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Article

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Financial development and economic growth in sub-Saharan Africa: A sectoral perspective

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Abstract: Research on the impact of financial development on economic growth remains inconclusive. Previous empirical examination of the link is based on aggregate GDP on the presumption that each economic sector responds identically to financial development. However, the extent of credit utilisation, as well as productivity of credit, may not necessarily remain the same across sectors. This study therefore seeks to contribute to the literature by examining the effect of financial development across sectors in sub-Saharan Africa using the Generalised Method of Moments (GMM) over the period 1990–2018. Indeed, the findings show that while financial development has a positive effect on the service and agricultural sectors, a certain threshold of financial development must be reached before it can positively contribute to the growth of the industrial sector. The findings are robust to a different estimation technique. With the industrial sector considered critical for economic transformation, our findings imply that policymakers in sub-Saharan Africa need to continue to promote financial development to spur industrialization.

Subjects: Economics; Finance; Business, Management and Accounting

Keywords: financial development; threshold; generalised method of moments; seemingly unrelated regression; sub-Saharan Africa

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PUBLIC INTEREST STATEMENT

The finance–growth nexus has been extensively examined within the context of sub-Saharan Africa. The results, however, remain complex and inconclusive. This paper seeks to contribute to the literature by examining whether the impact of financial development in sub-Saharan Africa varies across different sectors of the economy. The findings show that financial development has a positive impact on the growth of the service and agricultural sectors. In the case of the industrial sector, the initial impact is negative, but becomes positive after reaching a certain threshold. The results suggest that policymakers in sub-Saharan Africa need to continue to promote financial development to spur industrialisation.

1. Introduction

The finance–growth nexus has long been a subject of interest among practitioners and policy-makers (Acaravci, 2009; Elijah & Hamza, 2019; Ibrahim & Alagidede, 2018; Nyasha & Odhiambo, 2017). The persistent interest may be due to the important role that finance plays in propelling growth; by mobilising excess liquidity in the system and allocating it to the most productive sectors of the economy in the most efficient manner (Ahmed & Wahid, 2011; Durusu-ciftci et al., 2017). However, after decades of extensive studies on the subject, the relationship between finance and growth remains inconclusive (An et al., 2020; Deb et al., 2019; Herwartz & Walle, 2014; Sehgal et al., 2012). Nyasha and Odhiambo (2019) described the relationship as complex and pointed out that the results varied depending on country-specific factors, the empirical model used, and the measure of financial development. Another factor that could account for the mixed results, but which has not been well researched, is the possibility that the impact of financial development on growth could vary across different sectors of the economy.

While attention has been given to the relationship between financial development and growth, little is known about the impact of financial development on sectoral growth. Examining the impact of sectoral growth is more helpful than looking at the aggregate growth as different sectors could have different intensities of financial demands and productivity. Besides, policies on growth are initiated at the sectoral level, hence studying the impact of financial development at the sectoral level would be a handy tool to inform sector-level policies. Indeed, credit allocation has varied significantly across different sectors of the economy, with the agricultural sector being the most negatively affected despite the sector's contribution to employment and livelihoods. According to the Alliance for a Green Revolution in Africa (2017), the share of total credit to agriculture in sub-Saharan Africa was less than 1%. Financial institutions prefer to lend to the non-agricultural sector as they perceive agricultural activities to be too risky and the cost of extending credit is high as a result of multiple low-volume transactions. The situation is significantly the same across countries. For instance, credit allocated to the agricultural sector in Ghana for June 2019 was about 4% compared to 22% for the service sector (Bank of Ghana, 2019). Even in countries where agriculture's contribution to GDP is over 50%, credit to the sector is skewed in favour of the trade sector which receives about 38% compared to 4.1% of the agricultural sector (Central Bank of Liberia, 2019). Further, in Burundi, the rate is less than 5% compared to 60% in the transport sector (African Development Bank, 2019). Hence, the impact of financial development could vary across different sectors of the economy. Another point worth noting is the fact that the productivity of capital could vary across the sectors. The return on investible projects could dictate which sector receives more credit. According to the Growth Research Programme (2015), the agricultural sector in sub-Saharan Africa is characterised by low productivity owing to low returns and perpetual risk of harvest failure. This vulnerability is due to the sector's heavy reliance on rain which could fail and hence affect the outcome of any investment. In contrast, the service and industrial sectors may attract good projects and the environment may prove more conducive for such projects. Some have however argued that the service and industrial sectors are capital intensive and therefore the level of financial development would have to be higher to realise a positive effect on growth (see, for example, Daway-Ducanes & Gochoco-Bautista, 2019).

This study seeks to contribute to the literature on the relationship between finance and growth in sub-Saharan Africa on two levels. First, previous studies (see, for instance, Aluko et al., 2020; An et al., 2020; Ho & Iyke, 2020; Ibrahim & Alagidede, 2018) focused on the impact of financial development on aggregate growth. This study complements existing literature by examining the impact of financial development on sectoral growth. Though there are some studies with a focus on sectoral growth, they rely either on a single measure of financial development or are country-specific (for example, Asaleye et al., 2018; Daway-Ducanes & Gochoco-Bautista, 2019; Ogbonna et al., 2020; Oliynyk-Dunn, 2017). This is significant because this study argues that the impact of financial development on growth may vary across different sectors of the economy. Hence, the evidence based on sectoral growth could help policymakers in shaping sector-specific policies aimed at enhancing the growth of various sectors. Second, the study seeks to contribute by employing the newly constructed financial development index devised by Svirydzenka (2016) to assess the relationship between financial

development and sectoral growth in the context of sub-Saharan Africa. The index is a comprehensive measure of financial development incorporating banking, stock market, insurance, mutual fund, pension fund indicators, among others. The financial sector has evolved beyond banking and stock markets (Svirydzenka, 2016). Therefore, the index better reflects the activities of financial intermediation in an economy relative to using a single measure. Measuring financial development has been an unresolved issue in the literature. How to accurately and comprehensively measure financial development is crucial for policymaking because the choice of measurement could result in a different impact on growth, leading to a misleading policy prescription (Demirguc-Kunt & Maksimovic, 2002). The study is therefore of significance to policymakers and practitioners in a number of ways.

The rest of the article is organised as follows: section 2 presents a review of relevant literature, followed by section 3 which describes the methodology used, data and data sources. Section 4 presents results and analysis, while conclusions and policy implications are provided in the last section.

2. Review of literature

Extensive theoretical and empirical literature on the impact of financial development on economic growth exists (Murari, 2017). Chuah and Thai (2004) identified four main lines of argument in the theoretical literature on the relationship between finance and growth.

The first line of argument led by Schumpeter (1934) asserted that finance has a positive impact on growth by financing innovative ideas. McKinnon (1973) and Shaw (1973) developed a framework within which the financial sector increases growth by raising savings and investment. To achieve this, they called for liberalisation of interest rates and, as the real interest rate increases, the incentive to save also increases. Gurley and Shaw (1955) highlighted the role of financial institutions in directing surplus units to deficit units to promote growth. Bencivenga and Smith (1991) developed an endogenous equilibrium model in which the role of the bank is central in financial intermediation. They argued that financial intermediation affects growth through investment, where banks mobilise and direct savings into productive investment. King and Levine (1993) complemented this argument by explaining the role of finance in growth through an endogenous growth model. They argued that financial institutions help growth by screening potential projects of entrepreneurs and, through financial intermediation, mobilise finance to support the most productive economic activities and diversifying the risk associated with these economic activities.

The second argument is the demand-following hypothesis which states that it is economic growth rather than financial development that leads to the emergence and development of the financial sector. This view was introduced by Robinson (1952), who argued that expansion in economic activities within an economy necessitates the presence of financial institutions to provide services essential for economic growth. Hence, growth leads, and finance follows.

The third standpoint sought to combine the two arguments above and suggested the existence of a mutual relationship between finance and growth. Patrick (1966) put forward the stages of a development hypothesis where finance initially spurs economic growth, as suggested by the finance-leading or supply hypothesis. As growth is enhanced through expansion in economic activities, growth then supports finance, following the demand-leading hypothesis. This position is supported by Greenwood and Jovanovic (1990) who argued that there is an inextricable link between finance and growth. They explained that at the initial stage of development, the intermediation function played by finance promotes growth by encouraging a higher return on capital. At a later stage, the resultant growth supports the expansion of the financial structure. The final line of argument led by Lucas (1988) sought to suggest that the role of finance in the growth process has been overstretched and, hence, the impact of finance on growth is negligible.

The empirical literature on the finance–growth relationship has been examined at the country and cross-country, levels. Evidence from earlier studies established a linear and positive relationship between financial development and growth (Benczúr et al., 2019). Goldsmith (1959) made

a pioneering contribution to the empirical examination of the finance–growth nexus. Using a sample of 35 countries, he found a positive correlation between finance and growth. Recent studies also reinforce the positive impact of finance on growth (for example, Türsoy & Faisal, 2018; Lenka & Sharma, 2020; Shravani & Sharma, 2020; Zeqiraj, Hammouhdeh, Iskenderoglu & Tiwari, 2020). There are, however, a few studies that have established either a negative or no relationship between finance and growth. For instance, Narayan and Narayan (2013) in a study of 65 countries across different regions in the world found bank credit to have a negative effect on growth while the stock market did not have any significant impact on growth. Further, Ayadi et al. (2013) focused on 11 Mediterranean countries over the period 1985–2009. These authors found the banking sector to be negatively related to economic growth. They, however, attributed the negative impact to the weak regulatory system.

Other studies reported the impact of finance on growth to vary depending on the structure of the financial system, that is whether the financial system was a bank or market dominated. One of the earliest studies in this respect was Atje and Jovanovic (1993), who found the stock market rather than the banking sector to have a positive impact on growth. However, their sample contained both developed and developing countries. A line of studies has subsequently been done to confirm whether a market-based or bank-based financial system promotes growth (for example, Boadi et al., 2019; Ibrahim et al., 2017; Lee, 2012; Mahmood & Rehman, 2019). The evidence provided by Lee (2012) demonstrated that, though he found the stock market to drive growth in countries that are market-based and the banking sector to drive growth in bank-based countries, the banking sector affects growth positively at the early stages of development, while the stock market takes over as the economy advances. The study by Ibrahim et al. (2017) pointed to a significant positive effect of both banks and the stock market in driving growth. Their samples were however a mixture of both developed and developing countries.

In a related study of 17 European countries over the period 1970–2013, Mahmood and Rehman (2019) reported both bank and market indicators to positively affect growth, but the impact of bank development was more persistent relative to the stock market. In another study, Boadi et al. (2019), using a sample of 60 countries, found support for the hypothesis that a market-based financial system drives growth relative to the banking sector. Yet, some found the impact of financial development on growth to vary based on income levels (see, for instance, Bist & Read, 2018; Deidda & Fattouh, 2002; Kim et al., 2012; Nguyen et al., 2019; Rahman et al., 2020; Sehgal et al., 2012). Sehgal et al. (2012) disaggregated their samples into lower-, middle- and upper-income countries. They found the banking sector to drive growth across the three income groups, while the stock market only drives growth in the middle- and upper-income countries. Similarly, Nguyen et al. (2019) identified the insurance sector to positively affect growth across income groups with the stock market only having a positive effect in middle- and upper-income countries. They however established the effect of the banking sector on growth to be negative across income groups, where they suggested that credit extended could have been utilised on consumption instead of growth-enhancing projects.

Further, some studies moved beyond the relationship to examine the possibility of a causal relationship between finance and growth, following Patrick's (1966) demand-following and supply-leading hypothesis, but the results were mixed. In earlier studies, Calderón and Liu (2003) found finance rather to cause growth, while Ang and Mckibbin (2007) established causality running from growth to finance. Hsueh et al. (2013) noted that the direction of causality was sensitive to the choice of financial development variable, and while they found domestic credit to robustly lead growth, growth rather led when money supply measures were used in some cases. Pradhan et al. (2017), using different indicators, pointed to a mixed causal relationship. They established a uni-directional causality running from growth to finance when a banking indicator was used, while a bi-directional causality was established in the case of stock market, bond, and insurance market indicators. Deb et al. (2019) disaggregated their samples into developed and emerging economies using quarterly data over the period 1993–2014. Their results showed that in developed economies, finance drives growth in line with the supply-leading hypothesis, while the demand-following hypothesis rather exists in the case of emerging economies. Dash et al. (2020), using both insurance and bank development indicators,

provided evidence of long-run causality between financial development and growth. In the short run, they found a bi-directional relationship between insurance and growth and then again in banking and growth. They argued that a developed insurance industry helps in overcoming economic shocks while expansion in the economy leads to increase in income levels and, hence, an increase in demand for insurance.

The new paradigm in literature, however, suggests that the relationship between finance and growth could be non-linear. In an influential paper, Cecchetti and Kharroubi (2012) established that finance has a positive impact on growth only up to a point, beyond which the impact of finance on growth becomes negative. This is known as the "too much finance" hypothesis. These authors asserted that the financial sector does not exist in isolation but rather competes with other sectors of the economy for scarce resources. Thus, as financial development increases, it begins to deprive the other sectors of the needed resources, and thus the negative effect. Subsequently, several related studies have been done in this direction, but with different approaches in estimating the threshold levels. While Soedarmono et al. (2017) used the square of financial development variable as a measure of a threshold, Tariq et al. (2020) employed the static Hansen's threshold model in their study on Pakistan. However, the findings of both studies were mixed, whereas Soedarmono et al. (2017) showed that the effect of finance is positive but turns negative after attaining a certain threshold. Contrary to the too much finance hypothesis, Tariq et al. (2020) found the impact of finance to be initially negative but that it only becomes positive after attaining a certain threshold. Swamy and Dharani (2019) employed both the square term and Hansen's threshold model in a sample of 24 developed countries for the period 1983–2013. They showed that above a threshold of 124%, the impact of finance on growth is negative. Law and Singh (2014) and Samargandi et al. (2015) used the Kremer et al. (2013) dynamic threshold model, which is an extension of Hansen's static model. The findings of both studies supported the too much finance hypothesis. In a meta-analysis study by Bijlsma et al. (2018) covering 68 empirical studies, they concluded that the impact of finance on growth is positive but decreases over time in line with the too much finance hypothesis.

Other studies have also looked at the impact of financial development at a sectoral level. Most of the studies were however conducted at country level and only examined a single sector. For instance, Shahbaz et al. (2013) and Oliynyk-Dunn (2017) found the impact of financial development on the agricultural sector to be positive in Pakistan and Ukraine. The study by Topcu and Çoban (2017) examined the causal relationship between finance and the industrial sector in Turkey and their findings support the supply-leading hypothesis. A recent study by Daway-Ducanes and Gochoco-Bautista (2019) addressed the role of finance in the growth of the service and manufacturing sectors using a sample of 77 developing countries. They established a non-linear relationship in both sectors, with the impact of finance becoming positive only after attaining a certain threshold. They argued that because of the initial large and lumpy investment needed in these sectors, the level of financial development would have to rise to a certain point before positive results could be realised.

In the sub-Saharan African context, different aspects of the finance–growth nexus have been examined either at the country level (Elijah & Hamza, 2019; Ho & Iyke, 2020) or cross-country level (An et al., 2020; Walle, 2014). Table 1 presents a summary of some of the recent empirical studies in Africa. The conclusions drawn by most of the studies show that finance has a positive impact on growth. Some studies, including Ahmed and Wahid (2011) and Nyasha and Odhiambo (2017), also addressed the issue of financial structure. A group of studies further looked at the possibility of causal relationships (for example, Aluko et al., 2020; Okunlola et al., 2020), but the results were mixed. In addition, some studies examined the non-linear relationship (see, for instance, Ibrahim & Alagidede, 2018; Taiwo, 2020). However, the existing studies have largely focused on aggregate growth with little evidence on whether the impact of finance could vary across different sectors of the economy. A notable exception is Asaleye et al. (2018) and Ogbonna et al. (2020). While Asaleye et al. (2018) only looked at the manufacturing sector in Nigeria, Ogbonna et al. (2020) disaggregated their growth measure into oil and non-oil growth.

3. Materials and method

3.1. Theoretical model

The study adopted the endogenous growth model following the framework proposed by Pagano (1993). The endogenous growth model relaxes the absorption of the exogeneity assumption of the neoclassical growth theory. The starting point of the model is the simple AK model specified as:

$$Y_t = AK_t \tag{1}$$

Where Y_t is the aggregate output in a linear function of aggregate capital stock (K_t) and A captures the productivity of capital. The model further assumes that a single good is produced in the economy and hence capital can either be invested or consumed. If invested, capital is expected to depreciate at the rate δ per period given a level of gross investment, I_t:

$$I_t = K_{t-1} - (1-\delta)K_t \tag{2}$$

The model further assumes a closed economy with no government intervention; hence the capital market is at equilibrium where gross savings (S_t)equals gross investment (I_t). Also, a proportion of savings $(1-\emptyset)$ is lost in the financial intermediation process, representing the cost of financial intermediation such as bank charges, fees for brokers and dealers, among others. The remaining amount is successfully channeled into investment as:

$$\emptyset S_t = I_t \tag{3}$$

From equation 1, the growth rate at time $t+1$ is given as:

$$g_{t+1} = \frac{Y_{t+1}}{Y_t} - 1 = \frac{K_{t+1}}{K_t} - 1 \tag{4}$$

Dropping the time indices from equation 2, the steady-state growth rate can be expressed in the final model as:

$$g = A\frac{I}{Y} - \delta = A\emptyset s - \delta \tag{5}$$

Pagano (1993) then identified three ways by which financial development could affect growth: first, finance can affect growth by raising the proportion of savings, $\emptyset$ which is expected to be channeled into investment. Second, it can increase the social marginal productivity of capital A; and, third, it can affect growth by increasing the rate of private savings, s.

3.2. Empirical model

In line with the theoretical model, the study specified the models to be estimated as:

$$SVA_{it} = \beta SG_{it-1} + \emptyset FD_{it} + \alpha X_{it} + \varphi_i + e_{it} \tag{6}$$

$$IVA_{it} = \beta IG_{it-1} + \emptyset FD_{it} + \alpha X_{it} + \varphi_i + e_{it} \tag{7}$$

$$AVA_{it} = \beta AG_{it-1} + \emptyset FD_{it} + \alpha X_{it} + \varphi_i + e_{it} \tag{8}$$

Table 1. A summary of recent studies on the relationship between finance and growth in Sub-Saharan Africa

Author(s)	Type of study	Econometric model used	Number of countries	A measure of financial development	Summary of findings
Ahmed and Wahid (2011)	Panel (1986–2007)	FMOLS	7	value of shares traded, private credit and stock market capitalization.	Stock market positively affects growth through efficiency and productivity while the banking institution impacts growth through capital accumulation.
Demetriades and James (2011)	Panel (1975–2006)	Westerlund cointegration	18	Bank deposit, liquid liability and private credit.	Evidence of demand-led hypothesis.
Walle (2014)	Panel (1975–2005)	Westerlund cointegration and DOLS	17	Liquid liability and private credit,	A long-run relationship exists and causality running from finance to growth.
Acaravci, Ozturk and Acaravci (2009)	Panel (1975–2005)	GMM and Pedroni cointegration	24	Domestic credit by the banking sector, private credit and liquid liability.	The direction of causality depends on the measure of financial development.
Aluko et al. (2020)	Panel (1990–2015)	Dumitrescu and Hurlin (2012) panel causality test model	33	Financial development index	Bidirectional relationship between finance and growth.
An et al. (2020)	Panel (1985–2015)	FE and RE models. Granger causality test	30	Liquid liability, broad money supply, domestic credit by banks to private sector and interest read spread	The difference depends on the income; negative impact in countries with low income while it is positive in the case of higher-income countries.
Elijah and Hamza (2019)	Timeseries (1981–2015)	VECM	Nigeria	Broad money supply,	Existence of positive long-run relationship but turns negative after accounting for a structural break.

(*Continued*)

Table 1. (*Continued*)

Author(s)	Type of study	Econometric model used	Number of countries	A measure of financial development	Summary of findings
Ho and Iyke (2020)	Timeseries (1975–2014)	ARDL	Ghana	Domestic credit by banks	A negative relationship between finance and growth both in the short and long-run.
Okunlola et al. (2020)	Timeseries (1985–2015)	Toda and Yamamota	Nigeria	Market capitalization, private credit	Uni-directional causality from growth to stock market, whilst bi-directional causality exists between growth and the banking sector.
Ehigiamusoe, Lean and Badeeb (2017)	Timeseries (1980–2014)	ARDL-Bound test	Nigeria and Cote D'Ivoire	Domestic credit, bank credit and broad money supply.	Finance leads growth in Cote D'Ivoire whilst a two-way relationship exists in the case of Nigeria.
Taiwo (2020)	Panel (1986–2015)	Hansen threshold model	38	Domestic credit	Finance has a positive impact on growth in the real and financial sector above a certain threshold.
Fowowe (2011)	Panel (1975–2005)	Panel Granger causality	17	Bank credit and bank deposit-liabilities.	Bi-directional causality between finance and growth.
Asaleye et al. (2018)	Timeseries (1981–2016)	VECM and Causality test	Nigeria	Private credit, market capitalization	Uni-directional causality from finance to growth.
Ogbonna et al. (2020)	Timeseries (1981–2015)	ARDL	Nigeria	Index of financial development	Finance has a positive impact on the growth of the non-oil sector while the impact is negative on the oil sector.
Ibrahim and Alagidede (2018)	Panel (1980–2014)	Hansen threshold model	29	Non-linear	U-shaped relationship between finance and growth.

Note: FMOLS refers to fully modified ordinary-least square, DOLS is dynamic ordinary least-square, GMM is general method of moment, FE is fixed effect, RE is random effect, ARDL is auto-regressive distributive lag and VECM is vector error correction model.

Where SVA, IVA, and AVA represents the dependent variable of value additions in service, industry and agriculture, respectively.[1] *FD* denotes the variables of interest that capture the various measures of financial development, X contains other explanatory variables, and φ is the unobservable country-specific effect, while e shows the error term. The subscripts i and t show the country index and time index, respectively. The various parameters to be estimated are captured by $\beta, \emptyset$ and φ.

Using fixed effect or random effect to estimate equations 6, 7 and 8 would yield inconsistent and biased coefficients because of the inclusion of the lagged dependent variables and φ which captures the country-specific effect (Olaniyi & Oladeji, 2020). This would mean that the error term would be correlated with the lagged values of the dependent variable, hence $E(e_{it}|y_{it-1}) \neq 0$. To address the issue of autocorrelation, Arellano and Bond (1991) suggested taking the first difference to eliminate the country-specific effect, φ within the framework of the Generalised Method of Moments (GMM). Applying the first difference to equations 6, 7 and 8 would result in:

$$\Delta SVA_{it} = \beta \Delta SG_{it-1} + \emptyset \Delta FD_{it} + \alpha \Delta X_{it} + \Delta e_{it} \tag{9}$$

$$\Delta IVA_{it} = \beta \Delta IG_{it-1} + \emptyset \Delta FD_{it} + \alpha \Delta X_{it} + \Delta e_{it} \tag{10}$$

$$\Delta AVA_{it} = \beta \Delta AG_{it-1} + \emptyset \Delta FD_{it} + \alpha \Delta X_{it} + \Delta e_{it} \tag{11}$$

Though the transformation described above eliminated the country-specific effect, it introduced a problem of endogeneity whereby the differenced error term was correlated with the lagged of the dependent variable. To overcome the problem of endogeneity, recent empirical studies applied either the first difference approach of Arellano and Bover (1995) or the extended system approach by Blundell and Bond (1998). This study opted for the system GMM, as the instruments used in the first difference GMM tended to be weak whereas the lagged dependent variable and other explanatory variables were persistent. Besides, the system GMM reduced the potential biases in finite samples (Blundell & Bond, 1998). However, the reliability of the GMM estimation was subject to passing two critical tests: the test for serial correlation and the test for the validity of instruments (Blundell & Bond, 1998; Roodman, 2009). The former required the absence of second-order serial correlation, while the latter depended on the failure to reject the null hypothesis of valid instruments based on the Sargan (1958) or Hansen (1982) test for overidentification.

3.3. Data description and sources

A sample of 44 sub-Saharan African countries was selected for the study, based on data availability covering the period 1990–2018. Only Somalia and Zimbabwe were not covered because of a lack of data on the financial development index, which is the main variable of interest. The choice of 1990 as the starting period was based on the fact that financial sector reforms in the region picked up after1990 (Aluko et al., 2020). The GMM required the number of cross-sectional units (N), in this case the number of countries, to be greater than the time-series dimension, T (Arellano & Bond, 1991; Roodman, 2009). To meet this requirement, the study took a three-year non-overlapping average (except for the last average), following studies such as (Beck et al., 2000; Olaniyi & Oladeji, 2020). The averaging resulted in the number of T being 9; 1990–1992, 1993–1995, 1996–1998, 1999–2001, 2002–2004, 2005–2007, 2008–2010, 2011–2013, 2014–2016 and 2017–2018. Taking the average had the added advantage of correcting for the business cycle effect and reducing the instrument counts (Law & Singh, 2014).

The dependent variables were sectoral value additions in the service, industrial and agricultural sectors measured as a percentage of GDP. Financial development is the main variable of interest. As the main objective was to examine the impact of financial development on sectoral growth, the financial development index (FinDI) was used as a measure of overall financial development. The

Table 2. Variable definition, measurement and data source

Variable	Definition	Measurement	Source
FinDI	Financial development index	0–100	Svirydzenka (2016)
FII	Financial institutions index	0–100	Svirydzenka (2016)
FMI	Financial markets index	0–100	Svirydzenka (2016)
Agriculture	Agricultural value addition as a percent of GDP	%	UNCTAD
Service	Service value addition as a percent of GDP	%	UNCTAD
Industry	Industry value addition as a percent of GDP	%	UNCTAD
Trade-openness	Export plus import/GDP	%	UNCTAD
Investment	Gross fixed capital formation as a percentage of GDP	%	UNCTAD
Consumption	Government final consumption on goods and services as a percentage of GDP	%	UNCTAD
Labour	the proportion of the active Labour force (15–64 years)	%	WDI

Note: UNCTAD refers to United Nation Conference on Trade and Development, while WDI represent World Development Indicators.

Table 3. Descriptive statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
Service	440	48.95	11.799	16.756	84.373
Industry	440	26.161	13.01	2.586	81.771
Agriculture	440	24.893	15.32	1.000	74.893
FinDI	436	0.133	0.091	0.016	0.644
FII	436	0.225	0.122	0.032	0.732
FMI	359	0.044	0.083	0.000	0.533
Investment	440	21.93	10.052	5.451	79.184
Consumption	440	15.731	7.454	1.066	47.86
Trade-openness	440	63.482	33.626	8.101	198.092
Labour	430	69.778	11.174	42.422	92.027

Note: FinDi is the financial development index, FII is the financial institution index and FMI is the financial markets index.

FinDI is an integration of two indices: financial institution index (FII) and financial market index (FMI). Both FII and FMI were computed using the three dimensions of access, depth and efficiency indicators of financial development.[2] The indices range between 0 and1, and the higher the value, the higher the level of financial development in an economy. The index has recently been used by Aluko et al. (2020) and Tariq et al. (2020) as a proxy for financial development. Also, in the spirit of recent studies such as Okunlola et al. (2020), Ibrahim et al. (2017), and Nyasha and Odhiambo (2017),

which looked at the financial structure, this study went beyond the impact of overall financial development to account for the effect of financial structure on sectoral growth. Examining the financial structure could moreover help policymakers appreciate where to lay emphasis when formulating financial reform policies and for which sector they should do so. In this regard, the FII and FMI were used as measures of financial institutions and financial markets, respectively.

Also, this study controlled for variables known in the growth literature to affect growth, namely labour, investment, consumption and trade-openness. *Labour* captures the economically active population and is measured as the proportion of the active labour force (15–64 years). Labour was included because it is an important input in the production process, particularly for sub-Saharan Africa where production is largely capital intensive. *Investment* represents investment in assets, such as equipment, and is measured as gross fixed capital formation as a percentage of GDP. Investment was included to assess the impact of domestic investment on growth. *Consumption* was added to capture the effect of government policies on growth and was measured as the ratio of government expenditure to GDP. Government spending may sometimes introduce some distortionary effect that could affect growth, hence including this variable helped in assessing the impact of consumption across sectors. The inclusion of *trade-openness* helped to determine whether pursuing trade liberalisation had helped or hurt growth across sectors. It was measured as the ratio of the sum of import and export to GDP. Studies that employed these variables include Beck et al. (2000), Hou and Cheng (2017), Fanta (2017), Fufa and Kim (2018), Ibrahim and Alagidede (2018), Benczúr et al. (2019), Boadi et al. (2019), Ehigiamusoe et al. (2019), Swamy and Dharani (2019), Apergis and Poufinas (2020), and Tariq et al. (2020), Zeqiraj et al.(2020), and Meniago and Lartey (2020).

Data on the measures of financial development were sourced from Svirydzenka (2016), while the data for sectoral value additions, government consumption and investment were taken from the United Nations Conference on Trade and Development database. Data on labour were sourced from the World Development Indicators (WDI) database of the World Bank. Table 2 summarises the definition, measurement and source of variables used in this study.

4. Empirical results

4.1. Descriptive statistics

As reported in Table 3, the mean share of the services sector in GDP over the sampling period was 49% relative to agriculture and industry, whose shares were 25% and 26%, respectively. This made the service sector the largest contributor to GDP in sub-Saharan Africa. The average level of financial development was 0.13, suggesting a low level of financial development in the region. In terms of financial structure, the mean value for financial institutions was higher compared to financial markets, which reflected the fact that financial development was dominated by financial institutions, particularly banking.

The mean value for *labour* was higher compared to that of *investment* as a percentage of GDP, suggesting that economic activities in the region were labour-driven. *Trade-openness* as a share of GDP had a higher mean value of 63%, reflecting increasing trade within and outside the region. The statistics also showed a great disparity between the minimum value of *consumption* as a percentage of GDP and the maximum value, depicting wider variations in government expenditure.

Further, the correlation analysis presented in Table 4 point to a low level of correlation among the variables and, hence, minimised the possibility of collinearity among the regressors. There was indeed a high degree of correlation among various measures of financial development but these variables were used in different models.

4.2. Financial development and sectoral growth

The findings for the impact of financial development on sectoral growth are shown in Table 5. On the diagnostics, all models passed the test of second-order serial correlation and overidentification, as

Table 4. Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Service	1.000									
(2) Industry	−0.146	1.000								
(3) Agriculture	−0.562	−0.736	1.000							
(4) FinDI	0.534	0.054	−0.410	1.000						
(5) FII	0.575	0.067	−0.449	0.936	1.000					
(6) FMI	0.351	0.024	−0.260	0.861	0.628	1.000				
(7) Investment	−0.002	0.394	−0.328	0.048	0.103	−0.042	1.000			
(8) Consumption	0.237	0.167	−0.302	0.299	0.416	0.061	0.121	1.000		
(9) Trade-openness	0.119	0.499	−0.499	0.283	0.326	0.156	0.420	0.490	1.000	
(10) Labour	−0.214	−0.322	0.416	−0.295	−0.270	−0.265	−0.027	0.045	−0.278	1.000

Note: FinDi is the financial development index, FII is the financial institution index and FMI is the financial markets index.

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evidenced by Hansen's p-value. There however was an indication of first-order serial correlation, which is to be expected owing to the inclusion of the lagged dependent variable. Also, the number of groups was more than the number of instruments in all estimations, hence there was no problem of too many instruments. The lags of the dependent variable were all significant, indicating growth persistence. The study also controlled for trend effect by adding year dummies. Further, the income effect was captured by incorporating income dummies. The World Bank's classification of countries into low income, low-middle income, upper-middle income, and high income was followed.

The results also showed that financial development had a positive impact on growth in service and agriculture. An increase in financial development by 1% led to an increase of about 0.34% and 0.19% in service and agricultural growth, respectively. A further notable observation was the fact that the square of financial development tended to be negative, which suggest the existence of a threshold. We applied the formula in Wooldridge (2003) to calculate for the threhold.[3] We found the threshold to be 47.2% and 31.7% for service and agricultural sectors respectively. Above these thresholds, a percentage increase in fianncial development leads to a reduction in service and agricultural growth by 0.0036% and 0.0030% respectively. This confirms the too much finance hypothesis in line with Ibrahim and Alagidede (2018) and Cecchetti and Kharroubi (2012). Thus, when the financial system grows bigger relative to the size of the economy, financial system may not contribute to efficiency of investment resulting in a negative effect. The impact of financial development on the industrial sector was significantly negative. An increase in financial development by 1% led to a 0.53% reduction in industry growth. However, the square of financial development has a positive and significant impact on industry growth. We estimated the threhold to be 43.3%. Above this threshold, an increase in financial development by 1% result in an increasing in industrial growth by 0.006%. As the industrial sector is capital intensive, the level of financial development would have to rise to a certain level for finance to have a positive impact on industry. Investment in areas such as mining and manufacturing require high level of capital. The finding is consistent with Daway-Ducanes and Gochoco-Bautista (2019). They argued that the size of the financial system matters for industrial growth to occur, and that an underdeveloped financial system may lack the capacity to channel large financial flows towards a growth-enhancing industry that requires a considerable amount of investment.

On the control variables, domestic investment was found to have a positive impact on industrial growth, while exerting a negative impact on service and agriculture. Though the finding is contrary to theory, it might be due to low investment, particularly in the agricultural sector. Lower level of domestic investment could adversely affect the growth of these sectors. Investment however exert a positive effect on industrial growth which is consistent with the findings of Daway-Ducanes and Gochoco-Bautista (2019). Government consumption was established to have a positive effect on the service sector while being negatively related to the agricultural sector. The negative relationship could be the result of the low level of government spending in the agricultural sector. The Food and Agricultural Organization of the United Nations estimated government expenditure on agriculture to be around 3% in 2017. The service sector, in contrast, received a relatively higher share of government expenditure. Finally, trade-openness impacted positively on industry growth, while it was negatively related to service growth. Thus, trade-openness did not favour the service sector. The positive relationship between trade-openness and industry growth may be because the sector is capital intensive and requires a higher level of technology—which may be lacking in most sub-Saharan African countries. Hence, opening to the rest of the world allows sub-Saharan African economies to add value to the extractive, manufacturing, and construction sectors of the economy. Though we found trade-openness to have a negative impact on the agricultural sector, the relationship is not significant.

4.3. Financial structure and sectoral growth

The result of the impact of financial institutions and financial markets on sectoral growth is displayed in Table 6. The findings mirrored that of the financial development presented in Table 5. Financial institutions exerted a positive impact on service and agricultural growth, while their squares showed a negative impact following the too much finance hypothesis. A percentage increase in the level of financial institutions resulted in a 0.28% and 0.50% increase in service and agricultural growth,

Table 5. Financial development and sectoral growth- GMM model

Variables	Service	Agriculture	Industry
Lagged dependent variable	0.838***	0.816***	0.765***
	(0.0736)	(0.0934)	(0.0682)
Investment	−0.0995**	−0.0455**	0.119***
	(0.0436)	(0.0189)	(0.0461)
Consumption	0.108**	−0.0650**	−0.0416
	(0.0502)	(0.0325)	(0.0450)
Trade-openness	−0.0213*	−0.0149	0.0400***
	(0.0127)	(0.0135)	(0.0138)
Labour	−0.0251	0.00347	0.0477
	(0.0299)	(0.0221)	(0.0299)
FinDI	0.339**	0.189*	−0.532***
	(0.143)	(0.101)	(0.126)
FinDI square	−0.00359*	−0.00298*	0.00614***
	(0.00206)	(0.00158)	(0.00177)
Constant	0.000	0.000	8.546**
	(0.000)	(0.000)	(3.521)
Diagnostics:			
Observations	387	387	387
Number of countries	43	43	43
Instruments	25	27	27
Year dummy	Yes	Yes	Yes
Income dummy	Yes	Yes	Yes
Hansen chi-square (p-value)	4.50(0.213)	6.99 (0.222)	8.37 (0.137)
AR(1): Z(p-value)	−3.07(0.002)	−3.04(0.002)	−2.46(0.014)
AR(2): Z(p-value)	1.51(0.132)	1.63 (0.102)	1.38 (0.168)

Note: Robust standard errors in parentheses, *** p < 0.01, ** p < 0.05, and * p < 0.1 refers to significant levels at 1%, 5% and 10% respectively. FinDI is financial development index.

respectively. The estimated thresholds were 67% for the service sector and 39% for the agricultural sector, which are higher compared to financial development. This is to be expected given that financial intermediation in sub-Saharan Africa is bank-driven relative to the stock market. Above these thresholds, an increase in financial development by 1% led to an increase in service growth by 0.28% and 0.50% for the agricultural sector. Similarly, the impact of financial institutions on industry was negative, while their square showed a positive relationship. An increase in the level of financial institution led to a reduction of 0.29% on industry growth, while an increase in the square of the financial institution by a percentage point led to an increase in industry growth by 0.003%. This suggests that for financial institutions to have a positive impact on industrial growth, it must rise above a threshold of 52%. The evidence for the financial markets was similar relative to that of financial institutions. Significantly, financial markets had a positive impact on service and agricultural sectors. An increase in financial markets by 1% led to a 0.44% increase in service and 0.21% in agricultural growth. Above a threshold of 25% a percentage increase in financial markets resulted in a decrease of service growth by 0.009%. The estimated threshold for the agricultural sector is 19%, above which, a percentage increase in financial markets led to a fall in agricultural growth by 0.01%. Consistent with the findings on financial development, the impact of financial markets on industry

Table 6. Financial structure and sectoral growth- GMM model

Variables	Financial institutions			Financial markets		
	Service	Agriculture	Industry	Service	Agriculture	Industry
Lagged dependent	0.824***	0.945***	0.928***	0.868***	0.805***	0.810***
	(0.0905)	(0.0842)	(0.0435)	(0.104)	(0.0797)	(0.0873)
Investment	−0.121***	−0.0585**	0.130***	−0.0920*	−0.0605**	0.111*
	(0.0420)	(0.0232)	(0.0431)	(0.0498)	(0.0306)	(0.0658)
Consumption	0.0866*	−0.0783**	−0.00158	0.135	−0.0519	−0.118*
	(0.0522)	(0.0374)	(0.0360)	(0.0936)	(0.0369)	(0.0624)
Trade-openness	−0.0229	−0.00800	0.0159*	−0.0214	−0.0157*	0.0339***
	(0.0151)	(0.0103)	(0.00916)	(0.0170)	(0.00955)	(0.0126)
Labour	−0.0244	−0.0220	0.00505	0.0138	0.00460	−0.0123
	(0.0330)	(0.0255)	(0.0191)	(0.0365)	(0.0196)	(0.0236)
FII	0.278***	0.498***	−0.293***			
	(0.0992)	(0.177)	(0.0858)			
FII square	−0.00207*	−0.00636**	0.00281**			
	(0.00118)	(0.00258)	(0.00111)			
FMI				0.439***	0.210**	−0.316***
				(0.146)	(0.105)	(0.0998)
FMI square				−0.00897**	−0.00555*	0.00554***
				(0.00351)	(0.00286)	(0.00185)
Constant	0	0	0	0	8.968**	5.158
	(0)	(0)	(0)	(0)	(4.236)	(4.028)
Diagnostics:						
Observations	387	387	387	315	315	315
Number of countries	43	43	43	36	36	36
Instruments	25	27	29	30	28	27
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Income dummy	Yes	Yes	Yes	Yes	Yes	Yes
Hansen chi-square (p-value)	5.87(0.118)	8.92(0.112)	11.48(0.119)	8.46(0.390)	8.71(0.190)	6.16(0.291)
AR (1): Z (p-value)	−3.11(0.002)	−3.05(0.002)	−2.53(0.012)	−2.63(0.009)	−3.13(0.002)	−2.29(0.022)
AR (2): Z (p-value)	1.53(0.126)	1.49(0.137)	1.41(0.159)	1.41(0.158)	1.78(0.076)	1.24(0.216)

Note: Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$ refers to significant levels at 1%, 5% and 10% respectively. FII is the financial institution index and FMI is the financial markets index.

growth was negative while the square was positive. Thus, for financial markets to have a positive impact on industrial growth, its level must rise to 29%. The thresholds for the financial markets are lower relative to both the overall financial development and financial institutions, reflecting the underdeveloped nature of financial markets in the region.

Table 8. Financial structure and sectoral growth- SUR model

Variables	Financial institutions			Financial markets		
	Service	Agriculture	Industry	Service	Agriculture	Industry
Investment	0.00472	−0.165***	0.160***	−0.0518	−0.119*	0.171***
	(0.0480)	(0.0545)	(0.0485)	(0.0585)	(0.0616)	(0.0588)
Consumption	0.288***	−0.363***	0.0740	0.428***	−0.213**	−0.215**
	(0.0727)	(0.0825)	(0.0734)	(0.0997)	(0.105)	(0.100)
Trade-openness	−0.0760***	−0.0349*	0.111***	−0.0540**	−0.0653***	0.119***
	(0.0177)	(0.0201)	(0.0178)	(0.0228)	(0.0240)	(0.0229)
Labour	−0.255***	0.110**	0.145***	−0.0554	0.0544	0.00114
	(0.0435)	(0.0494)	(0.0440)	(0.0577)	(0.0609)	(0.0580)
FII	0.625***	−0.138	−0.485***	−0.0980	1.069***	−0.972***
	(0.150)	(0.170)	(0.151)	(0.177)	(0.186)	(0.178)
FII square	−0.00105	0.00173	−0.000692	0.0106**	−0.0255***	0.0149***
	(0.00207)	(0.00235)	(0.00209)	(0.00445)	(0.00469)	(0.00447)
Constant	53.30***	39.74***	6.939*	45.75***	39.21***	15.03***
	(3.662)	(4.158)	(3.699)	(4.552)	(4.799)	(4.576)
Diagnostics:						
Observations	426	426	426	349	349	349
R-squared	0.372	0.583	0.553	0.260	0.615	0.499
Year dummy	Yes	Yes	Yes	Yes	Yes	Yes
Income dummy	Yes	Yes	Yes	Yes	Yes	Yes

Note: Robust standard errors in parentheses, *** p < 0.01, ** p < 0.05, and * p < 0.1 refers to significant levels at 1%, 5% and 10% respectively. FII is financial institution index and FMI is financial markets index.

4.4. Robustness check

To further validate the consistency of the findings of this study, the same models were estimated using the seemingly unrelated regression (SUR). The SUR can account for intersectoral linkages (Avery, 1977) where sectoral growth (dependent variables) in service, industry and agriculture are treated as endogenous variables and are simultaneously estimated. Thus, equations 6, 7 and 8 were simultaneously estimated. The results relating to the impact of financial development on sectoral growth are shown in Table 7. Indeed, the evidence showed that financial development had a positive impact on service and agricultural growth, while the impact was negative for industrial growth. The square of financial development, however, was positively related to industrial growth, while a negative relation was found in the case of the service and agricultural sectors. This is consistent with the results of the main GMM model.

The findings relating to the impact of financial structure on sectoral growth is displayed in Table 8. The evidence for the financial institutions partly corroborated the main results where the financial institution was found to have a significant positive impact on service growth and a significant negative impact on industrial growth. Financial markets were shown to have a significant positive effect on the agricultural sector, while the relationship was significantly negative with the industrial sector. The square of financial markets pointed to a threshold effect across the three sectors. This is also in line with the results in the main GMM model though the sign for the service sector in the SUR model is positive. Thus, the impact of financial structure varies across different sectors.

Table 7. Financial development and sectoral growth- SUR model

Variables	Service	Agriculture	Industry
Investment	0.0294	−0.174***	0.144***
	(0.0495)	(0.0542)	(0.0481)
Consumption	0.409***	−0.390***	−0.0191
	(0.0726)	(0.0795)	(0.0705)
Trade-openness	−0.0769***	−0.0438**	0.121***
	(0.0184)	(0.0202)	(0.0179)
Labour	−0.246***	0.0850*	0.162***
	(0.0448)	(0.0491)	(0.0435)
FinDI	0.739***	0.409**	−1.148***
	(0.179)	(0.196)	(0.174)
FinDI square	−0.00273	−0.00666*	0.00937***
	(0.00313)	(0.00343)	(0.00304)
Constant	54.02***	37.61***	8.358**
	(3.665)	(4.017)	(3.561)
Diagnostics:			
Observations	426	426	426
R-squared	0.332	0.586	0.560
Year dummy	Yes	Yes	Yes
Income dummy	Yes	Yes	Yes

Note: Robust standard errors in parentheses, *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$ refers to significant levels at 1%, 5% and 10% respectively. FinDI is financial development index.

5. Conclusion and policy implications

The role of financial development in economic growth has been extensively examined. By disaggregating value addition into agriculture, service, and industry, the study examines whether the impact of financial development varies across sectors of the economy. Using the Generalised Method of Moments and covering 44 sub-Saharan African countries over the period 1990–2018, the results revealed that financial sector development could spur the growth of service and agricultural sectors but only up to a threshold of 47.2% and 31.7% respectively, beyond these points financial development could serve as a drag on the growth of these sectors. The findings showed that financial development could positively affect industrial growth only after attaining a threshold of 43.3%. Thus, the study finds support for the too much finance hypothesis in the case of service and agricultural sectors while too little finance was established with respect to the industrial sector. The result is robust even after accounting for intersectoral linkages using the Seemingly Unrelated Regression model. Another key finding is that financial structure matters in explaining sectoral value addition as the impact of financial institutions and markets vary across sectors. The findings have some implications for policymakers in sub-Saharan Africa and developing countries with similar features. Policymakers should consider the optimal level of financial development when formulating sectoral growth policies. To maximise the benefits associated with industrialisation, there is a need to promote development of the financial sector as the results showed that financial development could affect industrial growth only at a higher threshold. The analysis further revealed that financial structure matter, hence there is the need for policies to develop both financial institutions and financial markets. Using financial development data on a sectoral basis could have added to the novelty of this study and policy recommendation; however, the study was limited by the lack of longitudinal data on this variable. Future studies that employ longer time series data on sectoral financial development indicators are needed to add further insights to the finance–growth literature.

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Notes

1. The sectoral classification of value addition follows the International Standard Industrial Classification (ISIC). Agriculture covers forestry, fishing, hunting, cultivation of crops, and livestock production. Services include wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services such as education, healthcare, and real estate services. The industrial sector comprises value added in mining, manufacturing (also reported as a separate subgroup), construction, electricity, water, and gas.
2. **FII**: *Access*: Commercial bank branches per 100,000 adults, and ATMs per 100,000 adults. *Depth*: Private sector credit to GDP, pension fund assets to GDP, mutual fund assets to GDP, and life and non-life insurance premiums to GDP. *Efficiency*: Net interest margin, lending-deposit spread, non-interest income to total income, overhead costs to total assets, return on assets and return on equity. **FMI**: *Access*: Percent of stock market capitalisation outside the top 10 largest companies, the total number of debt security issuers. *Depth*: In percent of GDP: Stock market capitalisation, stock market turnover, international government debt securities outstanding, and total debt securities outstanding of private non-financial corporations. *Efficiency*: Stock market turnover ratio (adopted from Svirydzenka, 2016).
3. The threshold values are calculated as: Cofficient of financial development/-2(Cofficient of square of financial development).

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