

Determinants of banking sector development: Evidence from Sub-Saharan African countries

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Abstract

This study examines the determinants of banking sector development in sub-Saharan African countries using a panel of 25 countries from 1997 to 2014. It utilises the system Generalized Method of Moments (GMM) dynamic panel model estimator. Using a composite index of banking sector development, the estimation results show that population density and simultaneous openness to trade and capital promote banking sector development while financial liberalisation hinders banking sector development. This study reveals that institutional quality, population density, and trade openness increases the depth of the banking sector. Also, it demonstrates that law, inflation, and religion promotes the efficiency of the banking sector while latitude, trade openness, income level, and ethnic diversity reduce banking sector efficiency. In addition, it shows that law and simultaneous openness to trade and capital enhances the stability of the banking sector while land area, financial liberalisation, economic growth, and inflation adversely affect banking sector stability.

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1. Introduction

The banking sector is a subset of the financial sector and its role in the growth process of an economy cannot be over-emphasized. It plays a dominant role in the financial intermediation process of most developing and developed countries, thus connoting that the financial sector of most countries is bank-based. The banking sector is a pivotal segment in many countries, hence the need for continuous implementation of adequate policy measures and reforms in order to ensure that the banking sector performs its function efficiently. According to Levine (2005), the banking sector performs five functions which can facilitate economic growth. These functions are (i)

providing ex ante information about possible investments and allocate capital, (ii) monitoring investments and exert corporate governance after providing credit, (iii) facilitating trading, risk diversification, and risk management (iv) mobilising and pooling deposits, and (v) facilitating the exchange of goods and services. Therefore, banking sector development refers to the increase in the ability of the banking sector to perform these functions efficiently. A growing number of literature provides empirical support for banking sector development as a predictor of economic growth (for example, Beck & Levine, 2004; Beck, Levine, & Loazya, 2000; Estrada, Park, & Ramayandi, 2010; Hassan, Sanchez, & Yu, 2011; King & Levine, 1993a, 1993b; Levine, 1997; Levine, Loazya, & Beck, 2000). Guiso, Sapienza, and Zingales (2009) contend that banking sector development promotes entrepreneurial activities and increases competition among firms. This suggests that banking sector development can boost economic productivity and increase efficiency among firms.

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Researchers have inquired into why banking sector development differs across countries. They argue that the differences, *inter alia*, are due to: economic institutions (Filippidis & Katrakilidis, 2014; Law & Azman-Saini, 2012; Le, Kim, & Lee, 2016); legal systems (Beck, Demirgüç-Kunt, & Levine, 2003a, 2001; Levine et al., 2000); legal traditions/origins (Beck, Demirgüç-Kunt, & Levine, 2003b); openness to trade and capital (Andrianaivo & Yartey, 2010; Baltagi, Demetriades, & Law, 2009; Mahawiya, 2015); economic growth (Le et al., 2016; Filippidis & Katrakilidis, 2014); macroeconomic stability (Boyd, Levine, & Smith, 2001); geographical endowments (Beck et al., 2003a, 2003b); income level (Andrianaivo & Yartey, 2010; Falahaty & Law, 2013); political institutions/democracy (Huang, 2010a, 2010b); culture (Dutta & Mukherjee, 2011; Stulz & Williamson, 2003); and human capital (Kodila-Tedika & Asongu, 2015; Ozkok, 2015). Identifying what makes the banking sector develop is essential because better developed banking sectors have greater ability to alleviate poverty, reduce household and firm financing constraints, increase competition among firms, and promote economic growth compared to less developed banking sectors.

The banking sector of most sub-Saharan African countries is underdeveloped despite series of reforms (Allen, Carletti, Cull, Qian, Senbet & Valenzuela, 2014; David, Mlachila, & Moheput, 2014). Standley (2010) observes that most banking sector depth indicators in sub-Saharan Africa are low compared to other regions of the world. The low institutional quality in most sub-Saharan African countries is a plausible reason for their lower levels of banking sector development. Anayiotos and Toroyan (2009) opine that the banks in majority of the sub-Saharan African countries conduct business within an environment characterised by weak institutional quality. A recent ranking by Krause (2016) shows that most countries in sub-Saharan Africa rank low on the institutional quality. The underdeveloped nature of banking sector of most sub-Saharan African countries is a plausible reason for the economic backwardness in the region.

Extensive research has been carried out to provide evidence on the impact of banking sector development on economic growth in sub-Saharan Africa, however, little research has been done to identify the determinants of banking sector development. In the light of this, this study examined the determinants of banking sector development in sub-Saharan African countries. There is lack of consensus among researchers on the adequate measure to capture banking sector development and myriad of empirical studies have used a single measure, commonly private sector credit to Gross Domestic Product (GDP). A single measure would not suffice to provide a comprehensive information on banking sector development (Svirydzenka, 2016). This is due to the multidimensional nature of banking sector development. Cihák, Demirgüç-Kunt, Feyen, and Levine (2013) identify four dimensions of banking sector development which include depth, access, efficiency, and stability. They note that these dimensions may not wholly show the characteristics of the banking sector, but to a large extent reflect what majority of empirical studies have focused on.

Few empirical studies on sub-Saharan African countries such as Mahawiya (2015), and David et al. (2014) went beyond using a single measure. They constructed an index from different measures of banking sector development which only reflect the size of the banking sector. This suggests that the index used in these studies accounts for only one dimension of banking sector development (depth) and did not capture other dimensions of banking sector development. This study addressed this gap by developing a composite index from different measures indicating the level of banking sector development, taking into consideration all dimensions of banking sector development except access to banking services. The reason for not considering the access dimension was because of huge gaps in data observations on access to financial services.

Sub-Saharan Africa is an interesting area to study because of the less developed nature of most banking sectors in the region compared to the other regions of the world. The contribution of this study is twofold. First, it identified the factors responsible for cross-country differences in banking sector development in sub-Saharan African countries using a more robust composite index which accounts for three dimensions of banking sector development—banking sector depth, efficiency, and stability. Second, it showed that banking sector development is sensitive to alternative measures. In other words, the determinants of banking sector development in sub-Saharan African countries depend on the dimension from which banking sector development is evaluated. The rest of this study is organised as follows. Section 2 presents the literature review. Section 3 describes the methodology. Section 4 reports and discusses the empirical results. Section 5 provides the conclusion and policy implications.

2. Literature review

2.1. Theoretical framework

2.1.1. Endowment theory

The endowment theory, also known as the settler mortality hypothesis was developed by Acemoglu, Johnson, and Robinson (2001). The theory identifies the role of institutions and geography in financial sector development. It put forward that initial endowments such as geographical factors and disease environment of a colony shaped the formation of initial institutions by colonisers. Acemoglu et al. (2001) note that institutions in former colonies are partly influenced by their colonisation experience. The endowment theory suggests that differences in initial endowments had influence on the establishment of initial institutions which have had an enduring effect on protection of private property rights and financial sector development (Beck et al., 2003a).

The endowment theory has three underlying assumptions. The first assumption is that different colonisation strategies adopted by the Europeans settlers (colonisers) led to the creation of different types of institutions in the colonies. In one case, European settlers in colonies such as Australia, Canada, New Zealand and United States formed institutions that gave protection for private property and provided checks against government power of expropriation while in another case,

Europeans migrated to extractive states like Congo and established institutions that took private property rights protection and checks against expropriation by the government with laxity, but which gives power to transfer resources from the colony to the coloniser with little or no investment (Acemoglu et al., 2001). The second assumption is that the adoption of colonisation strategy by the Europeans depends on the possibility of living in the colony. In areas which do not favour European settlement such as areas with high mortality rates due to the disease environment, Europeans tend to form extractive states (Acemoglu et al., 2001). Beck et al. (2003a) opine that Europeans are likely to settle in colonies with good living conditions. The last assumption is that the institutions formed during colonisation still exist long after independence. Beck et al. (2003a) show that initial endowments are more important than legal origins in explaining international differences in financial sector development and countries with poor geographical endowments are likely to have less developed banking sector. Studies such as Le et al. (2016), Filippidis and Katrakilidis (2014), Anayiotos and Toroyan (2009), and Law and Demetriades (2006) show that institutions explain financial sector development. This study hypothesizes that institutional quality enhances banking sector development in sub-Saharan African countries. Also, it hypothesizes that geographical endowments (latitude, land area, landlocked, and population density) determine banking sector development in sub-Saharan African countries. Specifically, based on the geographical endowments, this study expects that sub-Saharan African countries closer to the equator have greater propensity to have less developed banking sector. It also predicts that sub-Saharan African countries with larger land area have less developed banking sectors. In addition, this study envisages that landlocked countries in sub-Saharan Africa experience lower levels of banking sector development. Lastly, it expects that countries with higher population density have higher levels of banking sector development in sub-Saharan Africa.

2.1.2. Law and finance theory

The law and finance theory credited to La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998) emphasizes the role of law in financial sector development. The theory is in two parts. The first part focuses on legal systems. Countries where legal systems place high priority on creditor rights and effective contract enforcement has better developed financial sector (Levine, 1998, 1999; Levine et al., 2000). The second part identifies legal traditions/origins as the reason for cross-country difference in financial sector development. It put forth that countries whose legal traditions originate from common law are more financially developed than countries following the civil law tradition. However, Oto-Peralías and Romero-Ávila (2014) argue that common law countries do not have better developed financial sector than civil law countries when there is high levels of endowments. The law and finance theory put forward that common law countries provide stronger legal protection for investors than civil law countries (La Porta et al., 1997, 1998). Chong and Zanforlin (2000) identify that civil law countries are negatively associated with bureaucratic development, lack of corruption and credibility of governments.

Studies such as Levine (1998, 1999), Djankov, McLiesh, and Shleifer (2007), and Cooray (2011) provide empirical support for the law and finance theory. However, Fowowe (2014) partially oppose the law and finance theory by empirically showing that legal origin does not explain why banking sector development varies across African countries. This study expects that the quality of legal system improves banking sector development in sub-Saharan African countries. It is also expects that countries with British legal origin have better developed banking sector than countries with French legal origin in sub-Saharan Africa.

2.1.3. Interest group theory of financial development

The interest group theory of financial development, often referred to as the simultaneous openness hypothesis is a contribution of Rajan and Zingales (2003). The theory shows that interest groups, cross-border trade and capital inflows can influence financial sector development. It suggests that trade and financial openness are necessary to promote financial sector development. However, the theory argues that financial sector development would be limited when the economy is open to only trade or capital. In other words, a country's financial sector needs simultaneous opening of trade and capital borders for its development. Rajan and Zingales (2003) argue that financial sector development is as a result interest groups' stance on financial sector development. Interest groups, particularly incumbent firms often stand against financial sector development because potential competitors would gain entry into the domestic market due to greater financial access. Therefore, incumbent firms do not support financial sector development because it encourages competition. Incumbent firms in a closed economy benefit from low levels of financial sector development caused by financial repressive policies because access to finance by potential competitors would be limited (Hauner, Prati, & Bircan, 2013).

Incumbent firms' opposition reduces when trade and financial openness are simultaneously chosen (Rajan & Zingales, 2003). Baltagi et al. (2009) note that trade and financial openness do not only weaken incumbent firms' ability to oppose financial sector development, but they also provide incentives for them to change their opposing view. Studies such as Mahawiya (2015), Gwama (2014), Andrianaivo and Yartey (2010), Law (2009, 2007) lend strong support to Rajan and Zingales (2003) argument that financial sector development would be enhanced if trade and financial openness simultaneously take place. However, Asiama and Mobolaji (2011), and Baltagi et al. (2009) offer weak support. Based on Rajan and Zingales (2003), this study hypothesizes that simultaneous opening of trade and capital borders promotes banking sector development in sub-Saharan African countries. Also, it expects that trade and financial openness positively influence banking sector development in sub-Saharan African countries.

2.1.4. Financial liberalisation theory

The financial liberalisation theory otherwise referred to as the McKinnon-Shaw hypothesis was put forth by McKinnon (1973) and Shaw (1973). It suggests that financial

liberalisation is a prerequisite for financial sector development which resultantly leads to economic growth. The theory points out that high and positive real interest rates would increase domestic savings which in turn increase the amount of loanable funds available for investment. McKinnon (1973) and Shaw (1973) view financial repression (administrative control of the financial sector) inhibits financial sector development. Financial repression causes market disequilibrium and limits the allocative efficiency function of the financial market (Andersen & Tarp, 2003).

In a financially repressed economy, firms are likely to face financing constraints due to limited access to external finance and credit controls. Laeven (2003) observes that financing constraints faced by small firms during the financial repression regime reduced following financial liberalisation while large firms experienced higher financing constraints due to financial liberalisation. Rajan and Zingales (2003) contend that the stimulating effect of financial liberalisation on financial sector development is conditioned by economic openness—trade and financial openness. In another stance, Ito (2006) is of the opinion that financial liberalisation spurs financial sector development provided a threshold level of legal development has been reached. Studies such as Baltagi et al. (2009), and Law and Habibullah (2009) offer evidence to show that the financial sector develops due to the liberalisation of the financial sector. Also, Andrianaivo and Yartey (2010), Ang (2008), and Ang and McKibbin (2007) show that financial repressive policies hinder financial sector development. Conversely, Khalaf and Sanhita (2009) shows that financial liberalisation does not promote financial sector development. In tandem with the McKinnon-Shaw hypothesis, this study hypothesizes that financial liberalisation fosters banking sector development in sub-Saharan African countries.

2.1.5. Demand-following hypothesis.

The demand-following or growth-led finance hypothesis pioneered by Robinson (1952) states that increase in the growth of an economy leads to increase in the demand for financial services by the real sector, thus resulting to financial sector development. Growth in demand for financial services is determined by the growth in the real sector (Arestis & Demetriades, 1997). Studies such as Akinlo and Egbetunde (2010), Odhiambo (2008), and Liang and Teng (2006) offer evidence to uphold the demand-following hypothesis contrary to Chang and Caudill (2005), Christopoulos and Tsionas (2004), and Chang (2002). This study conjectures that economic growth promotes banking sector development in sub-Saharan African countries.

2.1.6. Inflation and finance theory

Huybén and Smith (1999) developed a theoretical model to show that a negative relationship subsists between inflation and finance. They argue that increase in inflation causes banks to ration credit and reduces the real rate of return on equity and these lead to fall in financial market activity. A shallower and less efficient financial market is characterised by high inflation (Detragiache, Gupta, & Tressel, 2005). Rousseau and Wachtel

(2002) argue that high inflation discourages banks to provide finance on long-term basis and it reduces banks' ability to increase allocation of resources. The ability for finance to promote economic growth reduces in the presence of high inflation (Rousseau & Yilmazkuday, 2009; Yilmazkuday, 2011). Boyd et al. (2001) empirically show that the relationship between inflation and finance is nonlinear and inflation has a threshold effect. Studies such as Kim and Lin (2010), Khan, Seuhadji, and Smith (2006), and Rousseau and Wachtel (2002) also support the threshold effect of inflation on finance. This study expects that inflation undermines banking sector development in sub-Saharan African countries.

2.2. Potential determinants of banking sector development

The potential determinants of banking sector development as identified from empirical studies include but not limited to those discussed in this study.

2.2.1. Institutions

The endowment theory propounded by Acemoglu et al. (2001) identifies the role of institutions in banking sector development. Institutions have been widely identified as a key determinant of banking sector development in empirical studies. Recent studies show that improving the quality of institutions would promote banking sector development (Allen et al., 2014; Baltagi et al., 2009; Cherif & Dreger, 2016; Falahaty & Law, 2013; Filippidis & Katrakilidis, 2014; Law & Azman-Saini, 2012; Le et al., 2016; Luca & Spatafora, 2012). North (1990) describes institutions as rules established by humans to guide exchanges among them and they are the prime cause of economic development. Huang (2010a) says that the supply side of financial sector development tends to be greatly influenced by institutions. This connotes that the quality of banks in the financial sector is dependent on the quality of institutions. The quality of institutions reflects in the financial sector in the extent to which humanly developed rules result to increase in investor protection and ease of entrepreneurs' access to external financing (Herger, Hodler, & Lobsiger, 2008). Filippidis and Katrakilidis (2014) note that increase in the quality of institutions leads to increase in the efficiency of the financial market because it lowers transaction costs faced by economic agents. High quality of institutions promotes banking sector development (Law & Azman-Saini, 2012), whilst low quality of institutions limits banking sector development (Asiama & Mobolaji, 2011).

2.2.2. Law

A financial sector would develop if the right laws and institutions are present (Coyle & Turner, 2013). The impact of law on the financial sector has been widely researched from the two main parts of the law and finance theory developed by La Porta et al. (1997, 1998). The first part is the quality of legal systems and the second part is legal traditions/origins. The first part suggests that a legal system with institutions that provides strong investor protection and ensures effective contract

enforcement promotes banking sector development. This has been supported by Beck, Demirgüç-Kunt, and Levine (2001, 2003a, 2003b), Levine (1998, 1999), and Levine et al. (2000) which show that countries where there is existence of legal institutions that emphasize creditor rights and enforces contract effectively exist tend to have better developed banking sector compared to countries where such institutions are weak. Ayadi, Arbak, Naceur and De Groen (2013) document that the ability of legal institutions to promote banking sector development is contingent on good democratic governance and proper implementation of financial reforms. Miletkov and Wintoki (2009) show that the banking sector develops as the quality of legal system improves. The second part of the law and finance theory argues that common law tradition offers stronger legal protection to investors and support financial sector development than the civil law tradition (La Porta et al., 1997, 1998). They further argue that legal tradition is a reason for cross-country differences in financial sector development. Legal tradition is an important determinant of creditor rights (Djankov et al., 2007). Huang (2010a), and Beck et al. (2001, 2003a, 2003b) provide evidence consistent with the arguments of La Porta et al. (1997, 1998). Asongu (2012) finds that French civil law African countries enjoy greater efficiency in their banking sectors than countries with British legal origin. A recent study by Fowowe (2014) shows that legal origin does not explain cross-country differences in banking sector development in Africa.

2.2.3. Financial liberalisation

The financial liberalisation theory emerged from the independent works of McKinnon (1973) and Shaw (1973), hence it is otherwise referred to as the McKinnon-Shaw hypothesis. It argues that banking sector development is enhanced by financial liberalisation. A financial sector is said to be liberalised when government restrictions on financial activities are relaxed or eliminated, cross-border capital flows are permitted, and the interaction between the forces of demand and supply acts as the mechanism for price determination of financial services. In a financially repressed economy, government use restrictions and price distortions on the financial sector to increase public revenue via the financial sector and these are obstacles to financial sector development (Creane, Goyal, Moborak & Sab, 2004). Financial liberalisation can stimulate financial sector development by increasing the efficiency of the financial sector. However, financial liberalisation does not necessarily lead to an efficient financial sector. Ghosh (2005) states that financial liberalisation has led to an increase in financial crises in developing economies. Evidence shows that higher levels of financial liberalisation tend to make the banking sector prone to crises (Ahmed, 2013; Demirgüç-Kunt & Detragiache, 1998; Fowowe, 2010). However, Beck, Demirgüç-Kunt and Levine (2006) argue that countries with lesser regulatory restrictions on banking activities are less prone to crises. Atiq and Haque (2014) observe that the beneficial role of financial sector development in economic growth reduces as financial liberalisation increases. Ahmed (2013) documents financial liberalisation promotes banking sector development in sub-Saharan African countries.

It also shows that financial liberalisation stimulates banking sector development subject to quality of institutions, human capital, and trade openness. There is evidence in support of the stimulating effect of financial liberalisation on banking sector development (Bhetuwal, 2007; Demirgüç-Kunt & Detragiache, 1998; Law & Habibullah, 2009).

2.2.4. Macroeconomic factors

The macroeconomic factors that have been widely identified as determinants of banking sector development are openness to trade and capital, economic growth, inflation, remittances, income level, and government size.

Openness is the extent to which an economy allows trade and capital across its borders. Rajan and Zingales (2003) postulated the interest group theory of financial sector development, otherwise known as the simultaneous openness hypothesis which identifies openness—trade and financial openness—as a determinant of banking sector development. The theory posits that openness would lead to banking sector development when the economy does not choose trade openness or financial openness in isolation of each other. Put differently, financial sector development occurs when an economy is simultaneously open to both trade and capital. However, this is in contradiction to the sequencing process of financial liberalisation which suggests that an economy should be open to trade before eliminating capital inflow controls (Ito, 2006; McKinnon, 1991). Chinn and Ito (2006) finds that trade openness is needed before financial openness. David et al. (2014) observe that trade openness plays a greater role in financial sector development than financial openness in sub-Saharan African countries with better institutions. Andrianaivo and Yartey (2010) claim that trade openness would negatively affect banking sector development in financially repressed economies in sub-Saharan Africa. Calderón and Kubota (2009) show that the positive impact of financial openness on banking sector development is influenced by the level of institutional quality, quality of the legal system, and degree of trade openness. Law and Demetriades (2006) contend that openness matter more for banking sector development in middle-income countries than low-income countries. Studies showing that trade and financial openness influence banking sector development include Mahawiya (2015), Andrianaivo and Yartey (2010), Baltagi et al. (2009), Chinn and Ito (2006), and Law and Demetriades (2006).

The endogenous growth models argue that financial sector development is crucial for economic growth. However, Robinson (1952) pioneered the argument that economic growth is important for financial sector development. This connotes that financial sector development may not be strictly exogenous in an endogenous growth model. Robinson (1952) view is widely referred as the demand-following hypothesis. This hypothesis counters Schumpeter (1911) earlier view that real sector growth is led by financial sector development. It argues that real sector growth would make enterprises demand for more and improved financial services, hence leading to financial sector development. The implication of this argument is that economic growth is a potential determinant of banking sector development. Goldsmith (1969) documents that the banking sector tends to

develop as the economy grows. There is a strand of empirical literature on the finance-growth nexus supporting the demand-following hypothesis—causality from economic growth to banking sector development with no feedback response (Liang & Teng, 2006; Odhiambo, 2008). This suggests that banking sector development can be driven by economic growth. Recent studies confirm that economic growth positively influence banking sector development (Ahmed, 2013; Falahaty & Law, 2013; Filippidis & Katrakilidis, 2014; Le et al., 2016).

Inflation is the sustained and persistent rise in the general price level in an economy and it indicates the level of macroeconomic stability. Theoretically, increase in inflation rate tends to reduce financial sector activity (Huybens & Smith, 1999). Boyd et al. (2001) show that inflation has a negative effect on banking sector development, however, the effect reduces when inflation reaches a threshold level of 15%. They also find a nonlinear relationship between inflation and banking sector development. Rousseau and Wachtel (2002) find inflation mitigates banking sector development when inflation rate falls below a threshold of about 15%–20%. David et al. (2014), and Ayadi, Arbak, Naceur, and Groen (2013) discover that inflation adversely impacts on banking sector development in the sub-Saharan African and Mediterranean countries respectively. Ayadi et al. (2013) further reveal that the adverse impact of inflation on banking sector development becomes lesser when capital borders are open. The negative relationship between inflation and banking sector development is evident in many empirical studies (Aggarwal, Demirgüç-Kunt, & Peria, 2011; Ahmed, 2013; Allen et al., 2014; Andrianaivo & Yartey, 2010; Detragiache et al., 2005; Djankov et al., 2007; Dutta & Mukherjee, 2011; Filippidis & Katrakilidis, 2014; Gwama, 2014; Mahawiya, 2015; Naceur, Cherif, & Kandil, 2014).

Remittances can boost banking sector development, especially in developing countries where financial services are limited. They are funds transferred via financial institutions from one country to another country, which allow recipients to demand or have access to alternative financial services and products (Orozco & Fedewa, 2005). Guiliano and Ruiz-Arranz (2009) document that remittances stimulate growth of economies with less developed financial sectors by providing alternatives to finance investment and alleviating liquidity constraints. Remittances increase the volume of deposits and credit in developing economies (Aggarwal et al., 2011). Cooray (2012) finds that remittances deepen the banking sector but hinder the efficiency of the banking sector. Remittances promote banking sector development in African countries (Andrianaivo & Yartey, 2010; Coulibaly, 2015; Gupta, Pattillo, & Wagh, 2009; Gwama, 2014).

Income level reflects the developmental stage of an economy as well as measures the living standard of people in a country. The World Bank categorises countries into four income levels namely: high, upper-middle, lower-middle, and low-income countries. Income level has been commonly captured in empirical research using gross domestic product (GDP) per capita or gross national income (GNI) per capita. Income level is one of the reasons that have been identified in empirical literature for cross-country differences in banking sector

development. High income (developed) countries experience greater levels of banking sector development than other income groups (Beck, Demirgüç-Kunt & Levine, 2009; Demirgüç-Kunt & Levine, 1999). Levine (1997) reveals that real GDP per capita is positively correlated with banking sector development measures, thus presaging that increase in income would increase banking sector development. Recent research presents evidence to support this finding (Allen et al., 2014; Andrianaivo & Yartey, 2010; David et al., 2014; Falahaty & Law, 2013; Law & Habibullah, 2009; Le et al., 2016; Ozkok, 2015).

2.2.5. Geography

The endowment theory identifies the role of geography in banking sector development. Geography endowments explain cross-country variations in banking sector development (Allen et al., 2014; Beck et al., 2003a, 2001; Kodila-Tedika, Asongu, & Cinyabuguma, 2016). Huang (2010a) argues that geography may influence both the demand and supply side of financial sector development. Geographical endowments of a country such as absolute distance to the equator (latitude), land area, poor accessibility to coast and river navigable to the ocean (landlocked), and population density are probable determinants of banking sector development. Countries closer to the equator tend to have lower levels of banking sector development (Beck et al., 2003a). Huang (2010a) asserts that countries with larger land area tend to witness lower levels of financial sector development. Landlocked countries have limited access to water transportation by ocean and this may adversely affect banking sector development due to lesser access to external trade or higher transportation cost of goods compared to countries not landlocked. Allen et al. (2014) find that population density is more crucial for banking sector development in African countries than countries in other parts of the world. They argue that low population density in some African countries is the reason for their less developed banking sector.

2.2.6. Other potential determinants

Democracy can lead to higher levels of banking sector development (Dutta & Mukherjee, 2011; Girma & Shortland, 2008; Huang, 2010a, 2010b; Yang, 2011). It is a measure of the quality of a country's political institutions/environment. Ayadi et al. (2013) observe that good democratic governance coupled with sound implementation of financial reforms and strong legal system enhance banking sector development in the Mediterranean region. Democracy promotes banking sector development in countries with better institutions (Boudriga & Ghardallou, 2012; Huang, 2010a). Haber and Perotti (2008) argue that higher levels of democratic governance can lead to higher levels of banking sector development.

Government is also a determining factor for development of the banking sector (Ayadi et al., 2013; Cooray, 2011; Naceur et al., 2014). Literature identifies two perspectives—development and political—which explain how government can influence banking sector development. The development perspective was put forth by Gerschenkron (1962) and the political perspective was posited by Kornai (1979). The development perspective suggests that government participation in

countries that are backward can lead to banking sector development by reducing market failures and promoting market access. In contrast, the political perspective argues that government participation in the banking sector limits its development by increasing inefficiency among banks due to lower competition. Banking sector development is likely to be limited when governments increase their market power because of the disincentive effects of taxes, increased rent seeking and the crowding out effect on private investment (Cooray, 2011). La Porta, Lopez-de-Silanes, and Shleifer (2002) show that banking sector development becomes slower with increased government ownership of banks. This finding is corroborated by Barth, Caprio, and Levine (2004). Cooray (2011) uncovers government size measured by government expenditure as a share of GDP and government ownership of banks as an obstacle to banking sector efficiency. However, Detragiache et al. (2005) find that increased government ownership of banks in developing countries increases deposit mobilisation and efficiency in the banking sector.

Culture explains international differences in banking sector development (Dutta & Mukherjee, 2011; Herger et al., 2008). Guiso, Sapienza, and Zingales (2006) define culture as “customary beliefs and values that ethnic, religious, and social groups transmit fairly unchanged from generation to generation”. It is composed of certain values which shape an individual's behaviour and perception of the world (Hofstede & Bond, 1988). This suggests that an individual's decision-making process relating to finance can be influenced by culture. Stulz and Williamson (2003) argue that culture affects resource allocation. This implies that cultural beliefs shape individual's ability to save for future use and invest for future returns. This is related to uncertainty avoidance—one of dimensions of culture—identified by Hofstede (2001). Uncertainty avoidance shows the extent to which members of a cultural group are unwilling to tolerate ambiguity/unknown events. Kwok and Tadesse (2006) argue that countries with higher uncertainty avoidance tend to have bank-based financial systems. Dutta and Mukherjee (2011) provide evidence that uncertainty avoidance is negatively associated with banking sector development. Stulz and Williamson (2003) show that differences in culture measured by differences in religion and language account for variation in protection and enforcement of creditor rights among countries, but it is conditioned by the extent to which a country is open to external trade. Easterly and Levine (1997) argue that the underdeveloped nature of financial sectors in sub-Saharan African countries is due to high ethnic diversity. Ethnic diversity tends to negatively impact on banking sector development (Beck et al., 2003a; Boudriga & Ghardallou, 2012). Renneboog and Spaenjers (2012) contend that religion influences financing decisions. Less religious countries have higher levels of banking sector development than countries that are more religious (Beck et al., 2003a). This is because religious countries tend to be risk averse and the unwillingness to assume risk may stifle banking sector development. Cooray (2011) finds that religion is negatively related to banking sector development.

Meisenberg and Lynn (2011) argue that human capital is a direct cause of institutional development and economic outcomes. Meisenberg (2012) shows that human capital is

positively correlated to economic growth, economic freedom, education, democracy, population density and government size. Therefore, human capital is a possible determinant of banking sector development. Human capital reflects the risk management capability of a country and it is a proxy for social institutions. Kodila-Tedika and Asongu (2015) note that human capital in form of proficient or skilled personnel can promote bank stability. Recent empirical studies show that human capital fosters banking sector development (Cooray, 2011; Filippidis & Katrakilidis, 2014; Kodila-Tedika & Asongu, 2015; Ozkok, 2015). Allen et al. (2014) argue that the lack of ability to manage risk is detrimental to banking sector development. They show that human capital is positively correlated with banking sector development in Africa.

3. Methodology

3.1. Model specification

This study built a model underpinned by the endowment theory, law and finance theory, simultaneous openness hypothesis, McKinnon-Shaw hypothesis, demand-following hypothesis, and inflation and finance theory. The dependent variable lagged by one year was included as a regressor in order to introduce dynamism in the model. The lagged dependent variable allows for partial adjustment of the dependent variable to its long-run equilibrium (Baltagi et al., 2009). It was also included because banking sector development tends to depend on its own past realisations. Also, control variables were incorporated into the model to control for the effect of income level, remittances, democracy, government, culture, and human capital. The control variables included in the model have been identified in empirical studies to account for cross-country differences in banking sector development associated with income level, remittances, democracy, government, culture, and human capital. The dynamic panel data model specification is:

$$\begin{aligned} BSD_{it} = & \beta_1 BSD_{it-1} + \beta_2 Institutional\ Quality_{it} + \beta_3 Latitude_i \\ & + \beta_4 Land\ Area_i + \beta_5 Landlocked_i + \beta_6 Population \\ & Density_{it} + \beta_7 Legal\ System_{it} + \beta_8 British\ Legal\ Origin_i \\ & + \beta_9 French\ Legal\ Origin_i + \beta_{10} Trade\ Openness_{it} \\ & + \beta_{11} Financial\ Openness_{it} + \beta_{12} Trade\ Openness \\ & * Financial\ Openness_{it} + \beta_{13} GDP\ Growth_{it} \\ & + \beta_{14} Inflation_{it} + \beta_{15} Income\ Level_i + \beta_{16} Remittances_{it} \\ & + \beta_{17} Democracy_{it} + \beta_{18} Government\ Size_{it} \\ & + \beta_{19} Ethnic\ Diversity_i + \beta_{20} Religion_i \\ & + \beta_{21} Human\ capital_i + \mu_i + \varepsilon_{it} \end{aligned} \quad (1)$$

where BSD is banking sector development measured by a composite index, μ is the unobserved country-specific effect, and ε is error term. The subscripts i and t indicate country and

time period respectively. In order to avoid dummy variable trap, the constant term was not included in the model.

For robustness checks, this study regressed alternative measures of banking sector development on the regressors in Equation (1). A common measure of depth, efficiency, and stability of banking sector were used. Depth, efficiency, and stability were proxied by private credit to GDP, net interest margin, and bank Z-score respectively.

3.2. Population and sample size

The population for this study comprises of the 49 countries in sub-Saharan Africa region and the sample consists of 25 countries selected on the basis of data availability (see Appendix 1). The sample represents approximately 51% of the population.

3.3. Description of variables and data source

Banking Sector Development: This is a composite index constructed from various indicators of banking sector development using the Principal Component Analysis (PCA). PCA involves the transformation of a number of correlated set of variables into a smaller number of uncorrelated variables. It reduces a set of observed variables into principal components which as much as possible retain information from the original set of variables. Three dimensions of banking sector development were considered for the index construction—depth, efficiency, and stability. The depth measures are private credit by deposit money banks to GDP, liquid liabilities to GDP, bank deposits to GDP, central bank assets to GDP, deposit money banks' assets to GDP, and deposit money bank assets to deposit money bank assets and central bank assets. The efficiency measures are net interest margin, noninterest income to total income, overhead costs to total assets, and cost to income ratio. The stability measures are bank Z-score, bank credit to bank deposits, and liquid assets to deposit and short term funding. Data on all the measures were obtained from the Global Financial Development Database (GFDD) developed by Cihák et al. (2013). Using the original form of the measures of banking sector development, the first principal component was extracted as the composite index of banking sector development (see Appendix 2 for summary statistics of the first principal components).

Institutional Quality: This reflects the quality of governance and it is a proxy for economic institutions. It was proxied by the KKM index developed by Kaufmann, Kraay, and Mastruzzi (2009). The KKM index is based on six governance indicators namely: voice and accountability, political stability and absence of violence/terrorism, government effectiveness, regulatory quality, rule of law, and control of corruption. Similar to studies such as Le et al. (2016), and Luca and Spatafora (2012), the arithmetic mean of the six indicators was used to measure institutional quality. On each indicator, countries score a value between 0 and 100, obtained using the percentile ranking method. The indicators were sourced from World Governance Indicators (WGI) database.

Geographical Endowments: These are factors that show the geographical features of a country. The factors considered

in this study include latitude, land area, landlocked, and population density.

- i. Latitude is the absolute distance value of a country to the equator. Countries closer to the equator are more tropic. Countries closer to the equator have inhospitable environments and this led to the formation of extractive states by the European colonisers (Acemoglu et al., 2001). The latitude for each country, scaled to take a value between 0 and 1, was obtained from La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1999).
- ii. Land area represents the size of a country measured in square kilometres (km^2). The land area for each country was sourced from the Global Development Network (GDN) database and its natural logarithm (Ln) transformation was used.
- iii. Landlocked is a dummy variable which assigns 1 to a country with no coastal access and 0 otherwise. It was obtained from the GDN database. There are 10 landlocked countries in the sample.
- iv. Population density is the number of people per square kilometre of land area. It was obtained from the WDI database and used in natural logarithm (Ln) form.

Legal System: This reflects the quality of the legal environment and it was proxied by the Property Rights Index (PRI). This index shows the extent to which the legal environment protects the rights of property owners. It is constructed from five indicators namely: judicial independence, impartial courts, intellectual property protection, military interference in the rule of law, and integrity of the legal system. The PRI was obtained from the Heritage Foundation database.

Legal Origin: It indicates whether a country is practising the British common or French civil law tradition. Legal origin is a dummy variable sourced from La Porta et al. (1999). There are 12 British common law countries and 13 French civil law countries in the sample.

Trade Openness: This shows the degree to which a country is open to external trade and it is calculated as the ratio of the imports plus exports to GDP. It was obtained from the World Development Indicators (WDI) database.

Financial Openness: This was measured by the Chinn and Ito index (KAOPEN) which shows the extent to which a country allows capital flows. It is also a proxy for financial liberalisation. The index is a *de jure* measure based on information reported in the *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)* published by the International Monetary Fund (IMF). This index was preferred to *de facto* measures of financial openness such as Lane and Milesi-Ferretti (2007) financial openness index because it was constructed based on regulatory restrictions imposed by each country on capital flows. It was sourced from Chinn and Ito (2006).

Interaction of Trade Openness and Financial Openness: This is the multiplication of the trade openness and financial openness variables. The interaction term takes trade and financial openness as complements.

Economic Growth: It was measured by GDP growth rate which represents the percentage change in gross domestic product and it is a proxy for demand financing. It is widely believed that countries with higher growth rate demand for more finance. It was obtained from WDI database.

Inflation: It is the rate at which the general price level of goods and services changes in an economy. It was measured by annual growth of the GDP deflator obtained from the WDI database.

Income Level: It is a proxy for the stage of development of an economy and it was measured by initial (1997) GDP per capita based on Purchasing Power Parity (PPP), taken in natural logarithm (ln). The data was obtained from the WDI database.

Remittances: It is measured by the ratio by sum of current transfers by migrant workers and wages and salaries received by nonresident employees to GDP. It was obtained from the WDI database.

Democracy: This measures the quality of political institutions and it is proxied by POLITY2 index. The democracy index is calculated by subtracting the autocracy score from the democracy score. Countries score from –10 to 10 and the higher the score, the more democratic a country is. POLITY2 was obtained from the POLITY IV database.

Government: This reflects the fiscal pressures exerted by the government on the economy. This was measured by government size. Government size is proxied by the ratio of government expenditure to GDP and was obtained from the WDI database.

Culture: It captures the cultural characteristics of a country. Culture was assessed from two dimensions namely ethnic diversity and religion.

- i. Ethnic diversity shows the number of ethnic groups in a country. Several studies measure ethnic diversity using an ethnic fractionalization index. This study used Posner (2004) Politically Relevant Ethnic Groups (PREG) index developed for African countries. The PREG index is preferred to other measures of ethnic diversity because it considers only ethnic groups that can influence a country's macroeconomic policies.
- ii. Religion was proxied by the religion fractionalization index developed by Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg (2003). The index measures the probability that any two randomly chosen individuals of a country would belong to different religious groups.

Human Capital: It is the cognitive and non-cognitive resources possessed individually and collectively in a country. It was measured by the human capital index constructed by Meisenberg and Lynn (2011). The index is calculated as weighted average of School Achievement (SA) relative and Intelligent Quotient (IQ). SA relative is SA scaled to the IQ measurement. (see Table 1).

3.4. A priori expectation

Table 1
A priori expectation.

Variable	Expected outcome	Empirical studies
Institutional quality	Positive (+)	Le et al. (2016), Allen et al. (2014), Law and Azman-Sajni (2012)
Latitude	Positive (+)	Fowowe (2014), Beck et al. (2003a), Beck et al. (2003b)
Land area	Negative (–)	Huang (2010a)
Landlocked	Positive (+)	Huang (2010a)
Population density	Positive (+)	Allen et al. (2014)
Legal system	Positive (+)	Filippidis and Katrakilidis (2014), Beck et al. (2001), Levine et al. (2000)
British legal origin	Negative (–)	Beck et al. (2003b), Beck et al. (2001), Levine et al. (2000)
French legal origin	Negative (–)	Beck et al. (2003a), Beck et al. (2001), Levine et al. (2000)
Trade openness	Positive (+)	Le et al. (2016), David et al. (2014), Andrianaivo and Yartey (2010)
Financial openness/ liberalisation	Positive (+)	Kodila-Tedika and Asongu (2015), Baltagi et al. (2009), Law and Demetriades (2006)
Trade openness *Financial openness	Positive (+)	Mahawiya (2015), Ahmed (2013), Andrianaivo and Yartey (2010), Law and Demetriades (2006)
Inflation	Negative (–)	Fowowe (2014), Andrianaivo and Yartey (2010), Boyd et al. (2001)
Income level	Positive (+)	Allen et al. (2014), David et al. (2014), Boyd et al. (2001)
Remittances	Positive (+)	Cooray (2012), Andrianaivo and Yartey (2010), Gupta et al. (2009)
Democracy	Positive (+)	Filippidis and Katrakilidis (2014), Dutta and Mukherjee (2011), Huang (2010b)
Government	Negative (–)	Naceur et al. (2014), Cooray (2011)
Ethnic diversity	Negative (–)	Beck et al. (2003a), Beck et al. (2001)
Religion	Negative (–)	Cooray (2012), Cooray (2011), Huang (2010a)
Human capital	Positive (+)	Kodila-Tedika and Asongu (2015), Philippidis and Katrakilidis (2014), Cooray (2011)

Source: Authors' compilation

3.5. Estimation procedure

This study utilised a panel dataset which exploits both the time series and cross-section dimensions of data. Few missing gaps in the dataset were filled using the interpolation method. Averaging data over fixed intervals is a common practice in cross-country regression analysis (for example, Allen et al., 2014; Ayadi et al., 2013; Beck et al., 2001; Estrada et al., 2010). It smoothens out business cycle fluctuations and helps to reduce the influence of outliers. This study computed

average data over 3-year periods between 1997 and 2014 which corresponds to 1997–1999, 2000–2002, 2003–2005, 2006–2008, 2009–2011, and 2012–2014. Therefore, the estimation was performed using six data points for each country in the sample.

The dynamic panel data model was estimated using the dynamic panel Generalized Method of Moments (GMM) estimator. This estimator is appropriate when the number of cross-sectional units (N) exceeds the time period (T). The dynamic panel GMM estimator uses variables that are orthogonal to the error term as instruments. It is capable of controlling for unobserved individual heterogeneity, endogeneity problem, Nickell bias, simultaneity bias/reverse causality, measurement error, omitted variable bias, and heteroskedasticity. The dynamic panel GMM estimator was first proposed by Arellano and Bond (1991) using only first difference series as instruments and it is known as the first difference GMM estimator. It was later extended by Blundell and Bond (1998) to use level and first difference series as instruments and it is referred to as the system GMM estimator or Blundell-Bond GMM estimator. This study employed the system GMM estimator because it is superior to first difference GMM estimator. The first difference GMM estimator performs poorly when the time series are persistent because lagged levels of the series provide only weak instruments for subsequent first difference series (Bond, Hoeffler, & Temple, 2001). The system GMM estimator utilises the level and first difference series to overcome the problem of weak instruments, thus providing more efficient estimates. This study largely relied on the results of the two-step system GMM estimator because it has been argued that it produces more asymptotic efficient estimates than one-step system GMM estimator, particularly in the presence of heteroskedasticity. However, the one-step system GMM estimator is capable of producing consistent estimates. The two-step GMM estimator computes corrected standard errors based on Windmeijer (2005) finite sample correction method while the one-step GMM estimator produces robust standard errors, which are both heteroskedasticity-consistent.

According to Blundell, Bond, and Windmeijer (2001), the system GMM estimator is based on relatively slight restrictions on the initial condition process and is considerably asymptotically efficient. The validity of the instruments used was confirmed by the Hansen test for over-identifying restrictions. An instrument is valid if it is strictly exogenous (i.e. uncorrelated with the error term). Failure to reject the null hypothesis for the Hansen test implies that the model has not been wrongly specified. Roodman (2009a) notes that the Hansen test statistic performs better than the Sargan test statistic when the disturbances/residuals in the model are susceptible to non-sphericity (i.e. heteroskedasticity or autocorrelation). The presence of first order autocorrelation and absence of higher order autocorrelation are expected for the estimation to be valid. Roodman (2009b) warns against instrument proliferation in dynamic panel GMM estimation and advises the number of instruments should be kept below the number of groups (units).

4. Results and discussion

4.1. Model estimation

This study regressed the composite index of banking sector development on potential determinants and estimated the model using the two-step system GMM estimator.

Table 2 shows that the statistical significance of the one-period lagged dependent variable justifies the introduction of dynamism into the model and the use of a dynamic panel estimator. Without controlling for the effect of income level, remittances, democracy, government, culture, and human capital, only population density and interaction of trade openness and financial openness show a significant positive impact on banking sector development while financial openness has a significant negative impact. When the controls are included in the model, the impact of financial openness and interaction of trade openness and financial openness remain consistent, but the positive impact of population density fizzles out.

The impact of financial openness and interaction of trade openness and financial openness on banking sector development is higher with the introduction of controls. Financial openness becomes more detrimental while the interaction of trade openness and financial openness become more beneficial. The model diagnostics confirms that the models are valid. As

Table 2
Banking sector development estimation results.

	Without controls	With controls
Composite index of BSD _{t-1}	0.86 (0.10)*	0.85 (0.10)*
Institutional quality	−0.002 (0.006)	−0.01 (0.01)
Latitude	0.09 (0.26)	0.25 (0.42)
Land area	−0.05 (0.04)	−0.06 (0.11)
Landlocked	−0.06 (0.12)	−0.33 (0.22)
Population density	0.08 (0.04)***	0.13 (0.11)
Legal system	−0.003 (0.01)	−0.002 (0.01)
British legal origin	1.06 (0.80)	3.33 (2.76)
French legal origin	0.88 (0.72)	3.06 (2.62)
Trade openness (TO)	−0.003 (0.002)	−0.003 (0.003)
Financial openness (FO)	−0.31 (0.01)*	−0.25 (0.12)**
TO × FO	0.004 (0.001)*	0.005 (0.002)*
GDP growth	−0.02 (0.04)	−0.014 (0.05)
Inflation	−0.02 (0.02)	−0.014 (0.02)
Income level		0.03 (0.17)
Remittances		−0.002 (0.01)
Democracy		0.0003 (0.02)
Government size		0.01 (0.02)
Ethnic diversity		−0.74 (0.57)
Religion		−0.23 (0.75)
Human capital		−0.03 (0.02)
Model Diagnostics		
AR (1)	−3.20 [0.001]*	−3.18*[0.001]
AR (2)	−1.39 [0.165]	−1.39 [0.165]
Hansen test	0.08 [0.775]	0.25 [0.615]
Wald χ^2	163.97 [0.000]*	371.35 [0.000]*
No. of Instruments	15	22
No. of Groups	25	25

Notes: *, ** and *** indicate statistically significant at 1%, 5% and 10% significance level respectively. Also, standard errors and p-values are reported in () and [] respectively.

Source: Authors' computation

expected, the null hypothesis of no first-order autocorrelation is rejected at 1% significance level while no second-order autocorrelation is not rejected. The Hansen test fails to reject the null hypothesis of overidentifying restrictions. This implies that the instruments satisfy the orthogonality condition (i.e. they are uncorrelated with the error term) and this confirms that the instruments are valid. The validity of the instruments suggests that the models are correctly specified. The Wald χ^2 indicates that the models are statistically significant at 1% significance level and this implies that the variables specified in the models are jointly significant. The number of instruments does not exceed number of cross-sectional units (groups) in both models, thus informing that the models do not suffer from 'too many instruments' problem.

4.2. Robustness checks

The robustness checks were performed using three alternative measures of banking sector development. The alternative measures are private sector credit/GDP, net interest margin, and Z-score which are commonly used proxy for depth, efficiency, and stability of the banking sector respectively.

The robustness checks implicitly showed the determinants of banking sector depth, efficiency, and stability.

Table 3 indicates that none of the variables influence banking sector depth with the exemption of controls. However, institutional quality, population density, and trade openness positively influence banking sector depth when the controls are incorporated. Ignoring controls, latitude and trade openness has a negative effect on banking sector efficiency. Accounting for the effect of the controls, law (legal system, British legal origin, and French origin) and inflation become positively related to banking sector efficiency. British legal origin exerts a greater influence on banking sector efficiency than French legal origin. Also, the negative impact of latitude lessens whilst trade openness become insignificant. Among the controls, income level, ethnic diversity, and religion determine banking sector efficiency, with religion as the only positive determinant. Land area, law (legal system, British legal origin, and French legal origin), financial openness, economic growth, and inflation influence banking sector stability in the absence of controls.

With the exemption of law, all these factors negatively affect banking sector stability. In the presence of controls, only

Table 3
Robustness checks results^a.

	Private credit/GDP		Net interest margin		Z-score	
	Without controls	With controls	Without controls	With controls	Without controls	With controls
Dependent variable _{t-1}	1.07 (0.12)*	0.97 (0.09)*	0.63 (0.17)*	0.47 (0.12)*	0.29 (0.12)*	0.41 (0.18)**
Institutional quality	0.05 (0.04)	0.10 (0.03)*	0.006 (0.02)	−0.02 (0.01)	−0.03 (0.02)	−0.01 (0.03)
Latitude	−0.70 (1.50)	−0.800 (1.53)	−1.72 (0.77)**	−2.49 (1.38)***	−1.28 (2.63)	−0.08 (3.33)
Land area	0.15 (0.39)	−0.09 (0.53)	0.005 (0.14)	−0.34 (0.22)	−0.79 (0.30)*	−0.71 (0.89)
Landlocked	0.62 (1.14)	−1.47 (0.90)	0.33 (0.42)	−0.28 (0.58)	−0.21 (0.90)	0.95 (1.54)
Population density	0.36 (0.38)	0.92 (0.40)**	0.13 (0.14)	−0.12 (0.24)	0.25 (0.29)	0.18 (0.78)
Legal system	−0.05 (0.04)	−0.04 (0.04)	−0.004 (0.01)	0.03 (0.02)***	0.06 (0.04)***	0.04 (0.03)
British legal origin	−3.76 (5.00)	2.35 (12.52)	2.86 (2.92)	21.42 (4.74)*	14.31 (6.65)**	−0.63 (16.60)
French legal origin	−2.16 (5.01)	3.47 (12.12)	2.18 (2.60)	19.70 (4.66)*	11.98 (5.96)**	−2.26 (15.57)
Trade openness (TO)	0.01 (0.02)	0.03 (0.01)**	−0.02 (0.01)**	−0.004 (0.01)	0.02 (0.01)	0.01 (0.02)
Financial openness (FO)	−0.03 (0.66)	−0.01 (0.81)	0.25 (0.33)	0.30 (0.39)	−2.47 (0.70)*	−2.05 (0.97)**
TO × FO	0.01 (0.01)	0.01 (0.01)	−0.005 (0.004)	−0.002 (0.01)	0.03 (0.01)*	0.02 (0.01)
GDP growth	−0.06 (0.10)	−0.06 (0.09)	−0.02 (0.07)	−0.04 (0.07)	−0.14 (0.08)***	−0.09 (0.09)
Inflation	0.02 (0.04)	0.02 (0.04)	0.05 (0.03)	0.05 (0.03)**	−0.16 (0.05)*	−0.14 (0.08)***
Income level		0.19 (0.54)		−1.13 (0.33)*		0.43 (0.99)
Remittances		−0.08 (0.07)		−0.04 (0.03)		−0.07 (0.05)
Democracy		−0.19 (0.12)		0.02 (0.04)		−0.03 (0.11)
Government size		0.16 (0.11)		−0.06 (0.04)		0.04 (0.07)
Ethnic diversity		1.53 (3.02)		−2.48 (1.04)**		1.13 (2.96)
Religion		−3.98 (3.24)		2.62 (1.42)***		1.64 (5.81)
Human capital		−0.09 (0.13)		−0.05 (0.06)		0.11 (0.13)
Model Diagnostics						
AR (1)	−1.78 [0.074]***	−1.68 [0.092]***	−2.59 [0.009]*	−2.90 [0.004]*	−1.95 [0.051]***	−1.78 [0.074]***
AR (2)	−1.25 [0.213]	−1.37 [0.170]	−1.00 [0.319]	−1.16 [0.245]	−0.13 [0.897]	0.13 [0.894]
Hansen test	0.02 [0.881]	0.11 [0.739]	0.81 [0.369]	0.03 [0.865]	3.06 [0.216]	3.24 [0.198]
Wald χ^2	47.018.36 [0.000]*	468.784 [0.000]*	6073.48 [0.000]	19,043.49 [0.000]	1496.44 [0.000]	10,661.73 [0.000]*
No. of Instruments	16	22	15	22	16	23
No. of Groups	25	25	25	25	25	25

Notes: *, ** and *** indicate statistically significant at 1%, 5% and 10% significance level respectively. Also, standard errors and p-values are reported in () and [] respectively.

^a The results of the two-step system GMM estimator are reported except for Z-score (without controls) results which was provided by the one-step system GMM estimator.

Source: Authors' computation

financial openness and inflation determine banking sector stability, with their adverse effect becoming heightened.

4.3. Discussion of findings

Institutional Quality: Banking sector development in sub-Saharan African countries is not an outcome of the quality of economic institutions, similar to David et al. (2014). This can be as a result of the low level of institutional quality experienced in most African countries. However, taking the dimensions of banking sector development into perspective, institutional quality promotes banking sector depth only, thus providing empirical support for Ahmed (2013), and Allen et al. (2014). This finding still provides evidence to substantiate the endowment theory.

Geography: Population density is the only geographical factor enhancing banking sector development as well as deepens the banking sector. This finding implies that sub-Saharan African countries with higher population density possess better developed banking sector, thus corroborating Allen et al. (2014). Latitude is negatively related to banking sector efficiency, thus suggesting that countries closer to the equator in the sub-Saharan African region tend to have less efficient banking sector. Also, land area negatively impacts on banking sector stability. This implies that the banking sectors of sub-Saharan African countries with larger land area are more prone to banking crises than countries with smaller land area. The landlocked factor does not determine banking sector development as well the dimensions of banking sector development. This connotes that the landlocked characteristic of a country in sub-Saharan Africa does not cause it to experience lower levels of banking sector development. On a whole, the findings suggest that geography is a key determinant of banking sector development in sub-Saharan African countries, further giving support to the endowment theory.

Law: The quality of legal system and legal origin do not influence banking sector development in sub-Saharan African countries. On a dimensional basis, it is evident that the quality of legal system and legal origins improves banking sector efficiency and stability in sub-Saharan African countries. This study shows the quality of legal system and legal origins do not influence the depth of the banking sector in sub-Saharan African countries, as previously observed by Fowowe (2014). Contrary to Asongu (2012), this study finds evidence to imply that French legal origin countries have less efficient and stable banking sector than British legal origin countries in sub-Saharan Africa. This study offers partial support for the law and finance theory.

Openness: Trade openness neither promote nor reduce banking sector development, but in consonance with Mahawiya (2015), financial openness limits banking sector development in sub-Saharan African countries. However, the interaction of trade openness and financial openness fosters banking sector development. This indicates that increasing trade and financial openness simultaneously improves banking sector development in sub-Saharan African countries, in agreement with Mahawiya (2015), Ahmed (2013), and Andrianaivo and Yartey (2010).

The interaction of trade openness and financial openness has the highest positive impact on the banking sector development index, thus showing that opening of trade and capital borders is of utmost importance for banking sector development in sub-Saharan Africa. Therefore, the interest group theory of financial development (simultaneous openness hypothesis) is strongly valid for sub-Saharan African countries. The interaction of trade openness and financial openness promotes banking sector stability. The finding that trade openness increases the depth of the banking sector in sub-Saharan Africa countries is similar to David et al. (2014), and Andrianaivo and Yartey (2010). However, trade openness reduces the efficiency of banking sector in sub-Saharan African countries. Financial openness weakens banking sector stability, thus implying that the banking sector of sub-Saharan African countries experience lower levels of stability as capital flow restrictions are lessened.

Financial Liberalisation: Using the Chinn-Ito financial openness index, it can be adduced that financial liberalisation is negatively related to banking sector development. This finding implies that financial liberalisation does not stimulate banking sector development in sub-Saharan African countries, in stark contrast to the McKinnon-Shaw hypothesis. In line with recent evidence (Andrianaivo & Yartey, 2010; David et al., 2014; Mahawiya, 2015), financial liberalisation is a limiting factor for banking sector development in sub-Saharan African countries. Also, financial liberalisation reduces banking sector stability, thus suggesting that increase in financial liberalisation can lead to banking crisis. This gives more ground to the argument by Demirgüç-Kunt and Detragiache (1998) that countries with higher levels of financial liberalisation are more prone to banking crises, but its adverse effect would be lesser in countries with sound institutional environment. Most African countries are often characterised by weak institutional environment, hence this may be a plausible reason for the limiting effect of financial liberalisation on banking sector stability in sub-Saharan African countries.

Economic Growth: The finding suggests that economic growth is not crucial for banking sector development in sub-Saharan African countries and this does not support the demand-following hypothesis. This study shows that changes in the levels of banking sector depth and efficiency in sub-Saharan African countries is not due to economic growth. However, economic growth adversely affects banking sector stability. This suggests that sub-Saharan African countries recording higher growth rate tend to experience higher levels of instability in their banking sector.

Inflation: Surprisingly, inflation does not reduce banking sector development in sub-Saharan African countries as against its undermining effect put forth by the inflation and finance theory. Inflation is not significantly related to banking sector depth, thus implying that it neither makes the banking sector deeper nor shallower in sub-Saharan African countries and this is in tandem with Allen et al. (2014). However, inflation is positively related to banking sector efficiency, but negatively related to banking sector stability. This implies that inflation makes banking sector of sub-Saharan African countries in the sub-Saharan African region more efficient but less stable. This

further implies that increase in inflation increases banks' ability to allocate resources whilst making them more fragile.

Income Level: The results obtained showed that income level does not promote banking sector development in sub-Saharan African countries as predicted. Based on dimensions of banking sector development considered, income level influences banking sector efficiency only, but negatively. This finding indicates that low-income countries in sub-Saharan Africa tend to have more efficient banks than countries with higher income level.

Remittances: The finding that capital flows via remittances do not stimulate banking sector development in sub-Saharan African countries contradicts Gwama (2014), and Andrianaivo and Yartey (2010). It implies that remittances inflow is not important for banking sector development in sub-Saharan African countries. Also, banking sector depth, efficiency, and stability are not determined by the amount of remittances received by countries in sub-Saharan Africa.

Democracy: In support of recent finding (Fowowe, 2014; Mahawiya, 2015), democracy does not influence banking sector development in sub-Saharan African countries. The reason for this finding is not farfetched. This may be due to the poor democratic governance/weak political environment in most African countries. This study shows that democracy is not a factor necessary for improving banking sector depth, efficiency, and stability in sub-Saharan African countries.

Government: This study finds that government size does not influence banking sector development in sub-Saharan African countries. It also finds that government size does not increase or reduce banking sector depth, efficiency, and stability in sub-Saharan African countries. These findings do not support the development and political perspectives regarding the implication of fiscal spending on banking sector development. This study provides evidence against the thesis that increase in government spending crowds out private investment because ratio of government expenditure to GDP does not significantly affect private credit to GDP.

Culture: Ethnic diversity does not significantly affect banking sector development in sub-Saharan African countries. Also, it does not affect banking sector depth and stability, but it negatively relates to banking sector efficiency. This implies that ethnic diversity lowers the resource allocation ability of banking sectors in sub-Saharan African countries, thus making them less developed. This lends supports to Easterly and Levine (1997) argument that ethnic diversity is one of the reasons why most African countries have underdeveloped banking sector. Religion is not a determinant of banking sector development in sub-Saharan African countries. Congruent with Fowowe (2014), religion does not influence banking sector depth in sub-Saharan African countries. However, it positively influences the efficiency of the banking sector. This implies that religious countries have better functioning banking sector than less religious countries in sub-Saharan Africa. Also, this study finds that religion is not crucial for banking sector stability in sub-Saharan African countries.

Human Capital: This study shows that human capital is not a determinant of banking sector development in sub-

Saharan African countries. The prior study of Allen et al. (2014) provides similar evidence that human capital is not important for the depth of the banking sector in sub-Saharan African countries. Also, human capital does not determine banking sector efficiency and stability in sub-Saharan African countries. The low level of human capital development in most countries in Africa may be adduced as a reason for human capital not contributing positively to banking sector development in sub-Saharan African countries as predicted.

5. Conclusion and policy implications

Empirical research has shown that banking sector development is a critical element in the growth process of an economy. One of the reasons for economic backwardness in most sub-Saharan African countries is lower levels of banking sector development compared to other regions of the world. Therefore, this study examined the determinants of banking sector development in sub-Saharan African countries utilising the system GMM estimator designed for dynamic panel model estimation. Through robustness checks, this study identified the determinants of three dimensions of banking sector development (depth, efficiency, and stability) in sub-Saharan African countries. Based on the estimation results for the banking sector development index, this study evidenced that population density and simultaneous openness to trade and capital promote banking sector development while financial liberalisation deter banking sector development. It further showed that trade and financial openness increased at the same time matter most for banking sector development in sub-Saharan African countries. The robustness checks showed that the determinants of banking sector development are not robust to dimensional measures. In other words, banking sector development is sensitive to the depth, efficiency, and stability of the banking sector. Further findings showed that institutional quality, population density, and trade openness promote banking sector development by increasing the depth of the banking sector. Also, it revealed that law (quality of legal system and legal origins), inflation, and religion improves banking sector development via increasing the efficiency of the banking sector whilst latitude, trade openness, income level, and ethnic diversity lower banking sector efficiency. In addition, this study evidenced that the quality of legal system, legal origins, and simultaneous openness to trade and capital foster banking sector development by enhancing banking sector stability. On the other hand, land area, financial liberalisation, economic growth, and inflation weaken banking sector stability. This study provides evidence to support institutions, geography, law, openness, financial liberalisation, economic growth, income level, and culture as factors explaining cross-country differences in banking sector development in sub-Saharan Africa.

This study suggests that trade openness should not be increased at the expense of financial openness. In other words, trade and financial openness should be adopted concurrently. However, caution must be taken when implementing this policy due to the adverse effect of increased trade and financial openness on banking sector efficiency and stability respectively.

Also, it advocates that improving the quality of economic institutions is a policy mechanism to deepen the banking sector. In addition, this study suggests that enhancing the quality of the legal system would foster banking sector efficiency and stability. Lastly, maintaining macroeconomic stability is important for banking sector stability despite the positive impact of inflationary pressure on banking sector efficiency.

Appendix 1

List of Countries

Country	Legal Origin	Landlocked	Income level	Regional community
Benin	French	No	Low-income	ECOWAS
Botswana	British	Yes	Upper-middle	SADC
Burkina Faso	French	Yes	Low-income	ECOWAS
Burundi	French	Yes	Low-income	EAC
Cameroon	French	No	Low-income	ECCAS
Cote d'Ivoire	French	No	Low-income	ECOWAS
Gabon	French	No	Low-income	ECCAS
Ghana	British	No	Low-income	ECOWAS
Kenya	British	No	Low-income	EAC
Lesotho	British	Yes	Low-income	SADC
Madagascar	French	No	Low-income	SADC
Malawi	British	Yes	Low-income	SADC
Mali	French	Yes	Low-income	ECOWAS
Mauritius	French	No	Upper-middle	SADC
Mozambique	French	No	Low-income	SADC
Niger	French	Yes	Low-income	ECOWAS
Nigeria	British	No	Low-income	ECOWAS
Senegal	French	No	Low-income	ECOWAS
Sierra Leone	British	No	Low-income	ECOWAS
South Africa	British	No	Lower-middle	SADC
Swaziland	British	Yes	Lower-middle	SADC
Tanzania	British	No	Low-income	EAC
Togo	French	No	Low-income	ECOWAS
Uganda	British	Yes	Low-income	EAC
Zambia	British	Yes	Low-income	SADC

EAC = East African Community, ECCAS = Economic Community of Central African States, ECOWAS = Economic Community for West African States, SADC = Southern African Development Community.

Appendix 2

Summary Statistics of the First Principal Components

Country	% of Variance	Eigenvalue
Benin	58.77	7.64048
Botswana	50.56	6.57303
Burkina Faso	43.19	5.61499
Burundi	42.16	5.48065
Cameroon	50.52	6.56735
Cote d'Ivoire	47.60	6.1886
Gabon	33.49	4.35361
Ghana	40.37	5.24808
Kenya	52.47	6.82121

Country	% of Variance	Eigenvalue
Lesotho	42.04	5.46494
Madagascar	49.73	6.46523

Malawi	51.80	6.73385
Mali	52.05	6.767
Mauritius	45.38	5.89949
Mozambique	41.77	5.4301
Niger	64.05	8.32618
Nigeria	48.33	6.28336
Senegal	59.14	7.68809
Sierra Leone	59.80	7.77439
South Africa	47.22	6.13868
Swaziland	53.41	6.94353
Tanzania	61.58	8.00482
Togo	44.53	5.78829
Uganda	61.51	7.9968
Zambia	52.80	6.86397

Appendix 3

Summary Statistics for Annual Data

Variable	Mean	Std. Dev.	Minimum	Maximum
Composite Index of BSD	-3.37×10^{-9}	0.9849283	-2.963948	2.782821
Private credit/GDP	18.12605	16.78766	1.405447	102.5357
Net interest margin	7.27471	3.376943	-9.06129	18.63429
Z-score	8.563087	6.544254	-12.02465	89.93169
Institutional quality	36.58526	16.71114	3.64	77.72591
Latitude	0.167652	0.1359137	0.0111	0.6667
Land area	11.49594	1.69306	7.191429	13.71361
Landlocked	0.4	0.4904432	0	1
Population density	3.909622	1.164	1.066127	6.431572
Legal system	40.63333	13.86737	10	75
British legal origin	0.48	0.5001559	0	1
French legal origin	0.52	0.5001559	0	1
Trade openness (TO)	71.63057	32.25691	20.96405	211.15
Financial openness (FO)	-0.5785773	1.269191	-1.894798	2.389193
TO × FO	-38.70445	102.6747	-251.006	303.5777
GDP growth	4.599827	3.728214	-12.67379	33.73577
Inflation	8.533878	11.17224	-18.07454	112.6936
Income level	7.359729	0.9167374	5.924527	9.658342
Remittances	3.742424	8.20743	0	61.9877
Democracy	3.175556	5.025798	-9	10
Government size	15.44277	5.580058	5.152789	38.41085
Ethnic diversity	0.376	0.2449926	0	0.71
Religion	0.605412	0.1877185	0.1497	0.8603
Human capital	71.732	5.513122	61.2	86.6

Appendix 4

Summary Statistics for Averaged Data

Variable	Mean	Std. Dev.	Minimum	Maximum
Composite index of BSD	-4.94×10^{-8}	0.8367518	-1.82476	1.79323
Private credit/GDP	18.12605	16.73533	1.64733	99.1884
Net interest margin	7.27471	2.863331	2.33038	14.0362
Z-score	8.563084	5.805169	-4.91725	49.5428
Institutional quality	36.58526	16.67662	4.28667	76.9571
Latitude	0.167652	0.1362174	0.0111	0.6667
Land area	11.49594	1.696846	7.19143	13.7136
Landlocked	0.4	0.4915392	0	1
Population density	3.909621	1.166403	1.08503	6.42963
Legal system	40.63333	13.65614	10	71.6667
British legal origin	0.48	0.5012735	0	1
French legal origin	0.52	0.5012735	0	1
Trade openness (TO)	71.63057	31.89343	21.7305	190.933
Financial openness (FO)	-0.5785795	1.264651	-1.8948	2.38919
TO $\times$ FO	-38.70445	102.2107	-226.973	289.434
GDP growth	4.599828	2.59861	-2.02378	15.8449
Inflation	8.533878	7.912182	-3.31702	56.2834
Income level	7.359729	0.9187859	5.92453	9.65834
Remittances	3.742425	8.166209	0	59.3832
Democracy	3.175556	4.939258	-9	10
Government size	15.44277	5.469872	6.23062	36.9203
Ethnic diversity	0.376	0.2455401	0	0.71
Religion	0.605412	0.188138	0.1497	0.8603
Human capital	71.732	5.525442	61.2	86.6

Appendix 5

Correlation Matrix using Annual Data

Variable	Composite index of BSD	Private credit/GDP	Net interest margin	Z-score	Institutional quality	Latitude	Land area	Landlocked	Population density	Legal System	British legal origin	French legal origin
Composite index of BSD	1											
Private credit/GDP	0.11**	1										
Net interest margin	0.01	-0.41*	1									
Z-score	-0.07	0.46*	-0.25*	1								
Institutional quality	-0.01	0.55*	-0.18*	0.28*	1							
Latitude	0	0.17*	-0.21*	0.19*	0.18*	1						
Land area	0	-0.51*	0.25*	-0.43*	-0.23*	-0.34*	1					
Landlocked	0	-0.24*	0.16*	-0.05	0.03	0.04	-0.17*	1				
Population density	0.02	0.30*	0.06	0.05	-0.15*	-0.15*	-0.29*	-0.17*	1			
Legal system	-0.08***	0.35*	-0.02	0.22*	0.68*	0.15*	-0.18*	0.13*	-0.13*	1		
British legal origin	0	-0.04	0.41*	-0.03	0.12*	-0.08***	0.26*	0.20*	0.06	0.23*	1	
French legal origin	-0	0.04	-0.41*	0.03	-0.12*	0.08***	-0.26*	-0.20*	-0.06	-0.23*	-1	1
Trade openness (TO)	0.02	0.21*	-0.09**	0.05	0.37*	0.20*	-0.25*	0.07	0.03	0.43*	0.12	-0.12
Financial openness (FO)	-0.03	0.24*	0.03	-0.07	0.36*	-0.09***	0.12*	0.19*	-0.04	0.43*	0.27*	-0.27*
TO $\times$ FO	-0.04	0.33*	-0.06	0.04	0.39*	-0.05	0.04	0.10**	-0.01	0.37*	0.11**	-0.11**
GDP growth	-0.02	-0.09***	0.10**	-0.15**	0.06	-0.05	0.15*	0.02	0.04	-0.16*	0.13*	-0.13*
Inflation	-0.11**	-0.15*	0.30*	-0.09***	-0.06	-0.13*	0.15*	0.07	0.12*	0.06	0.33*	-0.33*
Income level	-0	0.49*	-0.24*	0.37*	0.46*	0.17*	-0.16*	-0.21*	-0.23*	0.57*	0.13*	-0.13*
Remittances	-0.05	-0.06	0.02	-0.10**	0.05	0.17*	-0.17*	0.19*	0.11*	0.07	0.15*	-0.15*
Democracy	0.03	0.38*	-0.06	0.11**	0.53*	-0.05	-0.13*	-0.08***	0.03	0.18*	0.05	-0.05
Government size	0.08	0.13*	-0.08***	0.16*	0.29*	0.15*	-0.15*	0.47*	-0.11**	0.18*	0.14*	-0.14*
Ethnic diversity	0	0.09***	0.15	-0.03	-0.27*	-0.07	0.06	-0.32*	0.33*	-0.26	0.23*	-0.23*
Religion	0	0.16*	0.15*	0.03	0.05	0.04	0.40*	-0.27*	0.24*	0.06	0.44*	-0.44*
Human capital	-0	0.47*	-0.17*	0.20*	0.37*	-0.02	-0.05	-0.13*	0.15*	0.52	-0	0

(continued on next page)

Appendix 5 (continued)

Variable	Trade openness (TO)	Financial openness (FO)	TO × FO	GDP growth	Inflation	Income level	Remittances	Democracy	Government size	Ethnic diversity	Religion	Human capital
Trade openness (TO)	1											
Financial openness (FO)	0.07	1										
TO × FO	−0.15*	0.90*	1									
GDP growth	−0.07	0.08***	0.08***	1								
Inflation	−0.08	0.02	0.02	−0.10**	1							
Income level	0.42*	0.26*	0.24*	−0.19*	−0.09***	1						
Remittances	0.57*	−0.10**	0.33*	−0.05	−0.07	−0.08***	1					
Democracy	0.05	0.17*	0.28*	0.15*	0.06	0.05	0.11**	1				
Government size	0.39*	0.07	−0.17*	−0.03	−0.10*	0.04	0.50*	0.17	1			
Ethnic diversity	−0.37*	0.22*	0.28*	0.13*	0.15*	−0.10*	−0.31*	−0.01	−0.49	1		
Religion	0.09	0.16*	0.09***	0.01	0.22*	0.24*	0.01	0.02	0.03	0.43*	1	
Human capital	0.34*	0.46*	0.44*	0.12	−0.06	0.59*	−0.10**	−0.04	0.06	−0.24*	0.07	1

Note: * indicates p-value < 0.01, ** indicates p-value > 0.01 but < 0.05, and *** indicates p-value > 0.05 but < 0.1.

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