factors in upper-middle- and high-income developing countries, where the interaction term is positive and significant. By contrast, in low- and lower-middle-income countries, the interaction effect is insignificant, indicating the presence of an institutional threshold below which investments in education do not translate into higher economic growth.

This finding supports the view that the effectiveness of educational investment critically depends on the quality of institutions. In environments characterized by weak governance, human capital may be diverted toward unproductive or rent-seeking activities, thereby limiting or even reversing its contribution to growth. These results are consistent with the theoretical framework of Benhabib and Spiegel ([1994](#)), as well as more recent empirical studies.

Overall, the results suggest that education policies alone are insufficient to foster economic growth in developing countries. Their effectiveness depends crucially on the institutional context and the stage of development, highlighting the need for coordinated reforms that simultaneously strengthen governance and promote human capital accumulation.

5 Conclusion and Policy Recommendations

This study provides new evidence on the triangular relationship between institutional quality, human capital, and economic growth in developing countries. The results confirm, on a first reading, the idea that education, as the main component of human capital, can contribute more to economic growth, in a favourable institutional environment.

Thus, it appears that in upper-middle-income countries and high-income developing countries, good-quality economic and political institutions play a catalytic role. They allow human capital to express its productive potential in a framework where the protection of property rights, political stability, bureaucratic efficiency, the fight against corruption, and the predictability of the rules of the economic game favour investment, innovation and growth. This result highlights a mechanism of complementarity: the positive effects of education on growth are only fully realised when institutions fulfil certain conditions of functionality. In this respect, researchers should quantify 'sufficient quality' using precise empirical indicators, such as the World Bank's governance indices (such as Voice and Accountability, Rule of Law and Control of Corruption) and to identify, through threshold analyses, the critical levels beyond which this synergy becomes effective.

On the other hand, our results reveal an absence interaction, between human capital and the quality of institutions in low- and lower-middle-income countries. This finding suggests that in these contexts, marked by simultaneous deficiencies in educational, institutional and economic terms, investment in education is not enough to generate growth externalities. Lack of administrative capacity, political distortions and clientelist practices are holding back the

mobilisation and development of human capital. These factors require a nuanced interpretation: institutions shape the returns to education, and in some cases, actors may divert qualified human resources from productive activities toward rent-seeking behavior.

These findings underline the importance of institutional thresholds. Investments in education yield growth dividends only once institutions have reached a minimum level of effectiveness. This non-linear dynamic has critical implications for development strategies: education policies, if not accompanied by institutional reforms, may fail to deliver growth in contexts marked by corruption, political instability, or weak administrative capacity.

From a policy perspective, the results argue in favor of an integrated approach. On the one hand, governments should strengthen the quality of governance by improving transparency, accountability, and the rule of law. On the other hand, they must design human capital development strategies that complement institutional reforms. International donors and multilateral organizations should also support this dual agenda by linking educational aid with governance initiatives.

In short, this paper demonstrates that human capital and institutional quality are not substitutes but complements in the growth process. For developing countries to achieve sustainable and inclusive growth, reforms must target both dimensions simultaneously.

Appendix

Countries	Code	Countries	Code	Countries	Code
Albania	ALB	Rwanda	RWA	Morocco	MAR
Algeria	DZA	Senegal	SEN	Mozambique	MOZ
Argentina	ARG	South Africa	ZAF	Namibia	NAM
Armenia	ARM	Sudan	SDN	Nepal	NPL
Bahrain	BHR	Tanzania	TZA	Nicaragua	NIC
Bangladesh	BGD	Thailand	THA	Niger	NER
Benin	BEN	Tunisia	TUN	Pakistan	PAK
Bolivia	BOL	Turkey	TUR	Panama	PAN
Brazil	BRA	Uganda	UGA	Ghana	GHA
Cambodia	KHM	Ukraine	UKR	Guatemala	GTM
Cameroon	CMR	Uruguay	URY	Haiti	HTI
Central African Republic	CAF	Zimbabwe	ZWE	Honduras	HND
Chile	CHL	Jamaica	JAM	India	IND
China	CHN	Jordan	JOR	Indonesia	IDN
Colombia	COL	Kazakhstan	KAZ	Peru	PER
Congo. Rep.	COG	Kenya	KEN	Philippines	PHL
Côte d'Ivoire	CIV	Malaysia	MYS	Mexico	MEX
Dominican Republic	DOM	Mali	MLI	Mongolia	MNG
Ecuador	ECU	Mauritania	MRT	El Salvador	SLV
Egypt. Arab Rep.	EGY	Mauritius	MUS	Gabon	GAB

Table. Estimates for the whole sample (Dynamic System Generalized Method of Moments d'Arellano and Bond 1991, System-GMM)

Dependent variable: logarithm of GDP per capita PPP (constant prices, base 2017)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(GDPPC_{it-1})	0.948*** (0.018)	0.965*** (0.021)	0.957*** (0.019)	0.952*** (0.018)	0.954*** (0.017)	0.956*** (0.017)	0.964*** (0.018)
ln (GFCF_{it})	0.069* (0.038)	0.080** (0.041)	0.062 (0.039)	0.074** (0.038)	0.052 (0.036)	0.059 (0.038)	0.061 (0.039)
ln (FDI_{it})	0.012** (0.004)	0.014*** (0.005)	0.013*** (0.004)	0.014*** (0.0047)	0.013*** (0.004)	0.014*** (0.004)	0.014*** (0.004)
ln (POP_{it})	-0.034 (0.035)	-0.048 (0.035)	-0.029 (0.030)	-0.033 (0.031)	-0.016 (0.028)	-0.021 (0.027)	-0.023 (0.030)
ln (Educ_{it})	0.069** (0.032)	0.060* (0.036)	0.086*** (0.030)	0.063* (0.033)	0.054* (0.030)	0.084*** (0.033)	0.062* (0.033)
Instit_Index_{it}	0.109** (0.047)	--	--	--	--	--	--
Var1_instit_{it}	--	0.061** (0.0318)	--	--	--	--	--
Var2_instit_{it}	--	--	0.029 (0.019)	--	--	--	--
Var3_instit_{it}	--	--	--	0.082** (0.037)	--	--	--
Var4_instit_{it}	--	--	--	--	0.088*** (0.026)	--	--
Var5_instit_{it}	--	--	--	--	--	0.052 (0.033)	--
Var6_instit_{it}	--	--	--	--	--	--	0.086*** (0.033)
Constant	0.267** (0.110)	0.624** (0.313)	0.261** (0.112)	0.206* (0.114)	0.219** (0.107)	0.230** (0.109)	0.266** (0.115)
Nbr of obs.	1161	1161	1161	1161	1161	1161	1161
Nbr of groups	60	60	60	60	60	60	60
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Arellano and Bond auto-correlation test AR(1)	Z= -2.76 Prb> z = 0.006	Z= -2.76 Prb> z = 0.006	Z= -2.73 Prb > z = 0.006	Z= -2.82 Prb > z = 0.005	Z= -2.72 Prb > z = 0.007	Z= -2.75 Prb> z = 0.006	Z= -2.74 Prb > z = 0.006
Arellano and Bond auto-correlation test AR(2)	Z= -0.72 Prb > z = 0.479	Z= -0.87 Prb> z = 0.384	Z= -0.75 Prb > z = 0.455	Z= -0.88 Prb > z = 0.379	Z= -0.89 Prb > z = 0.374	Z= -0.82 Prb> z = 0.412	Z= -0.89 Prb > z = 0.375

Source: Authors' calculations using Stata 18.0; Note: * coefficient significant at 10 percent; ** coefficient significant at 5 percent; *** coefficient significant at 1 percent; (.) : robust standard deviations. Var1_instit: Voice and Accountability; Var2_instit: Political Stability and Absence of Violence/Terrorism; Var3_instit: Government Effectiveness; Var4_instit: Regulatory Quality; Var5_instit: Rule of Law; Var6_instit: Control of Corruption; Institut_Index: synthetic index of institutional variables.

References

- Acemoglu D., Johnson S. and Robinson J.A. (2001), “*The Colonial Origins of Comparative Development: An Empirical Investigation*”, American Economic Review December 91(5): 1369-1401. <https://doi.org/10.1257/aer.91.5.1369>
- Acemoglu D., and Thaicharoen Y. (2003), “Institutional causes, macroeconomic symptoms: Volatility, crises and growth”, Journal Of Monetary Economics, Vol. 50, No. 1, pp. 49-123. [https://doi.org/10.1016/S0304-3932\(02\)00208-8](https://doi.org/10.1016/S0304-3932(02)00208-8)
- Acemoglu, D., Gallego, F. A., and Robinson, J. A. (2014). “*Institutions, human capital, and development*”. Annu. Rev. Econ. 6(1), 875-912. <https://doi.org/10.1146/annurev-economics-080213-041119>
- Acquah E., Carbonari L., Farcomeni A., et al. (2023), “Institutions and economic development: new measurements and evidence”. Empirical Economics, Vol. 64, No. 4, pp. 1331–1359. <https://doi.org/10.1007/s00181-023-02395-w>
- Adams-Kane, J., and Lim, J. J. (2009). “*Institutions, education, and economic performance*”. In *Silvaplana Workshop on Political Economy*, Vol. 72, pp. 315-345.
- Adeleye B. N. (2023), “Income Inequality, Human Capital and Institutional Quality in Sub-Saharan Africa”, *Social Indicators Research*, Vol. 171, No. 1, pp. 133–157. <https://doi.org/10.1007/s11205-023-03244-0>
- Adeleye, B. N. (2024). “Does institutional quality moderate the human capital–inequality dynamics? Comparative evidence from LAC and SSA countries”. *African Development Review*, 36, 153–169. <https://doi.org/10.1111/1467-8268.12740>
- Akther, U.M., Hakim A.M., Mansur M., (2019), “*Institutions, Human capital and economic growth in developing countries*”, Emerald Group Publishing Limited, Studies in Economics and Finance, Volume 38, Number 2, 2019, pp. 361-383(23). <https://doi.org/10.1108/SEF-10-2019-0407>
- Alesina A. and Perotti R. (1996), “Income Distribution, Political Instability, and Investment”. European Economic Review 40 (6): 1203-28. Of Minnesota.
- Arellano, M., and Bond, S. (1991), “Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations”. *Review of Economic Studies*, 58(2), 277–297.
- Bailey, D., and Katz, J. N. (2011). “Implementing panel corrected standard errors in R: the pcse package”. *Journal of Statistical Software*, 42(CS1), 1-11.
- Barro R.J. and Sala-I-Martin, X. (1995), “*Economic Growth*”, McGraw-Hill, New York.
- Barro R.J. (1990), “Government Spending in a Simple Model of Endogenous Growth”, *Journal of Political Economy*, 98 (five part 2), pp. 103-125. <https://doi.org/10.1086/261726>
- Barro, R. J. (1997) “*Determinants of Economic Growth: A Cross-Country Empirical Study*”. Cambridge, MA: MIT Press.

- Barro, R. J. (2001) “*Human Capital and Growth. American Economic Review*”, Papers and Proceedings, 91, 2, 12-17. <https://doi.org/10.1257/aer.91.2.12>
- Barro, R. J.; Lee, J. W. B (2021), “*Educational Attainment for the Population Aged 15-64 from 1950 to 2015*”, September 2021. <http://www.barrolee.com>
- Benhabib J. and Spiegel M. (1994), “*The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data*”. *Journal of Monetary Economics*, vol. 34, 143-179. [https://doi.org/10.1016/0304-3932\(94\)90047-7](https://doi.org/10.1016/0304-3932(94)90047-7)
- Bethencourt J. and Perera-Tallo M. (2024), “Public sector and human capital: on the mechanics of economic development”. *Journal of Economics*, Vol. 132, No. 2, pp. 123–145. <https://doi.org/10.1007/s00712-024-00834-2>
- Bhattacharyya, S. (2009). “*Unbundled institutions, human capital and growth*”. *Journal of Comparative Economics*, 37(1), 106-120. <https://doi.org/10.1016/j.jce.2008.08.001>
- Campos, N. F., and Nugent, J. B. (1998). “*Institutions and growth: Can human capital be a link?*” *CEPAL Review*. (64), 7 - 27.
- Castelló A, (2008), “On the Distribution of Education and Democracy”, *Journal of Development Economics*, 87, p. 179-190. <https://doi.org/10.1016/j.jdeveco.2007.10.006>
- Clague C., Keefer P. and Knack S. (1996), “Property and Contract Rights in Autocracies and Democracies”. *Journal of Economic Growth* 1 (2): 243-76.
- Danta, S., and Rath, B. N. (2024), “Do institutional quality and human capital matter for innovation in case of Asian region?” *Journal of Innovation and Global Development*. [Doi: 10.1016/j.igd.2024.100141](https://doi.org/10.1016/j.igd.2024.100141)
- Dawson, J. W. (1998). “*Institutions, investment, and growth: New cross-country and panel data evidence*”. *Economic Inquiry*, 36(4), 603-619. <https://doi.org/10.1111/j.1465-7295.1998.tb01739.x>
- Dias, J., and Tebaldi, E. (2012). “Institutions, human capital, and growth: The institutional mechanism”. *Structural Change and Economic Dynamics*, 23(3), 300-312. <https://doi.org/10.1016/j.strueco.2012.04.003>
- Dianda I. (2025), “Does Corruption Impede the Accumulation of Human Capital in Developing Countries? ”, *Economics of Transition and Institutional Change*, Vol. 33, No. 1, pp. 1–17. <https://doi.org/10.1111/ecot.12447>
- Dianda I., Zidouemba P. R., et Tou D. (2025), “Heterogeneous effects of economic freedom on human capital in developing countries ”, *Journal of Institutional Economics*, Vol. 21, No. 3, pp. 1–22. <https://doi.org/10.1017/S1744137425000123>
- Domar, E. D. (1946). “Capital Expansion, Rate of Growth, and Employment”. *Econometrica* 14 (April): 137–47. <https://doi.org/10.2307/1905364>
- Economic and Social Commission for Western Asia (ESCWA, 2021), “Institutions and human development: a panel Granger causality analysis”, *United Nations Beirut*.

- Gundlach, E. (1996) "The Role of Human Capital in Economic Growth: New Results and Alternative Interpretations". *Weltwirtschaftliches Archiv*, 131, 2, 383-402. <https://hdl.handle.net/10419/30189>
- Gupta, S., Clements, B., Tiongson, E., 1998. "Public Spending on Human Development". *Finance and Development* 35, 10-13.
- Gupta, S., de Mello, L., Sharan, R., 2001. "Corruption and military spending". *European Journal of Political Economy* 17, 794-77. [http://dx.doi.org/10.1016/S0176-2680\(01\)00054-4](http://dx.doi.org/10.1016/S0176-2680(01)00054-4)
- Gwartney, J. D., Holcombe, R. G., and Lawson, R. A. (2006). "Institutions and the Impact of Investment on Growth". *Kyklos*, 59(2), 255-273. <https://doi.org/10.1111/j.1467-6435.2006.00327.x>
- Hall R.E. and Jones C.I. (1999), "Why Do Some Countries Produce So Much More Output Per Worker Than Others?" *The Quarterly Journal of Economics*, 114 (1), 83- 116. <https://doi.org/10.1162/003355399555954>
- Harrod, R. F. (1939). "An Essay on Dynamic Theory". *Economic Journal* 49 (March): 14–33. <https://doi.org/10.2307/2225181>
- Helliwell, J.F. (1992). "Empirical Linkages between Democracy and Economic Growth". NBER Working Paper No. 4066, National Bureau of Economic Research, Cambridge. <https://doi.org/10.4236/ojbm.2016.42028>
- Hocking, R.R. (1976) "The analysis and selection of variables in linear regression". *Biometrics*, 32, 1-49. <http://dx.doi.org/10.2307/2529336>
- Islam N., (1995), "Growth Empirics: A Panel Data Approach", the *Quarterly Journal of Economics*, Vol. 110, No. 4 (Nov. 1995), pp. 1127-1170. <https://doi.org/10.2307/2946651>
- Kaufmann D. and Hellman J. (2001), "Confronting the Challenge of State Capture in Transition Economies", September 2001, Volume 38, Number 3.
- Kaufmann, D., Kraay, A., Mastruzzi, M. (2007). "Governance Matters VI: Aggregate and Individual Governance Indicators, 1996-2006". Policy Research Working Paper; No. 4280. World Bank, Washington, DC. World Bank. <https://openknowledge.worldbank.org/handle/10986/7473> License: CC BY 3.0 IGO.
- Kaufmann, D., Kraay, A., Mastruzzi, M. "The Worldwide Governance Indicators: A Summary of Methodology, Data and Analytical Issues". World Bank Policy Research Working Paper No. 5430. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1682130
- Knack S. and Keefer P. (1995), "Institutions and Economic Performance: Cross Country Tests Using Alternative Institutional Measures", *Economics and Politics*. <https://doi.org/10.1111/j.1468-0343.1995.tb00111.x>
- Krueger, A. B. and Lindahl, M. (2001) "Education for Growth: Why and for Whom?" *Journal of Economic Literature*, 39, 4, 1101-1136. <https://www.jstor.org/stable/2698521>

- Lucas R.E. (1988), “On the Mechanics of Economic Development”, *Journal of Monetary Economics*, vol. 22, p. 3-42. [https://doi.org/10.1016/0304-3932\(88\)90168-7](https://doi.org/10.1016/0304-3932(88)90168-7)
- Mamoon, D., and Murshed, S. M. (2009). “Want economic growth with good Quality institutions? Spend on education”. *Education Economics*, 17(4), 445-468. doi.org/10.1080/09645290801931782
- Mankiw N.G., Romer D., Weil D.N. (1992), “A Contribution to the Empirics of Economic Growth”, *Quarterly Journal of Economics*, vol. 107, May, p. 407-437. <https://doi.org/10.2307/2118477>
- Martínez-Vázquez, J., McNab, R.M., and Everhart, S.S. (2005). “Corruption, Investment, and Growth in Developing Countries”, Working Paper Series 2005/04. [Doi : 10.2307/41954395](https://doi.org/10.2307/41954395)
- Mauro P. (1995), “Corruption and Growth”, *Quarterly Journal of Economics*, vol. 110, no. 3, pp.681-712. <https://doi.org/10.2307/2946696>
- Mauro P. (1998), “Corruption and the composition of government expenditure”, *Journal of Public Economics*, 69, (2), 263-279. [https://doi.org/10.1016/S0047-2727\(98\)00025-5](https://doi.org/10.1016/S0047-2727(98)00025-5)
- Nana Kuindja, R., and Bitá, C. A. (2020). “Qualité des institutions et financement des économies en Afrique Sub-Saharienne : Rôle du capital humain”. *Alternatives Managériales Économiques*, 2(4). <https://doi.org/10.48374/IMIST.PRSM/ame-v2i4.23386>
- Nasreen S., Anwar S., (2015), “Institutions, Investment and Economic Growth: a cross-country and panel data study” , *The Singapore Economic Review*, Vol. 60, No. 4, World Scientific Publishing, Company [Doi: 10.1142/S0217590815500617](https://doi.org/10.1142/S0217590815500617)
- North Douglass C. (1990), “*Institutions, Institutional Change, and Economic Performance*”, New York: Cambridge University Press. <https://doi.org/10.1017/CBO9780511808678>
- North Douglass C. (1993), « The New Institutional Economics and Development», *Economic History* 9309002, University Library of Munich, Germany.
- OECD (2018), “*Perspectives on Global Development 2019: Rethinking Development Strategies*”, Perspectives on Global Development, OECD Publishing, Paris. https://doi.org/10.1787/persp_glob_dev-2019-en
- Ofori P. E., Kuuwill A., and Quaye B. (2024), “Effect of human capital development and institutional quality on inclusive growth in African countries”, *Cogent Economics and Finance*, Vol. 12, No. 1, Article 2357155. <https://doi.org/10.1080/23322039.2024.2357155>
- Ouedraogo I., Ngoa Tabi H., Atangana Ondo H. and Jiya A.N., (2022), “ Institutional quality and human capital development in Africa”, *Economic Systems*, Volume 46, Issue 1, March 2022, 100937 <https://doi.org/10.1016/j.ecosys.2021.100937>

- Pedroni, P. (1999). "Critical values for cointegration tests in heterogeneous panels with multiple regressors". *Oxford Bulletin of Economics and Statistics*, 61(S1), 653–670. <https://doi.org/10.1111/1468-0084.61.s1.14>
- Pedroni, P. (2004). "Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis". *Econometric Theory*, 20(3), 597–625. <https://doi.org/10.1017/S0266466604203073>
- Pesaran, M. H. (2015). "Testing Weak Cross-Sectional Dependence in Large Panels". *Econometric Reviews*, 34(6–10), 1089–1117. DOI: <https://doi.org/10.1080/07474938.2014.956623>
- Reinikka, R. and Svensson, J. (2005), "Fighting Corruption to Improve Schooling: Evidence from a Newspaper Campaign in Uganda". *Journal of the European Economic Association*, 3, 259-267. <http://dx.doi.org/10.1162/154247605447288>
- Robert J. and Franzese Jr (1996), "A GAUSS Procedure to Estimate Panel-Corrected Standard-Errors with Non-rectangular and/or Missing Data", *the Political Methodologist*.
- Rodrik D. (1999), "Where did all the growth go? External shocks, social conflict and growth collapses". *Journal of Economic Growth*. No. 4, PP. 385-412. <http://dx.doi.org/10.3386/w6350>
- Rodrik, D. (2000), "Institutions for high-quality growth: what they are and how to acquire them", National Bureau of Economic Research, Working Paper 7540 <http://dx.doi.org/10.3386/w7540>
- Rogers, M.L. (2008), "Directly Unproductive Schooling: How Country Characteristics Affect the Impact of Schooling on Growth". *European Economic Review*, 52, 356-385. <http://dx.doi.org/10.1016/j.euroecorev.2007.03.001>
- Romer P. (1986), "Increasing Return and Long Run Growth", *Journal of Political Economy*, vol. 94, October, no. 5, pp. 1002-1037. <http://dx.doi.org/10.1086/261420>
- Romer P.M. (1990), "Human Capital and Growth: Theory and Evidence", *Carnegie-Rochester Conference Series on Public Policy*, Elsevier, vol. 32(1), pages 251-286, January. [https://doi.org/10.1016/0167-2231\(90\)90028-J](https://doi.org/10.1016/0167-2231(90)90028-J)
- Saint Paul G. and Verdier T., (1993), "Education, democracy and growth", *Journal of Development Economics*, 42, (2), 399-407. [https://doi.org/10.1016/0304-3878\(93\)90027-K](https://doi.org/10.1016/0304-3878(93)90027-K)
- Smith A. (1776), "*Inquiry into the Nature and Causes of the Wealth of Nations*", translated by Taieb P., PUF, Paris, vol. 4, 1995.
- Solow R.M. (1956), "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, vol. 70, February, p. 65-94. <https://doi.org/10.2307/1884513>
- Stein. E and Daude. C, (2007), "The Quality of Institutions and Foreign Direct Investment", *Economics and Politics*, volume 19, No. 3, November. [Doi: 10.1111/j.1468-0343.2007.00318.x](https://doi.org/10.1111/j.1468-0343.2007.00318.x)

- Tavares, J., and Wacziarg, R. (2001). “How Democracy Affects Growth”. *European Economic Review*, 45(8), 1341-1378. [https://doi.org/10.1016/S0014-2921\(00\)00093-3](https://doi.org/10.1016/S0014-2921(00)00093-3)
- Wandeda, D. O., Masai, W., and Nyandemo, S. M. (2021). “Institutional quality and economic growth: Evidence from Sub-Saharan Africa countries”. *African Journal of Economic Review*, 9(4), 1–20. <https://www.ajol.info/index.php/ajer/article/view/214283>
- Westerlund, J. (2007). “Testing for error correction in panel data”. *Oxford Bulletin of Economics and Statistics*, 69(6), 709–748. <https://doi.org/10.1111/j.1468-0084.2007.00477.x>
- Williamson O.E. (2000), “The New Institutional Economics: Taking Stock, Looking Ahead”, *The Journal of Economic Literature*. Doi: [10.1257/jel.38.3.595](https://doi.org/10.1257/jel.38.3.595)
- Wößmann, L., (2003), “Specifying Human Capital”, *Journal of Economic Surveys* vol. 17, no. 3. <https://doi.org/10.1111/1467-6419.00195>
- Zaman M. (2025), “Institutions and Growth Dynamics in Latin America, 1801–2015”, *Economics of Transition and Institutional Change*, Vol. 33, No. 1, pp. 1–17. <https://doi.org/10.1111/ecot.12449>