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Asongu, Simplice and Soumtang, Valentine and Edoh, Ofeh

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Simplice A. Asongu
African Governance and Development Institute,
P.O. Box: 8413, Yaoundé, Cameroon.
E-mails:asongusimplice@yahoo.com/asongus@afridev.org

Valentine B. Soumtang
Faculty of Economics and Management,
University of Yaoundé II, Cameroon.
E-mail: valentinebime@yahoo.com

Ofeh M. Edoh
Association for Promoting Women in Research and
Development in Africa (ASPROWORDA), Cameroon.
E-mails: marilynedoh@gmail.com / edohmarilyn@asproworda.org

Research Department

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Abstract

This study assesses financial determinants of informal financial sector development in 48 Sub-Saharan African countries for the period 1995-2017. Quantile regressions are used as the empirical strategy which enables the study to assess the determinants throughout the conditional distribution of informal sector development dynamics. The following financial determinants affect informal financial development and financial informalization differently in terms of magnitude and sign: bank overhead costs; net internet margin; bank concentration; return on equity; bank cost to income ratio; financial stability; loans from non-resident banks; offshore bank deposits and remittances. The determinants are presented from a plethora of perspectives, *inter alia*: U-Shape, S-Shape and positive or negative thresholds. The study not only provides a practical way by which to assess the incidence of financial determinants on informal financial sector development, but also provides financial instruments by which informal financial development can be curbed.

Keywords: Informal finance; financial development; Africa

1. Introduction

This study is motivated by two main strands in the scholarly and policy literature, notably: the role of informal finance in the economy and gaps in the literature. The two points are expanded in turn. First, the informal financial sector still represents a substantial part of the financial system in Africa, not least, because most of the adult population does not yet have bank accounts in formal financial institutions and by extension, recourse to informal financial mechanisms in borrowing and saving (Klapper & Singer, 2015; Tchamyou et al., 2019). Moreover, according to Aryeetey (2008), many analysts and scholars understand informal finance as an effect of a formal financial system that is inadequate and therefore, reforms in the financial sectors are expected to engender a decline in the influence of the informal financial sector. According to the author, "*transformation of the informal financial sector can take place if it is driven by a need to increase access to the resources of the formal financial sector* "(Aryeetey, 2008, p. 6). Building on this narrative, the purpose of this study is to assess formal financial sector determinants of the informal financial sector, not least, because of the need to fill an apparent gap in the attendant literature.

Second, as substantiated or critically engaged in Section 2, the corresponding formal and informal finance literature has not focused on the problem statement being considered in this study. Moreover, in this study, the concepts of informal financial development and financial informalization are conceived, defined and measured building on a disentanglement of the financial system in order to articulate the formal, semi-formal, informal and non-formal financial sectors. Informal financial development is understood as the progress of the informal financial sector relative to other economic sectors while financial sector informalization is defined as the progress of the informal financial sector to the detriment of the formal and semi-formal financial sectors (Asongu, 2015). Hence, the study also provides a practical way by which to assess the incidence of indicators of the formal financial system on the informal financial sector.

The rest of the study is organized as follows. The literature review is covered in Section 2 while the data and methodology are discussed in Section 3. The empirical results are provided in Section 4 while Section 5 concludes with future research directions.

2. Review of the literature

Financial development is recognized in the literature as a factor of development because of its effects in terms of faster growth and better allocative efficiency. To this end, works have most often focused on formal finance. However, the development gap that exists between different countries can be justified by the existence and role played by informal financial systems in some countries (Ullah, 2019). Indeed, the economic system of several developing countries is heavily dominated by an informal financial system due to their institutional specificities. To this effect, Steel et al. (1997) explain that there are two main reasons that can justify the existence of the informal sector. First, excessive state intervention leads to underdeveloped financial systems. Secondly, formal banks are faced with costly procedures and problematic management, which contributes to poor access to credit; this in turn contributes to a sharp rise in informal finance. In relation to this aspect, studies on informal finance focus on the different theories behind this concept, its different determinants and its effects in general.

Initially, with regard to the theoretical background, several works have dwelt on the existence of informal finance. In particular, according to the financial repression hypothesis, Mckinnon (1973) and Shaw (1973)[1]state that the existence of large informal financial sectors is due to repressive financial systems. In other words, when the State sets interest rate ceilings and allocates credit, a large part of the population is excluded from using formal credit services. As a result, this part of the population has no choice but to turn to informal means of accessing credit, such as family, friends, relatives and tontines. Following this work, the structuralist school (Taylor 1979; Van Wijnbergen, 1983) argues that credit market failures create gaps in the formal financial system. This encourages individuals to move from the formal to the informal financial system; hence the existence of informal credit markets alongside formal credit institutions. So according to them, the importance of informal finance in developing countries is explained by the structural weaknesses of formal finance.

On the other hand, the institutionalist school argues that informal finance gets its legitimacy from the institutional constraints faced by the formal institutions operating in some areas. According to Bagachwa (1995, 1996), these constraints include the lack of appropriate mechanisms to deal with financial risk management, contract enforcement and loan selection and monitoring. As a result, formal institutions are likely to serve only those clients who present minimal risk and cost to them. Other clients will have to turn to informal sources

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[1] These authors implemented the theory of financial liberalization being the free access to financial services by the people without the intervention of the state as a solution to financial repression.

tomeet their financial service needs. Another strand of the literature explains that imperfect information and costly contract enforcement lead to market failures and thus fragmentation of the credit market. Informal finance is based on relationships and reputation and information asymmetries between informal lenders and their borrowers are less important. The loan application process is lighter and the collateral required is easier to satisfy (Allen et al., 2010). Thus, agency theory suggests that adverse selection or reluctance of lenders to lend to firms perceived as risky borrowers by lenders. In such a case, especially for small and medium size enterprises (SMEs), access to capital may be limited. Moral hazard is another problem that lenders face due to asymmetric information (Tchamyou & Asongu, 2017a; Asongu & Odhiambo, 2018; Tchamyou, 2019). This can further compound the lack of access to capital for SMEs in banks (Allen et al., 2019).

Secondly, with regard to the different determinants, the literature distinguishes economic determinants and institutional determinants. Related to economic determinants, Deng et al. (2019) study data based on a series of national surveys of Chinese enterprises between 2006 and 2012. They show that corporate social capital plays an important role for informal finance. They also demonstrate that it is positively correlated with their ability to obtain informal finance. And this effect is more pronounced in situations of financial crisis, when social trust in general is weakened. Similarly, Sekyi et al. (2019) examine access to informal credit among farmers in rural Ghana. They show that age is a key determinant. Rural farm households' decision to access informal credit is negatively correlated with individual age and education. Indeed, the authors suggest that informal lenders may view older farmers as high-risk clients for fear that they will die.

Also, an educated farmer can conceptualize credit information, assimilate this information and better understand the credit system. However, they instead show that factors such as farm size, multi-crop production, non-farm business equipment and group membership positively influence rural farm households' decision to access informal credit. Subsequently, work by Zins and Weill (2016) shows that in Kenya, being a woman increases the propensity to engage in informal savings as African women use informal finance more than formal. In the same vein, Sile and Bett (2015) determine that gender, as well as the sector of activity is important factors for informal finance. This is because women in rural areas resort to informal finance because they do not have tangible collateral to finance domestic expenses due to cultural restrictions on property ownership. This is because there are few formal institutions in rural areas, low awareness and low income in rural areas.

Furthermore, income is also an important determinant. Instead, the authors show that increasing income enhances the choice of using informal finance. These authors also point out that the level of education significantly influences the choice of informal finance. Individuals with primary education or no education all use informal systems for savings and credit, while those with higher education at secondary level do not use informal loans. The study shows that the age of an individual significantly affects his choice of informal finance. The majority of informal finance users are young (under 35 years old). This is because young people do not have the security required by formal financial institutions for credit services. So they turn to informal finance.

Also, Campero and Kaiser (2013) study the knowledge and use of formal and informal credit sources in Mexico. They use an ensemble training model and selection correction. They find that household size positively affects knowledge and use of informal credit sources. Also, a study conducted in Nigeria investigated the determinants of credit demand and supply in informal credit markets (Nto et al., 2011). It does a double least squares analysis, and shows that farm income, profit and education determine the demand for informal credit.

In terms of institutional determinants, some authors such as An and Lin (2021) study the impact of legal origin on informal finance between 2005 and 2019. They find that places with a common law origin have better informal financial development than those with a civil law tradition. Also, the work of Cao et al. (2019) employs the ordinary least squares (OLS) method for the period 2003 and 2013 on Chinese non-state and listed firms. They show that religion increases trade credit which is one of the main instruments of informal finance. They rely on Buddhism, Taoism and Christianity.

Finally, the literature has focused on the different effects of informal finance on economic development in general. To this end, Goodland et al. (1999) showed that informal financial enterprises contribute to the equitable distribution and use of local resources, especially incoming commodities. This is because the credit obtained has been used to finance income- generating activities that yield higher returns than the loan contracted, thus ensuring economic stability. This ensures economic stability. Some works have also shown that loans provided by the rotating savings credit association increase the income of individuals and stimulate asset building (Zaman, 1999). They also improve the economic situation of subsistence farmers through easy access to financing for adequate storage facilities to protect their agricultural products from seasonal price fluctuations.

It is also noted that in China, informal finance provides four times more access to credit than formal finance (Ifad, 2001). Tsai (2002) showed in his study on small business ownership that informal financial institutions were responsible for upto three quarters of private sector financing during the decades of reform. The informal sector represents a major source of finance for traders and farmers who systematically provide socio-economic development (Tsai, 2004). Similarly, Ghazala (2006) finds positive effects of informal finance institutions such as microcredit programs on the welfare of the people. He finds that microcredit reduces poverty through microfinance and savings societies. Also, microcredit increases women empowerment, improves savings and purchase of agricultural inputs and easy access to loans with significantly reduced interest rates. Ngutor et al. (2013) also find that the informal financial institutions that exist in Adikpo reduce poverty through easy access to credit. In the same vein, Sekyi et al. (2019) also argue that access to informal credit significantly promotes agricultural productivity. Specifically, they find that farmers with access to informal credit were able to achieve 48.42 kg/ha more yield than their counterparts without access to informal credit.

3. Data and methodology

3.1 Data

The study used data for the period 1995 to 2017 from 48 countries in sub-Saharan Africa[2]. The indicators selected for the study are from the Financial Development and Structure Database (FDSD) of the World Bank. Accordingly, the number of countries and corresponding periodicity are motivated by constraints in the availability of data at the time of the study. As apparent in Table 1 and consistent with recent literature (Asongu, 2015; Tchamyou et al., 2019), the financial sector formalization and informalization variables are derived from the FDSD of the World Bank. Given the information disclosed in Table 1, the financial formalization indicator reflects how the formal financial sector is being enhanced at the expense of the informal financial sector while financial informalization denotes the development of the informal financial sector to the detriment of the formal financial sector.

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[2] The 48 countries are: "*Angola; Benin; Botswana; Burkina Faso; Burundi; Cabo Verde; Cameroon; Central African Republic; Chad; Comoros; Congo Democratic Republic; Congo Republic; Côte d'Ivoire; Equatorial Guinea; Eritrea; Eswatini; Ethiopia; Gabon; Gambia, The; Ghana; Guinea; Guinea-Bissau; Kenya; Lesotho; Liberia; Madagascar; Malawi; Mali; Mauritania; Mauritius; Mozambique; Namibia; Niger; Nigeria; Rwanda; Senegal ; Seychelles; Sierra Leone ; Somalia ; South Africa; South Sudan; Sudan; São Tomé and Principe; Tanzania; Togo; Uganda; Zambia and Zimbabwe*".

The context of the financial system underpinning the financial sector development propositions is presented in Table 2.

Table 1: Summary of financial sector formalization and informalization variables

	Panel A: GDP-based financial development indicators		
Propositions	Name(s)	Formula	Elucidation
Proposition 1	Formal financial development	Bank deposits/GDP	Bank deposits[3] here refer to demand, time and savings deposits in deposit money banks.
Proposition 2	Semi-formal financial development	(Financial deposits – Bank deposits)/ GDP	Financial deposits[4] are demand, time and saving deposits in deposit money banks and other financial institutions.
Proposition 3	Informal financial development	(Money Supply – Financial deposits)/GDP	
Proposition 4	Informal and semi-formal financial development	(Money Supply – Bank deposits)/GDP	
	Panel B: Measures of financial sector importance		
Proposition 5	Financial intermediary formalization	Bank deposits/ Money Supply (M2)	From 'informal and semi-formal' to *formal* financial development (formalization)[5].
Proposition 6	Financial intermediary 'semi-formalization'	(Financial deposits - Bank deposits)/ Money Supply	From 'informal and formal' to *semi-formal* financial development (Semi-formalization)[6].
Proposition 7	Financial intermediary 'informalization'	(Money Supply – Financial deposits)/ Money Supply	From 'formal and semi-formal' to *informal* financial development (Informalization)[7].
Proposition 8	Financial intermediary 'semi-formalization and informalization'	(Money Supply – Bank Deposits)/Money Supply	Formal to '*informal and semi-formal*' financial development: (Semi-formalization and informalization)[8]

N.B: Propositions 5, 6, 7 add up to unity (one) arithmetically spelling-out the underlying assumption of sector importance. Hence, when their time series properties are considered in empirical analysis, the evolution of one sector is to the detriment of other sectors and vice-versa.
Source: Asongu (2015).

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[3] Lines 24 and 25 of the International Financial Statistics (October 2008).

[4] Lines 24, 25 and 45 of the International Financial Statistics (2008).

[5] "*Accordingly, in undeveloped countries money supply is not equal to liquid liabilities or bank deposits. While in undeveloped countries bank deposits as a ratio of money supply is less than one, in developed countries this ratio is almost equal to 1. This indicator appreciates the degree by which money in circulation is absorbed by the banking system. Here we define 'financial formalization' as the propensity of the formal banking system to absorb money in circulation.*" (Asongu, 2015, p. 432).

[6] "*This indicator measures the rate at which the semi-formal financial sector is evolving at the expense of formal and informal sectors.*" (Asongu, 2015, p. 432).

[7] "*This proposition appreciates the degree by which the informal financial sector is developing to the detriment of formal and semi-formal sectors.*" (Asongu, 2015, p. 432).

[8] "*The proposition measures the deterioration of the formal banking sector in the interest of other financial sectors (informal and semi-formal). From common sense, propositions 5 and 8 should be almost perfectly antagonistic, meaning the former (formal financial development at the cost of other financial sectors) and the latter (formal sector deterioration) should almost display a perfectly negative degree of substitution or correlation.*" (Asongu, 2015, p. 432).

Table 2: Segments of the financial system by degree of formality in paper's context

Paper's context			Tiers	Definitions	Institutions	Principal Clients
Formal financial system		Formal Financial sector (Deposit Banks)	Formal banks	Licensed by central bank	Commercial and development banks	Large businesses, Government
Semi-formal and informal financial systems	IMF Definition of Financial System from International Financial Statistics (IFS)	Semi-formal financial sector (Other Financial Institutions)	Specialized non-bank financial institutions		Rural banks, Post banks, Saving and Loan Companies, Deposit taking Micro Finance banks	Large rural enterprises, Salaried Workers, Small and medium enterprises
			Other non-bank financial institutions	Legally registered but not licensed as financial institution by central bank and government	Credit Unions, Micro Finance NGOs	Microenterprises, Entrepreneurial poor
	Missing component in IFS definition	Informal financial sector	Informal banks	Not legally registered at national level (though may be linked to a registered association)	Savings collectors, Savings and credit associations, Money lenders	Self-employed poor

Source: Asongu and Acha-Anyi (2017)

Given the motivation of this study which is to assess the financial determinants of the informal financial sector, only Propositions 3 and 7, respectively for informal financial sector development and financial sector informalization, are used in the study. The financial determinants are selected from the FDSD. Accordingly, all variables that have convenient degrees of freedom for the period 1995-2017 are selected, namely: bank overhead costs to total assets; net internet margin; bank concentration; return on equity; bank cost to income ratio; financial stability; loans from non-resident banks; offshore bank deposits and remittances. Given that the study is focused on assessing determinants of informal financial development, we cannot a priori establish the signs of the financial indicators.

The definitions and source of variables are provided in Appendix 1 while the summary statistics is disclosed in Appendix 2. Appendix 3 provides the correlation matrix which informs the study on concerns about multicollinearity. Accordingly, concerns about multicollinearity affect the estimated signs of determinants and by extension, could misplace policy implications (Asongu *et al*., 2020, 2021).

3.2 Methodology

Given the nature of the problem statement which is to assess determinants of informal financial development throughout the conditional distribution of informal financial

development dynamics, a quantile regression approach is adopted, consistent with the literature that has adopted a similar approach to assess a similar problem statement for alternative outcomes such as governance standards, notably: Billger and Goel (2009) and Asongu (2013). Accordingly, the employment of the QR technique enables the study to assess how the considered financial determinants affect informal financial development dynamics when initial levels of attendant informal financial development dynamics are taken into account. Hence, in line with the attendant literature, the technique is appropriate when low, intermediate and high levels of the corresponding informal financial development dynamics are considered, notably: Keonker and Hallock (2001), Tchamyou and Asongu, (2017) and Boateng *et al.* (2018).

It is also important to note that, compared to the OLS technique that assumes the presence of normally distributed error terms, the QR approach is not contingent on residuals that are normally distributed. Moreover, in QR, the parameter estimates are obtained at multiple points of the conditional distribution of the outcome variable (Koenker & Bassett, 1978). Accordingly, the θth quantile estimator of informal financial development is obtained by solving for the following optimization problem in Equation (1) below, which is disclosed without subscripts for simplicity and ease of presentation.

$$\min_{\beta \in R^k} \left[\sum_{i \in \{i:y_i \geq x_i'\beta\}} \theta |y_i - x_i'\beta| + \sum_{i \in \{i:y_i < x_i'\beta\}} (1-\theta)|y_i - x_i'\beta| \right], \tag{1}$$

where $\theta \in (0,1)$. Compared to OLS which is fundamentally focused on minimizing the sum of squared residuals, with the QR approach, for multiple quantitles, the weighted sum of absolute deviations for various quantiles such as the 25th or 75th (with $\theta = 0.25$ or 0.75 respectively), are minimised by weighing approximately the residuals. The conditional quantile of informal financial development or y_i given x_i is:

$$Q_y(\theta / x_i) = x_i'\beta_\theta \tag{2}$$

where for each θth specific quantile, unique slope parameters are computed. This formulation is analogous to $E(y / x) = x_i'\beta$ in the OLS slope where parameters are examined exclusively at the mean of the conditional distribution of informal financial development. For the model in Eq. (2), the dependent variable y_i is the informal financial sector development indicator while x_i contains a constant term, *bank overhead costs to total*

assets; net internet margin; bank concentration; return on equity; bank cost to income ratio; financial stability; loans from non-resident banks; offshore bank deposits and remittances.

4. Empirical results

The empirical results are disclosed in this section in Tables 3-4, respectively, focusing on informal financial sector development (Proposition 3) and financial sector informalization (Proposition 7). It is worthwhile to note that compared to the OLS results, the QR findings are different in terms of signs and magnitude of signs which is further evidence that the adoption of the QR approach is worthwhile, not least, because responses of the considered determinants are contingent on the initial levels of informal financial development. The findings reported in Tables 3-4 are discussed in terms of four main perspectives: (i) U-Shape, (ii) S-Shape and (iii) positive or negative thresholds with increasing or decreasing tendencies, respectively and (iv) estimates that do not fall in any of the first-three categories.

It is relevant to note that consistent with complementary threshold literature (Asongu, 2014, 2017); the notion of threshold based on QR is assessed in the light of how the estimates respond to the outcome variable throughout the conditional distribution of the outcome variable. For instance, if an estimate consistently increases throughout the conditional distribution of the outcome variable, the notion of positive threshold is used and in the same vein, if an estimate consistently decreases throughout the conditional distribution of the outcome variable; the notion of negative threshold is employed to describe the tendency. As for a U-shape tendency, the magnitude of the estimate first decreases as initial levels of the outcome variable increase before eventually increasing in top quantiles of the outcome variable. With respect to an S-shape, the corresponding magnitude either: increases, decreases and then increases or decreases, increases and then decreases, throughout the conditional distribution of the outcome variable.

The following findings can be established for Table 3 on the nexus between financial development and informal financial sector development: (i) net interest margin decreases informal financial development with a negative threshold from the 25th to the 90th quantile; (ii) financial stability and life insurance penetration exert a negative effect with a U-shape tendency; (iii) non-life insurance and offshore bank deposits have a positive effect with an S-shape tendency; (iv) remittances and return on equity (bank cost to income ratio) have (has) a positive (negative) impact, though not throughout the conditional distribution of informal financial sector development and (v) the incidence of loans from non-resident banks is negative in the 25th quantile and positive in the 75th quantile.

Table 3: Finance and informal financial sector development (Proposition 3)

	OLS	Q.10	Q.25	Q.50	Q.75	Q.90
	\multicolumn{6}{c}{Dependent variable: Informal financial sector development (Proposition 3)}					
Constant	**14.499***	**7.349***	**8.396***	**11.158***	**22.776***	**22.628***
	(0.001)	**(0.050)**	**(0.034)**	**(0.008)**	**(0.000)**	**(0.000)**
Overhead	0.175	-0.271	-0.086	-0.085	0.133	0.490
	(0.423)	(0.293)	(0.751)	(0.767)	(0.647)	(0.100)
Net Interest Margin	**-0.718***	-0.173	**-0.409***	**-0.440***	**-0.810***	**-1.021***
	(0.000)	(0.389)	**(0.054)**	**(0.051)**	**(0.001)**	**(0.000)**
Bank concentration	0.015	0.019	0.014	0.004	0.018	-0.001
	(0.465)	(0.397)	(0.558)	(0.847)	(0.477)	(0.959)
Return on Equity	**0.079***	0.052	**0.066***	**0.072***	0.021	0.061
	(0.043)	(0.104)	**(0.052)**	**(0.047)**	(0.574)	(0.103)
Bank Cost to Income Ratio	**-0.134***	-0.019	-0.025	-0.043	**-0.125***	**-0.108***
	(0.006)	(0.674)	(0.599)	(0.393)	**(0.019)**	**(0.042)**
Financial Stability	0.197	**-0.162***	**-0.142***	-0.036	**-0.319***	**-0.321***
	(0.164)	**(0.023)**	**(0.056)**	(0.648)	**(0.000)**	**(0.000)**
Life Insurance	**-8.818***	**-11.027***	**-10.471***	**-6.106***	**-3.606***	**-3.825***
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Non-life insurance	**7.796***	**3.095***	**8.060***	**6.750***	**5.824***	**11.048***
	(0.005)	**(0.038)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.000)**
Loans from Non-resident Banks	-0.074	-0.041	**-0.152***	0.006	**0.189***	0.093
	(0.532)	(0.494)	**(0.018)**	(0.929)	**(0.007)**	(0.184)
Offshore Bank Deposits.	**0.007***	**0.012***	**0.008***	**0.009***	**0.006***	0.002
	(0.003)	**(0.000)**	**(0.017)**	**(0.047)**	**(0.080)**	(0.491)
Remittances	**0.432***	**0.342***	**0.264***	0.120	**0.263***	0.191
	(0.002)	**(0.006)**	**(0.044)**	(0.387)	**(0.067)**	(0.182)
R²/Pseudo R²	0.747	0.735	0.482	0.242	0.182	0.248
Fisher	**28.59***					
Observations	489	489	489	489	489	489

*, **, ***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R² for OLS and Pseudo R² for Quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where informal financial sector development is least.

The following findings are apparent in Table 4 related to finance and financial sector informalization (Proposition 7): (i) bank concentration has a positive effect with a positive tendency from the median to the highest quantile while life insurance has a negative effect with a negative threshold; (ii) the effects of bank to income ratio, financial stability, non-life insurance and loans for non-resident banks are predominantly negative in the bottom quantile while the impact of return on equity and remittances are positive in the bottom and top quantiles, though not throughout the conditional distribution and (iii) the positive effect of overhead cost is exclusively significant in the top quantiles of financial sector informalization.

Table 4: Finance and financial sector informalization (Proposition 7)

	OLS	Q.10	Q.25	Q.50	Q.75	Q.90
	Dependent Variable: Financial sector informalization (Proposition 7)					
Constant	**0.421*****	**0.406****	**0.447*****	**0.382*****	**0.432*****	**0.405*****
	(0.000)	**(0.011)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Overhead	**0.013****	0.011	0.003	-0.0007	**0.025*****	**0.025*****
	(0.018)	(0.274)	(0.637)	(0.906)	**(0.001)**	**(0.000)**
Net Interest Margin	-0.001	-0.004	0.002	0.004	-0.005	**-0.008****
	(0.773)	(0.570)	(0.576)	(0.362)	(0.315)	**(0.038)**
Bank concentration	**0.002*****	**0.002****	0.0004	**0.001****	**0.002*****	**0.003*****
	(0.000)	**(0.019)**	(0.458)	**(0.021)**	**(0.000)**	**(0.000)**
Return on Equity	**0.001***	0.002	**0.001****	**0.002*****	0.001	**0.001****
	(0.053)	(0.117)	**(0.028)**	**(0.006)**	(0.178)	**(0.029)**
Bank Cost to Income Ratio	**-0.003*****	**-0.003****	**-0.002***	-0.0004	-0.002	-0.0009
	(0.000)	**(0.044)**	**(0.068)**	(0.710)	(0.101)	(0.294)
Financial Stability	0.005	**-0.005***	**-0.003****	-0.002	-0.003	**-0.007*****
	(0.129)	**(0.056)**	**(0.035)**	(0.166)	(0.102)	**(0.000)**
Life Insurance	**-0.184*****	**-0.247*****	**-0.243*****	**-0.136*****	**-0.084*****	**-0.063*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Non-life insurance	-0.059	**-0.137****	0.049	-0.037	-0.069	**-0.056***
	(0.348)	**(0.031)**	(0.211)	(0.326)	(0.111)	**(0.050)**
Loans from Non-resident Banks	**-0.004***	0.001	**-0.002***	-0.002	-0.001	-0.0003
	(0.077)	(0.516)	**(0.091)**	(0.157)	(0.424)	(0.793)
Offshore Bank Deposits.	**0.0001****	0.0001	0.0001	0.0001	0.00006	2.49e-06
	(0.012)	(0.203)	(0.128)	(0.175)	(0.510)	(0.969)
Remittances	**0.009***	**0.010***	0.001	-0.002	**0.006***	**0.008*****
	(0.050)	**(0.057)**	(0.639)	(0.427)	**(0.078)**	**(0.001)**
R²/Pseudo R²	0.792	0.722	0.522	0.344	0.291	0.342
Fisher	31.27***					
Observations	488	488	488	488	488	488

*,**,***: significance levels of 10%, 5% and 1%, respectively. OLS: Ordinary Least Squares. R² for OLS and Pseudo R² for Quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial sector informalization is least.

5. Conclusion and future research direction

The purpose of this study has been to examine trends of informal financial development in Africa over the past decades by assessing how financial determinants have affected the informal financial sector. Particularly, the concepts of informal financial development and financial informalization have been conceived, defined and measured building on a disentanglement of the financial system in order to articulate the formal, semi-formal, informal and non-formal financial sectors. Informal financial development is understood as the progress of the informal financial sector relative to other economic sectors while financial sector informalization is defined as the progress of the informal financial sector to the detriment of the formal and semi-formal financial sectors.

The empirical evidence is based Quantile regressions with data from 48 countries in Sub-Saharan Africa for the period 1995 to 2017. The multitudes of financial determinants as reported are discussed in terms of many perspectives, *inter alia*: U-Shape, S-Shape and positive or negative thresholds. The study not only provides a practical way by which to

assess the incidence of financial determinants on informal financial sector development, but also provides financial instruments by which informal financial development can be curbed.

Future studies can improve the extant literature by employing alternative estimation techniques and financial instruments to assess which financial determinants boost the informal financial sector and by extension, which can be employed to decrease the influence of the sector in the economy. Moreover, the study could be replicated within the remit of the formal financial sector, notably by assessing how financial determinants affect formal financial sector development (i.e. Proposition 1) and financial sector formalization (Proposition 5).

Appendices
Appendix 1: Definitions and sources of variables

Variables	Definitions	Sources
Informal financial development	Proportion of money supply circulating outside the financial system as percentage of GDP: (Money Supply – Financial deposits)/GDP. (Proposition 3)	FDSD (World Bank), Asongu (2015)
Financial intermediary 'informalization'	From 'formal and semi-formal' to informal financial development (Informalization). "*This proposition appreciates the degree by which the informal financial sector is developing to the detriment of formal and semi-formal sectors.*" (Asongu, 2015, p. 432). (Proposition 7)	FDSD (World Bank), Asongu (2015)
Overhead	Bank overhead costs to total assets (%).Accounting value of a bank's overhead costs as a share of its total assets.	FDSD (World Bank)
Net Interest Margin	Net Interest Margin (%).Accounting value of bank's net interest revenue as a share of its interest-bearing (total earning) assets.	FDSD (World Bank)
Bank concentration	Bank concentration (%).Assets of three largest banks as a share of assets of all commercial banks.	FDSD (World Bank)
Return on Equity	Bank Return on Equity. Average Return on Assets (Net Income/Total Equity)	FDSD (World Bank)
Bank Cost to Income Ratio	Bank Cost to Income Ratio(%).Total costs as a share of total income of all commercial banks.	FDSD (World Bank)
Financial Stability	Bank Z-Score. Z-score is estimated as (ROA+equity/assets)/sd(ROA); sd(ROA) is the standard deviation of ROA.	FDSD (World Bank)
Life Insurance	Life insurance premium volume as a share of GDP.	FDSD (World Bank)
Non-life insurance	Nonlife insurance premium volume as a share of GDP.	FDSD (World Bank)
Loans from Non-resident Banks.	Loans from non-resident banks (AMT Outstanding) to GDP (%).Offshore bank loans relative to GDP.	FDSD (World Bank)
Offshore Bank Deposits.	Offshore bank deposits to domestic bank deposits (%)	FDSD (World Bank)
Remittances	Net remittance inflows as a share of GDP.	FDSD (World Bank)

GDP: Gross Domestic Product. GNI: Gross National Income. GCIP: Global Consumption and Income Project.

Apppendix 2: Summary Statistics

	Mean	S.D	Min	Max	Obs
Informal financial development	10.442	69.737	-972.204	571.732	1104
Financial intermediary 'informalization'	0.323	1.405	-22.622	0.954	1020
Overhead	6.161	4.587	0.001	89.423	868
Net Interest Margin	7.526	6.435	0.0001	114.248	855
Bank Concentration	77.367	18.641	22.280	100.000	707
Return on Equity	21.120	20.216	-93.620	161.923	869
Bank Cost to Income Ratio	59.628	18.584	19.895	218.087	875
Financial Stability	10.975	7.050	0.566	96.680	893
Life Insurance	0.835	2.182	0.0004	15.380	733
Non-life insurance	0.798	0.923	0.003	14.722	778
Loan from Non-resident Banks	59.248	402.779	0.000	5198.04	916
Offshore Bank Deposits	101.378	332.937	1.68e-06	5467.123	1016
Remittances	3.853	8.517	0.000	108.403	876

SD: Standard Deviation. Min: Minimum. Max: Maximum.

Appendix 3: Correlation matrix (uniform sample size: 488)

	Prop3	Prop7	Overhead	NIM	B.Conc	ROE	Costinc	Zscore	LifeI	NlifeI	LNRB	OSBD	Remit
Prop3	1.000												
Prop7	0.949	1.000											
Overhead	0.132	0.256	1.000										
NIM	0.152	0.292	0.619	1.000									
B.Conc	0.016	0.071	-0.060	-0.071	1.000								
ROE	0.090	0.138	0.045	0.355	0.203	1.000							
Costinc	-0.011	0.036	0.480	-0.032	-0.034	-0.370	1.000						
Zscore	-0.216	-0.253	-0.212	-0.210	-0.111	-0.208	-0.068	1.000					
LifeI	-0.836	-0.875	-0.281	-0.288	0.013	-0.062	-0.118	0.327	1.000				
NlifeI	-0.560	-0.707	-0.305	-0.295	-0.016	-0.073	-0.220	0.276	0.783	1.000			
LNRB	-0.099	-0.201	-0.155	-0.176	0.123	-0.082	-0.079	0.158	0.170	0.338	1.000		
OSBD	0.148	0.090	-0.095	-0.018	0.140	0.047	-0.193	-0.021	-0.065	0.119	0.174	1.000	
Remit	0.162	0.131	-0.022	-0.085	0.022	-0.076	0.164	-0.001	-0.106	-0.032	-0.002	-0.040	1.000

Prop3: Infomal financial sector development. Prop7: Financial sector informalization. Overhead: Bank overhead costs to total assets (%). NIM: Net Internet Margin. B.Conc: Bank concentration (%). ROE: Return on Equity.Costinc:Bank Cost to Income Ratio(%). Zscore: Financial Stability. LNRB: Loans from Non-resident Banks. OSBD: Offshore Bank Deposits. Remit: remittances.

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