

## **Deciphering African Financial Development Interaction With Institutional Quality and Economic Growth Nexus**

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**Abstract**

The paper scrutinized the correlation between financial development interaction with institutional quality and economic growth in Africa. The study adopted 30 different interactions. The study used the Augmented mean group estimation technique to estimate the model. Gross domestic savings/GDP and broad money/GDP positively influenced growth with the majority of interactions with institutional quality indicators. Credit to Private Sector/GDP interaction with Voice & Accountability; and Political Stability has a higher impact on growth than any interaction variable. However, government effectiveness, regulatory quality, and corruption control are weak in Africa; even if interacted with financial development indicators, it mostly reduces economic growth. This study recommends that governments in Africa strengthen financial development indicators; Bank Deposit/GDP, Gross Domestic Savings/GDP and Credit to private sector/GDP, and institutional quality indicator political stability & absence of violence since their interaction has proven to aid rapid economic growth.

**Keywords:**

financial development, institutional quality, economic growth, interactions

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## Introduction

A robust economy and progressively increasing economic growth is the ultimate objective of every country. Every government seeks to achieve this objective by consciously and strategically focusing on the factors that enhance rapid economic growth. Studies have shown that financial development is one factor that boosts economic growth (Asteriou & Spanos, 2019; Effiong, 2015; Ibrahim & Alagidede, 2018; Skare et al., 2019; Sobiech, 2019; Yang, 2018). Also, other research points out that reliable systems or institutional quality contribute significantly to economic growth (Asghar et al., 2015; Effiong, 2015; Elyas et al., 2019; Erum & Hussain, 2019; Iheonu et al., 2017; Kebede & Takyi, 2017).

The theoretical argument in associating financial development to growth, it has come to light that a robust financial system performs numerous vital functions to help the proficiency of intermediation by managing transactions, information, and monitoring costs (Khan, 2008; Nawaz et al., 2014). Previous studies on finance-growth nexus highlight that economies with secure developed financial systems enjoy rapid economic growth. Briefly, countries should adopt the right macroeconomic policies, admonish healthy competition in the financial sector; this will translate into significant economic growth (Asteriou & Spanos, 2019; Sobiech, 2019).

Institutional quality is stated clearly by the World Bank as “the manner in which power is exercised in the management of a country’s economic and social resources for development.” IQ is clustered into six indicators; Rule of Law, Control of Corruption, Regulatory Quality Government Effectiveness, Voice & Accountability, and Political Stability & Absence of Violence/Terrorism (Kaufmann et al., 2011). The institutional framework of a country consists of formal and informal rules which make the “rules of the game” and that guide interaction in economic, social, and political spheres. Robust institutions create a conducive business structure, which decreases the cost of transactions and enhances efficient production. This helps to develop the private sector, build up human and physical capital, and promote economic growth (Effiong, 2015). Some economies continuously undergo political reforms and institutional improvements in order to improve their ability to transform their resources into a substantial economic benefit in the long run (Elyas et al., 2019).

A study conducted on the effects of FD and IQ on economic growth for the Organisation for Economic Co-operation Development (OECD) countries in 2002-2014, using Generalized Moment Method (GMM) estimator. It was revealed that FD and IQ have a significant and positive effect on growth in some economies. The interactive effect showed that FD might result in economic growth for developed economies due to the strong institutions they have (Kacho & Dahmardeh, 2017). Also, a study by Effiong (2015) concentrated on the effect of FD and IQ on growth with data for 21 south Sahara economies in 1960-2010. It was revealed that IQ is statistically significant and has a positive effect on economic growth, FD however, does not impact economic growth. He tested for the interaction effect impact on economic growth and concluded that it was positive but insignificant this implies the interaction would not help the link between the two factors. The study, however, used one FD indicator and two IQ indicators.

Hasan et al. (2009) examined the impact of financial depth and IQ on the economic growth of provinces in China for 1986-2002. They stated that property rights awareness, financial market development, political pluralism, and regulatory environment are correlated to rapid growth. Demetriades & Law (2006) scrutinised the significance of FD and institutional issues on economic growth with panel data of 72 economies for 1978-2000. They stated that FD and economic growth would be more effective once the financial system in the institutional framework is implemented efficiently. Balach & Law (2015) studied the correlation between FD, human capital, quality of institutions, and economic performance in South Asian countries for 1984-2008. They concluded that IQ positively impacts economic performance when the financial sector is associated with a stable institutional framework which has suitable human capital.

Law & Azman-Saini (2012) used private credit and stock market capitalization as a representation for financial development to extend the literature on finance-institution nexus by scrutinising the linear and nonlinear IQ and FD liaison. They applied dynamic GMM estimators to 63 developing and developed economies for 1996-2004. It was reported that while IQ appears significant for the banking sector, FD has no impact on the stock market. Six Arab Gulf Countries were studied for the period 1995 to 2012. The results stated that the quality institutions are the transmission trajectory of the financial sector into the desired growth. Therefore, the financial sector cannot kindle economic growth without a strong institutional framework. The framework is, however, based on a better socio-economic environment, better bureaucracy, strong legal foundation, and corruption eradication (Yahyaoui et al., 2019). Generally, FD indicators can be linked with the stock market, banking sector, or trade openness. If FD interacts with IQ, the impact turns out to be substantially significant subject to the country. That is to say, the level of the interaction's effect varies between countries (Hamzah et al., 2019).

Employing panel regression and GMM, Girma & Shortland (2008) studied the impact of democracy on FD, they specified that political stability and the level of democracy are critical to the rate of FD. They opined that the banking sector gains from stable democracy and stock market capitalization increase rapidly from democracy. Huang (2010) stated a positive impact of IQ on FD in the short run, this is more prominent in lower-income countries, French legal-origin economies, and ethnically divided countries. Law & Azman-Saini (2008) examined the effect of IQ on FD developing and developed countries. It came to light that the efficiency of IQ on FD is non-monotonic and differs across countries, which is dependent mainly on the economic development level. A study on 189 countries using dynamic models OLS, fixed effect, random effect, and GMM estimators, shows that IQ is significant to financial development; precisely, regulatory quality, control of corruption, and political stability, positively affect FD. However, the rule of law negatively affects FD, revealing that in most countries, the rule of law is weak. Interestingly, control of corruption positively affects FD emerging economies that indicates that corruption has reduced (Khan et al., 2020).

Furthermore, Rani & Kumar (2019) researched on economic growth, gross capital formation, and trade openness by using autoregressive distributed lag (ARDL) approach,

they opined that there is a long-run causal linkage between the variables. Raza et al. (2019) scrutinised the correlation between foreign direct investment (FDI), good governance and growth, and established a positive connection among the variables in OECD economies. Besides, Bhasin & Garg (2020) studied the influence of the institutional environment on FDI inflow in rising countries, they stated that there is a positive effect of the institutional environment on FDI inflow. Nguyen (2019) stated that Institutional quality hinders the positive effect of FDI on growth. However, growth can reduce the impact of trade openness in areas where FDIs are used to increase the spill-over effect. The impact of inflation on growth is higher when the inflation rate is minimal (Thanh, 2015). Besides, inflation-growth nexus may be determined by other macroeconomic pointers like; financial development and trade openness (Eggoh & Khan, 2014). Moreover, Raghutla et al. (2018) stated that there is a substantial link between FD, trade openness, and growth. They further opined that trade openness does have a positive effect on growth.

The seemingly reoccurring and cyclical financial crises have prompted economists, financial analysts, financial governing bodies, and the international community as a whole to seek trustworthy and reliable measures to this turmoil (Law & Azman-Saini, 2012). In order to avoid the shocks from the financial crisis from collapsing economies, there is the need to implement policies and systems that will serve as shock absorbers for the economies. These policies and systems can be enforced through laws, rules, and regulations. A combination of the institutions (policies and systems) and financial development will certainly catalyse economic growth. Theoretically, a consensus has been reached on the benefits that quality institutions have of financial development and economic growth (Asteriou & Spanos, 2019; Law & Azman-Saini, 2012; Salman et al., 2019).

Nonetheless, there is a pressing question in the literature that needs to be addressed; what is the right combination of financial development indicator and institutional quality indicator that will ensure rapid economic growth? Is there any study on Africa as to how best to combine these two indicators to Africa's benefit? Will strong institutions and a solid financial system ever promote economic growth in Africa? This paper seeks to render the answer to these lingering questions. There is therefore a research gap on the right interaction of financial development and institutional quality indicators, most researchers adopt two or three Institutional quality indicators and financial development indicators in their study making it selective or bias. This study expands existing literature in an unprecedented manner, and the paper employs thirty different interaction variables in its analysis. A combination of six institutional quality indicators and five financial development indicators. The study also uses robust means of data analysis thus; using second generation methodology, the Augmented Mean Group estimation technique. To ensure that policy makers can make good use of the study, the paper considers the causal direction of each of the interaction variables on growth. Unlike abound literature, the paper uses Africa as a whole, not just sub-Saharan. The paper carefully uses a rigorous and robust methodology in the data analysis to avoid any biasness.

## Methods

This paper used six Institutional Quality (IQ) indicators, from World Governance Indicators (WGI) compiled by Kaufmann et al. (2011). WGI has been used in different studies as a proxy for institutional quality (Dwumfour & Ntow-Gyamfi, 2018; Elyas et al., 2019; Kebede & Takyi, 2017). The paper adopted five financial development (FD) indicators from the Global Financial Development Indicators (GFDI), it is a proxy for the financial sector in an economy (Eren et al., 2019). The paper also used the natural logarithm of Gross Domestic Product per capita (lnGDP) from WDI to represent economic growth (Eren et al., 2019; Hao et al., 2018; Topcu et al., 2020). The control variables are from WDI; thus, foreign direct investment, gross fixed capital formation, trade openness, government expenditure, and inflation. The study is from 1997 to 2017, and 39 economies in Africa, the countries with available data were used (Elyas et al., 2019).

The technique for the study is in this procedure; correlation analysis test, cross-sectional dependency test, panel unit root test, estimation of the model, and Causality test. The correlation analysis is to determine the statistical sign for a linear relationship within the variables of the study. To verify for a relationship that is amid the variables, the paper will use the formula:

$$r_{xy} = \frac{cov(x, y)}{\sqrt{var(x)} \cdot \sqrt{var(y)}}$$

Cov (X, Y) indicates covariance between Y and X. in addition, Var (X) and Var (Y) are corresponding coefficients of (X) and (Y). The correlation coefficient is usually between 0 and 1. If the value is closer to 1, then the variables are said to be highly correlated; conversely, if it is closer to 0, then they are weakly correlated (Salman et al., 2019). To detect any possible multicollinearity among the variables, the paper adopted the pairwise correlation analysis.

One critical procedure in panel data study is to check for cross-sectional dependence (CD). This is to check for how variables have an effect on other variables in the panel study. There is the possibility of a spill-over effect in a panel study with a particular trend. That is to say, an incident or occurrence in one cross-section can have an effect on another (Salman et al., 2019). In the case of countries, an explanation to this may be the growing interaction and integration among the economies in question (De Hoyos & Sarafidis, 2006). Testing for CD helps to determine the next test to conduct to avoid biasness in the studies, it also helps to decide on the estimation technique (Canh et al., 2019; Fromentin, 2017; Paramati & Roca, 2019). There are mainly two different CD tests; the CD test suggested by Breusch & Pagan (1980) and Pesaran (2004).

$$LM = \sum_{i=1}^{N-1} \sum_{j=i+1}^N T_{ij} \hat{p}_{ij}^2 \rightarrow x^2 \frac{N(N-1)}{2}$$

For this paper, N=39, T=21. Besides,  $\hat{p}_{ij}^2$  is the error's factor, the null hypothesis as  $x^2$  Moreover, N (N-1)/2 is the degrees of freedom. Breusch-Pagan LM test focuses on

the average of the squared pairwise correlation limits of the residuals, and it is mostly applied when N is stationary and  $T_{ij}$  is infinity (Breusch & Pagan, 1980).

$$CD = \sqrt{\frac{2}{N(N-1)}} \left( \sum_{i=1}^{N-1} \sum_{j=i+1}^N T_{ij} \hat{\rho}_{ij}^2 \rightarrow N(0,1) \right)$$

In this equation,  $\hat{\rho}_{ij}$  represents the value to be used in the model. The cross-sectional distributed as  $N(0,1)$ , where,  $T_{ij} \rightarrow \infty$ , and  $N \rightarrow \infty$ . The letters, N and T represent cross-section and time, respectively. With the Pesaran CD test, the null hypothesis is written as  $H_0: \hat{\rho}_{ij} = 0$  for  $i \neq j$  and the alternative  $H_a: \hat{\rho}_{ij} \neq 0$  for  $i \neq j$ .

There are generally two forms of panel unit root tests; first and second-generation tests. However, there is a third generation test developed by Bai & Carrion-i-silvestre (2009), this test is gradually gaining grounds and was recently used by Beyaert et al. (2019) in their studies for European countries. Our CD test showed that there is CD among the variables; therefore, the second generation panel unit root test was used specifically, Cross-sectional Augmented DF (CADF) panel unit root test. CADF, as developed by Im et al. (2003) states that the test is based on regular unit root factors in a regression. That is to say, DF (or ADF) regression is amplified with the cross-section averages of lagged levels and first-differences of different series.

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \sum_{j=1}^{pi} \rho_{ij} \Delta y_{i,t-j} + \varepsilon_{it}$$

$$\Delta z_{it} = \alpha_i + b_i z_{i,t-1} + d_i \Delta \bar{z}_t + e_{it}$$

The growth model is also known as the AK model. Lucas (1988) has gone through several ‘interpretations’ and ‘upgrade’ or development. The model is stated initially as:

$$y = AK^\alpha(\ell h)^{1-\alpha}$$

The growth model can be expressed in economic growth terms; this is when other macroeconomic variables have been included (Yang, 2018). In the new development, the growth model becomes;

$$G_{i,t} = y_{i,t} = \alpha_i + \beta_i F_{i,t} + \gamma_i C_{i,t} + \mu_i + \varepsilon_{i,t}$$

For the model,  $G_{i,t}$  and connotes growth or real GDP per capita,  $F_{i,t}$  signifies financial development, represents the conditioning variables,  $\varepsilon_{i,t}$  and  $\mu_i$  are the stochastic or error terms. The subscript i and t are cross-sectional and time respectively. In view of this, this paper further developed the model to fit the studies as;

$$y_{i,t} = \alpha_i + \beta_i (FD * IQ)_{i,t} + \gamma_i C_{i,t} + \mu_i + \varepsilon_{i,t}$$

Where  $FD * IQ$  will be the interaction of financial development with institutional quality. Further expansion of the model, that consider all the conditioning variables will become;

$$\ln GDP_{it} = \alpha_{it} + \beta_1 (FD * IQ)_{it} + \beta_2 EXP_{it} + \beta_3 GCF_{it} + \beta_4 INF_{it} + \beta_5 TOP_{it} + \beta_6 FDI_{it} + \varepsilon_{it}$$

In explaining the model,  $\ln GDP_{it}$  denotes economic growth,  $FD * IQ_{it}$  represents the interaction of financial development with institutional quality,  $EXP_{it}$  signifies government



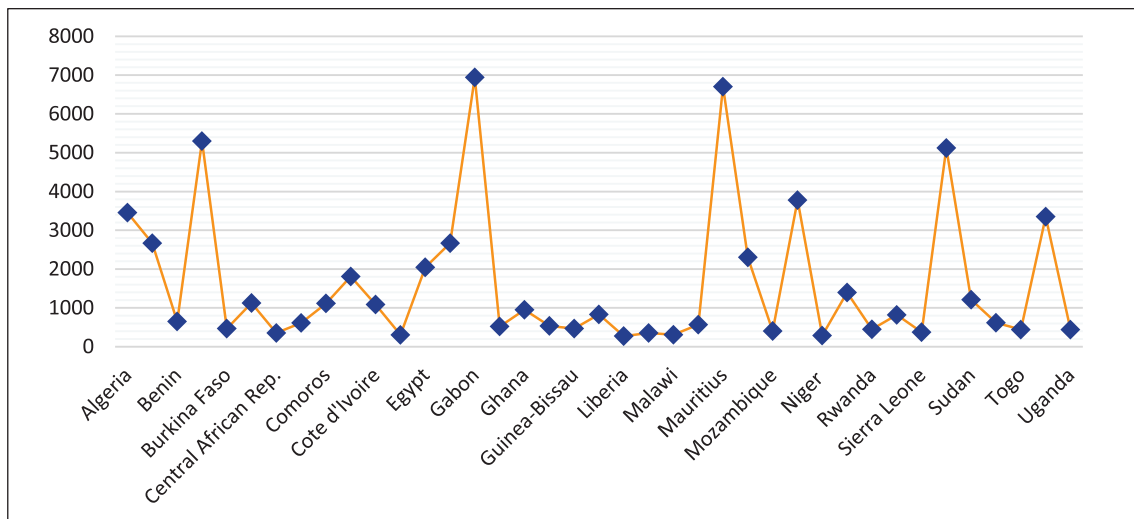
expenditure, then  $GCF_{it}$  denotes gross capital formation, also,  $INF_{it}$  represents inflation, besides,  $TOP_{it}$  characterizes trade openness finally,  $FDI_{it}$  denotes foreign direct investment.

The paper resulted in using; Augmented Mean Group (AMG) estimation technique by Eberhardt & Bond (2009). Adopting this estimation technique will eliminate the effect of any possible issue of cointegration (Paramati & Roca, 2019). Using the AMG estimation technique will show numerous relationships except for causality direction. The paper will adopt the panel causality test by Dumitrescu & Hurlin (2012). This is a further development from the initial Granger causality test. The causality direction is vital in making policies. Causality tests separate cross-section units, meaning, it makes coefficients to differ through the cross-section, the test also uses the average statistics of the countries. It precisely shows the causality route of the variables.

### Result and Discussion

Figure 1 shows the graphical representation of the GDP per capita averages. Out of the 39 economies, 22 countries representing 56.4% of them have GDP per capita averages below \$1,000. This revelation tells us that the countries for the study are mostly developing economies (Dwumfour & Ntow-Gyamfi, 2018). It is also observed that 13 economies from the study, which represents 33.34%, have GDP per capita range between \$1,000 and \$4,000. Besides, 4 out of the 39 economies obtained GDP per capita average above \$4,000, and these are; South Africa \$5,121, Botswana \$5,300, Mauritius \$6,704, and Gabon \$6,939.

**Figure 1. GDP per capita averages for the economies in Africa (1997-2017)**



Source: Authors' computation

Table 1 shows the descriptive statistics of the variables for the study. The mean of all the interactive variables displays negative results. This gives us a general picture that there is either weak financial development or weak institutional quality within the economies under the study. This position has been echoed in a study by Dwumfour &

Ntow-gyam (2018). Besides, the observations of the variables are 702 for the FD and IQ interactions. The missing observations resulted from the computation of IQ indicators by Kaufmann et al. (2011). However, the missing years does not render the study invalid (Dwumfour & Ntow-Gyamfi, 2018; Elyas et al., 2019; Kebede & Takyi, 2017).

**Table 1. Statistical Analysis**

VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
LNGDP	819	6.79847	1.058742	4.63128	9.27951
BMYPE	702	-14.6314	23.67484	-85.8955	112.1355
BMYRQ	702	-12.6244	23.59884	-101.754	116.6342
BMRYL	702	-13.7807	23.95802	-79.4009	105.1918
BMGCC	702	-15.2198	20.47426	-73.3093	58.25354
BMVVA	702	-13.7345	30.07841	-118.019	95.40863
BMGPS	702	-13.8064	32.75113	-141.09	113.5253
PCYGE	702	-4.48699	19.51109	-48.7911	107.7895
PCYRQ	702	-3.66816	18.61935	-38.3831	112.1139
PCYRL	702	-4.81023	16.17195	-44.2597	101.0018
PCGCC	702	-5.85355	14.12149	-41.7172	81.48423
PCVVA	702	-4.2629	24.93552	-97.8763	102.2857
PCGPS	702	-5.28094	21.02013	-93.1857	102.5716
DCYGE	702	-12.441	42.09022	-466.447	122.0316
DCYRQ	702	-11.2122	44.36071	-500.82	131.5564
DCYRL	702	-12.57	40.44397	-477.088	114.3432
DCGCC	702	-13.7999	33.19207	-421.087	101.2104
DCVVA	702	-10.4412	40.14476	-304.797	125.4348
DCGPS	702	-15.3346	47.18638	-455.182	124.9403
GSYGE	702	-6.60801	23.57016	-83.8158	204.6401
GSYRQ	702	-5.82483	23.86974	-103.132	248.9203
GSYRL	702	-7.04164	22.57728	-95.3367	208.5255
GSYCC	702	-7.67212	20.8169	-87.2778	176.3035
GSVVA	702	-8.09658	19.10052	-92.8527	173.0344
GSGPS	702	-5.74862	24.08301	-116.676	183.1498
BDYGE	702	-16.1089	69.65014	-927.688	100.9942
BDYRQ	702	-15.2684	76.08569	-975.291	105.046
BDYRL	702	-14.7151	63.2494	-702.52	91.19741
BDGCC	702	-14.686	49.41306	-637.643	50.48368
BDVVA	702	-12.0122	40.99206	-537.257	87.39079
BDGPS	702	-15.1689	76.27211	-950.144	99.86099



VARIABLE	OBS	MEAN	STD. DEV.	MIN	MAX
GCF	810	20.48268	7.732852	-2.42436	75.19494
TOP	816	70.40043	32.86974	17.85861	311.3553
INF	812	9.951599	31.20869	-10.0088	513.9069
FDI	815	4.679286	11.61633	-6.05721	159.7189
EXP	808	13.78195	4.725183	2.05759	30.0692

Source: Authors' computation

The pairwise correlation analysis result shows that there is a positive correlation between economic growth and all the interaction of financial development with institutional quality indicators, with the exception of GSY with IQ indicators, which shows a negative correlation. Besides, all the correlation analysis shows a relatively weaker correlation among the variables, which means there is no possible autocorrelation. None of the thirty interaction (financial development and institutional quality) variables were correlated with each other because each interaction variable is used in a different model.

**Table 2. Cross Sectional Dependency Test (CD)**

Variable	CD-test	p-value	average joint T	mean $\rho$	mean abs( $\rho$ )
LNGDP	104.566***	0.000	21	0.84	0.87
BMYGE	20.33***	0.000	18	0.18	0.36
BMYRQ	17.009***	0.000	18	0.15	0.36
BMYRL	10.243***	0.000	18	0.09	0.34
BMYCC	13.424***	0.000	18	0.12	0.31
BMYVA	2.561**	0.010	18	0.02	0.36
BMYPs	3.588***	0.000	18	0.03	0.35
PCYGE	35.056***	0.000	18	0.3	0.52
PCYRQ	30.419***	0.000	18	0.26	0.51
PCYRL	18.672***	0.000	18	0.16	0.43
PCYCC	23.66***	0.000	18	0.2	0.45
PCYVA	5.962***	0.000	18	0.05	0.42
PCYPS	10.652***	0.000	18	0.09	0.39
DCYGE	24.382***	0.000	18	0.21	0.54
DCYRQ	29.145***	0.000	18	0.25	0.53
DCYRL	13.371***	0.000	18	0.12	0.42
DCYCC	19.03***	0.000	18	0.16	0.43
DCYVA	4.325***	0.000	18	0.04	0.41
DCYPS	11.987***	0.000	18	0.1	0.4

Variable	CD-test	p-value	average joint T	mean $\rho$	mean abs( $\rho$ )
GSYGE	11.83***	0.000	18	0.1	0.33
GSYRQ	7.607***	0.000	18	0.07	0.32
GSYRL	7.002***	0.000	18	0.06	0.31
GSYCC	4.84***	0.000	18	0.04	0.31
GSYVA	6.155***	0.000	18	0.05	0.31
GSYPS	6.794***	0.000	18	0.06	0.34
BDYGE	39.927***	0.000	18	0.35	0.62
BDYRQ	39.558***	0.000	18	0.34	0.57
BDYRL	21.417***	0.000	18	0.19	0.51
BDYCC	34.711***	0.000	18	0.3	0.53
BDYVA	7.516***	0.000	18	0.07	0.43
BDYPS	9.304***	0.000	18	0.08	0.4
GCF	14.611***	0.000	20.55	0.12	0.4
TOP	13.739***	0.000	20.85	0.11	0.39
INF	10.162***	0.000	20.65	0.08	0.23
FDI	11.116***	0.000	20.79	0.09	0.28
EXP	2.795***	0.005	20.44	0.02	0.35

Source: Authors' computation. Note: The superscripts \*\*\*, \*\* and \* denote the statistical significance at 1%, 5% and 10% levels, respectively.

Table 2 shows there are a presence of cross-sectional dependency within the African countries under the study. There is a strong rejection of cross-sectional independence at 1% significance level for all the variables except BMYVA, which is at 5%. That is to say, an event in one country will have a spill over effect in another country. That is, the effect of an interaction of financial development with institutional quality, whether positive or negative will have an effect in another African country.

Table 3 displays the CADF panel unit root test for the study. At level, it was observed that economic growth was stationary at 1% significance level, while all the explanatory variables were stationary at 1% significance level except trade openness. For the interaction variables, at level, BMYGE, BMYPS, PCYRL, and PCYCC were stationary at 5% significance level, and GSYPS was stationary at 1% significance level. All the other interaction variables were not significant at any level. Nevertheless, at first difference, all the variables were stationary at 5% significance level.

**Table 3. Panel Unit Root Test (CADF)**

Variable	Level		1 <sup>st</sup> Difference	
	Z[t-bar]	P-value	Z[t-bar]	P-value
LNGDP	-6.527***	0.000	-9.605 ***	0.000
BMIGE	-1.744**	0.041	-8.895***	0.000
BMIRQ	2.140	0.984	-5.684***	0.000
BMIRL	-0.795	0.213	-8.357***	0.000
BMICC	-0.562	0.287	-6.502***	0.000
BMIVA	1.230	0.891	-7.173***	0.000
BMIPS	-2.031**	0.021	-5.157***	0.000
PCIGE	-0.731	0.232	-2.329**	0.010
PCIRQ	2.050	0.980	-1.644**	0.030
PCIRL	-2.103**	0.018	-4.738***	0.000
PCICC	-1.975**	0.024	-1.728**	0.042
PCIVA	1.833	0.967	-5.689***	0.000
PCIPS	-0.580	0.281	-4.056***	0.000
DCIGE	1.756	0.960	-5.463***	0.000
DCIRQ	1.895	0.971	-6.952***	0.000
DCIRL	0.238	0.594	-4.986***	0.000
DCICC	2.130	0.983	-3.852***	0.000
DCIVA	3.050	0.999	-4.937***	0.000
DCIPS	-1.366*	0.086	-5.201***	0.000
GSIGE	0.938	0.826	-8.681***	0.000
GSIRQ	-1.229	0.110	-5.610***	0.000
GSIRL	1.190	0.883	-8.036***	0.000
GSICC	2.427	0.992	-6.373***	0.000
GSIVA	-0.718	0.236	-9.436***	0.000
GSIPS	-2.714***	0.003	-7.526***	0.000
BDIGE	2.197	0.986	-3.955***	0.000
BDIRQ	3.947	1.000	-3.601***	0.000
BDIRL	2.779	0.997	-3.709***	0.000
BDICC	2.745	0.997	-2.669***	0.004
BDIVA	3.503	1.000	-3.274***	0.001
BDIPS	3.665	1.000	-2.726***	0.003
GCF	-3.590 ***	0.005	-7.724 ***	0.000
TOP	1.533	0.937	-5.812***	0.000
INF	-7.884***	0.000	-15.736***	0.000
FDI	-2.394***	0.008	-11.065 ***	0.000
EXP	-3.065***	0.001	-10.612***	0.000

Source: Authors' computation. Note: The superscripts \*\*\*, \*\* and \* denote the statistical significance at 1%, 5% and 10% levels, respectively.

Tables 4 and Table 5 show the results of the model estimation using AMG, it displays the impact of the interaction variables on economic growth. The result shows that broad money/GDP and domestic credit/GDP if interacted with the IQ indicators, it is mostly statistically insignificant to economic growth. This result opposes the study by Ntow-Gyamfi et al. (2019) who obtained statistically significant relationship. Also, Gross Domestic Savings/GDP's interaction with IQ shows that, they are all statistically insignificant to inclusive growth. However, Credit to private sector/GDP interaction with IQ, it is mostly statistically significant to economic growth. This result is in line with study by Ntow-Gyamfi et al. (2019) who also obtained statistically significant relationship. For Bank Deposit/GDP interaction with IQ, there is a split between statistically significant and insignificant this result is in support of Hamzah et al. (2019) who obtain a similar mixed results of significance and insignificance impact on economic growth. Besides, BMYRQ, BMYCC, PCYGE, PCYRL, PCYRQ, and PCYCC are statistically significant to economic growth, yet the effect is negative. For instance, a percentage change in the interaction of control of corruption with broad money/GDP and credit to private sector/GDP will cause economic growth to decrease by 0.014% and 0.023%. By this, the paper can confidently say control of corruption is very weak in Africa, to the extent that it causes the economies to decline in growth even if interacted with financial development indicators the findings are in line with Song et al. (2020) and Hamzah et al. (2019). Similarly, a percentage increase in the interaction of regulatory quality with broad money/GDP and credit to private sector/GDP will cause growth to decrease by 0.012% and 0.029%, respectively. This shows that regulatory quality is relatively weak in Africa, making it affect the economy negatively even if it interacts with financial development (Paramati & Roca, 2019).

Findings from the tables suggests that credit to private sector/GDP interaction with voice and accountability, has the highest impact on growth, besides, credit to private sector/GDP interaction with political stability & absence of violence, and the interaction term Bank deposit/GDP with political stability & absence of violence also contributed substantially to economic growth. This shows that, the political system in Africa over the past two decades has been stable and is contributing to economic growth. This findings is in line with Baklouti & Boujelbene (2020). Though BMYGE, BMYRL, BMYVA, BMYPS, PCYVA, and PCYPS are statistically insignificant to growth, there is a positive impact on growth. A percentage point increase in the interaction of broad money/GDP with government effectiveness and voice & accountability will cause an increase of 0.002% in economic growth.

**Table 4. Augmented Mean Group Estimation**

Model	AMG											
	BMYGE	BMYRQ	BMYRL	BMYCC	BMYVA	BMYPS	PCYGE	PCYRQ	PCYRL	PCYCC	PCYVA	PCYPS
FD*IQ	0.002 [0.001]	-0.0127* [0.003]	0.0005 [0.001]	-0.014* [0.004]	0.002 [0.001]	0.001 [0.001]	-0.0306* [0.007]	-0.029* [0.008]	-0.022* [0.009]	-0.023* [0.007]	0.007 [0.004]	0.005 [0.006]
FDI	-0.005 [0.003]	0.011 [0.014]	-0.003 [0.003]	0.016 [0.015]	-0.002 [0.003]	-0.002 [0.003]	0.016 [0.012]	0.017 [0.010]	0.015 [0.013]	0.016 [0.012]	-0.001 [0.003]	0.014 [0.010]
INF	-0.002 [0.001]	-0.0005 [0.004]	-0.003 [0.001]	-0.003 [0.004]	-0.002 [0.001]	-0.001 [0.002]	-0.001 [0.005]	0.001 [0.004]	-0.001 [0.004]	-0.001 [0.004]	-0.003 [0.001]	-0.0006 [0.003]
GCF	0.004 [0.002]	0.016* [0.008]	0.003 [0.002]	0.0109 [0.008]	0.002 [0.003]	0.004 [0.002]	0.017* [0.007]	0.015 [0.009]	0.011 [0.008]	0.012 [0.008]	0.003 [0.003]	0.016* [0.008]
TOP	-0.003* [0.001]	0.004 [0.003]	-0.003* [0.001]	0.004 [0.003]	-0.003* [0.001]	-0.004* [0.001]	0.002 [0.002]	0.002 [0.003]	0.003 [0.003]	0.003 [0.003]	-0.003* [0.001]	0.002 [0.002]
EXP	-0.016* [0.005]	-0.003 [0.011]	-0.018* [0.005]	-0.0203* [0.009]	-0.015* [0.005]	-0.013* [0.006]	-0.016 [0.009]	-0.001 [0.003]	-0.009 [0.010]	-0.009 [0.010]	-0.018* [0.005]	-0.014 [0.013]
Constant	6.785* [0.212]	6.088* [0.296]	6.854* [0.000]	6.601* [0.378]	6.844* [0.237]	6.827* [0.246]	6.421* [0.289]	6.215* [0.209]	6.406* [0.296]	6.491* [0.359]	6.835* [0.232]	6.484* [0.340]
Wald chi2(6)	25.3	22.28	24.34	25.5	22.59	17.21	39.42	22.99	12.94	20.1	25.42	17.62
Prob > chi2	0.0003	0.0011	0.0005	0.0003	0.0009	0.0085	0.0000	0.0008	0.0441	0.0027	0.0003	0.0073

Note: The superscripts \* denote the statistical significance at 5%. Asymptotic standard errors are in parentheses.

Table 5. Augmented Mean Group Estimation

Model	AMG																	
	LNGDP is the dependent variable																	
	DCYGE	DCYRQ	DCYRL	DCYCC	DCYVA	DCYPS	GSYGE	GSYRQ	GSYRL	GSYCC	GSYVA	GSYPS	BDYGE	BDYRQ	BDYRL	BDYCC	BDYVA	BDYPS
FD*IQ	-0.008* [0.003]	-0.012* [0.004]	-0.001 [0.005]	-0.006 [0.004]	0.002 [0.001]	0.001 [0.001]	0.001 [0.001]	-0.004 [0.003]	-0.006 [0.008]	0.001 [0.002]	0.001 [0.002]	0.001 [0.002]	-0.035* [0.006]	-0.031* [0.006]	0.002 [0.002]	-0.0005 [0.003]	-0.020* [0.008]	0.004 [0.002]
FDI	0.016 [0.013]	0.015 [0.010]	0.013 [0.014]	0.017 [0.013]	-0.003 [0.003]	-0.002 [0.002]	-0.003 [0.003]	-0.005 [0.004]	0.007 [0.012]	-0.003 [0.003]	-0.0007 [0.004]	-0.002 [0.002]	0.011 [0.010]	0.015 [0.011]	-0.002 [0.003]	-0.004 [0.003]	0.005 [0.010]	-0.003 [0.003]
INF	-0.004 [0.004]	-0.0007 [0.004]	-0.005 [0.004]	-0.003 [0.004]	-0.003* [0.001]	-0.002 [0.001]	-0.003 [0.001]	-0.003 [0.001]	-0.004 [0.004]	-0.004* [0.001]	-0.003 [0.001]	-0.003 [0.001]	-0.001 [0.004]	-0.005 [0.004]	-0.002 [0.001]	-0.003 [0.001]	0.0008 [0.004]	-0.002 [0.001]
GCF	0.021* [0.007]	0.017* [0.007]	0.016* [0.007]	0.016* [0.007]	0.002 [0.003]	0.004 [0.002]	0.006* [0.003]	0.007* [0.003]	0.023* [0.008]	0.006* [0.002]	0.005 [0.003]	0.005 [0.003]	0.021* [0.005]	0.021* [0.007]	0.002 [0.002]	0.004 [0.003]	0.017* [0.007]	0.004 [0.002]
TOP	0.001 [0.003]	0.002 [0.002]	0.002 [0.002]	0.002 [0.002]	-0.003* [0.001]	-0.003* [0.001]	-0.004* [0.001]	-0.004* [0.001]	0.004 [0.002]	-0.004* [0.001]	-0.004* [0.001]	-0.004* [0.001]	-0.001 [0.002]	0.0009 [0.002]	-0.003* [0.001]	-0.003* [0.001]	0.004 [0.002]	0.004 [0.001]
EXP	-0.003 [0.007]	0.004 [0.007]	-0.005 [0.009]	-0.004 [0.008]	-0.018* [0.006]	-0.015* [0.006]	-0.019* [0.005]	-0.018* [0.005]	-0.026* [0.010]	-0.022* [0.005]	-0.017* [0.005]	-0.014* [0.006]	-0.012 [0.009]	0.003 [0.011]	-0.019* [0.005]	-0.019* [0.005]	-0.013 [0.014]	-0.013 [0.006]
Constant	6.404* [0.324]	6.198* [0.288]	6.551* [0.317]	6.494* [0.342]	6.854* [0.242]	6.834* [0.233]	6.792* [0.217]	6.736* [0.209]	6.589* [0.331]	6.85* [0.241]	6.753* [0.227]	6.766* [0.244]	6.300* [0.324]	6.133* [0.267]	6.840* [0.235]	6.810* [0.240]	6.279* [0.365]	6.819* [0.243]
Wald chi2(6)	17.46	21.46	9.84	10.82	27.38	19.41	27.78	22.93	26.56	31.12	22.49	18.04	65.04	34.06	26.29	26.43	20.07	23.81
Prob > chi2	0.0077	0.0015	0.1315	0.0940	0.0001	0.0035	0.0001	0.0008	0.0105	0.0000	22.4900	0.0061	0.0000	0.0000	0.0002	0.0002	0.0027	0.0006

Note: The superscripts \* denote the statistical significance at 5%. Asymptotic standard errors are in parentheses.



Broad money/GDP if interacted with institutional quality indicators (government effectiveness and voice & accountability), it will enhance economic growth better the finding is in line with the findings of Maruta et al. (2020). Therefore, policymakers can channel more attention to government effectiveness and voice & accountability if broad money to GDP is being considered to boost economic growth. Besides, a percentage increase in the interaction of credit to private sector/GDP with voice& accountability and political stability & absence of violence will cause economic growth by 0.007% and 0.005%, respectively. This shows Credit to Private Sector/GDP interaction with Voice & Accountability, and Credit to Private Sector/GDP interaction with Political Stability & Absence of Violence has more impact on economic growth than the interaction of Credit to Private Sector/GDP with other institutional quality indicators. Consequently, in crafting policy for the economies in Africa, if credit to private sector/GDP is being considered to help boost economic growth, more emphasis should be put on Voice & Accountability and Political Stability & Absence of Violence because it has the potential to increase economic growth.

On the other hand, the interaction variables, credit to private sector/GDP with government effectiveness; and, bank deposit/GDP with government effectiveness, recorded the worse relationship with economic growth, they reduce economic growth substantially, this shows that, governments in Africa are not very effective that is why it as negative impact on economic growth, an improvement in government effectiveness will be beneficial to Africa, this findings is in line with Adzima & Baita (2019). Form table V it can be deduce that, DCYGE, DCYRQ, GSYRQ, GSYRL, BDYGE, BDYRQ, BDYCC, and BDYVA are statistically significant to economic growth but has a negative effect on with economic growth. A percentage increase in the interaction of government effectiveness with domestic credit/GDP and bank deposit/GDP will cause a decrease in economic growth by 0.008% and 0.035%. This tells us that government effectiveness in Africa is weak, so even sif it interacted with IQ it would defiantly have negative impact on growth. In the same light, an increase in the interaction of regulatory quality with domestic credit/GDP and bank deposit/GDP will cause economic growth to decrease by 0.012% and 0.031%. Thus, regulatory quality, coupled with domestic credit/GDP and bank deposit/GDP will cause economic growth really decline.

Finally, DCYCC, DCYRL, DCYVA, DCYPS, GSYGE, GSYCC, GSYVA, GSYPs, BDYRL, and BDYPS are statistically insignificant but have a positive impact on economic growth. A percentage increase in the interaction of domestic credit/GDP with voice and accountability and bank deposit/GDP with rule of law will cause an increase of 0.002% in economic growth. This tells us that, the interaction of domestic credit/GDP with voice & accountability and bank deposit/GDP interaction with rule of law will cause help the economies in Africa to grow a little, therefore if policies on economic growth are being formulated, then it will be prudent to consider framing policies around these indicators since they have the potential of causing economic growth. In a similar instance, a percentage increase in the interaction of bank deposit/GDP with political stability & absence of violence will cause economic growth by 0.004%. That means, the interaction

of bank deposit/GDP with political stability & absence of violence is likely to cause higher economic growth than the interaction of domestic credit/GDP with voice & accountability and bank deposit/GDP interaction with rule of law. For the other control variables, in tables IV and V; gross fixed capital formation generally impacts economic growth positively. In general, inflation negatively affects economic growth. Nevertheless, foreign direct investment, trade openness, and government expenditure vary from one model another, and each model has a different interaction variable.

**Table 6. Pairwise Dumitrescu Hurlin Panel Causality Tests**

Direction	Zbar-Stat.	Prob.	Direction	Zbar-Stat.	Prob.
LNGDP → BDYCC	5.11524***	3.00E-07	BDYCC → LNGDP	0.43805	0.6613
LNGDP → BDYRL	4.84539***	1.00E-06	BDYGE → LNGDP	0.90861	0.3636
LNGDP → BDYGE	6.15782***	7.00E-10	BDYPS → LNGDP	0.8173	0.4138
LNGDP → BDYPS	3.28621***	0.001	BDYRL → LNGDP	1.84152*	0.0655
LNGDP → BDYRQ	4.66086***	3.00E-06	BDYRQ → LNGDP	0.59424	0.5524
LNGDP → BDYVA	2.1245**	0.0336	BDYVA → LNGDP	0.82501	0.4094
LNGDP → BMYCC	3.97662***	7.00E-05	BMYCC → LNGDP	3.75546***	0.0002
LNGDP → BMYGE	6.66134***	3.00E-11	BMYGE → LNGDP	1.88212*	0.0598
LNGDP → BMYPS	3.4778***	0.0005	BMYPS → LNGDP	2.93006***	0.0034
LNGDP → BMYRL	3.96635***	7.00E-05	BMYRL → LNGDP	4.43571***	9.00E-06
LNGDP → BMYRQ	6.2897***	3.00E-10	BMYRQ → LNGDP	2.13334**	0.0329
LNGDP → BMYVA	4.76544***	2.00E-06	BMYVA → LNGDP	2.25722**	0.024
LNGDP → DCYCC	4.83104***	1.00E-06	DCYCC → LNGDP	1.27252	0.2032
LNGDP → DCYGE	7.1012***	1.00E-12	DCYGE → LNGDP	1.33186	0.1829
LNGDP → DCYPS	4.37568***	1.00E-05	DCYPS → LNGDP	1.74469*	0.081
LNGDP → DCYRL	4.40491***	1.00E-05	DCYRL → LNGDP	2.77605***	0.0055
LNGDP → DCYRQ	5.69867***	1.00E-08	DCYRQ → LNGDP	1.06524	0.2868
LNGDP → DCYVA	4.01906***	6.00E-05	DCYVA → LNGDP	1.19696	0.2313
LNGDP → GSYCC	4.75699***	2.00E-06	GSYCC → LNGDP	-1.0399	0.2984
LNGDP → GSYGE	8.22995***	2.00E-16	GSYGE → LNGDP	0.091	0.9275
LNGDP → GSYP	9.53309***	0.0000	GSYPS → LNGDP	0.40618	0.6846
LNGDP → GSYRL	5.70364***	1.00E-08	GSYRL → LNGDP	1.10352	0.2698
LNGDP → GSYRQ	7.10013***	1.00E-12	GSYRQ → LNGDP	0.12981	0.8967
LNGDP → GSYVA	8.90117***	0.0000	GSYVA → LNGDP	1.30315	0.1925
LNGDP → PCYCC	6.45008***	1.00E-10	PCYCC → LNGDP	0.11191	0.9109
LNGDP → PCYGE	6.81236***	1.00E-11	PCYGE → LNGDP	2.52828**	0.0115
LNGDP → PCYPS	3.89501***	0.0001	PCYPS → LNGDP	-0.28335	0.7769
LNGDP → PCYRL	5.38969***	7.00E-08	PCYRL → LNGDP	2.29556**	0.0217
LNGDP → PCYRQ	3.68526***	0.0002	PCYRQ → LNGDP	1.8233*	0.0683
LNGDP → PCYVA	4.60556***	4.00E-06	PCYVA → LNGDP	-0.2299	0.8182

Source: Authors' computation: Note: The superscripts \*\*\*, \*\* and \* denote the statistical significance at 1%, 5% and 10% levels, respectively.

Looking at the Pairwise Dumitrescu Hurlin Panel Causality Tests as shown in Table 6, it can be deduce that there is causality running from economic growth to all the Financial Development and Institutional quality indicators at 1% significance, except BDYVA which is at 5%. On the other hand, there is causality to growth from BMYCC, BMYPS, BMYRL, BMYRQ, BMYVA, DCYRL, PCYGE, and PCYRL at 5%. That is to say that, there is dual causality between economic growth and BMYCC, BMYPS, BMYRL, BMYRQ, BMYVA, DCYRL, PCYGE, and PCYRL. Dual causality in this study tells us that the interaction variables will cause economic growth, and economic growth will cause the interaction variables also to grow.

Arguably, the interaction of broad money/GDP with IQ indicators (control of corruption, political stability & absence of violence, rule of law, regulatory quality and voice & accountability) presents dual causality making broad money/GDP a more reliable FD indicator to consider in implementing policies when IQ is being considered. However, the interaction of credit to private sector/GDP with IQ indicators (government effectiveness and rule of law) also needs to be considered since they also have dual causality, just like the interaction of domestic credit/GDP with rule of law. The paper can confidently attest that rule of law is very critical in economic growth since if it interacts with FD indicators (broad money/GDP, domestic credit/GDP, and credit to private sector/GDP) it causes dual causality with growth. Nonetheless, there is no causality from the remaining 22 interactions to economic growth. That is to say there is one-way causality from growth. This means economic growth will cause the 22 interaction variables to grow but they will not necessarily cause economic growth. Therefore, to have rapid economic growth, those 8 interaction variables must be concentrated on in decision making.

## **Conclusion**

In a nutshell, this study considered the relationship of thirty different FD and IQ interactions on economic growth for 39 countries in Africa for the period 1997 to 2017, after going through the robust tests, the study used Augmented mean group estimation technique (AMG) to estimate the model. Our main findings of the study were; Gross Domestic Savings /GDP's interaction with IQ shows that, they are all statistically insignificant to inclusive growth. Broad money/GDP and Domestic Credit /GDP when interacted with the IQ indicators, it is mostly statistically insignificant to economic growth. The significance of Bank Deposit/GDP on growth, depends on the IQ indicator used. It was concluded that, credit to private sector/GDP interaction with voice and accountability, has the highest impact on growth. Financial development indicators; Credit to private sector/GDP and Bank deposit/GDP interactions with political stability & absence of violence contributed substantially to economic growth. On the other hand, financial development indicators, credit to private sector/GDP and, bank deposit/GDP interaction with government effectiveness, recorded the worse relationship with economic growth. For the causal direction, there is dual causality between economic growth and eight interaction variables, of which five are broad money/GDP interactions

with IQ indicators. That means that broad money/GDP interactions with IQ indicators influence economic growth and vice versa. All the other twenty-two interactions have one-way causality.

To expedite rapid economic growth in Africa, this study recommends that, governments in Africa should strengthen financial development indicators; Bank Deposit/GDP, Gross Domestic Savings /GDP and Credit to private sector/GDP and institutional quality indicator political stability & absence of violence since their interaction has proven to aid rapid economic growth. However the other indicators seems to be promising and an improvement in them will be beneficial.

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