Journal of Economics and Behavioral Studies (ISSN: 2220-6140)
Vol. 11, No. 2, pp. 120-131, April 2019

Investigating the Banking Sector Development Transmission Mechanism of Financial Development to Growth: Evidence from Sub-Saharan Africa (SSA)

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Abstract: The search for financial development's transmission channel to growth has always been updated in the literature. While there has not been a consensus on this matter, empirical findings on finance-growth nexus have been ambiguous. Relying on this, we investigate its bank development transmission channel to growth in a panel of twenty-eight Sub-Saharan Africa (SSA) countries from 2000-2016. Having adopted the augmented Solow (1956) and Mankiw et al. (1992) growth model, the fixed effect and dynamic system GMM estimation techniques reveals a negative non-significant and positive significant direct impact of finance on growth in the static and dynamic models respectively, thereby suggesting institutional (dynamic) factors that can spur finance. Secondly, the non-linear effects of bank development had a direct positive significant impact on growth and its marginal-effects before and after the financial crisis of 2007/08 were relatively stable. This implies that banks in SSA were relatively stable in financial intermediation; therefore SSA countries need to reinforce and improve its banking policy through FinTechs adoption. Finally, the interaction between bank development and financial development significantly increase steady-state growth. This implies that SSA economies can promote steady-state growth from financial development only when a threshold of bank development is reached.

Keywords: *Financial-Development, Bank-Development, Growth.*

1. Introduction

There are a number of studies that links financial development to growth without a clear transmission mechanism through which finance can impact growth (World Bank Report 2013:32). Levine (1998) also added that it is less clear how exactly finance influences economic growth. This means that there is a missing link between finance and growth which have not been covered by literature. Although there has been quite a number of works in this area, 'the literature rarely attempt to identify the particular mechanism through which finance-growth nexus emerges' (Arestis, Chortareas, and Desli 2006). Given this dichotomy, the results of the findings further reveal inconsistent and ambiguous conclusions; while some authors like Hondroyiannis et al. (2005), Huang and Lin (2009) and Durusu-Ciftci, et al. (2017) found evidence to justify financial development positive impact on growth; conversely a negative nexus between finance and growth were found by others such as Luintel and Khan (1999) on seven countries among the ten countries used in their samples; by Gregorio and Guidotti (1992) when the sample is restricted to the Latin American countries; and Sassi & Goaied (2013) among MENA countries. This further stresses the need for an efficient banking sector for the purpose of intermediation.

There cannot be efficient financial intermediation that can generate growth without an efficient and stable financial sector. Sassi & Goaied (2013) went further to assert that financial development can spur growth through ICT diffusion, therefore economies in Mena region can only benefit from financial development once a threshold of ICT development is reached. In the context of African economies, the link between ICT diffusion and financial development is contestable as many people and not only financial excluded but also non-ICT compliant. They conversely added that in 'Mena countries studies on Financial Development-Growth Nexus are especially associated with Banking sector development since financial market is not well developed'; thereby suggesting the need to incorporate the role of financial sector efficiency in the finance-growth model as a transmission mechanism. Therefore the search on the need for a more reliable and consensus threshold through which finance-growth nexus can emerge has always been continuously updated in the literature. It is on this background that this study, therefore, aims at filling this gap and complementing existing literature to investigate whether the impact of financial development on growth is strengthened through improved banking sector development among Sub-Saharan Africa.

Problem Statement: Low productivity is one of the major challenges facing sub-Saharan Africa (World Bank 2013:32). The problem with low productivity can be traced to low savings leading to low investment which can further lead to a situation of absorption being greater than income thereby hampering potential growth among SSA especially as most SSA are exporters of primary products. Apart from the fact that savings in SSA are not sufficient for investment purposes; they are often lost during the process of intermediation. As Pagano (1993:614) pointed out that a proportion (1-δ) of savings is lost in the process of financial intermediation; hence only "δ" of savings gets to the deficit zones for investment. The extent to which this gap between total savings and investment for growth can be bridged depends greatly on how stable and efficient the financial sector is. Hence, as the financial sector becomes more efficient and stable, (1-δ) will approach zero. In SSA a number of factors can be said to limit this such as high rate of bank distress, incessant bank robbery, fluctuating exchange rate, poor monetary policy measures, lack of efficient-trained personnel in the financial sector, political instability, cultural diversities, high illiteracy level, and lots more. It is pertinent to note that even with all the financial reforms and transitions, the problem gets worsened. The usefulness of the various financial reforms cannot be fully grasped without an efficient structure of intermediation that will diversify excess savings into more potential real investments 'at the highest available rates of return, and with minimum transactions costs' (Killick and Martin, 1990).

2. Literature Review

Over the time, the link between economic growth and financial development has long received significant attention in economic research with no consensus among economists on its transmission mechanism. Less attention has been given to the sources of growth in order to identify the exact mechanisms through which financial development influences economic growth (Rioja and Valev 2004). Therefore, more recent studies attempt to explain this mechanism. As Levine (1998: 6) puts it 'if finance is to explain economic growth, we need theories that describe how financial development influences resource allocation decisions in ways that foster productivity growth'. Levine, Loayza, and Beck (2000) and most recent researchers writing on this issue believe that the mechanism through which financial development can transmit into improving economic growth is through increased productivity of each sector such as the bank financial sector development. Hence, 'the nexus/interaction between financial development and banking sector development can generate growth through increased competitive efficiency within financial markets thereby indirectly benefiting non-financial sectors of the economy (Torruam et al. 2013)'. The implication of this is that a well-developed banking sector has the potential of efficient financial intermediation to generate overall growth through credit extension to other sectors of the economy. This assertion was supported by the findings of Hasan et al. (2008) that the interaction between better banking and deeper capital markets is indeed most beneficial for higher growth attainment. Shamim (2007) having conducted the empirical investigation on 61 countries over the period 1990–2002, using the GMM dynamic panel estimation.

Found that an increase of mobile phone subscribers and internet users affect positively financial depth, which is a backbone of any country to grow. Her result was consistent with the findings of Sassi & Goaied (2013) who work on the countries in the Mena region affirms that economies in this region can benefit from financial development only once a threshold of ICT development is reached. Hence, supporting the view that financial development transmission mechanism to growth is through improved ICT adoption. Although a number of literature linked finance to growth, however, there has not been a clear transmission channel through which finance can impact growth. Some studies such as Shamim (2007); Kpodar and Andrianaivo (2011); Sassi & Goaied (2013) uses mobile phone subscriptions and ICT as transmission channels found an inconsistent result as to whether finance impacts positively or negatively to growth. This debate has received continuous updates from many studies. Given this light, since the banking sector are basically saddled with the responsibility to mobilize savings into investment projects through financial intermediation strategy as Nzotta and Okereke (2009) affirms that financial development is the ability of financial institutions in an economy to effectively mobilize savings and financial resources for investment purposes and ultimately for growth; this study, therefore, argues that the extent to which these savings can permeate the economy and generate growth depends greatly on how developed the banking sector is. This suggests that an efficient financial sector can serve as the transmission channel through which finance will generate growth. Furthermore, the works of Gurley and Shaw (1960), McKinnon (1973) and Shaw (1973) recognizes bank development as one of the drivers of economic growth.

According to them, banks mobilize saving for investment purposes, improve the efficiency of resource allocation, and stimulate technological innovation. Ferreira (2013) also verifies their assertion by finding a positive bi-directional causality existing between bank development and economic growth. These findings were further supported by Hasan et al. (2008) but with a stronger validity for advanced countries because of their well-developed capital market. Therefore financial development can actually impact on economic growth only when a threshold of better intermediation through improved banking sector/capital market development is reached.

The Theoretical Model: We employed the augmented Solow (1956) and Mankiw et al. (1992) growth models to test the hypothesis that credit market development interacts with financial intermediation to generate growth in the long run. As with Solow–Swan growth model assumptions of no technical progress, no institutional change and no land, we further make an assumption on the form of saving function that investment is financed externally with debts generated from the interplay of credit market financial intermediation, following the theory of capital structure. Also according to Pagano (1993:614), a proportion (φ) of savings is lost in the process of financial intermediation; hence only (1-φ) of savings gets to the deficit zones for investment purposes. Therefore investment will equal the proportion of savings that is left after intermediation thus:

$I_{it} = (1-\varphi)S_{it}$ ……(1)

The argument in this study is, therefore, as the banking sector develops, their ability for financial intermediation will also improve thereby causing the savings loss (φ) to approach zero, and hence savings will equal investment. For the sake of simplicity, we also assume that aggregate savings are generated by the credit markets in a closed economy Solow model. Hence, following the Trade-off theory and Durusu-Ciftci, et al. (2017) Cobb-Douglas type saving function, we rewrite equation (1) as:

$$I_{it} = S_{it} = FD_{it}^{\beta} * BD_{it}^{1-\beta} \quad 0 < \beta < 1 \text{ .....(2)}$$

Where I_{it} and S_{it} are the aggregate investment-savings equality for economy *i* in period *t* respectively, FD_{it} and BD_{it} represent financial development indicators and credit market/bank deposits respectively, and β is the financial development transmission elasticity. Hence their product is the aggregate financial intermediations generated by their interactive role. In this study, financial development will be measured with two proxies of bank credit to private sectors to GDP (CPS) and broad money supply to GDP (BMS) while banking sector development is captured with bank deposit to Gross Domestic Product. In a closed economic model of Solow-Swan (1956), the technology augmenting labour Cobb-Douglas production function in period *t* is stated thus:

$$Y_t = K_t^{\alpha} * (A_t * L_t)^{1-\alpha} \qquad 0 < \alpha < 1 \text{ .....(3)}$$

Where Y_t is output, labour force (L_t), physical capital (K_t), technology (A) is the total factor productivity that represents the technology, human capital, institutions or in general anything that can affect output and parameter α represents production elasticity of capital while capital is depreciating at a constant rate of δ. The economy produces a unique good (Y) which can be used as a consumption good or as an investment. We assume full employment of factors. Also, L_t and A_t are assumed by Mankiw et al. (1992) to grow at rates of n and g respectively thus:

$L_t = L_0 e^{nt}$ .....(4)

$A_t = A_0 e^{gt}$ .....(5)

Where L_0 and A_0 represent initial levels population and technology stock respectively; n and g are their respective exogenous growth rates. According to Mankiw et al. (1992: 409), the number of effective units of labour $A_t L_t$ grows at the rate n+g. Hence, the effective inputs Labour and capital are of immense importance in Mankiw's model.

The capital accumulation equation is given by Solow as :

$K_{t+1} = K_t - \delta K_t + sY_t$ ……(6)

Substituting (2) into (6) yields:

$$K_{t+1} = K_t - \delta K_t + (FD_t^{\beta})(BD_t^{1-\beta}) * Y_t \text{ .....(7)}$$

To convert (7) to Per-Capita terms and rearranging yields:

$$k_{t+1} - k_t = \left(\frac{FD_t}{Y_t}\right)^{\beta}\left(\frac{BD_t}{Y_t}\right)^{1-\beta} * y_t - \delta k_t \quad \text{.....(8)}$$

Note $\frac{FD_t}{Y_t}$ = Credit to private sector to Gross domestic product (CPS) and Broad money supply to Gross domestic product (BMS) as the two measures of financial development while $\frac{BD_t}{Y_t}$ = Bank Deposits to Gross Domestic Product (BSD) as a measure for Banking sector development. Furthermore, at steady state equilibrium, changes in capital stock ($k_{t+1} - k_t$) = 0 and hence, assuming capital per effective ($\bar{k}_t = K_t/A_tL_t$) worker and output per effective worker ($\bar{y}_t = Y_t/A_tL_t$), with the rate of growth of technology (A_t) and labour (L_t) as g and n respectively as in equations (4) and (5) and for simplicity sake, we have to use *FD* as a measure of financial development all through so that we have:

$$(n + g + \delta)\bar{k} = (FD)^{\beta}(BSD)^{1-\beta} * \bar{k}^{\alpha} \quad \text{..... (9)}$$

Therefore capital (k) converges to a steady state value k* thus:

$$k^* = [(FD^{\beta} * BSD^{1-\beta})/(n + g + \delta)]^{\frac{1}{1-\alpha}} \quad \text{..... (10)}$$

The steady-state Capital-Labour ratio as shown in equation (10) reveals that it relates positively to the level of total financial intermediations/savings (FD*BSD) and negatively to the rate of population growth. By substituting equations (5) and (10) into the production function in equation (3) yields the economy's steady-state growth rate thus:

$$\bar{y}^* = Y_t / L_t = [(A_0 e^{gt})((FD^{\beta} * BSD^{1-\beta})/(n + g + \delta))]^{\frac{\alpha}{1-\alpha}} \quad \text{..... (11)}$$

Mankiw et al. (1992:410) postulated that the main determinants of the Solow growth model are a function of the level of savings and population growth. Therefore, taking the natural log of both sides gives the linear specification of the steady-state of income per capita thus:

$$Ln\bar{y}^* = Ln(A_0) + g_t + \left(\frac{\beta\alpha}{1-\alpha}\right)Ln(FD) + \left(\frac{(1-\beta)\alpha}{1-\alpha}\right)Ln(BSD) + \left(\frac{\alpha}{1-\alpha}\right)Ln(n + g + \delta) \quad \text{.....(12)}$$

3. Estimation Methodology

As a static panel model, the Hausman test will be used to ascertain which of the fixed effect or random effect models will be most appropriate. A Hausman probability test value of less than five percent will suggest the need to employ the fixed effect model; otherwise, a random effect model will be most appropriate. However, due to the presence of high heterogeneity among SSA countries because of the different conditions and degree of development of each country (Acaravci & Ozturk, 2010), the dynamic aspect of the model will be verified by incorporating the first lag of the independent variable as one of the predictors; thereby employing the use of a System Generalized Method of Moments (GMM) estimation techniques for robustness check. Caselli et al. (1996) show that the System Generalized Methods of Moments (GMM) dynamic panel estimation is capable to correct for unobserved country heterogeneity, omitted variable bias, measurement error and endogeneity problems that frequently arise in growth estimation. It also eliminates the problems of serial correlation and heteroscedasticity as well as the endogeneity problem and it is more efficient when the individual observation of the panel is more than or equal to its time observation. In our case, we have twenty-eight cross-sectional identities with seventeen time series identity. Moreover, in our model, some of the independent variables are not strictly exogenous, meaning they are correlated with past and possibly current realizations of the error with fixed individual effects hence, further suggesting the use of a GMM model. Two specification tests of Sargan test of overall validity of instruments and autocorrelation test were suggested by Arellano and Bond (1991). The null hypotheses for the two tests are: all instruments as a group are exogenous; and: the error term μ_{it} of the differenced equation is not serially correlated particularly at the second order (AR2) therefore a higher p-value is desirable. One should not reject the null hypothesis of both tests.

Data Source and Measurement: The analysis was based on a panel of 28 Sub-Saharan African countries with a dataset ranging from 2000 to 2016 sourced from the World Development Indicators published by World Bank. This period of coverage is necessary as it will cover both the pre-financial and post-financial

crisis of 2007/2008 and periods when most financial reforms took place among African economies. Moreover, given that Sub-Saharan African economies are the study area due to the underdeveloped state of its financial sector and invariably financial intermediate, twenty-eight of SSA economies were selected based on availability of data and a well-structured credit markets that intermediates for funds. The variables of interest based on the theoretical model are per capita GDP (GDPPP) as the explained variable and the explanatory variables includes ratio of credit provided to private sector to GDP (CPS), broad money supply to GDP (BMS) as measures of financial development, tertiary school enrolment (TSR) to capture effective labour, gross capital formation as a ratio of GDP (GCF) to measure investment, foreign direct investment (FDI) to measure technology level and the level of trade openness (TOP) as the control variables.

Model Specification: The econometric form of model (12) for this study based on the augmented theoretical growth model of Solow (1956) and Mankiw et al. (1992) affirms that an economy continues to grow as long as they maintain a consistent flow in their technology augmenting labour-capital ratio, hence it is adjusted to observe that credit extension and banking sector development promotes growth in the following order. By widening the scope of the initial technology base (A_0) to include institutions, endowment and climate among other things which may differ across countries to give the model a robust application provided they can be supported by economic theory, Mankiw et al. (1992:411) specified A_0 as:

$A_0 = \lambda_0 + \varepsilon$ …… (13)

Where λ_0 is a constant and ε represents country's specific shocks. Therefore in our model, λ_0 can specify to include a definition of Gross capital formation to GDP (GCF), effective labour (TSR) and foreign direct investment (FDI) in a Cobb-Douglas function thus:

$A_0 = \lambda_0 GCF^{\lambda 1} TSR^{\lambda 2} FDI^{\lambda 3} e^{\varepsilon}$ …… (14)

Taking the log form of equation (14), substituting it into (12) and for uniformity sake, let $\frac{\beta\alpha}{1-\alpha} = \lambda_4$; $\frac{(1-\beta)\alpha}{1-\alpha} = \lambda_5$ and $\frac{\alpha}{1-\alpha} = \lambda_6$ to yield a panel model to be estimated thus:

Note: *FD = {CPS, BMS}*

$$\bar{y}_{it}^{*} = \lambda_0 + \lambda_1 GCF_{it} + \lambda_2 TSR_{it} + \lambda_3 FDI_{it} + \lambda_4 FD_{it} + \lambda_5 BSD_{it} + \lambda_6 BSD_{it}^2 + \lambda_7 TOP_{it} + \varepsilon_{it} \text{ .. (15)}$$

Where y* is real per capita income growth rate, λ_1, λ_2 and λ_3 are the shares of gross capital formation as a ratio of GDP (a proxy for investment), tertiary school enrolment (TSR) a measure of effective labour, foreign direct investment (FDI) a measure of technology transfer respectively to growth; while λ_4 and λ_5 represents the proportions of savings (credit to private sector and broad money supply to GDP), banking sector development (BSD) respectively to growth; and λ_7 is the parameter of the control variable trade openness (TOP) to output growth; CPS and BSD are the levels of financial and banking sector development respectively; and n, g and δ are as defined above. Furthermore, in their specification, Mankiw et al. (1992:412) assumes that g and δ are constant across countries; whereas g is primarily the advancement of knowledge, which is country specific. δ the rate of capital depreciation is constant across countries; therefore g and δ are superimposed in the error term (ε) and the constant term (λ_0) respectively as represented in model (15).

Model 15 also follows that of Sassi & Goaied (2013) and Vu (2011) by incorporating a quadratic function to account for the long run non-linear relationship between banking sector development and growth. The null hypothesis here is that improved banking sector development, in the long run, will get to a point where it becomes productive and promotes overall growth which will not be rejected if the parameter estimate of banking sector development quadratic term is both positive and statistically significant. The policy implication here is that it is only when this condition is fulfilled that banking sector development can form a transmission channel of financial development to growth in the long run. Given this, we, therefore, go further to specify an interactive model between financial development and banking sector development terms in the next equation to check whether the ability of financial development to impact on growth depends on the level of improved development in the banking sector and for the sake of uniqueness, we use ϕ instead of λ :

$$\bar{y}_{it}^{*} = \phi_0 + \phi_1 GCF_{it} + \phi_2 TSR_{it} + \phi_3 FDI_{it} + \phi_4 FD_{it} + \phi_5 BSD_{it} + \phi_6 BSD(FD)_{it} + \phi_7 TOP_{it} + \varepsilon_{it} \ldots (16)$$

4. Results and Discussion

The findings from the estimation results will be presented in this section starting with summary statistics to see the overall behaviour and relationships among the variables. After which a standard growth model as specified in equation 1 above will be estimated to show how financial development and banking sector development individual impacts growth. This is followed by a non-linear growth model to account for the long run effect of banking sector development on growth as this will measure to what extent will increased bank development will get to before it begins to accelerate or hamper growth among Sub-Saharan Africa; and finally, the analysis will estimate the interactive impact of financial development and bank development as a transmission channel to growth.

Summary Statistics: The summary statistics show that the analysis made use of nine endogenous and exogenous variables with 476 data series comprising of twenty-eight cross-sectional units and seventeen-time variant identity. The mean, median, standard deviation, minimum, maximum, Skewness and Kurtosis results were presented. Trade openness shows has the highest mean value as well as the largest highest standard deviation. This means that its dispersion from the mean is largest compared to other series in the model. The average growth rate among SSA countries stood at 2.33 percent per annum with a very high financial development indicator at 31.82 percent (M2/GDP) and 22.81 percent (credit to private sector/GDP). With these results, it is expected that with reasonable intermediation efficiency on the side of the bank financial institutions, financial development should trigger substantial growth and welfare among the people for the period under consideration. The statistics show that the average banking sector development stood at an average rate of 24.24 percent, which is still very low to spur growth among SSA countries. This hypothesis will be justified under model (16) estimation results. Finally, on this note, the summary statistics reveal that our series is not normally distributed because the p-values of the Jarque-Bera statistics were all less than 5 percent. Since the probability value of the Hausman test on whether to employ the fixed effect or random effect model is less than 5 percent, thereby suggesting the use of a fixed effect model, the result of the fixed effect estimation of model 15 is presented in table 1 below: The result output as presented in table one is a four-model estimate of equation 15. The first two models is a fixed effect model with two measure of financial development as broad money to GDP (BMS) and credit to private sector to GDP (CPS) respectively whereas the last two models present the system GMM result in the same manner.

Table 1: A Fixed Effect and System GMM Estimate of Model 15

	Fixed Effect model		**System GMM Model**	
Dependent Variable	GDPPR(1)	GDPPR(2)	GDPPR (3)	GDPPR (4)
Constant	-0.651	-0.725	-2.598	-1.627
	(0.46)	(0.52)	(2.16)*	(1.56)
GCF	0.138	0.139	0.231	0.168
	(3.94)**	(3.97)**	(6.40)**	(4.37)**
TSR	-0.030	-0.029	0.010	-0.014
	(1.21)	(1.19)	(0.49)	(0.74)
FDI	0.037	0.037	-0.061	-0.042
	(0.84)	(0.82)	(1.30)	(0.90)
BMS	-0.013		0.176	
	(0.22)		(2.66)**	
CPS		0.006		0.058
		(0.17)		(3.35)**
BSD	-0.198	-0.217	-0.342	-0.201
	(2.15)*	(2.93)**	(3.96)**	(3.51)**
BSD^2	0.001	0.001	0.001	0.001
	(1.99)*	(1.98)*	(2.51)*	(2.43)*
TOP	0.054	0.053	0.007	0.032
	(3.51)**	(3.48)**	(0.60)	(2.23)*

L. GDPPR	NA	NA	0.174	0.160
	NA	NA	(3.35)**	(3.01)**
AR2	NA	NA	0.209	0.135
Sargan	NA	NA	0.791	0.449
R-squared / Wald F(8,439)	0.27	0.27	22.26(0.000)	23.70(0.000)

Absolute value of t statistics in parentheses
*** significant at 5%; ** significant at 1%**
Source: Estimation

The model tested whether financial development and banking sector development individually impacts on growth. Evidence from the fixed effect reveals that whereas the two measure of financial development does not significantly impact on growth among SSA countries, banking sector development can positively promote growth significantly only in the long run but dampens it in the short run. The non-linear effect measures its long-run impact on growth. This finding may be explained by the poor performance and lack of competition in SSA banking systems. African banking systems tend to behave as under monopolistic competition and are significantly less competitive compared to other regions (Anzoategui, Rocha, & Perı´a, 2010). Therefore SSA economies need to improve bank performance by privatizing national banks, strengthening its financial sector policies, bank reforms, removal of obstacles to entry and the adoption of financial technology banking style to help absorb liquidity outside the banking sector thereby improving their capital base and general performance. The need for financial technology adoption in the financial system to accelerate growth is supported by the fact that trade openness (TOP) and gross capital formation had an all-inclusive positive impact on economic growth for the models. However, that the measures of effective labour and foreign direct investment could not explain growth does not only reveal the low quality of human capital and inflows of investment but its negative sign also implies that it retards growth.

The robustness check of the models was carried out using the dynamic system GMM technique to also examine none current prevailing economic and stochastic conditions that could hamper or promote growth. The estimate reveals a consistent result with that of the fixed effect estimation except that financial development measures now had a direct significantly positive impact on growth. This can be justified on the ground that the model is a dynamic one rather than a static model, hence; current behaviour does not depend only on the current economic climate but also on anticipation of what the future holds. Therefore as a forward-looking and a practical model, it incorporates the first lag of the dependent variable (per Capita growth rate) to account for possible disturbances and other macroeconomic factors that must have facilitated financial intermediation such as expectations, rate of interest, government intervention and so on. The fact that this variable is significantly positive implies that their effect on financial development spurred its development. On the other hand, the complementary role of banking sector in financial intermediation was tested with an interactive model as specified in equation 16. Since financial development could not directly impact on growth in a static model but does in a dynamic condition, therefore; this study argues that improved banking performance in financial intermediation will lead to financial development indirect impact to growth. Hence, the transmission channel to growth. The results as presented in table 2 below were also estimated using the two techniques of fixed effect and system GMM for robustness check.

The fixed effect estimate of equation 16, the interactive model of banking sector development and financial development as presented in model 5 and 6 were consistent with our findings in the static model above. The result shows that gross capital formation, trade openness and banking sector development had a direct significant impact on growth among Sub-Saharan Africa economies. While the first two promotes growth, banking sector development significantly retards it. Moreover, the results reveal that while financial development indicators had a negative direct but non-significant effect on growth, its combined impact/interaction with bank development had a positive significant effect on growth. This justifies the assertion that bank development transmits financial development to growth. This result was also consistent with the GMM result. The dynamic factor of the model, the first lag of the dependent variable is both positive and significant. This further amplifies the fact that current economic behaviour does not depend only on the current situations but also on what the future holds. The results of their pre-crisis marginal effect of bank crisis as compared to their post-crisis result as presented below was consistent with Caggiano et al. (2014) assertion. The results were estimated using equations 15 and 16 for the marginal effects of bank sector

development (MEBSD) to ascertain whether there are any substantial changes in the banking sector development (BSD) interacting with financial development to foster growth among the SSA region before and after the financial crisis of 2007/08.

Table 2: A Fixed Effect and System GMM Estimate of Model 16

	Fixed Effect Model		**System GMM Model**	
	GDPPR(5)	GDPPR(6)	GDPPR(7)	GDPPR(8)
Constant	-0.339	-1.154	-2.160	-0.893
	(0.23)	(0.85)	(1.54)	(0.85)
GCF	0.137	0.134	0.226	0.166
	(3.92)**	(3.83)**	(5.60)**	(3.73)**
TSR	-0.028	-0.039	-0.012	-0.010
	(1.15)	(1.62)	(0.47)	(0.46)
FDI	0.039	0.033	-0.058	-0.027
	(0.88)	(0.73)	(1.21)	(0.55)
TOP	0.055	0.055	0.010	0.023
	(3.58)**	(3.59)**	(0.73)	(1.48)
BSD	-0.173	-0.110	-0.326	-0.117
	(2.09)*	(2.73)**	(3.25)**	(3.82)**
BMS	-0.053		0.158	
	(0.86)		(1.70)	
CPS		-0.070		-0.043
		(1.32)		(1.03)
BSD(BMS)	0.001		0.001	
	(2.19)*		(2.27)*	
BSD(CPS)		0.001		0.002
		(1.58)*		(2.60)**
L. GDPPR			0.166	0.156
			(3.10)**	(2.74)**
Observations	476	476	448	448
Number of group(Ctry)	28	28	28	28
AR2	NA	NA	0.222	0.122
Sargan Test	NA	NA	0.581	0.434
R-squared/Wald F(8,439)	0.27	0.27	21.48(0.000)	20.75 (0.000)

Absolute value of t statistics and z statistics are in parentheses
*** significant at 5%; ** significant at 1%**

Source: Estimation

The diagnostic check of the model 5 and 6 shows that our predictors could explain variations in the growth rate to the tune of 27 percent of the total variations whereas the Arellano and Bond (1991) serial correlation test and Sargan tests of over-identification and exogeneity of the instrumental variable were all greater than 5 percent, therefore we cannot reject the null hypotheses that the error terms μ_{it} of the differenced equation is not serially correlated particularly at the second order (AR2) and that all instruments as a group are exogenous. Moreover, another interesting aspect of the findings in this study is that it assesses the pre-crisis and post-financial crisis effect of banking sector development interaction with financial development to foster growth to verify whether there are changes in bank development between these two periods and how those changes interacted with financial development to generate or hamper growth.

Their marginal effects were estimated using the average of the pre-crisis data ranging from 2000 to 2006 as well as the average of post-crisis data ranging from 2009 to 2016 as presented in the appendix table 2. As (Prasanna Gai et al., 2008) observed that 'increasing intermediation and rapid development in the financial sector through financial technology may have made economies less vulnerable to crisis as they widen access to liquidity and allow assets to be traded more easily during periods of stress. However, given that Sub-Saharan African economies are technologically backward with a high level of financial exclusion 'increased financial deepening and financial transaction (without a commensurate transmission mechanism) are likely

to make the banking system more vulnerable' (Caggiano et al., 2014). Therefore, following Sassi & Goaied (2013), it can be computed from equations 15 and 16:

$$MEBSD = \partial y^{*}_{it} / \partial BSD_{it} = \lambda_5 + 2\lambda_6 BSD_{it} \quad \text{.....(17)}$$

$$MEBSD_{it} = \partial y^{*}_{it} / \partial BSD_{it} = \phi_5 + \phi_6 FD_{it} \quad \text{..... (18)}$$

Equations 17 and 18 are the marginal effect of changes in the steady-state growth rate as a result of one standard deviation or changes in bank sector development derived from equations 15 and 16 respectively. Using equations (17) gives us an insight into the degree at which changes in (BSD) directly impacts on the steady-state growth rate whereas the use of equation (18) gives its indirect interaction impact with financial development. They will be used to ascertain whether there is any marginal change in the way banking sector performed before the financial crisis (pre-financial crisis) and after the financial crisis (post-financial crisis) of 2008. The average values of banking sector development and broad money supply to GDP will be substituted from equations 17 and 18 respectively. Given that the coefficients λ_5 and λ_6 were estimated from model one as at -0.198 and 0.001 respectively in model one; whereas that of ϕ_5 and ϕ_6 were estimated as -0.173 and 0.001 from model five respectively, therefore the threshold effect for the pre-financial crisis (see table 2 in the appendix) is calculated.

As -16% and -14% for equations 17 and 18 respectively while the post-financial crisis marginal effect of bank efficiency interaction with financial development to generate growth stood at -14% and -14% for equations 17 and 18 respectively. These suggests that as long as bank financial institutions during the pre-financial and post-financial era can create credit to GDP to the tune 20.89 and 27.65percent respectively, there won't be any significant changes in the steady-state growth level as its marginal effect stood at an average of -14% before and after the financial crisis of 2008. This suggests that the financial crisis of 2008 could not impact on SSA banks' ability to create credit. Therefore for financial development to foster growth, banks in SSA need to generate credit above an average rate of 27.65percent of the economy' Gross Domestic Product (GDP). Hence, further researches on this area should explore the macroeconomic impact of 2007/08 financial crisis and the areas it affected the performance of SSA financial institutions.

5. Concluding Remarks and Policy Implications

This study investigates the interactive role of banking sector development with financial development on economic growth among Sub-Saharan Africa. We adopted the Solow and Mankiw et al. growth theory to develop a finance-bank development augmented growth model in the premise of Wu et al. (2010) framework. The theoretical part also employed theory of capital structure utilizing the Trade-off Theory to develop a model convenient for empirical applications. The empirical model is estimated for a panel of 28 Sub-Saharan African countries over the period 2000–2016 to cover the pre-financial crisis and post-financial crisis era by means of a fixed effect and system generalised method of moments (GMM) estimation methods, which allows cross-sectional dependencies and heterogeneous effects respectively. Our empirical analysis to determine the contribution of banking sector development interaction with financial development on economic growth yielded the following results and policy issues: Financial development indicators both positive and negative non-significant short-run effects on steady-state level of GDP per capita growth rate in a static model but a positive significant impact in a dynamic model. This implies that dynamic economic conditions can positively affect financial development and by extension growth, consistent with, Levine and Zervos (1998), Cooray (2010), Wu et al. (2010), Sassi & Goaied (2013), and Durusu-Ciftci, et al. (2017).

Although banking sector development significantly dampens steady-state growth among SSA countries, however, its non-linear effect significantly promotes it. Therefore emphasis is on implementing credit market policies which will enhance the efficiency of banking sector in the long run, in line with Cojocaru, et al. (2016). Gross capital formation to GDP and trade openness had an all-inclusive impact on the steady-state growth rate across the eight models, consistent with Durusu-Ciftci, et al. (2017). This suggests that growth potentials of SSA countries could be drawn from the foreign markets and the accumulate capital especially within the banking system such as financial technology adoption without neglecting other sectors in the process. However, the measure of foreign direct investment could not explain growth for the period under consideration is ambiguous, therefore further research should investigate in this area. Furthermore, the

result showed evidence that credit extension and deepening by banks increases their financial leverage and develops them. This is justified with a positive significant interactive model between banking sector development and financial development indicators as their individual direct impact either dampens growth or could not significantly explain the growth. Therefore the need to promote financial institutions' efficiency through deregulation, bank reforms and monetary policy measures cannot be overemphasized.

This assertion is strengthened by the significant impact of the policy parameter, the lag of income Per-Capita growth rate in a dynamic economic condition. Finally, the marginal effects of bank development on steady-state growth reveal that there was no significant difference in the ability of banks to mobilize savings for investment purposes for the two time zones, pre-financial crisis 2000-2007 and the post-financial period 2009-2016. This implies that banking sector in SSA is relatively consistent in generating growth through financial intermediation, thereby promoting macroeconomic stability and investors' confidence. However, the negative effect of bank sector's marginal effect on growth is an indication of the underdeveloped state of the sector. Therefore the need for institutional and legal improvements that strengthen creditor and investor rights and contract enforcement as well as increasing financial inclusion through financial technology adoption should be enforced to promote financial markets' stability and overall economic performance.

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Appendix Table A1: Summary Statistics

	GDPPR	BMS	CPS	BSD	GCF	FDI	INF	TSR	TOP
Mean	2.332876	31.81795	22.80926	24.24375	23.59086	4.309060	6.365555	20.80779	75.85307
Median	2.106676	24.52860	14.59569	17.39030	22.54271	2.700927	5.228060	10.41897	66.40679
Maximum	56.88336	110.7687	160.1248	98.56020	147.8791	64.38410	37.39336	103.9174	351.1057
Minimum	-15.29999	5.735473	0.410356	2.600060	2.781138	-4.852284	-8.974740	0.000000	19.10080
Std. Dev.	4.973277	20.72471	27.13034	19.13956	12.50186	6.540029	6.195537	24.76565	40.90047
Skewness	3.682457	1.843685	3.242937	1.940112	4.508266	4.646521	1.768579	1.632154	2.620540
Kurtosis	38.94496	6.240381	13.96116	6.625824	40.19174	32.51154	8.058168	4.741021	14.03918
Jarque-Bera	26701.27	477.9192	3217.237	559.3542	29046.38	18986.29	755.5816	271.4560	2961.761
Probability	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	1110.449	15145.35	10857.21	11540.03	11229.25	2051.113	3030.004	9904.506	36106.06
Sum Sq. Dev.	11748.41	204018.9	349626.3	174003.3	74240.88	20316.69	18232.72	291335.4	794602.9
Observations	476	476	476	476	476	476	476	476	476

Table A2: Pre-Financial Crisis and Post Financial Crisis Averages

	PRE-FINANCIAL CRISIS (2007/08) AVERAGE (DATA SERIES 2000-2007) No OF OBS= 224				**POST-FINANCIAL CRISIS (2007/08) AVERAGE (DATA SERIES 2009-2016) No OF OBS = 224**			
	Mean	Std. Err.	Min	Max	Mean	Std. Err.	Min	Max
GDPPR	2.9219	6.1349	-15.3000	56.8834	1.742244	3.5555	-12.9453	12.8152
BMS	28.6789	21.5224	5.7355	110.7687	35.0488	19.5025	10.4875	110.0037
CPS	19.3098	26.0756	0.4104	160.1248	26.2648	27.7634	3.9310	151.0675
BSD	20.8876	19.3750	2.6000	97.4334	27.6457	18.4613	4.4622	98.5602

Source: Estimation

Table A3: Lists of Selected Sub-Saharan African Countries

Benin	Gabon	Mali	South Africa
Botswana	Ghana	Mozambique	Sudan
Burundi	Guinea-Bissau	Namibia	Swaziland
Burkina Faso	Equatorial Guinea	Niger	Seychelles
Cameroon	Kenya	Nigeria	Tanzania
Cote d`Ivoire	Madagascar	Rwanda	Togo
Chad	Mauritius	Senegal	Zambia

Source: Estimation