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Scrutinizing the complex relationship between Financial Development Gross Fixed Capital Formation and Economic Growth in Africa by adopting CCEMG and AMG estimation techniques

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Abstract:
This paper explores the relationship between gross fixed capital formation, financial development, and economic growth in Africa. The study used 39 African countries from 1997 to 2017. The study adopted five financial development indicators. The study employed Augmented Mean Group and Common Correlated Effects Mean Group estimation techniques for the estimations. From the study, Bank Deposit to GDP is statistically significant, it has a negative effect on economic growth, and it shows dual causality, Bank Deposit is inadequate in Africa but significant to economic growth. Broad Money to GDP, Domestic Credit to GDP, and Credit to Private Sector to GDP are all statistically insignificant to growth. They also have negative influence on economic growth. Broad Money shows dual causality with growth while both Domestic Credit, and Credit to Private Sector displays one way causality from economic growth. Gross Domestic Savings to GDP is statistically insignificant and it has a positive bearing on growth, it has one-way causality from growth. Broad Money is very limited in Africa to the extent that, the funds available for domestic transactions are barely enough to have any impact on economic growth. Domestic banks and financial institutions hardly gives credit to private sector and government institutions, due to high risk factor. Gross fixed capital formation has a positive bearing on economic growth. It displays bi-directional causality with economic growth. Financial development does not have a blanket relationship with economic growth, but rather it depends on the type of financial development indicator being used.

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1.0 Introduction

There is a rising thirst for financial liberation in Africa over the past few decades. Countless attempts have been made to identify and solve the ailing financial landscape in Africa. The significance of the effect that of financial development (FD) has on economic growth and the role that gross fixed capital formation (GCF) plays, has been scrutinised under various geographical locations with the different panels. For instance, in Sub-Sahara Africa, (Ibrahim & Alagidede, 2018b) conducted a study and opined that FD is positively associated with growth. Similarly, Erum & Hussain (2019) demonstrated that gross capital formation positively influenced growth in 43 Organisation of Islamic Countries for the period 1984–2016. Similarly, other researchers have focused on the causal direction. Studies from Yousuf & Al-yousif (2002) show the causal link as bi-directional between FD and growth in developing countries. Also, Using VECM, Onyinye et al. (2017) studied the causal connections between gross capital formation and growth for 1971-2014, results confirmed a bi-directional or dual causality. Besides, Yang (2018) emphasised that FD has a marginal effect on economic growth. Inversely, Maswana (2005) stated that FD has no substantial impact on growth. Similarly, Hao et al. (2018) researched on the provinces in China, and opined that FD negatively impacts economic growth.

In this research, we consider gross fixed capital formation as another essential element of economic growth. The production capacity of a nation is determined by capital accumulation, which ultimately affects economic growth (Solow, 1956). The effect of capital accumulation on economic growth largely relies on the form of accumulations, such as interest rates, foreign direct investments, and savings. Inadequate capital accumulation is a critical factor hindering the sustainable economic growth of developing economies (Onyinye et al., 2017). A study by Muhammad & Khan (2019) stated that though capital is significant, it has an adverse effect on economic growth in Asian host countries, whereas capital of 35 other host nations and 118 source nations recorded a positive effect on growth. Basically, we do not downplay the effect of capital formation in Africa. However, the impact has not been clearly examined in recent studies. As we seek to find an amicable remedy to the weak economic growth in Africa, we cannot overemphasize the role that gross fixed capital plays in it.

This study presents keen results on the complicated relationship between FD, GFC, and economic growth. . In this study, we are attempting to conduct our investigation on Africa as a whole, and not just sub-Sahara as previous studies has concentrated on, for instance, Ibrahim & Alagidede (2018a) and Fowowe (2011), restricted their studies to only sub-Sahara but not Africa as a whole. Besides, previous studies take into account one or two financial development indicators, but we are using five indicators for our study, it makes our study broader and resilient. This paper also contribute to the existing literature on the finance-capital-growth nexus, we seek to make a substantial contribution on the impact and causal relationship using Common Correlated Effects Mean Group (CCEMG/CCE) and Augmented Mean Group (AMG). For robust and reliable findings, we conduct the cross-sectional dependency test, panel unit root test before using or estimation techniques, and then find the causality. This study is structured as follows; literature review, methodology, data & variables, results & discussion, and concluding remarks.

2.0 Literature Review

After their study conducted on 71 economies for 35 years Levine et al. (2000) stated that FD has a positive influence on economic growth. They adopted generalized moment method

(GMM) using dynamic panel data in their study. Besides, Rioja & Valev (2004) conducted a study using 74 economies also admitted the positive impact of FD in improving economic growth, they further stated that the significance of FD on growth cannot be overemphasized. Similarly, studies from Ibrahim & Alagidede (2018a) and Rioja & Valev (2004), showed a positive impact and causality between FD and growth. On the other hand, Shan & Morris (2002) studied data from 19 OPEC economies and China, their study, did not show any significance of FD to economic growth. Remarkably, Mishra & Narayan (2015) studied 43 developed and rising economies which revealed that influence of FD on economic growth whether positive or negative, is largely dependent on cross-sectional averages. In line with that, Masten & Coricelli (2008), also opined that FD influences economic growth substantially in developing countries than developed ones. Confidently, a strong financial sector reduces or increases the impact of real or monetary fluctuations on business progression and long term volatility components Ibrahim & Alagidede (2018b). It has been stated by Adu et al. (2013) that the general effect of FD on growth largely relies on the type of FD indicators used. Research by (Asteriou & Spanos, 2019) on European Union settled that, FD positively impacted on growth in the pre-economic crisis era, nonetheless, post-economic crises period, the impact became negative.

Gross Fixed Capital Formation (GCF) studies by Boamah et al. (2018) concluded that GCF has substantially enhanced the economic growth of 18 economies in Asia. In addition, Ibe & Osuagwu (2016) categorizes GCF as gross private and public domestic investments. Using 193 economies over the period 1990–2017 Khan et al. (2019) revealed that gross capital formation positively impacts growth. By employing NARDL model, Awodumi & Adewuyi (2020) opined that capital formation in the long term impacts growth positively in Egypt and Angola, but it in the short-run, it only impacts growth in Egypt. (Rahman & Velayutham, 2020) used FMOLS and DOLS to illustrate that an increase of 1% in fixed capital formation causes an increase in economic growth by 0.58%. On the part of the causal direction, Uneze (2013) studied the nexus between gross capital formation and growth for 13 Sub-Saharan African economies, for the causal relationship, it was bi-directional. Besides, Satti et al. (2014) studied the nexus between growth and gross capital formation in Venezuela for 1971–2011 using VECM Granger causality, and it proved to be bi-directional. Another study in Iran was conducted by Ahmed et al. (2016) it proved that there exist bi-directional or dual causality nexus between capital and economic growth. However, in a study for Pakistan Baz et al. (2019), reported uni-directional, or one-way causality from capital to growth. In a panel study for 124 countries from 1980-2018, Topcu et al. (2020) revealed that for high-income economies, gross capital formation, energy and urbanization usage impacts positively on economic growth, whereas capital formation negatively impacts low-income economies.

Endogenous growth theorists think that factors of economic growth are endogenous or internal. The assumption and belief are that growth can happen without relying on exogenous factors such as changes in technology or population (Bencivenga & Smith, 1995; Grossman & Helpman, 2015; Romer, 1989). Besides, Grossman & Helpman (2015) state that the literature in growth theory has enabled the recent researchers to take a look at many concerns that have to remain key to financial development and growth for a long time. Levine (2005) and Bencivenga & Smith (1995) were part of the initial researchers to recommend the endogenous growth models as a means of locating ways through which the financial system impacts long term economic growth. They emphasize the delicate duty that financial markets play in managing agents' risk (investment and liquidity risks). According to Frankel & Romer

(1999), financial markets also lure more savings into productive investment, simultaneously discouraging untimely liquidating capital invested in long-term projects. Financial development influences economic growth in different ways, as stated by the famous "AK" model; *Yt=AKt* (Pagano, 1993). The AK model assumes the making of one kind of product (Y) with only capital (K) as input, and "*A"* here denotes capital productivity. Also, K relies on the savings rate, where parts (f) of the savings (S) is an investment. Form the model, a stable growth equation is determined, which is g = A f S – d. Now, "d" is the rate of depreciation. This equation states that financial development is likely to impact growth by the financial system efficiency or capital productivity.

The other variables in the study also have some effect on economic growth, to begin with, Foreign Direct Investment (FDI), is stated as having a significant impact on growth in MENA economies (Omri et al. 2015). The effectiveness of FDI largely depends on the financial and stability in the country, fragile institutions, lack of highly trained human capital, feeble financial & money markets, and sophisticated trade restrictions are likely to impede the positive impact of FDI on a country (Kleimeier & Versteeg, 2010). Besides, Trade Openness (TOP) is as critical as other indicators in an economy's growth. In a panel study by (Menyah et al., 2014), it was revealed that trade openness has a considerable effect on FD and, subsequently, economic growth. Though the connection between growth and inflation has not been categorically stated in the classical growth theory, it is clandestinely admitted that there is a negative correlation between economic growth and inflation (Akinsola & Odhiambo, 2017). Some macroeconomic indicators like; financial development and trade openness can influence the inflation-growth relationship (Eggoh & Khan, 2014).

3.0 Research Methods

3.1 Data and Variables

Our source of data is the World Development Indicators (WDI) and the Global Financial Development Indicators (GFDI). The data is from 1997 to 2017. The sample size is 39 African economies (Appendix 1); our reason for the sampled economies is the availability of data (Yang, 2018). The proxy for economic growth is the natural logarithm of GDP per capita (Hao et al., 2018; Ibrahim & Alagidede, 2018a; Yang, 2018). We used five distinctive FD indicators; firstly, Bank Deposit to GDP (BDY), it measures deposits and time in banks & financial institutions (Sobiech, 2019). Secondly, Broad Money to GDP (BMY), this is considered a monetization variable; higher BMY means a stronger and more robust financial sector (Al-yousif, 2002; Musamali & Moyi, 2014). Thirdly, Total Domestic Credit to GDP (DCY) it covers all financial credit issued to various sectors of the economy on a gross basis. The indicator considers banking and non-banking institutions (Ibrahim & Alagidede, 2018a; Yang, 2018). Fourthly, Gross Domestic Savings to GDP (GSY), this indicator is GDP minus final summary expenditure. GSY was considered as financial depth indicator of a nation, yet, its ability to compute the financial position of an economy cannot be downplayed (Lenka, 2015). Finally, Credit to Private Sector to GDP (PCY) measures is the proportion of funds that the private sector has access to, from depository institutions, thus deposit-accepting firms apart from the central bank (Batuo et al., 2018; Yue et al., 2019). We anticipate all the FD indicators to positively impact growth.

Other control variables are; gross fixed capital formation, foreign direct investment, inflation, trade openness, and government expenditure. Gross fixed capital formation (GCF) is a representation of investment, it is the acquisition of fixed or permanent assets within a

definite time frame, plus the improvement of the assets acquired in a country (Hussin & Saidin, 2012). Hence, we expect GCF to be positively related to growth. Trade Openness (TOP), it is the summary for imports and exports of all services and goods computed as a ratio of GDP (Musamali & Moyi, 2014; Vo et al., 2018). Foreign Direct Investment (FDI) is the net inflow of direct investment, which comes from outside a country as a ratio of GDP (Hussin & Saidin, 2012). Inflation (INF), it is the yearly ratio adjustment in the consumer price index in a country (Thanh, 2015; Vo et al., 2018) Finally, Total Government Expenditure (EXP), is the summary government expenditure computed as a ratio of GDP (Sobiech, 2019; Yang, 2018).

Our study carefully follows a series of robust tests in this order; correlation analysis, then cross-sectional dependency tests, followed by panel unit root test, then we estimate the model, and finally, Causality test.

3.2 Correlation analysis

The Correlation test checks for any statistical clue with a linear link amongst the same group of variables in the data, and any possibility of multicollinearity in the variables for the study using the formula:

$$r_{xy} = \frac{cov(x,y)}{\sqrt{var(x)}.\sqrt{var(y)}} \quad (1)$$

3.3 Cross-sectional dependency test

Cross-sectional dependency (CD) tests are conducted to determine if there is a 'spill-over' effect from one cross-section to another in the data. It also helps in choosing a suitable estimation technique (Fromentin, 2017; Paramati & Roca, 2019; Yang, 2018).

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\hat{p}^2\, ij\right) \quad (2)$$

3.4 Panel Unit root tests

We take a look at the second generation unit root test since there is a possible CD among our variables, we considered Cross-sectional Augmented IPS (CIPS), and Cross-sectional Augmented DF (CADF). The CADF, as proposed by Im et al. (2003);

$$\Delta y_{it} = \alpha_i + \beta_i y_{i,t-1} + \sum_{j=1}^{pi}\rho_{ij}\,\Delta y_{i,t-j} + \varepsilon_{it} \quad (3)$$

$$\Delta z_{it} = \alpha_i + b_i z_{i,t-1} + d_i \Delta \bar{z}_t + e_{it} \quad (4)$$

CIPS makes use of critical values and computed values to deduce variables stationarity (Arezki et al., 2012).

$$CIPS(N,T) = N^{-1}\sum_{I=1}^{N} t_i(N,T) \quad (5)$$

3.5 Model estimation

The AK model (6) by Lucas (1988) has been further expanded into another model (7) by Yang (2018), this model (7) explains the growth of an economy:

$$y = AK^{\alpha}(\ell h)^{1-\alpha} \quad (6)$$

$$G_{i,t} = y_{i,t} = \alpha_i + \beta_i F_{i,t} + \gamma_i C_{i,t} + \mu_i + \varepsilon_{i,t} \quad (7)$$

To explain the model; $y_{i,t}$ and $G_{i,t}$ is GDP per capita, and growth; α_i is constant; $F_{i,t}$ is financial development variable; $C_{i,t}$ is conditioning variable; β_i and γ_i are the coefficients of the variables, $\varepsilon_{i,t}$ and μ_i are stochastic terms; i is the country, and t is time. We further developed it into our model;

$$lnGDP_{it} = \alpha_{it} + \beta_1 FD_{it} + \beta_2 C_{it} + \varepsilon_{it} \quad (8)$$

Our study consists of five distinct financial development indicators; therefore, we will have five models. Each model will measure a unique FD indicator; thus, BDY, BMY, DCY, GSY, and PCY. Introducing the control variables, the model will be;

$$lnGDP_{it} = \alpha_{it} + \beta_1 FD_{it} + \beta_2 GCF_{it} + \beta_3 EXP_{it} + \beta_4 INF_{it} + \beta_5 TOP_{it} + \beta_6 FDI_{it} + \varepsilon_{it} \quad (9)$$

3.6 Pairwise Dumitrescu-Hurlin Panel Causality Test

The Dumitrescu & Hurlin (2012) panel causality test considers specific cross-section units, therefore making all factors to be different through the cross-section, and uses the average figures across all cross-sectional units.

4.0 Results and Discussion

4.1 Data

Table 1 reveals the summary statistics of the study; the standard deviations tells us that the variables under the study do not have a normal distribution. The table displays the data as being positively skewed, but, GSY is negatively skewed. All the variables have kurtosis coefficient above 3.0 except *ln*GDP. We see the kurtosis for our data as leptokurtic.

Table 1- Statistical Summary

	Mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob	Sum	Sum Sq. Dev.
***ln*GDP**	6.7984	6.566	1.058742	0.449936	2.218143	48.49398	0.000	5567.947	916.9242
BMY	32.656	24.092	23.17435	1.637599	5.346652	553.9749	0.000	26745.81	439307.1
BDY	28.592	16.852	49.87556	9.217190	111.6635	414536.0	0.000	23416.93	2034834.
DCY	31.132	18.002	40.18638	2.259916	9.095530	1965.066	0.000	25497.66	1321025.
GSY	12.742	10.800	18.93841	-2.0546	19.74191	10141.17	0.000	10436.10	293386.8
PCY	21.431	12.707	26.66390	2.852433	11.88390	3803.886	0.000	17552.63	581568.1
GCF	20.257	20.241	7.981499	0.715230	6.664436	528.0608	0.000	16590.97	52110.14
EXP	13.596	13.486	4.954496	0.175894	3.232192	6.062909	0.048	11135.82	20079.47
FDI	4.6564	2.2912	11.59249	8.359004	90.38481	270119.8	0.000	3813.618	109927.7
INF	9.8665	5.1118	31.08839	10.52005	133.9855	600596.1	0.000	8080.698	790587.1
TOP	70.142	63.210	33.08425	1.919476	11.52518	2983.077	0.000	57446.75	895356.3

Note: Statistical Summary the dataset. Calculations by Authors

4.2 Pairwise Correlation analysis

From table 2, there is no possible multicollinearity in the study since they are all below 0.8 therefore, the variables can be used for the study. Apart from BDY to *ln*GDP and GCF to DCY all the other financial development indicators were significant at 5%. INF negatively correlated to all the variables.

Table 2- Pairwise Correlation analysis

	*ln*GDP	BMY	BDY	DCY	GSY	PCY	EXP	GCF	TOP	INF	FDI	TOP
*ln*GDP	1.000											
BMY	0.551*	1.000										
BDY	0.098*	0.325*	1.000									
DCY	0.287*	0.629*	0.626*	1.000								
GSY	0.509*	0.114*	-0.356*	-0.199*	1.000							
PCY	0.576*	0.721*	0.251*	0.767*	0.105*	1.000						
EXP	0.391*	0.343*	0.045	0.133*	0.109*	0.408*	1.000					
GCF	0.348*	0.216*	0.061	0.002	0.334*	0.133*	0.329*	1.000				
TOP	0.295*	0.163*	0.451*	0.188*	-0.100*	0.144*	0.278*	0.298*	1.000			
INF	-0.123*	-0.112*	-0.064	-0.092*	-0.003	-0.101*	-0.209*	-0.134*	-0.065	1.000		
FDI	-0.137*	-0.021	0.185*	0.105*	-0.275*	-0.057	-0.033	0.077*	0.249*	0.034	1.000	
TOP	0.295*	0.163*	0.451*	0.188*	-0.100*	0.144*	0.278*	0.298*	1.000*	-0.065	0.249*	1.000

*Note: Pairwise correlation analysis of the variables. The sign * means the variable is significant at 5%. Calculations by Authors*

4.3 Cross-section dependence test

All three CD tests in table 3; Pesaran Scaled LM, Breusch-Pagan LM, and Pesaran-CD test rejected the null hypothesis at 1%. Meaning, there is the presence of cross-sectional dependency. That means an effect or shock from one economy will have a spill-over impact on another economy in Africa.

Table 3 - Cross-section dependency test

Test	Statistic	d.f.	Prob.
Breusch-Pagan LM	2651.719***	741	0.0000
Pesaran scaled LM	49.63325***		0.0000
Pesaran CD	3.131435***		0.0017

*Note: the sign *, **, *** denotes significance level of 10%, 5% and 1% respectively. Calculations by Authors*

4.4 Panel Unit Root Test

Table 4 shows that at levels, some variables were not stationary at 5% significance level. Therefore, we tested at first difference (Fromentin, 2017). At first difference for CADF and CIPS, all the variables are stationary at 1% significance level. These results enabled us to continue and run our models since our variables are now stationary.

Table 4: Panel Unit root test

	CADF				CIPS			
	Level		1st Difference		Level		1st Difference	
Variable	**t-bar**	**P-value**	**t-bar**	**P-value**	**Critical Value 1%**	**Computed value**	**Critical Value 1%**	**Computed value**
*ln*GDP	-2.774	0.000***	-3.299	0.000***	-2.23	-2.742***	-2.25	-4.154***
BDY	-1.136	1.000	-2.563	0.000***	-2.23	-0.725	-2.25	-3.212***
BMY	-2.234	0.001***	-3.718	0.000***	-2.23	-2.384***	-2.25	-4.535***
DCY	-1.274	0.999	-2.778	0.000***	-2.23	-1.302	-2.25	-4.016***
GSY	-1.491	0.958	-3.297	0.000***	-2.23	-1.996	-2.25	-4.776***
PCY	-2.008	0.055*	-3.437	0.000***	-2.23	-1.967	-2.25	-3.635***
GCF	-2.158	0.005***	-2.960	0.000***	-2.23	-2.162**	-2.25	-4.250***
EXP	-2.054	0.029**	-3.437	0.000***	-2.23	-2.177**	-2.25	-4.226***
INF	-3.111	0.000***	-4.443	0.000***	-2.23	-3.729***	-2.25	-5.459***
TOP	-1.559	0.903	-2.771	0.000***	-2.23	-1.702	-2.25	-4.276***
FDI	-2.148	0.006***	-3.563	0.000***	-2.23	-3.103***	-2.25	-5.179***

*Note: The sign *, **, *** shows figures are Stationary at 10%, 5% and 1% respectively. Calculations by Authors*

4.5 Model Estimation

Tables 5 and 6 are divided into ten models; each model has one financial development indicator and a different estimation method. For models 1 and 6; Bank Deposit to GDP (BDY) all things being equal, a unit adjustment in the BDY will result in a negative change of -1.16% and -1.04% on economic growth for CCEMG and AMG, and it is significant to growth. Economically, this tells us that banks in Africa generally record low deposits and this may be ascribed to several factors; people have low disposable income, bank branches are not easily accessible, and lack of trust in the banking sector. This finding goes a long way to explain how significant banking deposit is to economic growth however, if the banking deposits ae relatively low, it will have no or negative impact on economic growth. The study suggests that, higher deposit in banks will yield positive economic growth and will have significant impact as well, because higher bank deposit will give the banks enough money to offer various business loans so that they can expand their operations and grow bigger.

Interestingly, models 2 and 7; Broad Money to GDP (BMY), all things being equal, a unit adjustment in BMY will result in a negative change of -0.21% and -0.55% on growth for

CCEMG and AMG, nonetheless, it is statistically insignificant to growth. Economically, the quantum of money available for various financial transactions in Africa is low; therefore, the daily financial activities do not positively affect the economy. The findings are in agreement to the study of Yang (2018). Generally, the quantum of money available for business transactions in Africa is relatively low, there are numerous start-ups and other enterprises, but since there is not enough money in the economies for daily transactions, businesses are not able to thrive therefore Broad Money does not have any significant impact in economic growth. The funds available in these economies are mostly controlled by the few multinational and giant corporations who mostly trade outside the continent, therefore there is usually small amount of money available for small and medium enterprises to operate with. Financial institutions mostly refuse to give these enterprises loans to expand their business which leads to less money circulating in the economy and does not support economic growth. If funds are made available to smaller enterprises, broad money to GDP will increase and it will have positive impact on economic growth.

Table 5- Common Correlated Effects Mean Group Estimation

	Dependent Variable (lnGDP)				
	Coefficient (Standard Error)	*Coefficient (Standard Error)*	*Coefficient (Standard Error)*	*Coefficient (Standard Error)*	*Coefficient (Standard Error)*
Model	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***
BDY	*-0.0116***				
	(0.0049)				
BMY		*-0.0021*			
		(0.0072)			
DCY			*-0.0035*		
			(0.0029)		
GSY				*0.0035*	
				(0.0024)	
PCY					*-0.0062*
					(0.0079)
GCF	*0 .0081***	*0.0052**	*0.0064***	*0.0060*	*0.0052*
	(0.0031)	*(0.0028)*	*(0.0029)*	*(0.0040)*	*(0.0033)*
EXP	*-0.0089*	*-0.0079*	*-0.0062*	*-0.0042*	*-0.0077*
	(0.0049)	*(0.0059)*	*(0.0058)*	*(0.0065)*	*(0.0048)*
INF	*-0.0024*	*-0.0026*	*-0.0025*	*-0.0013*	*-0.0029*
	(0.0012)	*(0 .0015)*	*(0.0013)*	*(0.0014)*	*(0.0015)*
TOP	*-0.0057*	*-0.0035*	*-0.0047*	*-0.0059*	*-0.0040*
	(0.0011)	*(0.0013)*	*(0.0010)*	*(0.0012)*	*(0.0009)*
FDI	*-0.0027*	*-0.0009*	*-0.0015*	*0.00003*	*0.0001*
	(0.0028)	*(0.0035)*	*(0.0029)*	*(0.0033)*	*(0.0024)*
Constant	*-0.4056*	*0.5556*	*0.2460*	*0.4188*	*0.1421*
	(0.5036)	*(0.6547)*	*(0.4640)*	*(0.5777)*	*(0.6509)*
Wald chi2(6)	*41.88*	*13.37*	*30.65*	*40.99*	*24.58*
Prob > chi2	*0.0000*	*0.0376*	*0.0000*	*0.0000*	*0.0004*

*Note; The sign *, **, *** shows significance of 10%, 5% and 1% respectively. Calculations by Authors.*

For Total Domestic Credit to GDP (DCY), it has negative effect on economic growth for using both CCEMG and AMG estimators. Models 3 and 8 shows that, it DCY has no significant impact on economic growth. This means financial support issued by local financial institutions to various indigenous business firms and government enterprises in Africa is inadequate. Local financial institutions refuse to lend money to indigenous business in Africa citing high risk of these businesses as a reason. This practice render the financial environment to be less robust.

Domestically, it is very difficult for government agencies and private businesses to obtain loan from the local financial institutions, this makes the economies record low domestic credit to GDP. If government agencies and private business cannot secure credit facilities from the financial institutions, then there is no capital flow in the economy and those financial institutions rather turn to invest in foreign economies which means they help grow other foreign countries but not the economies which they operate in. by so doing, total domestic credit to GDP falls thereby having negative impact in the economy. This practice has led to government agencies and big corporations to mostly borrow from foreign financial markets to do their businesses which goes to say they will pay interest to the foreign financial institutions. Therefore, the domestic credit to GDP negatively affect economic growth.

Besides, models 4 and 9; Gross Domestic Savings to GDP (GSY), *ceteris paribus* a unit adjustment in GSY will cause a positive change of 0.35% and 0.24% in growth for CCEMG and AMG respective. GSY is statistically insignificant to the model. Economically, domestic savings in Africa contribute to economic growth. In recent times, governments in Africa try to secure a healthy financial balance in the treasury of their central banks to prevent their local currency from recording astronomical depreciations. For some time now, the depreciation of local currencies in Africa were terrible, as part of effort to curb this menace, the economic plan adopted was to save more domestically and avoid the practice of import dependency. Various government in Africa makes effort to stabilize their economies by saving in their domestic central banks for any foreseeable circumstance, this has led to GSY having positive impact on economic growth, however, it is not significant to economic growth because, the money saved can be used to generate more income rather than saving it in the central banks whiles the economy struggles with funds for business transactions.

Table 6- Augmented Mean Group Estimation

	Dependent Variable (lnGDP)				
	Coefficient (Standard Error)	*Coefficient (Standard Error)*	*Coefficient (Standard Error)*	*Coefficient (Standard Error)*	*Coefficient (Standard Error)*
Model	***(6)***	***(7)***	***(8)***	***(9)***	***(10)***
BDY	*-0.0104***				
	(0.0042)				
BMY		*-0.0055*			
		(0.0033)			
DCY			*-0.0033*		
			(0.0021)		
GSY				*0.0024*	
				(0.0015)	
PCY					*-0.0071*
					(0.0043)
GCF	*0 .0071****	*0.0052***	*0.0052***	*0.0063***	*0.0060****
	(0.0023)	*(0.0021)*	*(0.0023)*	*(0.0024)*	*(0.0021)*
EXP	*-0.2000*	*-0.0183*	*-0.0180*	*-0.0176*	*-0.0196*
	(0.0073)	*(0.0068)*	*(0.0074)*	*(0.0065)*	*(0.0070)*
INF	*-0.0028*	*-0.0032*	*-0.0032*	*-0.0034*	*-0.0035*
	(0.0015)	*(0 .0012)*	*(0.0013)*	*(0.0013)*	*(0.0014)*
TOP	*-0.0046*	*-0.0039*	*-0.0040*	*-0.0044*	*-0.0043*
	(0.0012)	*(0.0014)*	*(0.0011)*	*(0.0032)*	*(0.0012)*
FDI	*-0.0044*	*-0.0026*	*-0.0018*	*-0.0018*	*-0.0001*
	(0.0031)	*(0.0034)*	*(0.0028)*	*(0.0032)*	*(0.0029)*
Constant	*6.918****	*6.893****	*6.841****	*6.715****	*6.837****
	(0.2739)	*(0.2534)*	*(0.2561)*	*(0.2417)*	*(0.2561)*
Wald chi2(6)	*33.86*	*27.32*	*24.15*	*43.73*	*27.73*
Prob > chi2	*0.0000*	*0.0001*	*0.0005*	*0.0000*	*0.0001*

*Note; The sign *, **, *** shows significance of 10%, 5% and 1% respectively. Calculations by Authors.*

In addition, models 5 and 10 shows that, *ceteris paribus*, a unit change in Credit to Private sector to GDP (PCY) will result in a negative change of 0.62% and 0.71% in economic growth for CCEMG and AMG correspondingly. Credit to private sector from both domestic financial institutions and international financial institutions are a bit difficult to come by in Africa. Though it is known that the private sector is the backbone of the economy, it hardly secures enough funds for its operations, banks and other financial institutions considers the private sector (especially the smaller enterprises) as high risk ventures, thereby refusing them loans to expand their operations. The ones who are able to secure the loans are given very strict conditions which does not give them the freedom and enough time to turn the funds around to make any substantial profits. The credit facility available to private sector is limited therefore it cannot substantially impact economic growth. Our finding is in proportionate to Sobiech (2019) that credit to the private sector generally has a negative influence in developing countries, but it has a positive bearing in developed countries.

Nonetheless, Gross Fixed Capital Formation (GCF), has positive impact on economic growth in Africa in all the models, it is also significant to economic growth for all models except models 4 and 5. Our findings tell us that infrastructure and land improvements in Africa significantly contribute to economic growth. This outcome is in harmony with various studies (Appiah et al., 2020; Hussin & Saidin, 2012; Song et al., 2020). Government expenditure recorded a negative coefficient in all the models; It makes us know that expenditure by the government has a negative effect on economic growth in Africa; our finding is supported by Ruiz (2018). Inflation also reported negative coefficients for all the models. Therefore, we conclude that inflation has a negative bearing on economic growth in Africa; our finding is in line with a study by Ibrahim & Alagidede (2018). Trade openness, it recoded negative coefficients in our models. Thus, most African countries are import-dependent and have a balance of trade deficit (Vo et al., 2018). Foreign Direct Investment recorded a negative effect on economic growth in all the models except for models 4 and 5 in the CCEMG estimator. Just as stated by Azman-Saini et al. (2010), FDI would be valuable to economic growth after the financial sector exceeds a certain threshold. The threshold is usually directly proportional to the quality of institutions in the economy; until then, it remains insignificant to economic growth.

4.6 Panel Causality Tests

In table 7, the causality test from *ln*GDP to FD indicators; BDY, BMY, PCY, and the variable GCF reject the null hypothesis of no causality and accept the alternative that there is causality at 1% and vice versa. Therefore, there is dual causality. Remarkably, there is a causal direction from *ln*GDP to DCY & GSY at 1% significance level, but not the other way round; therefore, there is one way. Our causality test results support earlier findings stating that the causal effect that exists between FD and growth is subject to the financial development indicator adopted (Adu et al., 2013; Yang, 2018).

Table 7- Pairwise Dumitrescu Hurlin Panel Causality Tests

Dependent Variable	*Independent Variable*						
	ΔlnGDP	*ΔBDY*	*ΔBMY*	*ΔDCY*	*ΔGSY*	*ΔPCY*	*ΔGCF*
ΔlnGDP		*6.137****	*4.307****	*6.829****	*5.595****	*7.748****	*4.531****
		(0.0000)	*(8.E-06)*	*(0.0000)*	*(2.E-13)*	*(0.0000)*	*(7.E-07)*
ΔBDY	*4.123****		*2.235*	*5.867****	*5.612****	*4.372****	*4.167****
	(5.E-05)		*(0.8240)*	*(1.E-15)*	*(1.E-13)*	*(4.E-06)*	*(3.E-05)*
ΔBMY	*4.287****	*4.243****		*3.926****	*4.174****	*3.085**	*4.099****

	(1.E-05)	(2.E-05)		(0.0003)	(3.E-05)	(0.0890)	(6.E-05)
ΔDCY	2.927	4.986***	3.301**		5.613***	2.736	4.153***
	(0.1792)	(2.E-09)	(0.0285)		(1.E-13)	(0.3619)	(4.E-05)
ΔGSY	2.568	4.128***	2.858	4.363***		3.029	4.036***
	(0.5946)	(5.E-05)	(0.2348)	(4.E-06)		(0.1155)	(0.0001)
ΔPCY	3.571***	3.953***	3.468**	3.850***	6.558***		3.956***
	(0.0051)	(0.0002)	(0.0102)	(0.0006)	(0.0000)		(0.0002)
ΔGCF	3.633***	4.203***	2.745	3.833***	4.363***	3.864***	
	(0.0033)	(2E-05)	(0.3508)	(0.0007)	(4.E-06)	(0.0005)	

*Note: Table shows statistics with p-value in parenthesis. The sign. *, **, *** denotes significance level of 10%, 5% and 1% respectively. Calculations by Authors.*

5.0 Conclusion

In this study, for 39 countries and 21 years, we examined the relationship between gross fixed capital formation, five financial development indicators, and economic growth in Africa. Specifically, we adopted CCEMG and AMG estimation techniques to examine the relationships. First, Bank Deposit to GDP (BDY) is statistically significant and has a negative effect on economic growth, and it has dual causality, that is to say BDY is inadequate in Africa but significant to economic growth, also economic growth causes it to also improve. Secondly, Broad Money to GDP (BMY) is statistically insignificant; it negatively influences economic growth and also has dual causality. BMY is very limited in Africa to the extent that, the funds available for local transactions are barely enough to have any impact on economic growth, however when there is economic growth, funds will be available for local transactions.

For Domestic Credit to GDP (DCY), it is statistically insignificant, it has a negative effect on growth and has one-way causality from growth. Local banks and financial institutions hardly gives credit to government and local business, they rather prefer to trade internationally partly because they are trying to secure the limited funds available to them, however if there is economic growth, domestic banks and financial institutions will have enough money to loan out to local businesses and government agencies. Our study found that, Gross Domestic Savings to GDP (GSY) is statistically insignificant, it has a positive bearing on economic growth, and it has one-way causality from growth. GSY remains positive to economic growth because the savings being done by governments in Africa seem to be yielding some positive impact on economic growth, however, it is not significant to growth unless the money is release to be used by the business community in the economy.

Finally, Credit to Private Sector to GDP is statistically insignificant; it negatively impacts economic growth and has dual causality with growth. the private sector receives very little credit facility from banks and other financial institutions, this negatively affect economic growth, if more funds are available to the private sector, it will boost economic growth and vice versa. Financial development does not have a blanket relationship with economic growth, but rather it depends on the type of financial development indicator being used. With all the five financial development indicators, Gross fixed capital formation (GCF) has a positive bearing on economic growth. It also has dual or bi-directional causality with economic growth, as more investments is made in fixed assets and land improvements it causes the economy to grow, and as the economy grows, GCF also increases. We recommend that, for financial development to have positive impact and to be significant to economic growth in Africa, the various governments in Africa must make conscious efforts to make funds available to the domestic business or enterprises through the domestic banks so that,

the cycle of financial flow will be within the economy they by causing significant economic growth.

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Appendix 1: List of countries under the study

List of countries under the study		
Algeria	Eswatini	Mozambique
Angola	Gabon	Namibia
Benin	The Gambia	Niger
Botswana	Ghana	Nigeria
Burkina Faso	Guinea Bissau	Rwanda
Cameroon	Guinea	Senegal
Central African Republic	Kenya	Sierra Leon
Chad	Liberia	South Africa
Comoros	Madagascar	Sudan
Congo Republic	Malawi	Tanzania
Cote d'Ivoire	Mali	Togo
Democratic Rep. of Congo	Mauritius	Tunisia
Egypt	Morocco	Uganda

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