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UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

THE IMPACT OF INSTITUTIONS ON ECONOMIC PERFORMANCE: AN EMPIRICAL CASE OF AFRICAN ECONOMIES.

A Research Report submitted in partial fulfilment of the Degree of

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In the School of Economics and Finance,

University of the Witwatersrand

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DECLARATION

I, Ngitholiseni Mkhize, hereby declare that this thesis, which is submitted for the degree of Master of Commerce in Economics to the University of the Witwatersrand, Johannesburg is my work, except otherwise indicated and acknowledged. It has not been submitted before for any degree or examination in any other university.



Signature of Candidate: _____

Date: 07 April 2021

Abstract:

Explaining cross-country variations in economic performances not only requires a deeper understanding of the links between growth and public policies, but it also requires an understanding of the channels through which institutions affect the growth rates of countries. This study examines the impact of institutions on economic performance using balanced panel data covering 39 African countries from 2002 to 2018. A standard growth regression is estimated with linear interaction between economic growth, institutional quality and structural determinants of economic performance. The study applied Pooled Ordinary Least Squares (POLS), fixed effects (FE), and random effects (RE) models. Empirical findings show that institutions do matter for Africa's economic growth; the institutional quality measure significantly explains growth. Furthermore, trade openness, government spending, gross capital formation, and population growth have a strong positive impact on African growth, whereas human capital is found to weakly influence growth and is either significant in some models and insignificant in other models. The findings imply that African countries should improve government administration and develop more efficient legal institutions while increasing investments in human capital accumulation. Growth policies should also focus on liberalizing the countries to open for international trade, to benefit from spill overs of ideas and new technologies while advancing fixed capital formation.

Table of Contents

1. Introduction 5
2. Background 8
   2.1. Background 8
   2.2. Institutions and growth. 10
3. Related Literature 11
4. Data and Methodology 15
   4.1. Theoretical Model 15
   3.2. Empirical model Specification 16
   3.2. Description of estimation techniques used 17
   3.3. Data description 18
   3.4. Model Selection 22
4. Discussion of Results and Analysis 23
5. Recommendations and Conclusion 30
6. References 32
7. Appendix 38

1. Introduction

Good institutional quality is essential for a well-functioning economy. In the absence of appropriate institutional quality exists political instability, violations of civilian rights, unfair electoral procedures, lack of freedom of expression in the media, inefficient financial markets, poor infrastructure, inefficient resource allocation, corruption and poorly managed governmental organisations (Dobler, 2011). Bad Institutions also impact economic growth negatively by increasing the costs of doing business that inhibit investments and thus, straining capital formation. This is common among developing economies with high government debt, poor education systems, high fertility rate, and thus high population growth rate which correlates negatively with public goods provision (Easterly and Levine, 2016; Bittencourt, 2018).

Additionally, poor institutions deteriorate social security, increase political risks, weaken the implementation of property rights and thus limit the quality of research output (Dobler, 2011). This means that poor institutional quality is associated with poor human capital, which impedes labour productivity and thus, reduces national output/income. Despite the vital impact of good institutional governance quality on economic performance, surprisingly little is known about systematic patterns of institutional-governance quality on economic performance over time, especially within developing economies.

Although Africa is largely known as a developmental continent with *poor institutional quality*. Most studies that examine this relationship tend to only investigate the links between economic growth rates and governance indicators while overlooking the roles of structural variables (Bulte, Damania and Deacon, 2005; Omoteso and Mobolaji, 2014; Fosu, 2015; Khan, 2015; Owoye and Bissessar, 2017). We are convinced that this relationship must be explored in detail. Therefore, the main goal of this study is to explore the impact of institutional quality on economic performance in African economies.

There are several reasons behind this. Firstly, good institutional quality enhances the economic performance of public and private businesses through increased openness to trade, which

allows for the adoption of technology from advanced economies, and reduced diversion of resources through enhanced total factor productivity (Acemoglu *et al*., 2003). Hence, we need to assess the role of good institutional quality, conditional to structural variables such as openness to trade, gross capital formation, population growth, total government spending on final consumption, and population growth. These factors are closely associated with institutional quality, which is largely documented in economic and social sciences literature as the distinguishing factor between *rich and poor* countries (Easterly and Levine, 2003; Luiz, 2009; Seck, 2017; Epaphra and Kombe, 2017).

Secondly, African economies – on average – report a staggering GDP growth rate throughout the study period. In addition to this, Africa underperforms by almost every measure when compared to other developing regions (World Bank, 2020b). Another reason relates to the shocking statistics on the world's extreme poverty. Africa's low growth is closely linked to the concept of poverty. Most people living in extreme poverty are in Sub-Saharan Africa (World Bank, 2020a). As projected by the World Bank (2020a), 87% of the world's poorest in 2030 will be living in Africa if economic growth patterns follow the same path.

Additionally, there has been an upsurge in the number of high-profile government officials reported for corruption, while the level of corruption has been persistently higher among African countries; corruption is highly correlated with poor institutional quality. According to the World Bank (2020), 43 countries with the highest levels of poverty are also fragile or conflict-affected situations (FCS) and are all in Sub-Saharan Africa. Furthermore, the history of African colonialism and the existence of extractive institutions provide a strong basis for exploring the role played by these institutions on growth. It is well established that African countries have poor institutional quality (Acemoglu *et al*., 2001, 2004, 2011; Khan, 2015; Owoye and Bissessar, 2017), we neither dispute this nor attempt to prove the existence of poor institutions. Our goal is to explore the impact of institutions on economic growth.

When compared to other developing regions, Africa underperforms in almost every measure of economic and social welfare (Bulte, Damania and Deacon, 2005; World Bank, 2020a, IMF, 2021). Apart from Africa's average low growth rates, the data from the International Monetary

Fund's (IMF) global economic outlook (2021) shows significant variations in the real GDP per capita annual growth rates across countries, for instance during the 2002 – 2018 period, Rwanda grew by 5.06 percent on average, followed by Mozambique and Ghana, at 3.79 percent equally and respectively. By contrast, countries such as Gabon, Burundi, and the Gambia, declined by 0.63, 0.44, and 0.39 percent respectively during the same period (for more details see Figure A1 in the appendix).

This study departs from previous studies in two ways. The first is that our focus is mainly on African economies, we compare African countries to one another. This is motivated by the fact that Africa is different from the rest of the world in many ways, for example, the role of chiefs in shaping African leadership and political institutions is often overlooked in the literature. By contrast, there are eight Regional Economic Communities (RECs) in Africa operating under the African Union (African Union, 2021). These set different goals, have different structures and operate differently, bringing them together under one continental union may be difficult. Furthermore, colonial history implies that different former colonies have different legal origins (Acemoglu, 2001). This would each have a unique impact on economic growth across the region.

Secondly, this study does not only examine the impact of institutional quality on economic performance but also includes the impact of the other five determinants of economic performance, using country-specific data. Given the rise in usage of fixed effects model in literature and the characteristics of the dataset used in this study, we are confident that it is the best estimation method for the current study because it eliminates the effects of the time-invariant features of the variables (Stock and Watson, 2018). This claim is also supported by the result of the Hausman test, as reported in Table A1 in the Appendix.

The rest of this thesis is structured as follows. In Section 2 we give a comprehensive background, followed by the details of related literature in Section 3. Details of the data used for this study are outlined in Section 4. Section 5 describes the methodology; section 6 reports the findings and analysis. Finally, Section 7 offers some recommendations and a conclusion.

2. Background

2.1. Background

Defining Institutions

According to North (1990:1), institutions are "humanly devised constraints that structure political, economic, and social interactions…and consist of both informal constraints and formal rules". Similarly, Williamson (1998) defines institutions as encompassing the rules and policies, the norms, beliefs, and organisations. By contrast, Hodgson (2006:13) characterizes institutions as "durable systems of established and embedded social rules that structure interactions". We thus distinguish *formal institutions* to mean constitutions, laws, and regulations; while *informal institutions* refer to norms, codes of conduct, established ways of doing business, and informal conflict resolution procedures (North, 1990; Hodgson, 2003). These institutions, according to North (1990), create order and reduce uncertainty in exchange.

According to Lowes, Nunn, Robinson and Weigel (2017), stronger institutions instil cultural values that further strengthens institutions. Although it is difficult to measure informal institutions, it should be noted that these have a significant role in shaping formal institutions, as identified by North (1990), Hodgson (2016) and Lowes *et al.*, (2017). Therefore, in this study, we treat institutions as embedding both formal and informal institutions.

The State of African Economies and Institutions

The high levels of corruption and weak governance have led to a rise in policy recommendations for institutional reforms by global financial institutions for development, which often advocate for good governance, transfer of institutions and policies that erode corruption. Trade partners and foreign aid agencies often recommend good governance and anti-corruption policies as conditions when investing in Africa (del Rio, 2018). This implies that for African economies to advance, they need to transform their institutions to curb corruption and boost investor confidence while regaining trust from citizens and improving state capacity (Rodrik, Subramanian, and Trebbi, 2004).

Institutions often emerge as a potential answer to the crucial, yet unanswered questions in economic development. One of these questions - posed by Acemoglu, Johnson, and Robinson (2004:1) - is: *"Why are some countries so poorer than others?"* Neoclassical growth models, following Solow (1956), attribute the disparities in income per capita to path-dependent human and physical capital accumulation. According to these models, differences in factor accumulation stem from differences in savings rates and technical change (Solow, 1956), preferences, productivity, and the creation of new ideas (Romer, 1990) as cited by Acemoglu *et al*. (2004). However, these growth models did not account for the direct and indirect effect of institutions in explaining disparities in economic development.

According to Efendic, Pugh, and Adnett (2011), institutions have a direct influence on economic outcomes (for example, through the effects of transaction costs) or indirect economic channels (for example, as noted by Baum and Lake (2003), through inducing people to accumulate physical or human capital). This implies that institutions are one of the main drivers of economic performance (Rodrik, 2004; Acemoglu *et al.*, 2004). This seems to be true when comparing developed and developing economies, due to developing countries' inability to effectively implement modernization programs, and stagnating even to date (Bardhan, 2002; Acemoglu *et al.,* 2011; Abubakar, 2020).

Furthermore, Africa's abundant natural resources and unequal access to those resources due to racial segregation led to slow growth and high inequality within the continent (Sokoloff and Engerman, 2000). There is growing literature on institutions, as a channel through which corruption corrodes resources (Sokoloff and Engerman, 2000; Luiz, 2009; Khan, 2015). Motivated by Africa's poor economic performance since independence, its colonial history of extractive institutions, the ethnic conflicts, the availability of new data, and the existing empirical evidence for poor institutions in Africa. We explore the intricate dynamics of the impact of institutional quality on the contemporaneous underdevelopment of the African continent.

2.2. Institutions and growth.

Institutions play a pivotal role in enforcing economic growth. As argued by North and Thomas (1973) and Siddiqui and Ahmed (2013) institutional quality affects growth through its impact on property rights, incentive structure, transactions cost and risk reduction. More precisely, by creating the basis of exchange of exchange through contract enforcements, efficient institutions lower transaction costs, and promote economic activity, which in turn lead to increased tax revenues, and provided that these funds are gainfully used, increase the provision of public goods.

Institutions can also limit legal, bureaucratic, and public rents that can increase the cost of doing business through the predatory behaviour from economic participants with high bargaining power. These rents hinder inclusive growth as it prevents those who do not have such powers cannot enter contracts and thus limit long-run growth (Siddiqui and Ahmed, 2013). Therefore, having stronger rule of law and efficient control for corruption in place not only reduce risk but also limit rent-seeking and corruption.

Furthermore, political competition, viewed by Siddiqui and Ahmed (2013) as enhancement of opportunity cost to monopoly, increases the bargaining power of the society and increase their voice in deciding on who should govern. It further increases the marginal benefits of lower transaction costs and decrease the marginal cost of enforcing property rights and threat of takeover. This is evident in literature as countries with stronger voice and accountability, government effectiveness, and political stability exhibit positive economic growth (Méon and Weill 2006; Siddiqui and Ahmed, 2013; Owoye and Bissessar, 2017). In addition to these good institutions are argued to fast-track the collaborations between public and private sector by creating an enabling environment for economic activity to take place (Flachaire, García-Peñalosa and Konte, 2014), in absence of strong institutions, bureaucrats and private sector may seek to profit on the inefficiencies created by the dysfunctionality of such collaboration, at an expense of the public (Méon and Weill 2006).

Institutions are multidimensional in nature, as such, we have included the respective worldwide governance indicators (WGIs)[1] in the model to capture the different dimensions of institutional governance.

[1] The Worldwide governance indicators are explained in detail in section 3.3. For further details, see Kaufman, Kraay & Mastruzzi (2011).

3. Related Literature

The existing literature on cross-country variations in economic performance underscores bad institutions as the main source of the devastating growth of African countries. There is evidence that low quality of education, political instability, underdeveloped financial systems, distorted exchange markets, and insufficient infrastructure (Easterly and Levine, 1997; Epaphra and Kombe, 2017) are strongly correlated with slow growth (Luiz, 2009; Owoye and Bissessar, 2017).

According to Hall and Jones (1999), countries with high productivity tend to be the ones that spend more in accumulating physical and human capital and have good institutions and policies in place. The authors measure economic performance using output per worker and regress it on educational attainment (human capital) for the individuals aged 25 and above in 1985 and physical capital stock from 1988. The instruments used are the distance from the equator and the fraction of the population speaking European languages (Hall and Jones, 1999). These capture the degree to which a country's growth was affected by European expansion. Findings suggest that the long-run economic performance depends on institutions and state policies which shape the environment in which skills are accumulated, ideas are transferred, and goods and services are produced.

Similarly, Acemoglu *et al*., (2001) use European settler mortality from 64 ex-colonies, with income (GDP) per capita to proxy economic performance and indices for protection from expropriation to assess the impact of institutions on economic performance. The authors argue that Europeans adopted various policies in different colonies, setting extractive institutions where they faced high mortality rates. Using distance from the equator (latitude) and average protection from expropriation as instrumental variables, Acemoglu *et al*., (2001) report a high correlation between early settler mortality and early institutions; and between early institutions and present institutions. The authors also highlight a strong impact of institutions on income per capita, arguing that improving institutions would increase income.

In the subsequent papers, Acemoglu *et al*., (2002, 2004) argue that there has been a reversal of fortune in national income following the European expansion in the early 1500s. Using data on population density and urbanization patterns, they reach a similar conclusion that Europeans would create progressive institutions in previously poor countries (based on European settler-mortality rates). Acemoglu *et al*., (2004) maintain that the allocation of political power determines the allocation of resources through economic institutions, and therefore, determines economic performance. Consequently, they argue that the persistence and changes in institutions are equilibrium outcomes. That is, agents will change institutions that no longer serve their purpose. This indicates that institutions are dynamic and need to be aligned with growth objectives (Rodrik, 2000).

In a paper titled *Africa's growth tragedy,* Easterly and Levine (1997) argue that the cross-country variations in government policies and economic performance can be explained by ethnic diversity. The study demonstrates that Sub-Saharan African economic growth is related to political instability, poor education, weak financial markets, deformed foreign exchange markets, large government deficits, and inadequate infrastructure. They attribute all these to high fragmentation in Africa. As a result, Africa reports the highest infant mortality rates and low life expectancy (Easterly and Levine, 1997).

Leukert (2005) demonstrates that economic institutions are crucial drivers of income across the world. According to Leukert (2005), there should be a complete match between formal institutions - *constitutions, laws, and regulations* - and informal institutions - *norms, codes of conduct, established ways of doing business, and informal conflict resolution procedures*. Otherwise, all attempts for institutional reforms that change only the formal institutional framework, while people do not update the informal institutions to support and legitimize the new formal rules, will fail (Leukert, 2005).

In an important paper titled, *Do Institutions Cause Growth?* Glaeser *et al*., (2004) provide compelling evidence that institutional-governance indices used in literature are conceptually unfit for the purpose. The authors also highlight flaws in the instrumental variables used in the literature that posits a causal impact of institutions on growth. Finally, they argue that their

Ordinary Least Squares (OLS) results display stronger deterministic power of human capital than institutions; that good policies enable countries to emerge from poverty and successively better their political institutions.

The studies that focus on Africa have tended to use different channels, different datasets, and others have only focused on a single country. Using the worldwide governance indicators (WGI) and real GDP, Omoteso and Mobolaji (2014) investigate the effect of governance indices (focusing mainly on the control for corruption) on economic growth in 47 Sub-Saharan African countries for the years 2002-2009. They find that political stability and regulatory quality exert a significantly positive impact on growth; a negative correlation between government effectiveness and growth; and an ambiguous association between anti-corruption measures and growth.

A similar study by Owoye and Bissessar (2017) provides empirical support for the argument that corruption and bad governance are signs of weak leadership and institutional failures in Africa. The authors use data from 53 African countries with the following indicators: year of independence attainment, frequency of leadership changes, Successful coup, Corruption Perception Index, and corruption rank from 2011. They demonstrate a significant increase in corruption during the period 1980-2000 and attribute the persistence of corruption to bad governance. The authors further argue that African leaders choose to govern within weak institutions, to avoid accounting for their corrupt behaviour (Owoye and Bissessar, 2017).

In a slightly different study, Oliuwatobi, Efobi, Olurinola and Alege (2015) assert that innovation, as a catalyst for growth and rapid advancement in different sectors of the economy, is a channel by which institutions can drive economic operations and relationships. Using the system generalized method of moments (SGMM), they regress corruption on government effectiveness (GE) and regulatory quality (RQ) for 40 African countries from 1996 to 2012. The findings show that the included institutional governance variables (GE and RQ) have an equivalent impact on innovation and conclude that countries that seek to expand innovation should advance the frameworks for regulation and increase government effectiveness.

The study puts more emphasis on the impact of regulatory quality. Relating it to previous studies (Mankiw, Romer and Weil, 1992), the authors argue that the documentation and administration processes can limit innovation and generate incentives for corruption. They further argue that the weaker protection for property rights and long processes for patent applications hinge innovation, and consequently, growth and development (as argued by Romer, 1986; Mankiw, Romer and Weil, 1992).

Using the Generalized Method of Moments, Epaphra and Kombe (2017), study the effect of institutions on economic growth in Africa. The findings reveal that institutions are crucial for African economic growth, with political stability being the most significant institutional variable. Among the observed structural variables, trade liberalization, fixed capital formation, labour force, and foreign direct investments are reported to have a substantial effect on African growth.

Despite the significant effect of institutions in determining economic growth, there is no agreement on the type of institutions that affect economic growth in Africa. For instance, Mkandawire (2005) attributes Africa's stagnant economic growth to deflationary policies and irresponsiveness to economic stimuli. Noting that by undermining the investment-growth-trade nexus, African states discouraged trade expansion, investments, and diversification. Similarly, Epaphra and Kombe (2017) highlight that political instability, aid dependence, low growth, and fixed capital formation are the causes of African Stagnation. According to Flachaire, García-Peñalosa and Konte (2014), political and economic institutions are the key determinants of economic growth.

Furthermore, Hall and Jones (1999) reveal that government policies and institutions are the main determinants of the cross-country variations in capital accumulation and productivity and thus, output per worker. Nevertheless, Ajab (2013) argues that institutions are just the mechanism for getting the prices right, whereas total factor productivity is the real driver of economic growth. Additionally, Grier & Tullock (1989) reveal that there is no substantial effect of institutions on economic growth in developing countries. Also, Barro and Lee (1993) report

a "statistically insignificant relationship between democracy and growth" (as cited by Epaphra and Kombe, 2017:3).

Overall, there is limited (but expanding) empirical literature that examines the impact of institutions on economic performance in Africa. These studies highlight that institutions affect economic growth differently across the continent. The current study adds to the ongoing debate by examining the impact of institutions on economic growth in Africa while accounting for the effect of the structural determinants. In addition to the conventional institutional-governance indices which capture different aspects of institutional quality, we also include structural determinants of economic growth, which we explain in detail in the next section.

4. Data and Methodology

This section outlines the approach to be followed to obtain the empirical results.

4.1. Theoretical Model

The model for this study follows from the methodology of Mlilo (2019) and Hansson and Henrekson (1994). It assumes a *Hicks-neutral* (technology-augmenting) production function as follows:

$$Y_{it} = A_{it} f(K_{it} L_{it}) \tag{1}$$

where Y_{it} is output for country *i* at time *t*, given as a function of capital K_{it} and labour L_{it}. A_{it}, represents total factor productivity (TFP) level. Differentiating for all variables with respect to time to express the production function in standard form and rewriting the equation yields the following equations:

$$\frac{dY}{dt_{it}} = \frac{dY}{dA}\left[\frac{dA}{dt_{it}}\right] + \frac{dY}{dK}\left[\frac{dK}{dt_{it}}\right] + \frac{dY}{dL}\left[\frac{dL}{dt_{it}}\right] \tag{2}$$

$$\frac{dY}{dt_{it}} = \frac{dY}{dA}\left[\frac{dA}{dt_{it}}\frac{A}{A}\right] + \frac{dY}{dK}\left[\frac{dK}{dt_{it}}\frac{K}{K}\right] + \frac{dY}{dL}\left[\frac{dL}{dt_{it}}\frac{L}{L}\right] \tag{3}$$

$$\frac{dY}{dt_{it}}\frac{1}{Y} = \frac{dY}{dA}\left[\frac{dA}{dt_{it}}\frac{A}{A}\right]\frac{1}{Y} + \frac{dY}{dK}\left[\frac{dK}{dt_{it}}\frac{K}{K}\right]\frac{1}{Y} + \frac{dY}{dL}\left[\frac{dL}{dt_{it}}\frac{L}{L}\right]\frac{1}{Y} \tag{4}$$

$$\frac{\dot{Y}}{Y_{it}} = p_A\left[\frac{\dot{A}}{A_{it}}\frac{A}{Y}\right] + p_K\left[\frac{\dot{K}}{K_{it}}\frac{K}{Y}\right] + p_L\left[\frac{\dot{L}}{L_{it}}\frac{L}{Y}\right] \tag{5}$$

$\frac{\dot{A}}{A_{it}}$, $\frac{\dot{K}}{K_{it}}$ and $\frac{\dot{L}}{L_{it}}$ are the comparative growth rates of TFP, capital and labour for country *i* at a given time *t*, p_A is marginal productivity of TFP; p_K and p_L are the respective marginal productivities for capital and labour. For simplicity, we assume that the marginal productivities

of labour and capital are constant, while the marginal productivity of TFP and varies across countries. We further assume that institutional quality affects economic performance through the growth rate of the TFP, given by:

$$\frac{\dot{A}}{A_{it}} = \delta + \theta INST_{it} \quad (6)$$

where δ represents the initial income and other variables that affect the TFP growth rate. θ captures the effect of institutional quality on TFP growth.

Consequently, combining equations 6 with 5 to express output growth for country *i* yields:

$$\frac{\dot{Y}}{Y_{it}} = \beta_0 + \beta_1 INST_{it} + \beta_2 \left[\frac{\dot{K}}{K_{it}}\right] + \beta_3 \left[\frac{\dot{L}}{L_{it}}\right] + u_{it} \quad (7)$$

3.2. Empirical model Specification

Economic performance, the dependent variable, is represented by real Gross Domestic Product (real GDP), and is assumed to be influenced by institutions, measured by the institutional-governance (INST) indicators. These include rule of law (RL), regulatory quality (RG), voice and accountability (VA), political stability (PS), government effectiveness (GE), and control for corruption (CC). To avoid multicollinearity, a composite score will be created, and the individual *INST* indicators will be regressed in a stepwise manner. Additional to the research variables, we have a control variable that accounts for factors that affect growth variables, represented by a vector (X_{it}), for example, variables such as trade openness, human capital, physical capital, population growth, and government expenditure are included, $\propto_i$ represents country-specific effects.

$$\Delta GDP_{it} = \propto_i + \beta_1 INST_{it} + X_{it} + \epsilon_{it} \quad (8)$$

The above linear model will be estimated using panel data methods. These include the Pooled Ordinary Least Squares (POLS), Random effects (RE), and Fixed effects (FE) models (Seddighi, 2000). According to Seddighi (2000), the pooled regression model has constant coefficients, including the intercepts. The POLS enables researchers to pool all the data and estimate using the OLS regression model. "The fixed effect model is the differences across cross-sectional units that can be captured in differences in the constant term and the intercept

term of the regression model varies across the cross-sectional units" (Seddighi, 2000:3). On the contrary, in the random-effects model, "the individual effects are randomly distributed across the cross-sectional units and to capture the individual effects" (Seddighi, 2000:3), the regression model includes an intercept term capturing an overall constant term.

Economic theory suggests that any country with good governance and strong institutions should have low levels of corruption (Acemoglu *et al*., 2002, 2003, 2011; Easterly and Levine, 2003, 2016; Owoye and Bissessar, 2017). Theoretically, one expects all the β coefficients in equation 1 to be positive. That is, the impact of institutions on economic performance should be positive. However, given the institutional-governance quality in African countries (as demonstrated in previous studies), the signs of β coefficients can be ambiguous. That is, institutions may curb corruption in some countries and perpetuate it in some instances (where bad governance and poor institutions persist). Equation 1 follows the models used in the study by Omoteso & Mobolaji (2014); the only difference is that they only consider institutional indices whereas the current study also includes structural determinants of economic growth.

Due to the high correlation among the institutional-governance indices, we capture the multidimensionality of institutions using a composite score created through the Principal Component Analysis (PCA). This is aimed at reducing the dimensions of the dataset while minimizing data loss and increasing the interpretability of the results (Wold, Esbensen and Geladi, 1987). The major drawback of PCA is the possible bias in the result should the initial dataset not be standardized before performing PCA (Abdi and Williams, 2010). According to Wold, Esbensen, and Geladi (1987), this problem is fully accounted for as the transformed variables have the same range. Traditional panel data analysis recommends introducing the highly correlated variables individually into the model (Wold, Esbensen and Geladi, 1987). Instead of introducing the institutional indices individually in our initial model, we use PCA for the initial FE model and do the former for the robustness test.

3.2. Description of estimation techniques used

To obtain pooled OLS estimates, we combine all time series and cross-section components in successive chunks. As noted by Mlilo (2019), the POLS model is reliant on the assumption that

the intercept and slope coefficients are constant across all units. This assumption does not hold for the current study as countries included in the sample have uniquely heterogeneous characteristics. As such, we overlook the POLS results and opt for flexible techniques that can overcome heterogeneity.

The fixed effects and random effects of the error term offer some improvements for the shortcomings of the POLS. For instance, the FE model assumes that the error term has a "fixed element that can be estimated and a stochastic, independent and identically distributed component" (Mlilo, 2019:39). Consequently, the FE model is only applicable if we limit the inference to the behaviour of the selected countries. On the contrary, the RE model assumes that the error term also has to components, being a "randomly determined individual component and a stochastic, independent and identically distributed component" (Mlilo, 2019:39). It is critical that the error term should be uncorrelated with the regressors for the RE model be unbiased and consistent.

Although the FE model improves the POLS model, the use of dummy variables can result to loss pf degrees of freedom, or multicollinearity (Mlilo, 2019). The FE model also falls short in the face of time-invariant variables or country-specific features such as income levels, cultural diversity, fractionalization, and ethno-linguistics which influence institutional quality elements included in this study. The RE model, on the contrary, preserves the degrees of freedom. Given the complexities of the country-specific variations in our estimate, we cannot justify, yet, if these are random. Therefore, the choice between FE and RE models is left to the Hausmam test detailed in the section 3.4.

3.3. Data description

The dataset covers 39 African countries (inclusive of low-income to high-income economies) which were selected for this study based on data availability, for the 2002-2018 period. It is strongly balanced, meaning that each variable is observed for every country in all years. The real GDP per capita is used as a measure of economic performance and is regressed on institutional and structural variables. Six institutional quality indices include Control for Corruption (CC), Government Effectiveness (GE), Political Stability and Absence of Violence/Terrorism (PS), Rule of Law (RL), Regulatory Quality (RQ), and Voice and Accountability (VA). We also include structural variables such as human capital, trade

openness, government expenditure on final goods, gross fixed capital formation, and population growth. The next section provides detailed descriptions of these variables.

Control for Corruption measures perceptions of the degree to which office power is used for private benefit, including both petty and grand forms of corruption, as well as "state capture" by elites and private interests. Government Effectiveness measures the quality of government services, it captures the degree to which civil services are independent of political pressures, the quality of policy formation and execution, and the reliability of the government's loyalty to these policies. Political Stability and Absence of Violence/Terrorism on the other hand captures perceptions of the possibility of political instability and/or politically driven violence, involving terrorism.

Rule of Law measures the perceptions of the degree of trust that citizens have in and abide by the rules of society, especially the quality of contract enforcement, property rights, the legal systems, and the probability of crime and violence. Regulatory Quality measures perceptions of the state capacity to create and implement good policies and regulations that encourage private sector development. Voice and Accountability capture perceptions of the degree to which citizens can partake in government elections, freedom of expression, freedom of association, and independent media.

Estimates for all the above variables give the country's cumulative score of each indicator in the standard normal distribution, i.e., ranging from roughly -2.5 to 2.5. A negative value closer to -2.5 indicates low institutional quality per indicator, whereas a positive value, closer to 2.5 indicates good institutional quality (Kaufman, Kraay & Mastruzzi, 2011). The real GDP per capita, (*rgdp_capita*), is the total gross domestic product per person – the value of all final goods produced within the borders of the country in each period. Trade Openness (*trade*) is the sum of exports and imports of goods and services measured as a share of GDP (World Bank, 2021).

General government final consumption expenditure (*govspend*) is the growth rate of government purchases of final goods, as a percentage of GDP. Human Capital (*humancap*) is measured as the proportion of educational attainment for people aged 25 and above with at least secondary school completion. Gross fixed capital formation (*capitalform*) is the investment in physical capital, given as a proportion of GDP. Population growth (*popgrowth*) is the exponential rate of growth of the midyear population from year t-1 to t, expressed as a percentage (World Bank, 2020b).

Table 1 presents the descriptive statistics, showing a *strongly balanced* panel with 663 observations for each variable. The average values of the institutional quality variables are negative, indicating that institutions are generally weaker in Africa on aggregate. However, this kind of aggregation overlooks country-specific variations and should be interpreted with caution. As evident in the last two columns of Table 1, the minimum and maximum values vary largely across countries. The lowest value for political stability is -2.66, below the lower bound of the indicator, and the highest is 1.2. This shows that African countries have different characteristics, some are politically stable, while others are conflict-ridden.

Table 1: **Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
rgdp capita	663	2.023	3.902	-31.333	21.028
Govspend	663	7.556	25.953	-38.078	565.539
Trade	663	72.207	34.499	19.101	311.354
Capitalform	663	9.333	21.325	-65.827	231.418
Humancap	663	1.828	.429	1.088	2.901
Popgrowth	663	2.397	.904	-.617	4.63
CC	663	-.602	.564	-1.532	1.217
GE	663	-.649	.57	-1.746	1.057
PS	663	-.542	.82	-2.665	1.2
RQ	663	-.548	.559	-2.236	1.127
RL	663	-.577	.574	-1.852	1.077
VA	663	-.533	.67	-1.841	.941

Source: Author's formulation using World Bank's Worldwide Governance Indicators (WGI) and World Development Indicators (WDI) for the period spanning from 2002 – 2018.

The minimum values of almost every institutional variable are negative, and the maximum values are just above 1. This means that, although many African countries emerge from ethnic conflict, violence, corruption and have inefficient governments (Khan, 2015), some countries have restored peace and have implemented institutional reforms that transformed the extractive institutions into growth-promoting institutions (Ajab, 2013), although the magnitudes are low. The real GDP per capita growth rate figures oscillate between -31.33 and 21.03%, this provides striking evidence that the economic performance differs largely across African economies. Out of the 39 countries in the sample, 15 are in the lower-income category, 19 are in the lower-middle-income, only 4 are in the upper-middle-income group, and just 1 is in the higher income group (World Bank, 2021). Overall, the state of the African economy has remained poor over the last two decades.

Table 2 below is a correlation matrix outlining the degree and direction of correlation among the variables. The degree and sign of the correlation coefficients indicate the prevalent relationship between the institutional-governance indices, the structural variables and economic growth, as indexed by the annual growth rate of real GDP per capita. Similarly, Figure A2 (in the Appendix) provides a graphical representation of the correlation between basic regressors and economic growth. Evidently, all the institutional indices have positive correlation coefficients (lower-left panel of Table 2), demonstrating a positive relationship between institutions and the economic growth rate in Africa. However, the correlation coefficients are quite low, indicating weak relations between institutional-governance indices and economic performance. The far-right panel of Table 2 shows high correlation coefficients for institutional-governance indices. This implies that, for robust estimates, the institutional variables must be regressed separately. The coefficients for trade openness, capital formation, and government spending are positive, while human capital and population growth have negative coefficients.

Table 2: **Pairwise correlations**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) rgdp_capita	1.000											
(2) trade	0.019	1.000										
(3) capitalform	0.227	-0.002	1.000									
(4) humancap	-0.017	0.252	-0.038	1.000								
(5) govspend	0.158	0.001	0.066	-0.026	1.000							
(6) popgrowth	-0.019	-0.348	0.098	-0.495	0.036	1.000						
(7) CC	0.139	0.206	0.009	0.366	-0.062	-0.476	1.000					
(8) GE	0.127	0.084	-0.037	0.476	-0.063	-0.510	0.861	1.000				
(9) PS	0.092	0.288	0.014	0.320	-0.088	-0.276	0.694	0.649	1.000			
(10) RQ	0.133	0.003	-0.020	0.307	-0.105	-0.303	0.782	0.861	0.631	1.000		
(11) RL	0.124	0.103	-0.026	0.417	-0.091	-0.410	0.847	0.886	0.732	0.891	1.000	
(12) VA	0.100	0.115	0.033	0.269	-0.025	-0.181	0.605	0.603	0.549	0.696	0.736	1.000

Source: Author's estimates.

3.4. Model Selection

The Breusch – Pagan Lagrangian Multiplier (LM) test for random effects tests the null hypothesis that error variances of the observed units are equal, against the alternative that the error variances are not equal (Breusch and Pagan, 1980). Failing to reject the null hypothesis implies that POLS would be the best method for estimating the model since there are no panel effects. Table A1 in the appendix summarizes the model specification tests. The LM test has a chi-square value of 0.00 with a probability of 1.0000. This indicates that there are panel effects and that POLS is not a suitable model for the dataset. The random-effects model is not suitable for this present study as the test suggests that there are no random effects (Berrington and Smith, 2006).

Next, we explore the Hausman test for model specification (also presented in Table A1), which tests the null hypothesis that the random effect is the appropriate model against the alternative that the fixed effect model is appropriate. The chi-square value of 47, 14 with a p-value of 0.00 (which is greater than 0.05) implies that we reject the null hypothesis, in favour of the alternative. That is, each country has specific characteristics that may affect the regressors. The fixed Effects model eliminates the effects of the time-invariant characteristics and enables us

to evaluate the net effect of the regressors on the dependent variable (Berrington and Smith, 2006).

The FE model also assumes that these time-invariant characteristics are uniquely country-specific and should not be correlated with other country-specific characteristics. This implies that the error term and the constant of one country should not be correlated with the others (Epaphra and Kombe, 2017). We have established through the Hausman test that the error terms are not correlated (see Table A1 in the appendix). The panel unit root tests (summarized in Table A2 in the appendix) shows that all variables are stationary at level and 1st difference, according to the Levin-Lin-Chu test (Levin, Lin, and Chu, 2002). Only human capital is non-stationary at level but becomes stationary at 1st difference when the Harris and Tzavalis (1999) and Breitung (2000) tests are considered. This implies that there are autocorrelations among the regressors.

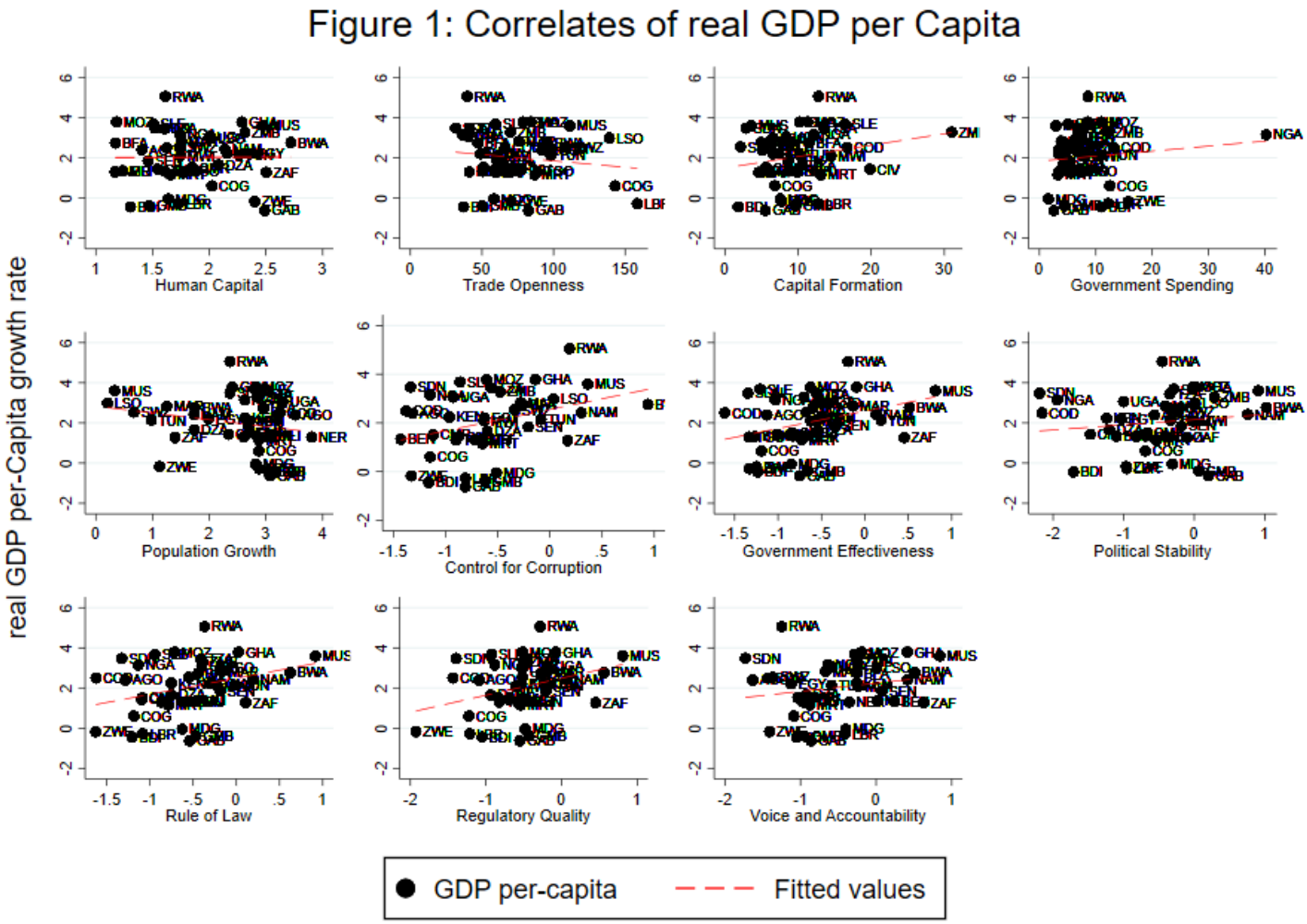
4. Discussion of Results and Analysis

We begin our discussion of the results by showing the observed association between the real GDP per capita growth rate and institutional-governance indices as well as structural indices. Figure 1 gives a graphical representation of the correlations between the means of real GDP per Capita and the respective regressors. The observed relationship is consistent with most findings in the literature on institutional quality and growth. More precisely, countries with better institutions such as Rwanda, Ghana, Mauritius, Mozambique, Cape Verde, and Botswana have higher GDP growth rates than countries with weaker institutional quality such as Madagascar, Zimbabwe, Burundi, Democratic Republic of Congo, Libya and the Congo Republic.

This implies that the quality of institutions and governance differ substantially across the African continent. Evidently, economic activities tend to be more profitable in a less corrupt and politically stable economy as more investors tend to run away from politically unstable economies with ineffective governments. Although it is clear from Figure 1 that institutional-governance indices are positively correlated with economic performance. We cannot conclude

that poor economic performance is solely due to poor institutions. Evidence from Figure 1 indeed shows that countries with greater gross capital formation and higher government spending appear to also have a better growth rate of GDP per capita.

Table 4 presents the estimation results from the POLS, FE, and RE models. The LM test rejected the POLS model. The Hausman test rejected the efficient random effects model in favour of the consistent fixed effects model. We thus base our discussion on the results from the fixed effects models 3 and 4 in Table 4. To avoid Nickell Bias (Nickell, 1981), the lag of GDP per capita is omitted in the fixed effects estimation. The results show that the coefficients on government spending, trade openness, and population growth are positive and statistically significant at a 1% significant level, based on the first model which excludes institutions. These coefficients remain positive and highly statistically significant at a 1% significance level even after we include the principal component for institutions in the second model. This principal component for institutions is also positive and highly statistically significant at a 1% significance level. This implies that institutions do matter for economic growth in African economies.



Source: Author's estimation

Note: Graphical Representation of the correlations between means of real GDP per Capita and the respective regressors.

Table 4: POLS, FE and RE Regressions

	Pooled OLS		Fixed Effects		Random Effects	
Dependent Variable: Real Gross Domestic Product (GDP) per capita						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
VARIABLES	POLS	POLS	FE	FE	RE	RE
rgdp_lag1	0.299***	0.280***			0.299***	0.280***
	(0.0348)	(0.0349)			(0.0348)	(0.0349)
Govspend	0.0190***	0.0205***	0.0191***	0.0195***	0.0190***	0.0205***
	(0.00536)	(0.00532)	(0.00552)	(0.00549)	(0.00536)	(0.00532)
Trade	0.00308	0.00357	0.0259***	0.0294***	0.00308	0.00357
	(0.00426)	(0.00422)	(0.00813)	(0.00816)	(0.00426)	(0.00422)
Capitalform	0.0378***	0.0366***	0.0351***	0.0336***	0.0378***	0.0366***
	(0.00640)	(0.00635)	(0.00675)	(0.00672)	(0.00640)	(0.00635)
humancap	-0.258	-0.639*	-2.280*	-2.237*	-0.258	-0.639*
	(0.369)	(0.381)	(1.196)	(1.188)	(0.369)	(0.381)
Popgrowth	-0.292	-0.136	2.187***	2.083***	-0.292	-0.136
	(0.183)	(0.187)	(0.508)	(0.506)	(0.183)	(0.187)
Inst		0.283***		0.813***		0.283***
		(0.0796)		(0.270)		(0.0796)
Constant	1.876*	2.203**	-1.390	-1.464	1.876*	2.203**
	(1.042)	(1.037)	(2.447)	(2.431)	(1.042)	(1.037)
Observations	624	624	663	663	624	624
R-squared	0.174	0.190	0.118	0.131	39	39
Number of ID	NO	NO	39	39	YES	YES
Country FE	-	-	YES	YES	YES	YES
Rob SE	YES	YES	YES	YES	YES	YES
F- test (prob)/chi2	0.000	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, indicate significance levels at 1%, 5%, and 10% respectively.

Only human capital has a negative and statistically significant coefficient, significant at the 10% level. The constant term is insignificant in both models 3 and 4. These results imply that improvements in institutional quality, coupled with increases in government spending (Mlilo, 2019), gross fixed capital formation, population growth and liberalized trade policies lead to improvements in economic growth. More precisely, unit increases in government spending, trade openness, gross fixed capital formation, and population growth is associated with 0.0195, 0.0294, 0.0336 and 2.083 units increase in economic growth. Furthermore, 1 unit improvement in overall institutional quality is associated with 0.813 units increase in the growth rate of the real GDP per capita. While a unit increase in human capital is associated with 2.237 units decline in economic growth.

As already noted, the institutional indices exhibit high collinearity. This is expected as they all measure different dimensions of institutional quality. To account for this high degree of collinearity, we added these indices separately into the regression models. Table 5 shows that, when estimated separately, the institutional-governance indices yield ambiguous growth effects. On one hand, political stability and voice & accountability seem to have the strongest positive impact on economic growth in Africa, the two indices report positive coefficients that are highly significant at 1% level. Furthermore, regulatory quality and rule of law are positive and statistically significant at 5% and 10% significance levels, respectively. Contrary to popular views in literature, we find that control for corruption and government effectiveness are statistically insignificant at all levels.

The coefficients of government spending, trade openness, capital formation, and population growth remain positive and statistically significant at a 1% significance level in all models. While human capital is negatively significant at a 10% significance level in models 1 to 3, significant at a 5% level in models 6 and 7, and insignificant in models 4 to 5. As expected, these results reinforce our expectation that good institutions, precisely politically stable economies with stronger regulations and accountable bureaucrats which are selected fairly by citizens, tend to grow faster.

Table 5: Robustness Tests

Dependent Variable: Real Gross Domestic Product (GDP) per capita							
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
VARIABLES	Robust FE	Robust FE	Robust FE	Robust FE	Robust FE	Robust FE	Robust FE
Govspend	0.0191***	0.0191***	0.0190***	0.0194***	0.0201***	0.0193***	0.0185***
	(0.00552)	(0.00552)	(0.00552)	(0.00550)	(0.00552)	(0.00552)	(0.00550)
Trade	0.0259***	0.0267***	0.0270***	0.0279***	0.0289***	0.0276***	0.0262***
	(0.00813)	(0.00816)	(0.00819)	(0.00812)	(0.00818)	(0.00818)	(0.00809)
Capitalform	0.0351***	0.0344***	0.0348***	0.0341***	0.0341***	0.0347***	0.0335***
	(0.00675)	(0.00678)	(0.00675)	(0.00672)	(0.00673)	(0.00674)	(0.00674)
Humancap	-2.280*	-2.221*	-2.173*	-1.921	-1.884	-2.521**	-2.981**
	(1.196)	(1.197)	(1.199)	(1.197)	(1.201)	(1.202)	(1.218)
Popgrowth	2.187***	2.091***	2.197***	2.068***	2.217***	2.122***	2.018***
	(0.508)	(0.516)	(0.508)	(0.507)	(0.506)	(0.509)	(0.509)
CC		0.911					
		(0.845)					
GE			0.957				
			(0.866)				
PS				1.064***			
				(0.397)			
RQ					2.003**		
					(0.797)		
RL						1.422*	
						(0.841)	
VA							1.877***
							(0.695)
Constant	-1.390	-0.775	-1.071	-1.326	-1.309	-0.0958	1.293
	(2.447)	(2.512)	(2.463)	(2.435)	(2.436)	(2.560)	(2.629)
Observations	663	663	663	663	663	663	663
R-squared	0.118	0.119	0.120	0.128	0.127	0.122	0.128
Number of ID	39	39	39	39	39	39	39
Country RT	YES	YES	YES	YES	YES	YES	YES
F- test (prob)/chi2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1, indicate significance levels at 1%, 5%, and 10% respectively.

Our results are comparable to the findings of Epaphra and Kombe (2017) and Omoteso and Mobolaji (2014), who report positive and significant coefficients for government effectiveness, rule of law and control for corruption, but differ significantly in that we find government effectiveness and control of corruption to be insignificant, although the signs are still consistent with the previous studies. The diminishing significance of government effectiveness and

control for corruption may be due to other underlying causes such as the unique features of the countries in our sample.

The highly significant variable according to the results in Tables 4 and 5 however, is government spending on final consumption, trade openness, population growth rate and gross fixed capital formation. The more liberalized economies benefit from technological transfer, a variety of goods for consumption and the transfer of resources (Hall and Jones, 1999). Surprisingly, population growth seems to have a significant impact on economic growth in Africa. The increase in population growth is usually considered a proxy for growth in the labour pool (Epaphra and Kombe, 2017). Thus, Africa being a labour-intensive and labour abundant region, there is no doubt that a large percentage increase in economic growth is associated with a high population growth rate. Also, African economies depend largely on government spending (World Bank, 2020b), as such, higher government spending on final consumption leads to increases in economic growth albeit if government spending is effective (Mlilo, 2019).

The positive impact of population growth and gross fixed capital formation validate the relevance of the Solow model in explaining economic performance in Africa, as cited by Epaphra and Kombe (2017). Moreover, trade openness is well documented in literature as one of the major elements of economic performance across the world, and more so in Africa. It is widely known from the pioneering works of Romer (1990) and Mankiw, Romer and Weil (1992) that good institutions, coupled with good structural variables and technological progress offer fast and sustainable growth. Similarly, good governance promotes the creation of new ideas through the strong protection of property rights and patents, while enabling the private sector and loosening trade restrictions to stimulate economic growth (Hall and Jones, 1999).

Our results are qualitatively similar to those from recent studies. In a study by Epaphra and Kombe (2017), the reported coefficients for institutional indices are all positive and significant. Political stability is reported to have the greatest impact on economic growth, highly significant at 1% level, while the rest of the indices are significant at 10% level. A similar study by Omoteso and Mobolaji (2014) reported somewhat different results. They found that regulatory quality to have the highest impact on economic growth, with a positive coefficient, significant

at a 1% level. Political stability and government effectiveness both reported positive and significant coefficients at 5% and 10% levels, respectively. While rule of law and voice & accountability were found to be negative and insignificant at all levels.

Overall, this paper reveals that the effect of institutional quality has significant implications for economic growth. Based on the findings of this study, policies that improve the quality of voice and accountability, enhance political stability and regulatory quality are most likely to boost economic performance. Certainly, rapid economic growth requires that people have more voice in shaping the institutions and for bureaucracies to be accountable to people. The high political instability in Africa has been argued to increase costs of doing business in Africa (Epaphra and Kombe, 2017), hence, political stability and the absence of violence in Africa would reduce costs of doing business and enhance economic growth. Stronger and effective regulations would spill over to reducing corruption and the hindrances to research and development caused by poor regulatory quality in African economies.

5. Recommendations and Conclusion

The paper aimed at analysing the impact of institutional quality on economic performance in Africa. Using a sample of 39 African countries over the 2002 – 2018 period, this paper documents the important dynamics of the impact of institutions and structural factors on economic performance. The study applied Pooled OLS, Random Effects (RE) and Fixed Effects (FE) panel data models. To account for collinearity and multidimensionality of institutional proxies, a joint PCA component was used. Guided by the Breusch-Pagan LM test and the Hausman test, the emphasis was given to the Fixed Effects model mainly because of its power in dealing with country-specific differences in regressors.

Given the Fixed Effects estimates, we conclude that institutions are crucial in explaining the cross-country variations in growth figures and that institutions have a significant role in enhancing economic growth in Africa. The results indicate that improving institutional quality is expected to enhance economic growth rate in Africa. The most prominent of the six

institutional indices are voice and accountability; political stability; the absence of violence or terrorism; regulatory quality; and the rule of law. These seem to have a greater impact on African economic growth during the period of study.

Other critical components for African growth include trade openness, gross fixed capital formation, population growth and government spending on final consumption. By contrast, government effectiveness and control for corruption are insignificant. This is unsurprising, considering that the African continent is rife with government maladministration and poor legal institutions. While human capital has a significant but negative effect on African growth during the period of study.

The results from this study have strong implications for African economies. Improving institutions by increasing political stability, voice and accountability, rule of law, and regulatory quality will result in economic expansion. Logically, institutional-governance quality not only maintains peace and political stability but also drives the efficient functioning of inclusive economic growth and development. However, institutions-governance quality alone might not be adequate.

Therefore, to safeguard sustainable growth in Africa, trade restrictions should be minimised, the gross fixed capital formation should be increased while ensuring responsible increases in government spending on final goods and promoting healthy increases in the labour force. Arguably, a higher degree of trade openness and increases in government spending tend to be more substantial in explaining the economic growth of African economies when better institutions and good governance are in place.

This study has not identified which types of institutions and policies matter for economic growth. It also has not determined the extent to which African demographics matter for economics. Further research should focus on determining the type of policies and institutions that would enhance Africa's economic growth.

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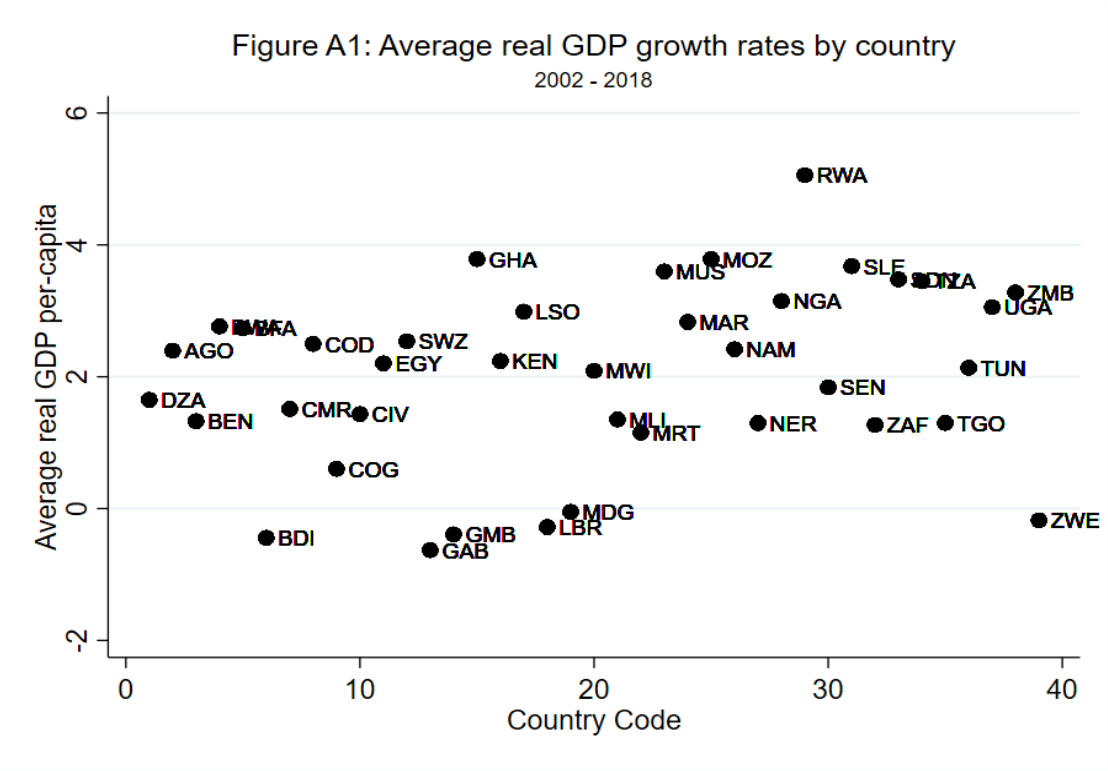
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7. Appendix



Source: Author's estimation

Model Selection Tests				
Type of test	**Purpose of test**	**Chi-Square**	**p-value**	**Test outcome**
Lagrange Multiplier (LM) test for RE	Choosing between panel data models (random effects) and POLS. Tests null that the error variances are all equal - there are no panel effects.	0,00	1,0000	The p-value (1) is greater than 0,05. Thus, we reject the null that differences across units are zero. Therefore, we conclude that there exist panel effects.
Hausman Test	Choosing between fixed - and random effects model. The null is that there are random effects.	47,14	0,0000	The p-value (0) is less than 0,05. We reject the null that there is no correlation between unique standard errors. Based on this outcome, we conclude that there the best model is the **fixed effects** model.

Table A1: Model Selection Criteria

Source: Author's estimation. Descriptions based on the works of Hausman (1978)

Table A2: Panel Unit Root Tests.

Variable	Number of differencing	LLC		HT		Breitung	
		Stat.	Prob.	Stat.	Prob.	Stat.	Prob.
rgdp_capita	At level	-7.4624	0.0000	0.2254	0.0000	-6.9861	0.0000
	1st difference	-13.9256	0.0000	-0.3345	0.0000	-9.6878	0.0000
Govspend	At level	-6.6249	0.0000	-0.0826	0.0000	-8.0032	0.0000
	1st difference	-19.4849	0.0000	-0.5284	0.0000	-11.5622	0.0000
Trade	At level	-4.7533	0.0000	0.6611	0.0000	-2.2678	0.0117
	1st difference	-10.0251	0.0000	-0.0440	0.0000	-12.3685	0.0000
Capitalform	At level	-6.6429	0.0000	-0.0273	0.0000	-8.8049	0.0000
	1st difference	-16.4814	0.0000	-0.5170	0.0000	-11.6847	0.0000
Humancap	At level	-1.3652	0.0861	1.0183	1.0000	18.9524	1.0000
	1st difference	4.6079	0.0000	0.6458	0.0000	-0.8630	0.0191
Popgrowth	At level	-20.4550	0.0000	0.8932	0.9852	4.1830	1.0000
	1st difference	-18.5451	0.0000	0.6340	0.0000	1.7147	0.0568
CC	At level	-2.7626	0.0029	0.7501	0.0012	-1.6704	0.0473
	1st difference	-7.6168	0.0000	-0.0853	0.0000	-8.5145	0.0000
GE	At level	-5.3900	0.0000	0.7185	0.0000	-1.5651	0.0588
	1st difference	-14.2847	0.0000	-0.2426	0.0000	-10.1934	0.0000
POST	At level	-4.8473	0.0000	0.7756	0.0180	-0.3173	0.3755
	1st difference	-9.7308	0.0000	-0.1442	0.0000	-8.5355	0.0000
RQ	At level	-2.4234	0.0077	0.7926	0.0692	-0.9721	0.1655
	1st difference	-9.2063	0.0000	-0.1790	0.0000	-8.5586	0.0000
RL	At level	-2.4249	0.0077	0.8081	0.1791	0.1041	0.5414
	1st difference	-10.0104	0.0000	-0.1338	0.0000	-9.1391	0.0000
VA	At level	-3.3448	0.0004	0.8158	0.2618	-1.3812	0.0836
	1st difference	-9.0384	0.0000	0.0397	0.0000	-7.8759	0.0000

Source: Author's calculations.

Note: LLC, HT, and Breitung indicate (respectively) unit root tests in Levine et al. (2002), Harris and Tzavalis (1999), and Breitung (2000). The values in parentheses represent the probabilities associated with the test statistics. p<0.01, p<0.05, and *p<0.1 the rejection of the null hypothesis of the presence of a unit root at 1%, 5%, and 10%.