



Economic complexity in Africa: The role of trade and governance institutions

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Abstract

It is evident that the role of trade and governance institutions in enhancing economic complexity in Africa is still under serious debate regarding whether it is detrimental or beneficial to economic growth. The purpose of this study is to investigate how trade and governance institutions influence economic complexity in Africa using a system Generalized Method of Moments (system GMM) and 31 African economies for the period 2011–2020. Beyond these key variables of interest, our study includes some macroeconomic variables in the model, such as international tourism arrivals, infrastructural development, and human capital development, to ensure robustness of the results. The results of the system GMM reveal that trade promotes economic complexity in Africa, while institutional quality indicators such as control of corruption, rule of law, government effectiveness, regulatory quality, political stability, and absence of violence/terrorism, including voice and accountability, are predominantly negative in improving economic complexity on the continent. Further results of system GMM also reveal that infrastructural and human capital developments are relevant drivers of economic complexity, while international tourism arrivals played a detrimental role. This study proposes that African leaders and policymakers across the continent should come together to advance free trade and advocate reform for strong institutions through the instrumentality of the African Union.

Keywords: Africa, Economic complexity, Institutional quality, System GMM, Trade.

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Contribution of this paper to the literature

This study contributes to the existing literature by investigating the combined effects of trade and governance institutions on economic complexity in Africa. It aims to determine whether trade and governance institutions, when included together in the model, can significantly influence economic complexity in Africa.

1. Introduction

Trade is one of the most crucial aspects of income generation in most economies across the world. Indeed, the essential role of trade has been documented in recent literature. For instance, trade stimulates job creation and raises the standard of living (Nchofoung, Asongu, Njamen Kengdo, & Achuo, 2022; Nkemgha, Nchofoung, & Sundjo, 2023). It can also change the fortune of African economies from the category distinguished by poverty to those distinguished by wealth (Geo-JaJa & Mangum, 2003). According to Acemoglu, Gallego, and Robinson (2014), trade can help in poverty alleviation, which in turn contributes to overall growth. The report from World Bank (2022) revealed various levels of trade participation in the world. On average, trade participation in Africa is 3 percent at the global level, while other continents such as the European Union and Latin America and the Caribbean have average trade levels of 55 and 42 percent, respectively. This report implies that trade in Africa is low relative to other continents of the world. This is because African economies are characterized by some factors such as poverty (Emmanuel O Nwosu, Ojonta, & Orji, 2018), high dependency ratio (Ojonta, 2023), and high level of inequality (Nwosu & Orji, 2016). These factors confronting trade development in African economies have constrained the continent from catching up with the rest of the world. Thus, African economies are generally characterized by a low level of total trade despite their abundance of both human and natural resources. This issue motivated this study.

Interestingly, trade (import and export) can be essential in illuminating the dynamics of economic complexity in an economy. Indeed, the ongoing argument about how trade promotes economic sophistication has drawn the attention of economists, with some arguments suggesting that economies that are more sophisticated have higher trade participation and more diversified exports compared to less developed economies that mainly export less complex products with little or no value addition (Sweet & Eterovic, 2019; Vu, 2020; Zhu & Li, 2016). Thus, economies that expand and diversify their participation in international trade are therefore anticipated to be comparatively more sophisticated than those with less emphasis on participating in international trade. The studies, Lee, Olasehinde-Williams, and Gyamfi (2023) and Doğan, Balsalobre-Lorente, and Nasir (2020) attest the facts and establish that trade diversification can engineer rapid and steady growth in sophisticated economies. This suggests that if trade is well harnessed, it will go a long way in contributing to global efficiency. An active participation of a country in international trade can enhance economic sophistication in diverse sectors of the economy. For instance, some recent empirical works have shown that international trade is an important channel through which economies can derive gains from economic complexity at both local and international levels (Mealy & Teytelboym, 2022; Ogbuabor, Emeka, Orji, & Onuigbo, 2023; Zhu & Li, 2017). Regrettably, Africa's economic complexity, when compared to other continents worldwide, shows that the large bulk of them are at the lowest rankings of the economic complexity index. According to the 2021 Atlas of Economic Complexity index, as issued in Table 1, which provides the values of economic complexity in Africa and other countries of the world in order of ranking, the report indicates that many African economies are not among the top 44 countries in this index. Indeed, Tunisia is the only African country that recorded a positive value in this index in 2021. This low ranking of economic complexity associated with African economies has been a significant concern to policymakers, despite the fact that African economies are endowed with abundant natural resources. This issue motivates this study to investigate the role of trade in driving economic complexity on the continent.

Table 1. Distribution of 2021 economic complexity index (ECI) by countries ranking.

ECI ranking for the top 25 countries			ECI ranking for top 25 countries in Africa		
Country	Ranking	ECI	Country	Ranking	ECI
Japan	1	2.26	Tunisia	45	0.39
Switzerland	2	2.14	Eswatini	63	0
South Korea	3	2.04	Egypt	67	-0.13
Germany	4	1.94	South Africa	68	-0.15
Singapore	5	1.83	Mauritius	71	-0.17
Czechia	6	1.75	Kenya	80	-0.35
Austria	7	1.68	Morocco	81	-0.35
United Kingdom	8	1.61	Malawi	89	-0.51
Slovenia	9	1.59	Uganda	92	-0.53
Sweden	10	1.54	Namibia	95	-0.58
Hungary	11	1.52	Algeria	96	-0.63
Slovakia	12	1.46	Senegal	97	-0.66
Ireland	13	1.44	Mali	99	-0.73
United States of America	14	1.4	Burkina Faso	100	-0.75
Finland	15	1.36	Madagascar	102	-0.77
Italy	16	1.35	Zambia	105	-0.84
France	17	1.34	Ethiopia	108	-0.88
China	18	1.33	Tanzania	109	-0.91
Romania	19	1.23	Botswana	111	-0.92
Belgium	20	1.18	Zimbabwe	113	-1.01
Israel	21	1.17	Togo	114	-1.03
Mexico	22	1.14	Angola	116	-1.04
Thailand	23	1.12	Libya	119	-1.11
Denmark	24	1.06	Mozambique	120	-1.17
Poland	25	1.02	Ghana	121	-1.18

Source: Author’s computation sourced from 2021 atlas of economic complexity index with 133 ranking countries were conducted by Massachusetts institute of technology’s observatory of economic complexity (<http://atlas.media.mit.edu>).

Apart from the role of trade in explaining the changes in economic sophistication, it has been established in the literature that institutional quality can also be essential in amplifying or deterring economic complexity. Indeed, many economies around the world cannot afford to function in isolation because their economies are enshrined in strong governance institutions. However, there is no doubt that any economy plagued by a lack of government effectiveness, widespread corruption, willful disregard for the rule of law, poor or weak regulatory environments, lack of accountability in governance, and persistent political instability and violence will find it difficult to achieve a high level of sustainable economic sophistication (Hussen, 2023). Additionally, Ojonta, Obodoechi, and Ugwu (2021) established that a considerable improvement in economic growth sustainability in many African countries has not been achieved because of the absence of relevant high-quality institutions in these countries. North (1990) also explained the significant role of high-quality institutions in an economy. The study believes that high-quality institutions create the enabling environment for businesses to thrive and also increase investors’ confidence in the domestic economy. Hence, the study posited that strong institutions are relevant to ensure overall growth in an economy. Easterly (2002) agrees with this position, and further suggested that this overall growth should be anchored on the respect for the rights of citizens. Unfortunately, most African economies have consistently performed poorly in various indicators of institutional quality, at least in the last two decades. For example, the poor levels of economic growth and development in Nigeria have been largely blamed on the persistently high level of corruption in the country due to weak governance institutions (Ogbonna, Ogbuabor, Eze, & Ugwuoke, 2021; Ogbuabor et al., 2023). Table 2 also shows that African economies have generally been characterized by weak institutions, and this further motivated this study.

Table 2. Average distributions of institutional quality according to their indicators from 2002 to 2021.

Indicators/Countries	Control of corruption	Government effectiveness	Political stability and absence of violence/Terrorism	Regulatory quality	Rule of law	Voice and accountability
Nigeria	-1.150	-1.047	-1.924	-0.901	-1.108	-0.625
China	-0.392	0.209	-0.464	-0.292	-0.416	-1.612
Germany	1.820	1.542	0.793	1.604	1.663	1.394
USA	1.388	1.525	0.341	1.455	1.550	1.111
Brazil	-0.185	-0.215	-0.233	0.016	-0.222	0.447

Note: The countries showcased in the Table are captured based on the fact that such countries witnessed the highest nominal GDP in 2021 in their respective regions. Nigeria is for Africa, China for Asia, Germany for Europe, USA for North America, and Brazil for South America.

Source: Author’s compilations using data originated from World Bank (2022).

In light of the aforementioned background, this study raises two crucial questions. (i) How is economic complexity responding to trade and institutional quality on the continent? (ii) How are other macroeconomic variables (examples of these include international tourism arrivals, infrastructural and human capital developments) incorporated in the model influencing economic complexity in Africa? Therefore, the specific objectives of this study are, first, to examine how economic complexity in Africa responds to trade and institutional quality. Second, to analyze how the effects of other macroeconomic variables (examples of these include

international tourism arrivals, infrastructural and human capital developments) incorporated in the model influence economic complexity in Africa.

The data and methodology are presented in Section 3, the empirical results are discussed in Section 4, the literature review is provided in Section 5, and the research is concluded with specific recommendations in Section 6.

2. Literature Review

2.1. Theoretical Literature

Many economic theories are cited in this paper, such as the theory of international trade, which is the similarity trade theory; the theory of economic complexity, which is also the theory of endogenous technological progress; and the theory of institutional quality, which is the theory of planned behavior. An explanation of these theories is provided below.

The country similarity trade theory was developed by [Linder \(1961\)](#). The theory explains the relationship between nations at similar stages of development and consumers with similar preferences. The theorist established that nations at comparable stages of development tend to have consumers with similar preferences. Additionally, the theorist believes that countries sharing uniform per capita incomes are more likely to engage in trade of most produced commodities. Some existing literature, such as [Samuelson \(1948\)](#), supports this theory. This support affirms that companies typically manufacture for domestic consumption and subsequently export to countries where end users share similar preferences. To understand trade theories where consumer decisions are influenced by product reputation and brand names, the theory of country similarity is particularly suitable. Some studies (e.g., [Blundell, Dearden, Goodman, & Reed, 2000](#); [Fitzenberger & Kurz, 2003](#); [Psacharopoulos, 1994](#))) lend support to this theory.

The theory of endogenous technological progress as proposed by [Aghion and Howitt \(1992\)](#), states that technological progress is useful in promoting economic complexity. The theorist believes that the usefulness can engender the contest between the implementation of long-term technological innovation and firms' product generation. The theory by [Aghion and Howitt \(1992\)](#) reveals that each innovation is expected to bring into the market new interim goods (technology), which can be utilized in a more efficient and effective production of products than the previous one. Furthermore, when there are products driven by technology, they tend to attract the interest of tourists. Therefore, policies and reforms have to be channeled towards technological advancement in order to enhance international tourism. Some studies [Abbasi, Lv, Radulescu, and Shaikh \(2021\)](#) and [Fatai, Agboola, Ozturk, Bekun, and Agboola \(2021\)](#), lend support to this theoretical perspective.

[Ajzen \(1991\)](#) developed the theory of planned behavior, which is another important theory in this study. The theory focuses on the general behaviors that allow a person to exercise self-control. It also establishes that human behavior can be classified into four distinct components: action behavior, target behavior, context behavior, and time behavior. The theorist believes that human behavior can be controlled through subjective norm. The theory conceptualizes institutional quality not only as the rule of law to capture a general perception of society but also to ensure that society is being controlled by the rule of law in terms of the quality of contract enforcement, the police, property rights, courts, violence, and crime.

2.2. Empirical Literature

A large sample of empirical studies has also investigated how economic complexity is driven by total trade and institutional quality using various econometric techniques across different countries and regions of the world. This section of the study reviews relevant literature within the objectives.

2.2.1. Trade, Institutional Quality and Economic Complexity

In a research to scrutinize the determinants of economic complexity in Africa, [Nchofoung and Asongu \(2022\)](#) showed that trade is a potent channel for promoting economic complexity on the continent. [Jiya, Sama, and Ouedraogo \(2020\)](#) explored the alliance between trade and infrastructural development for the period 1993-2016 using a dynamic fixed effect approach. The outcome of the study revealed that trade openness significantly impacts economic growth in Africa. Another study [Ho and Iyke \(2021\)](#), engaged three variables, including institutions and economic growth, as control variables. The focus of the study was to investigate how trade openness influences financial development in Africa for the using 43 countries. The study employed Sen's capability approach to predict the estimation result. The study maintained that trade openness is potential driver of financial development in Africa. The study by [Shao and Razzaq \(2022\)](#) intend to estimate how trade is impacting infrastructural development for the period 1996-2017. The results show that components of trade, such as imports and exports, are necessary factors in enhancing infrastructural development. [Nkemgha et al. \(2023\)](#) employed system GMM regression to investigate how trade and financial development moderate the consequence of human capital development on industrialization in Africa. The study achieved its objective by analyzing 33 economies in Africa. The results show that the impact of financial development is negative. [Fleisher, Li, and Zhao \(2010\)](#) conducted a study in China to examine the nexus between trade, output, and productivity growth patterns in China. The findings of the study indicate that trade has a positive influence on both output and productivity growth. The review of institutional quality and economic complexity, for example, [Emeka, Ajah, and Asongu \(2025\)](#) found that institutional quality and terrorism had a substantial influence on economic complexity in Africa when examining the contributions of industrialization and infrastructure development as drivers of economic complexity in the continent. [Ogbuabor et al. \(2023\)](#) look at the factors that influence economic complexity in Africa in a different study. Research indicates that economic complexity in Africa is significantly impacted by uncertainty. Once more, [Ogbuabor et al. \(2023\)](#) provided evidence of how governance institutions influence economic complexity. The study concludes that the continent's economic complexity is significantly and positively impacted by governance institutions. Subsequently, [Ogbuabor et al. \(2023\)](#) also demonstrated that, although institutional quality greatly reduces and amplifies their effects on economic complexity, international financial flows are crucial drivers of economic complexity in Africa.

However, the previous studies like [Nkemgha et al. \(2023\)](#) and [Shao and Razzaq \(2022\)](#) focused on the financial-growth relationship. Clearly, most studies in the literature failed to consider the combined effect of trade and governance institutions in promoting economic complexity; rather, the study focused mainly on the trade-economic growth nexus. We depart from the existing literature by focusing on the combined effect of trade and governance institutions on economic complexity for the period 2011–2020 in a panel of 31 African economies, using the system GMM technique. We therefore contribute to knowledge by filling the gap in the literature.

3. Data and Methodology

3.1. The Data

As you may remember, the main purpose of this research is to scrutinize how trade and institutional quality affect Africa's economic complexity. Hence, Africa is the geographical area of the study, and the time span runs from 2011 to 2020 based on the data currently available. This study covers the following nations: Algeria, Botswana, Angola, Cameroon, Chad, Burkina Faso, the Republic of Congo, the Democratic Republic of the Congo, Egypt, Ethiopia, Côte d'Ivoire, Guinea, Kenya, Gabon, Ghana, Madagascar, Mali, Namibia, Mozambique, Nigeria, Niger, South Africa, Senegal, Tanzania, Sudan, Tunisia, Togo, Zambia, Uganda, and Zimbabwe. [Appendix 1](#) provides more details on the variables used in the study as well as the data source. Additionally, [Appendixes 2 and 3](#) present the variables' descriptive statistics and correlation matrix, respectively. Descriptive statistics show that the mean values of all institutional quality indices are negative, indicating that, generally speaking, African economies are characterized by weak institutions. The mean value of 0.4042 for the human capital variable indicates that African economies have generally struggled with low levels of human capital development. The economic complexity index variable also revealed a negative mean value of -0.9376, indicating that African economies are generally experiencing low levels of economic complexity. There are no outliers in the data because the mean, maximum, and minimum values are generally fairly close to one another. All the variables showed some fluctuations during the study period, as expected based on the standard deviations. According to the correlation matrix results, only institutional quality measures have a high relationship with each other. Hence, to avoid collinearity problems, these indicators of institutional quality variables are utilized independently in each estimation of the underlying model for this study.

3.2. Model Specification

To interrogate the effect of trade and institutional quality on economic complexity in Africa, this study follows [Kang-Kook and Trung \(2020\)](#) and [Nguea, Kaguendo, and Noumba \(2022\)](#) by specifying a panel data model in terms of its functional form.

$$ECI = f(TOR, HCAP, TRD, INFS, INST) \quad (1)$$

Where: ECI = economic complexity; $INFS$ = infrastructural development; $HCAP$ = human capital development; TOR = international tourism; TRD = trade; and $INST$ = institutional quality indicator comprises control of corruption, government effectiveness, regulatory quality, rule of law, voice and accountability, and political stability and absence of violence/terrorism.

To simplify the estimation, the functional form of the economic complexity model in [Equation 1](#) is specified econometrically in terms of a dynamic panel data model as follows.

$$ECI_{it} = \beta_0 + \delta_1 ECI_{it-1} + \delta_2 TOR_{it} + \delta_3 HCAP_{it} + \delta_4 TRD_{it} + \delta_5 INFS_{it} + \delta_6 INST_{it} + \pi_{it} \quad (2)$$

Where: ECI_{it-1} is defined as the initial level of economic complexity, while $\pi_{it} = \mu_i + \varepsilon_{it}$, so that μ_i is the country-specific effect and the error term, $\varepsilon_{it} \sim iidN(0, \sigma_\varepsilon^2)$, shows no serial correlation, $E[\varepsilon'_{it}, \varepsilon_{is}] = 0$. Here, $INST_{it}$ denotes the variable of institutional quality. The variables such as trade, international tourism arrivals, and infrastructural development were subjected to a logarithm before the estimation. The purpose of logging the variables is in line with [Ketu, Tchouto, and Kelly \(2022\)](#) and [Kamguia, Ndjakwa, and Tadadjeu \(2023\)](#) model specification.

3.3. Estimation Method and Pre-Estimation Tests

The system GMM approach was utilized to estimate the underlying model specification as provided in [Equation 2](#). Hence, panel data analysis in this perspective has been found to be the most suitable application for this study. This is because our study's cross-sectional unit size exceeds the time period, which implies that the thirty-one African countries adopted for this research are higher in number than the time period, which is from 2011 to 2022. Another reason for adopting the technique is its superiority in managing endogeneity problems ([Arellano & Bover, 1995](#); [Blundell & Bond, 1998](#)). Other estimation methods, such as the pooled Ordinary Least Squares (OLS) estimation method, are typically hampered by endogeneity issues. Further research by [Windmeijer \(2005\)](#) indicates that the system GMM technique helps to improve model precision and reduces the bias associated with finite samples in the first-difference GMM estimator. However, we conducted a [Bond \(2002\)](#) test for the model in [Equation 2](#) to ensure that our choice to use the system GMM estimator was appropriate. The results from the [Bond \(2002\)](#) test in [Appendix 4](#) indicate that the system GMM estimator is suitable for this study. This is because the values are positive and significant in influencing the lag of the dependent variable, economic complexity. Additionally, a cross-sectional dependence test was performed, considering that many African economies, particularly those included in our analysis, may be interdependent. Furthermore, several sub-regional economic blocs within the African Union (AU) contribute to this interdependence, reflecting the trend toward economic integration across the continent. According to [De Hoyos and Sarafidis \(2006\)](#), neglecting the cross-sectional dependence test in our panel may lead to inefficient estimates. As a result, this study used a cross-sectional dependence test in accordance with [Pesaran \(2021\)](#), [Frees \(1995\)](#), and [Friedman \(1937\)](#) studies. The overall results of the cross-sectional dependence tests are shown in [Appendix 5](#). The test confirms that cross-sectional independence exists. As a result, the cross-sectional dependence test is not problematic in our model. The Arellano-Bond tests for second-order serial correlation, AR(2), indicate that our models (see [Table 3](#)) are free from serial correlation issues. Additionally, our [Hansen \(1982\)](#) tests, which assess over-identifying restrictions, reveal that the null hypothesis that the instruments used in the estimations are collectively valid is not rejected in any case. This

demonstrates that the instruments employed in the estimations are valid. Therefore, the results in Table 3 satisfy the conditions of jointly valid instruments and absence of serial correlation.

4. Empirical Results

The results of the system GMM as given by Equation 2 are shown in Table 3 with six panels. In order to prevent the estimation-related issue of collinearity, the indicators of institutional quality variables are included in the model and estimated independently. Some recent research findings, such as Emeka et al. (2025) and Ogbuabor et al. (2023), are consistent with this modelling procedure. The estimation results from Table 3 indicate that the combined effects of trade and institutional quality are important drivers of the complexity of Africa's economy. On the other hand, the estimation results indicate that trade in Africa contributes to the continent's economic complexity through strong governance institutions. This finding aligns with the a priori of economic expectation. It is also consistent with the Yalta and Yalta (2021) submission, which revealed that the combined effects of trade and human capital greatly increase Lesotho's economic complexity. Additionally, the result aligns with findings showing that trade through sectoral performance is the most potent factor influencing economic complexity in Africa. The conclusion is that the combined effects of trade and sectoral performance promote Africa's economic complexity. However, the findings of this study are contrary to some recent studies, which include Emeka et al. (2025) and Ogbuabor et al. (2023), which generally suggest that governance institutions can exert an unconditional, significant positive effect on economic complexity in Africa. Additionally, it goes against the view of Vu (2022) and Khan, Khan, Abdulahi, Liaqat, and Shah (2019), who contend that institutional quality can positively and significantly affect economic complexity. However, our results are in line with the reality of most African economies, which hold that weak institutions are a serious impediment confronting these countries. The evidence is found in Appendix 2, where the institutional quality indicators are showing negative in the mean values.

Other factors, the initial level of the predicted variable (i.e., the lag of the economic complexity variable), trade, human capital development, and infrastructural development are positive and significantly impact economic sophistication across all panels. These variables promote economic complexity in Africa. Specifically, the outcome of the initial level of economic complexity aligns with the findings of Javorcik, Lo Turco, and Maggioni (2018) and Njangang, Beleck, Tadadjeu, and Kamguia (2022), and Ogbuabor et al. (2023). These studies demonstrate that the initial level of the predicted variable is a crucial factor in enhancing economic complexity. Our finding that human capital development has a positive and significant influence on economic complexity is consistent with economic expectations. This result further indicates that as economies prosper, they gain greater capacity to improve their level of sophistication. The outcome of the study is consistent with Romero and Gramkow (2021), which revealed that there exists a significant and positive relationship between human capital development and economic complexity. Hence, this study has also established that increasing human capital development is an appropriate channel for promoting economic sophistication in African economies.

Our conclusions in Table 3 unveil that infrastructural development exerts a positive and significant effect on Africa's economic sophistication. Economically, improved infrastructural development increases business operations, enhances the exchange of goods and services, and improves job creation. It is also believed that infrastructural innovation can enhance the performance of local economies in terms of the quality production of goods and services for global competitiveness. These economic gains from infrastructural development can also lead to a higher economic complexity in domestic economies. Interestingly, our results are also consistent with studies like Ogbuabor et al. (2023); Gómez-Zaldívar, Llamosas-Rosas, and Gómez-Zaldívar (2021); Khan, Bibi, Lorenzo, Lyu, and Babar (2020), and Antonietti and Franco (2021). These studies also established that infrastructural development promotes economic complexity.

The regression results in Table 3 also revealed that international tourism arrivals are negatively and significantly impacting economic complexity in all the panels at the 5% level of significance. This finding establishes that international tourism arrivals are not contributing towards promoting economic complexity in Africa. This is contrary to some studies in the literature, such as Farsari, Butler, and Szivas (2011) and Quattrociochi, Mercuri, Calabrese, and Perano (2017), which established a significant positive relationship between international tourism arrivals and economic complexity in Greece and Europe, respectively. Indeed, our finding is also contrary to economic expectation, which posits that international tourism arrivals could be a channel for enhancing the economic complexity of African countries. Economically, international tourism arrivals are expected to attract various economic gains such as knowledge and technology transfer, foreign investors, and increased productivity, and these, in turn, are expected to promote the economic complexity of an economy. However, our finding reflects the fact that African economies not only have low levels of economic complexity but also low levels of international tourism arrivals relative to other continents of the world. The earlier findings can be summed up as follows. We find that: (i) the combined effects of trade and institutional quality are positive in influencing economic complexity in Africa; (ii) key drivers of economic complexity in Africa include the initial level of the predicted variable (economic complexity), infrastructural and human capital developments; (iii) international tourism arrivals are not relevant factors in promoting economic complexity on the continent.

Table 3. System GMM regression results for the economic complexity model.

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
ECI L1.	0.978*** (0.000)	0.972*** (0.000)	0.962*** (0.000)	1.011*** (0.000)	0.957*** (0.000)	0.990*** (0.000)
TOR	-0.484*** (0.002)	-0.352*** (0.006)	-0.353** (0.017)	-0.737*** (0.000)	-0.359*** (0.008)	-0.611*** (0.002)
HCAP	0.120*** (0.002)	0.127*** (0.002)	0.134*** (0.002)	0.108** (0.011)	0.132*** (0.002)	0.124*** (0.002)
INFS	0.095*** (0.008)	0.082** (0.014)	0.090** (0.010)	0.105** (0.016)	0.104*** (0.001)	0.077* (0.093)
TRD	0.337** (0.017)	0.361*** (0.002)	0.306*** (0.008)	0.304** (0.023)	0.279*** (0.009)	0.417*** (0.006)
INST (cfc)	-0.025* (0.066)					
INST (ge)		-0.016 (0.269)				
INST (rl)			-0.003 (0.814)			
INST (vc)				-0.034*** (0.000)		
INST (rq)					0.000 (0.997)	
INST (polst)						-0.028*** (0.003)
_cons	0.086 (0.613)	-0.062 (0.615)	-0.028 (0.845)	0.393** (0.030)	-0.005 (0.967)	0.158 (0.300)
Diagnostic						
Observations	310	310	310	310	310	310
Hansen	0.409	0.412	0.392	0.309	0.252	0.431
AR (2)	0.212	0.199	0.198	0.209	0.208	0.215
Instruments	27	27	27	27	27	27

Note: The estimation coefficients are provided, while the p-values are enclosed in parentheses. * p < 0.10. ** p < 0.05. *** p < 0.01. Further information: (i) Human capital and infrastructural development, including trade, are positively significant in all panels; (ii) The effects of all the indicators that constitute institutional quality, such as cfc, ge, rl, vc, and polst, are predominantly negative, while rq is mainly insignificant; (iii) The effects of international tourism arrivals on trade are negatively significant in all panels.

5. Conclusion and Policy Recommendations

Here are some policy implications of the above-mentioned findings. The finding that the initial level of economic complexity, trade, infrastructural, and human capital developments all contribute to economic complexity in Africa suggests that leaders and policymakers on the continent should collaborate to enlarge their economies, improve trade, enhance the quality of their human capital, and infrastructural developments. This can be accomplished through poverty alleviation and job creation in Africa, which typically impede the region's overall progress.

The estimation results that trade through institutional quality promotes economic complexity in Africa imply that the combined effects of trade and institutional quality in the region on economic complexity should be embraced. This study, however, recommends that policymaking bodies should ensure that strong institutions are established in Africa through institutional reforms. For instance, the countries in the African Union can come together at the continental level to discuss the deficiencies in governance institutions that have led to pervasive corruption, disdain for the rule of law, incompetence in public service, ongoing political unrest, and the surge in terrorism, among other challenges. This can be achieved through the instrumentality of the Union. The African Union should make it a matter of policy to build strong institutions on the continent so that any African leader who undermines governance institutions entrusted to him by the citizens will be severely sanctioned.

The finding that international tourism arrivals are exerting negative impacts on economic complexity in Africa implies that economic sophistication on the continent is not driven by international tourism arrivals. Hence, this study recommends that policymakers and leaders on the continent should team up in order to harness and promote international tourism arrivals to the African region, which, as at present, have mostly been untapped. This also suggests that factors that could discourage tourists or foreigners from visiting the continent, such as insecurity of lives and property, should be adequately addressed at the level of the African Union. For instance, the existing Multinational Joint Taskforce in the region can be reinforced by the African Union to combat insecurity on the continent. This will make tourist destinations in the region safer and enable African economies to leverage their tourism sector to diversify their economies.

References

Abbasi, K. R., Lv, K., Radulescu, M., & Shaikh, P. A. (2021). Economic complexity, tourism, energy prices, and environmental degradation in the top economic complexity countries: Fresh panel evidence. *Environmental Science and Pollution Research*, 28(48), 68717-68731. <https://doi.org/10.1007/s11356-021-15312-4>

Acemoglu, D., Gallego, F. A., & Robinson, J. A. (2014). Institutions, human capital, and development. *Annual Review of Economics*, 6(1), 875-912. <https://doi.org/10.1146/annurev-economics-080213-041119>

Aghion, P., & Howitt, P. (1992). A model of growth through creative destruction. *Econometrica*, 60(2), 323-351.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)

Antonietti, R., & Franco, C. (2021). From FDI to economic complexity: A panel Granger causality analysis. *Structural Change and Economic Dynamics*, 56, 225-239. <https://doi.org/10.1016/j.strueco.2020.11.001>

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29-51. [https://doi.org/10.1016/0304-4076\(94\)01642-D](https://doi.org/10.1016/0304-4076(94)01642-D)

- Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), 115-143. [https://doi.org/10.1016/S0304-4076\(98\)00009-8](https://doi.org/10.1016/S0304-4076(98)00009-8)
- Blundell, R., Dearden, L., Goodman, A., & Reed, H. (2000). The returns to higher education in Britain: Evidence from a British cohort. *The Economic Journal*, 110(461), 82-99. <https://doi.org/10.1111/1468-0297.00508>
- Bond, S. R. (2002). Dynamic panel data models: A guide to micro data methods and practice. *Portuguese Economic Journal*, 1(2), 141-162. <https://doi.org/10.1007/s10258-002-0009-9>
- De Hoyos, R. E., & Sarafidis, V. (2006). Testing for cross-sectional dependence in panel-data models. *The Stata Journal: Promoting Communications on Statistics and Stata*, 6(4), 482-496. <https://doi.org/10.1177/1536867X0600600403>
- Doğan, B., Balsalobre-Lorente, D., & Nasir, M. A. (2020). European commitment to COP21 and the role of energy consumption, FDI, trade and economic complexity in sustaining economic growth. *Journal of Environmental Management*, 273, 111146. <https://doi.org/10.1016/j.jenvman.2020.111146>
- Easterly, W. (2002). How did heavily indebted poor countries become heavily indebted? Reviewing two decades of debt relief. *World Development*, 30(10), 1677-1696. [https://doi.org/10.1016/S0305-750X\(02\)00073-6](https://doi.org/10.1016/S0305-750X(02)00073-6)
- Emeka, E. T., Ajah, A. C., & Asongu, S. A. (2025). Foreign direct investment, ICT diffusion, and economic complexity in Africa. *The Journal of International Trade & Economic Development*, 34(7), 1656-1678. <https://doi.org/10.1080/09638199.2025.2565197>
- Farsari, I., Butler, R. W., & Szivas, E. (2011). Complexity in tourism policies: A cognitive mapping approach. *Annals of Tourism Research*, 38(3), 1110-1134. <https://doi.org/10.1016/j.jannals.2011.03.007>
- Fatai, A. F., Agboola, P. O., Ozturk, I., Bekun, F. V., & Agboola, M. O. (2021). Environmental consequences of economic complexities in the EU amidst a booming tourism industry: Accounting for the role of brexit and other crisis events. *Journal of Cleaner Production*, 305, 127117. <https://doi.org/10.1016/j.jclepro.2021.127117>
- Fitzenberger, B., & Kurz, C. (2003). New insights on earnings trends across skill groups and industries in West Germany. *Empirical Economics*, 28(3), 479-514. <https://doi.org/10.1007/s001810200142>
- Fleisher, B., Li, H., & Zhao, M. Q. (2010). Human capital, economic growth, and regional inequality in China. *Journal of Development Economics*, 92(2), 215-231. <https://doi.org/10.1016/j.jdeveco.2009.01.010>
- Frees, E. W. (1995). Assessing cross-sectional correlation in panel data. *Journal of Econometrics*, 69(2), 393-414. [https://doi.org/10.1016/0304-4076\(94\)01658-M](https://doi.org/10.1016/0304-4076(94)01658-M)
- Friedman, M. (1937). The use of ranks to avoid the assumption of normality implicit in the analysis of variance. *Journal of the American Statistical Association*, 32(200), 675-701. <https://doi.org/10.1080/01621459.1937.10503522>
- Geo-JaJa, M. A., & Mangum, G. (2003). Economic adjustment, education and human resource development in Africa: The case of Nigeria. *International Review of Education*, 49(3), 293-318. <https://doi.org/10.1023/A:1025355320084>
- Gómez-Zaldívar, M., Llamosas-Rosas, I., & Gómez-Zaldívar, F. (2021). The relationship between economic complexity and the pattern of foreign direct investment flows among Mexican states. *Review of Regional Studies*, 51(1), 64-88.
- Hansen, L. P. (1982). Large sample properties of generalized method of moments estimators. *Econometrica: Journal of the Econometric Society*, 50(4), 1029-1054. <https://doi.org/10.2307/1912775>
- Ho, S.-Y., & Iyke, B. N. (2021). Short and long-term impact of trade openness on financial development in Sub-Saharan Africa. *The Journal of Developing Areas*, 55(1), 1-29. <https://doi.org/10.1353/jda.2021.0009>
- Hussen, M. S. (2023). Institutional quality and economic growth in Sub-Saharan Africa: A panel data approach. *Journal of Economics and Development*, 25(4), 332-348. <https://doi.org/10.1108/JED-11-2022-0231>
- Javorcik, B. S., Lo Turco, A., & Maggioni, D. (2018). New and improved: Does FDI boost production complexity in host countries? *The Economic Journal*, 128(614), 2507-2537. <https://doi.org/10.1111/eoj.12530>
- Jiya, A. N., Sama, M. C., & Ouedraogo, I. (2020). Infrastructure, trade openness and economic transformation in common market for Eastern and Southern Africa member countries. *Social Sciences & Humanities Open*, 2(1), 100072. <https://doi.org/10.1016/j.ssaho.2020.100072>
- Kamguia, B., Ndjakwa, M., & Tadjadjeu, S. (2023). Does infrastructural development foster export upgrading in Africa? *African Development Review*, 35(1), 79-94. <https://doi.org/10.1111/1467-8268.12684>
- Kang-Kook, L., & Trung, V. V. (2020). Economic complexity, human capital and income inequality: A cross-country analysis. *The Japanese Economic Review*, 71(4), 695-718. <https://doi.org/10.1007/s42973-019-00026-7>
- Ketu, I., Tchouto, J.-E. T., & Kelly, A. M. (2022). Does infrastructure development drive economic complexity in African countries. *Economics Bulletin*, 42(4), 2043-2053.
- Khan, A., Bibi, S., Lorenzo, A., Lyu, J., & Babar, Z. U. (2020). Tourism and development in developing economies: A policy implication perspective. *Sustainability*, 12(4), 1618. <https://doi.org/10.3390/su12041618>
- Khan, M. A., Khan, M. A., Abdulahi, M. E., Liaqat, I., & Shah, S. S. H. (2019). Institutional quality and financial development: The United States perspective. *Journal of Multinational Financial Management*, 49, 67-80. <https://doi.org/10.1016/j.mulfin.2019.01.001>
- Lee, C. C., Olasehinde-Williams, G., & Gyamfi, B. A. (2023). The synergistic effect of green trade and economic complexity on sustainable environment: A new perspective on the economic and ecological components of sustainable development. *Sustainable Development*, 31(2), 976-989. <https://doi.org/10.1002/sd.2433>
- Linder, S. B. (1961). *An essay on trade and transformation*. Uppsala: Almqvist & Wiksell.
- Mealy, P., & Teytelboym, A. (2022). Economic complexity and the green economy. *Research Policy*, 51(8), 103948. <https://doi.org/10.1016/j.respol.2020.103948>
- Nchofoung, T. N., & Asongu, S. A. (2022). Effects of infrastructures on environmental quality contingent on trade openness and governance dynamics in Africa. *Renewable Energy*, 189, 152-163. <https://doi.org/10.1016/j.renene.2022.02.114>
- Nchofoung, T. N., Asongu, S. A., Njamen Kengdo, A. A., & Achuo, E. D. (2022). Linear and non-linear effects of infrastructures on inclusive human development in Africa. *African Development Review*, 34(1), 81-96. <https://doi.org/10.1111/1467-8268.12619>
- Nguea, S. M., Kaguendo, U. V. E., & Noumba, I. (2022). Are growth effects of foreign capital significant for increasing access to electricity in Africa? *Energy Policy*, 168, 113129. <https://doi.org/10.1016/j.enpol.2022.113129>
- Njangang, H., Beleck, A., Tadjadjeu, S., & Kamguia, B. (2022). Do ICTs drive wealth inequality? Evidence from a dynamic panel analysis. *Telecommunications Policy*, 46(2), 102246. <https://doi.org/10.1016/j.telpol.2021.102246>
- Nkemgha, G. Z., Nchofoung, T. N., & Sundjo, F. (2023). Financial development and human capital thresholds for the infrastructure development-industrialization nexus in Africa. *Cities*, 132, 104108. <https://doi.org/10.1016/j.cities.2022.104108>
- North, D. (1990). *Institutions, institutional change, and economic performance*. Cambridge, MA: Harvard University Press.
- Nwosu, E. O., Ojonta, O., & Orji, A. (2018). Household consumption expenditure and inequality: Evidence from Nigerian data. *International Journal of Development Issues*, 17(3), 266-287. <https://doi.org/10.1108/IJDI-06-2017-0113>
- Nwosu, E. O., & Orji, A. (2016). Access to formal credit and enterprise performance in Nigeria: A gender perspective. *Argumenta Oeconomica*, 1(36), 191-224. <https://doi.org/10.15611/aoe.2016.1.08>
- Ogbonna, O. E., Ogbuabor, J. E., Eze, A. A., & Ugwuoke, W. O. (2021). Moderating effect of institutional quality on relationship between foreign aid and economic growth in Africa. *Političká Ekonomie*, 69(4), 457-478.
- Ogbuabor, J. E., Emeka, E. T., Orji, A., & Onuigbo, F. N. (2023). The effects of international financial inflows on economic complexity in Africa: Does institutional quality play a moderation role? *Journal of Economic Policy Reform*, 26(4), 348-369. <https://doi.org/10.1080/17487870.2023.2220862>
- Ojonta, O. I. (2023). Influence of credit access on the total sales of household non-farm enterprises in Nigeria: Evidence from binary logit regression. *International Journal of Economics and Business Research*, 25(1), 50-63. <https://doi.org/10.1504/IJEBr.2023.127267>
- Ojonta, O. I., Obodoechi, D. N., & Ugwu, P. N. (2021). Start-up capital source and credit access participation of household nonfarm enterprises in Nigeria: Evidence from logistic regression model. *Managing Global Transitions*, 19(3), 249-267. <https://doi.org/10.26493/1854-6935.19.249-267>
- Pesaran, M. H. (2021). General diagnostic tests for cross-sectional dependence in panels. *Empirical Economics*, 60(1), 13-50. <https://doi.org/10.1007/s00181-020-01875-7>

Psacharopoulos, G. (1994). Returns to investment in education: A global update. *World Development*, 22(9), 1325-1343. [https://doi.org/10.1016/0305-750X\(94\)90007-8](https://doi.org/10.1016/0305-750X(94)90007-8)

Quattrociochi, B., Mercuri, F., Calabrese, M., & Perano, M. (2017). Tourism supply chain & strategic partnerships for managing the complexity in tourism industry. *Enlightening Tourism*, 7(1), 62-93.

Romero, J. P., & Gramkow, C. (2021). Economic complexity and greenhouse gas emissions. *World Development*, 139, 105317.

Samuelson, P. A. (1948). International trade and the equalisation of factor prices. *The Economic Journal*, 58(230), 163-184. <https://doi.org/10.2307/2225933>

Shao, S., & Razzaq, A. (2022). Does composite fiscal decentralization reduce trade-adjusted resource consumption through institutional governance, human capital, and infrastructure development? *Resources Policy*, 79, 103034. <https://doi.org/10.1016/j.resourpol.2022.103034>

Sweet, C., & Eterovic, D. (2019). Do patent rights matter? 40 years of innovation, complexity and productivity. *World Development*, 115, 78-93. <https://doi.org/10.1016/j.worlddev.2018.10.009>

Vu, T. V. (2020). Economic complexity and health outcomes: A global perspective. *Social Science & Medicine*, 265, 113480. <https://doi.org/10.1016/j.socscimed.2020.113480>

Vu, T. V. (2022). Does institutional quality foster economic complexity? The fundamental drivers of productive capabilities. *Empirical Economics*, 63(3), 1571-1604. <https://doi.org/10.1007/s00181-021-02175-4>

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics*, 126(1), 25-51. <https://doi.org/10.1016/j.jeconom.2004.02.005>

World Bank. (2022). *World development report 2022: Finance for an equitable recovery*. Washington D. C: World Bank.

Yalta, A. Y., & Yalta, T. (2021). Determinants of economic complexity in MENA Countries. *Journal of Emerging Economies and Policy*, 6(1), 5-16.

Zhu, S., & Li, R. (2016). Economic complexity, human capital and economic growth: Empirical research based on cross-country panel data. *Applied Economics*, 49(38), 3815-3828. <https://doi.org/10.1080/00036846.2016.1270413>

Appendix 1. Definitions of variables and data sources.

Variable	Acronym	Description / Measurement	Data source
Economic complexity	ECI	The index is determined by the diversity of exports a country produces and its ubiquity.	Massachusetts Institute of Technology’s Observatory of Economic Complexity (http://atlas.media.mit.edu)
International tourism	TOR	International tourism, number of arrivals	World Development Indicators, WDI (https://datacatalog.worldbank.org/dataset/world-development-indicators)
Infrastructural development	INFS	Africa Infrastructure Development Index	African Development Bank’s Africa Infrastructural Development Index (AIDI), (https://infrastructureafrica.opendataforafrica.org/rscznob/africa-infrastructure-development-index-aidi)
Human capital development	HCAP	Human capital index	World Bank’s Human Capital Index, HCI (https://data.worldbank.org/indicator/HD.HCI.OVRL)
Trade	TRD	Trade (% of GDP)	World Development Indicators, WDI (https://datacatalog.worldbank.org/dataset/world-development-indicators)
Government effectiveness	ge	Government effectiveness	World Governance Indicators, WGI (https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators)
Voice and accountability	vc	Voice and accountability	World Governance Indicators, WGI (https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators)
Regulatory quality	rq	Regulatory quality	World Governance Indicators, WGI (https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators)
Rule of law	rl	Rule of law	World Governance Indicators, WGI (https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators)
Control of corruption	cfc	Control of corruption	World Governance Indicators, WGI (https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators)
Political stability and absence of violence/Terrorism	polst	Political stability and the absence of violence or terrorism	World Governance Indicators, WGI (https://datacatalog.worldbank.org/dataset/worldwide-governance-indicators)

Appendix 2. Descriptive statistics of the variables.

Variable	No. of observations	Mean	Std. dev.	Minimum	Maximum
eci	310	-0.937	0.515	-2.227	0.390
tor	310	1.835	2.982	1.040	1.510
hcap	310	0.404	0.055	0.286	0.546
trd	310	2.288	1.800	0.406	0.455
infs	310	3.464	1.896	3.909	0.389
cfc	310	-0.711	0.532	-1.592	0.966
ge	310	-0.754	0.495	-1.744	0.497
polst	310	-0.762	0.777	-2.522	1.104
rq	310	-0.676	0.512	-1.892	0.764
rl	310	-0.674	0.512	-1.822	0.601
vc	310	-0.567	0.632	-1.848	0.688

Appendix 3. Correlation matrix of the variables.

	eci	tor	infs	trd	hcap	cfc	rl	ge	rq	vc	polst
eci	1.0000										
tor	-0.1121	1.0000									
infs	0.0841	-0.0318	1.0000								
trd	0.4017	-0.2943	-0.3757	1.0000							
hcap	0.4001	-0.2031	0.0310	0.5235	1.0000						
cfc	0.5392	-0.0730	-0.1444	0.4268	0.1535	1.0000					
rl	0.6837	-0.0469	-0.0978	0.4343	0.2147	0.8853	1.0000				
ge	0.6802	-0.1105	-0.2150	0.5445	0.3372	0.8568	0.9105	1.0000			
rq	0.5957	-0.0369	-0.0316	0.3172	0.0424	0.7482	0.8533	0.8356	1.0000		
vc	0.5679	-0.0207	-0.0244	0.3579	0.1139	0.8038	0.8325	0.8205	0.9047	1.0000	
polst	0.4182	0.1697	-0.2909	0.3446	0.0614	0.6801	0.6888	0.6452	0.6650	0.6895	1.0000

Appendix 4. Bond (2002) test results for choice of GMM estimator.

Indicators	eci L1.(Bond1)	eci L1.(Bond2)	eci L1.(Bond3)	eci L1.(Bond4)	eci L1.(Bond5)	eci L1.(Bond6)
FE	0.458***	0.455***	0.469***	0.471***	1.106***	0.295***
OLS	0.895***	0.867***	0.880***	0.886***	0.901***	0.899***
FIRST DIFF	0.310***	0.307***	0.295***	0.335***	0.402***	0.341***
SECOND DIFF	1.070***	1.043***	1.108***	1.055***	1.106***	1.060***

Note: There are six panels in this Table, since the institutional quality variables are included in separate estimations of the underlying models. *** p < 0.01 represents 1% level of significance

Appendix 5. Results of tests for cross-sectional independence.

Economic complexity model						
	(1) cfc	(2) rl	(3) ge	(4) rq	(5) vc	(6) polst
Pesaran - fe	1.648 (0.331)	1.653 (0.331)	1.667 (0.329)	1.619 (0.329)	1.644 (0.328)	1.621 (0.332)
Pesaran - re	1.146 (0.314)	1.142 (0.316)	1.128 (0.316)	1.224 (0.315)	1.144 (0.314)	1.088 (0.314)
Friedman - fe	1.000 (0.331)	1.000 (0.331)	1.000 (0.329)	1.000 (0.329)	1.000 (0.328)	1.000 (0.332)
Friedman - re	1.000 (0.314)	1.000 (0.316)	1.000 (0.316)	1.000 (0.315)	1.000 (0.314)	1.000 (0.314)
Frees' – fe	1.215 (0.331)	1.236 (0.331)	1.050 (0.329)	1.042 (0.329)	1.063 (0.328)	1.186 (0.332)
Frees' – re	-0.054 (0.314)	0.102 (0.316)	0.121 (0.316)	0.039 (0.315)	-0.005 (0.314)	0.103 (0.314)
Decision	CID	CID	CID	CID	CID	CID

Note: There are six panels in this Table, since the institutional quality variables are included in separate estimations of the underlying models. Pr values are reported for the tests based on Pesaran and Friedman, while the alpha values are reported for the Frees' tests. Average absolute values are reported in parentheses in all cases. CID denotes cross-sectional independence.