A G D I Working Paper

WP/17/045

ICT, Conflicts in Financial Intermediation and Financial Access: Evidence of Synergy and Threshold Effects

Forthcoming: Netnomics

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

Paul N. Acha-Anyi
Tshwane University of Technology,
Private Bag X680, Pretoria, 0001
E-mails: acha-anyipn@tut.ac.za
/ achasinstitute@gmail.com

Research Department

ICT, Conflicts in Financial Intermediation and Financial Access: Evidence of Synergy and Threshold Effects

Simplice A. Asongu & Paul N. Acha-Anyi

January 2017

Abstract

In this study we investigate the role of information and communication technology (ICT) in conflicts of financial intermediation for financial access. The empirical evidence is based on contemporary (or current values) and non-contemporary (or lagged by a year) quantile regressions in 53 African countries for the period 2004-2011. The main findings are: *First*, the net effect of ICT in formalization for financial activity in the banking system is consistently beneficial with positive thresholds. The fact that corresponding, unconditional and conditional effects are persistently positive is evidence of synergy or complementary effects. *Second*, the net effect of ICT in financial informalization for financial activity in the financial system is negative with a consistent negative threshold. Hence, the positive (negative) complementarity of ICT and financial formalization (informalization) is an increasing (decreasing) function of financial activity. Policy measures on how to leverage the synergy or complementarity between ICT and financial formalization in order to enhance financial access are discussed.

Keywords: Allocation efficiency; financial sector development; ICT
JEL Classification: G20; G29; L96; O40; O55

1. Introduction

The policy relevance of this inquiry has at least five motives, notably: (i) the high penetration potential of information and communication technology (ICT) in Africa (ii) the need for domestic sources of finance to accommodate Africa's investment needs; (iii) inconsistency in the measurement of financial development from the perspective of concerns about excess liquidity in African financial institutions; (iv) hitherto unexplored literature on financial sector competition and (v) the need to account for existing levels of financial development when investigating the complementarity between ICT and financial intermediary sector development in financial access[1].

First, Africa is a very fertile ground for the development of ICT-oriented activities because, compared to other regions of the world that are experiencing ICT-growth stabilization, the penetration of mobile phones and internet on the continent is low, but growing in a promising way. As of 2010, the continent was characterised by an asymmetric development of ICT: 9.6% (41%) penetration rate for mobile phones (internet) (see Asongu, 2015a; Penard et al., 2012). It follows that, ICT is an important policy tool that could be leveraged to address pressing policy syndromes like the lack of finance for the continent's rising investment needs. This study employs ICT as a policy tool.

Second, a broad stream of African business literature is consistent with the position that (i) lack of finance is a fundamental challenge to starting and doing business and (ii) there is need for domestic sources of finance after privatization projects have failed, for the most part, to bring-in the much needed foreign capital (Darley, 2012; Tuomi, 2011; Bartels et al., 2009; Rolfe & Woodward, 2004; Tchamyou, 2016). A step in the right direction towards addressing

[1]The conception of financial development employed in the paper is different from capital markets. We are exclusively concerned with short term finance or financial intermediary development. Moreover, 'financial intermediary development' and 'financial development' are used interchangeably throughout the study.

the underlying African business challenge could entail *inter alia* transforming mobilised deposits in the banking industry into credit for investment by economic operators.

In the light of the above, African's investment needs can be partly addressed by financial institutions if the potential for ICT is properly leveraged to enhance doing business conditions. This is essentially because ICT can reduce informational rents that limit financial access and increase doing of business constraints, notably, by: improving eligibility to bank lending and enhancing the availability of timely information for business operations (Batuo & Kupukile, 2010; Allen et al., 2011).

Third, the suggested step in the second point sharply contrasts with the evidence that banking institutions on the continent of Africa are characterised for the most part by excess liquidity (Asongu, 2014a; Fouda, 2009; Saxegaard, 2006). Moreover, as far as we are aware, the literature has not tackled the surplus liquidity concern by defining and measuring financial development in the light of bank's ability to transform mobilised deposits into credit for economic operators. Accordingly, this fundamental role of financial intermediation has been neglected by the bulk of literature in the area (Kablan, 2010; Kiyato, 2009; Al-Obaidan, 2008; Ataullah et al., 2004). The relevant literature on African financial development has, for the most part, considered financial intermediation efficiency through the prism of cost efficiency (Chen, 2009; Mensah et al., 2012); Data Envelopment Analysis (DEA), technical efficiency (Kablan, 2009) and profit efficiency (Hauner & Peiris, 2005).We measure financial efficiency in this study as the ability of banks to fulfil their basic mission of transforming mobilised deposits into credit.

Fourth, we introduce the perspective of financial sector development because the bulk of African literature has been skewed towards (i) more specific areas like bank concentration and bank participation (see O'Toole, 2014; Asongu, 2015b) and (ii) the sensitivity of financial development to financial reforms (see Arestis et al., 2002; Batuo & Kupukile, 2010). This

study steers clear of the mainstream literature by emphasising the concept of financial sector development. The introduction of this concept makes a twofold contribution to the literature, notably, it responds to the macroeconomic literature on calibrating financial development and it contributes to an evolving economic development field of non-traditional financial development by means of ICT. The twofold contribution also doubles as an empirical exercise that provides a practical means of dissociating the complementarity of ICT with various financial sectors for development. To this end, hitherto unexplored concepts of formalization, semi-formalization, informalization and non-formalization are introduced in Section 2.2.

Fifth, the modelling approach is designed to account for existing levels of financial development. This addresses shortcomings in the recent literature in which linkages between information sharing and financial access have been modelled at the conditional mean of financial access. Two recent examples include Asongu et al. (2016) and Triki and Gajigo (2014) who have respectively employed Generalized Method of Moments and Probit models. We argue that blanket policy implications based on mean values of financial access may be ineffective unless they are contingent on existing levels of financial access and hence tailored differently across countries with low, intermediate and high levels of financial access. To this end, we employ contemporary (or current values) and non-contemporary (or lagged by a year) quantile regressions to assess the role of ICT in financial sector development throughout the conditional distributions of financial access.

Noticeably from the discourse above, room is left to complement the existing literature in four main dimensions, notably the imperative to: (i) focus on a continent where the prospect of ICT-penetration is high (ii) address the surplus liquidity syndrome by calibrating financial allocation efficiency within the framework of the fundamental mission of banks which is to transform mobilized deposits into credit for economic operators, (iii) investigate how ICT affects financial sector development for financial access and (iv) model the investigated

relationships throughout the conditional distributions of financial access. As we shall substantiate in Section 2.1, the positioning of the inquiry also goes a long way to complement the spare literature on the nexus between ICT and financial access in Africa. This is essentially because a bulk of this literature has focused on South and East Asia where ICT penetration is intense.

The remainder of the study is organized as follows. Theoretical underpinnings and financial sector development are covered in Section 2. The data and methodology are discussed in Section 3 while Section 4 covers the empirical results and policy implications. Section 5 concludes with future research directions.

2. Literature Review, Theoretical Underpinnings and Financial Sector Development

2.1 Literature Review

This section is discussed in two main strands. The first reviews the extant knowledge on information asymmetry and financial access whereas the second clarifies the notions of threshold and synergy employed in the study. In the first, it is important to note that the bulk of the literature on the nexus between ICT and financial access has focused on South and East Asia where the penetration of ICT is intense (Alafeef et al., 2011, 2012;Amin et al., 2012; Donner & Tellez, 2008; Duncombe & Boateng, 2009; Saleem & Rashid, 2011; Safeena et al., 2012; Jain, 2013)[2]. Kirui et al. (2013) and Warren have established how mobile banking mitigates poverty in rural communities while another stream of the literature is consistent with the position that telecommunication infrastructure is fundamental for the underlying financial inclusion (Maurer, 2008; Chan & Jia, 2011; Qiang et al., 2011; Singh, 2012; Mishra & Bisht, 2013), especially in the provision of enabling conditions that eliminate waste on the one hand

[2] Accordingly, the recent bulk of financial development studies has to clearly articulate the nexus between ICT and financial access (Fowowe, 2014; Daniel, 2017; Chikalipah, 2017; Wale & Makina, 2017; Osah & Kyobe, 2017; Bocher et al., 2017; Chapoto & Aboagye, 2017; Oben & Sakyi, 2017; Iyke & Odhiambo, 2017).

and on the other hand, match supply and demand (Muto & Yamano, 2009; Aker & Fafchamps, 2010).

With regard to the second strand, the notions of threshold and synergy are consistent with recent financial development literature (see Asongu & Nwachukwu, 2017; Tchamyou, 2017). According to the authors, in an interactive regression: (i) a synergy effect is apparent when estimated conditional and conditional effects have the same sign while and (ii) a threshold effect is apparent when in a quantile regression, estimated effects either have an increasing tendency or a decreasing tendency throughout the conditional distribution of the dependent variable. In the latter scenario, positive thresholds are defined as decreasing negative or increasing positive estimated effects from the independent variables of interest and vice versa for negative thresholds. In the light of the insight, the notion of threshold adopted is different from, *inter alia*: minimum conditions for appealing effects (Cummins, 2000); critical masses for desired impacts (Roller & Waverman, 2001; Batuo, 2015) and requirements for U-shaped and inverted U-shaped patterns (see Ashraf & Galor, 2013; Asongu & Le Roux, 2017).

2.2 Theoretical Underpinnings and Financial Sector Development

Two main schools of thought have dominated the literature on the nexus between information sharing and financial development. Whereas the first focuses on how the risk features of bank assets can be transformed, the second is oriented towards mechanisms by which bank provision of liquidity can be strengthened. In addition, this stream of literature agrees with the perspective that the principal goal of financial intermediation in the banking sector should focus on allocation efficiency through optimal allocation of mobilised financial resources from lenders to borrowers or investors. Unfortunately, information asymmetry due to issues of moral hazard (adverse selection) from borrowers (lenders) limits intermediation

efficiency (see Claus & Grimes, 2003; Triki & Gajigo, 2014; Tchamyou & Asongu, 2017a, 2017b).

Consistent with Asongu et al. (2017), information asymmetry is focused on the study of transactional decisions in which one party of the transaction is better informed than the other. The underlying imbalance in information leads to a disequilibrium of transactional power which gives an edge to one party so that he/she takes decisions in his/her interest, to the detriment of the other party. Such decisions often translate into higher prices. Taking the example of the bank and borrower, the party which receives the loan is liable to moral hazard because the borrower may decide to conceal transactions for which the loan was granted in order to limit his/her financial obligation towards the bank. Conversely, the party that grants the loan may limit financial access through higher interest rates because of limited information about the borrower's credit worthiness. The behavior of the bank in this latter scenario is termed as "adverse selection". This narrative is consistent with the bulk of literature on the relationship between information asymmetry and financial access (Asongu, 2017; Domeher et al., 2017; Asongu & Biekpe, 2017; Ofori-Sasu et al., 2017; Boadi et al., 2017; Fanta, 2016).

In the light of the above it is difficult to argue against the fact that information sharing by means of ICT contributes to reducing information asymmetry in the banking industry. ICT has been shown to enhance the diffusion of information between market participants in the developing world. Some of the documented advantages of ICT in easing access to finance include (i) mitigating information asymmetry (Aminuzzaman et al., 2003) and (ii) consolidating market participation and decreasing marketing cost (Muto & Yamano, 2009, p. 1887). In summary, the intuition underpinning ICT in financial sector development for financial access is based on the documented evidence that ICT improves financial sector development (Asongu, 2013) and mitigates information asymmetry (Andonova, 2006).

In the light of the above, the theoretical connection between information sharing by means of ICT and financial sector development can be viewed from the perspective of adverse selection on the part of lenders in both the formal and informal financial sectors. Such an information sharing mechanism could benefit a lender in a given financial sector to the detriment of a lender in an opposing financial sector. This is essentially because, ceteris paribus, the shares in money supply of one financial sector may either increase or decrease if the corresponding shares of money supply in the opposing sector decrease or increase respectively. This theoretical background is consistent with recent literature on the relevance technology-driven information sharing for financial access (Asongu et al., 2017) and information sharing in financial sector development for financial access (Asongu & Nwachukwu, 2017). The latter study which is closest to the current inquiry has focused on information sharing in the perspectives of public credit registries and private credit bureaus.

The link between information sharing offices and financial development can be viewed from the perspectives of moral hazard on the part of borrowers and adverse selection on the part of lenders. Information sharing offices provide banks or lenders with credit histories and information about borrowers which help in reducing high interest rates due to adverse selection from banks. Once borrowers have had access to finance, they may be liable to moral hazard because they can conceal real economic activities upon which the credit is based in order to limit the payment of their financial obligations towards the lender or bank. It is the responsibility of information sharing offices to discipline borrowers on the unhealthy consequences of noncompliance with their financial obligations. Often times, information sharing offices have to educate borrowers on the perils of defaulting on their debts and seeking refuge in the informal financial sector as a viable alternative to the formal financial sector.

The International Monetary Fund's (IMF) or International Financial Statistics (IFS) definition of the financial system has the shortcoming of not incorporating the informal financial sector. Whereas the IFS' conception of the financial system from a 'formal financial sector' standpoint borders with the reality of developed economies where a substantial bulk of the monetary base circulates within the formal banking sector, this is not the case with the developing countries where just about 21 percent of the adults living on less than $2US a day possess a bank account (Caulderwood, 2015). It follows that much of the population in developing countries substantially depends on informal financial services (Asongu, 2014a).

"Insert Table 1 here"

The propositions summarised in Table 1 address the neglect of the informal financial sector by rethinking the mainstream financial system definition in developing countries. In essence, the propositions challenge the IMF's IFS financial system definition by: (i) accounting for the informal sector in the definition, (ii) disentangling the existing definition into its semi-formal and formal components and (iii) emphasising the concept of financial sector development. In so doing, the propositions also respond to a stream of literature underlining the need to incorporate the neglected informal financial sector (Meagher, 2013; Adeusi et al., 2012; Aryeetey, 2005).

Whereas Panel A shows indicators of the financial sector that are based on the Gross Domestic Product (GDP), those in Panel B are more aligned towards financial sector development in shares of the money supply. The concept of financial sector development for the latter is articulated by notions of non-formalization, informalization, semi-formalization and formalization. For example, financial informalization represents improvements in the money supply shares of the informal financial sector to the detriment of other financial sectors

(formal and semi-formal sectors). These propositions have been used in recent financial development literature (see Asongu, 2015b, 2015c).

It is relevant to devote more space to clarify the notions of "non-formalization", "informalization", "semi-formalization" and "formalization". Financial formalization is the increase of shares in money supply in the formal financial sector to the detriment of other financial sectors (i.e. semi-formal and informal financial sectors). In the same vein, financial informalization is the progress of the informal financial sector at the expense of competing sectors (formal and semi-formal sectors). Within the same line of thought, semi-formalization is the growth of the semi-formal financial sector to the detriment of the formal and informal financial sectors. Financial non-formalization is the simultaneous development of the semi-formal and informal financial sectors to the detriment of the formal financial sector. It is important note that the contending financial sectors are competing for shares in money supply. In what follows, we clarify the grouping of various financial sectors.

Appendix 1, which is an extension of Steel (2006) categorizes various financial sectors as employed in this study. In the table, formal finance reflects services that are within the regulation of other supervisory authorities and the central bank. Semi-formal finance which distinguishes between informal and formal finance, is the financial segment that may be defined as being in the formal financial sector, but not formally recognized as being in the formal financial sector. An eloquent example with which to articulate this semi-formal financial sector is microfinance. Conversely, informal finance represents the financial sector that is neither enforced via the legal system nor arranged though formal mechanisms. For instance, in the fourth column, developing countries are characterized with the last-two categories of "saving and lending".

The main hypothesis tested in this study is that ICT complements formal financial development to increase financial access while it complements informal financial development to decrease financial access.

3. Data and Methodology

3.1 Data

The study assesses a panel of 53 African countries with annual data from the African Development Indicators (ADI) and the Financial Development and Structure Database (FDSD) of the World Bank for the period 2004-2011[3]. 2004 coincides with the year in which information sharing offices (private credit bureaus and public credit registries) were introduced in Africa with the goal of increasing financial access and interbank competition, whereas the latest year in the FDSD is 2011. The scope of Africa has been justified in the introduction.

In line with the engaged policy syndrome on excess liquidity issues, two financial development variables are employed. They are dynamics of allocation efficiency and activity. *First*, financial allocation efficiency which appreciates the ability to transform mobilised deposits into credit for economic operators is measured with the following two indicators.(i) banking-system-efficiency (with 'banking system credit' on 'banking system deposits') and (ii) financial-system-efficiency (with 'financial system credit' on 'financial system deposits'). *Second*, financial activity or ability to grant credit is measured with (i) banking system activity (with 'private domestic credit by deposit banks') and (ii) financial system activity (with 'private domestic credit by deposit banks and other financial institutions').

In accordance with the motivation in the introduction on the high potential for ICT penetration on the continent (see Penard et al., 2012), ICT is measured in terms of mobile

[3]Of the 54 African countries, South Sudan is not included because data for the country was not available before 2011.

phone and internet penetrations (Tchamyou, 2016). Propositions 5 and 7 are used respectively for financial sector formalization and informalization. Proposition 6 on financial sector semi-informalization is not used because of constraints in degrees of freedom while Proposition 8 is also not employed because of its very high degree of substitution with Proposition 7.

We employ seven control variables: five non-dummy (foreign aid, public investment, trade, GDP growth and inflation) and two dummy (income levels and legal origins) indicators. The choice of the variables is consistent with recent financial development literature (Price & Elu, 2014; Banya & Biekpe, 2017; Biekpe, 2011; Adjasi & Biekpe, 2006; Gossel & Biekpe, 2014; Asongu, 2014c; Osabuohein & Efobi, 2013; Huang, 2005; Owusu & Odhiambo, 2014; Nyasha & Odhiambo, 2015a, 2015b). Whereas development assistance is theoretically expected to bridge the saving-investment gap in less developed countries (see Easterly, 2005), from a more pragmatic angle, the connection could be negative for at least two reasons: (i) a great portion of the disbursed funds is withheld in developed countries and (ii) a significant amount of the fund that reaches destination/recipient countries is siphoned off and deposited in tax havens that are within the jurisdictions of developed countries. While trade openness (Huang & Temple, 2005; Do & Levchenko, 2004) and investment (Huang, 2011) have been documented to be positively linked to financial development, the association may also be negative depending on the type of investment and balance of trade. From intuition and contrary to private investment, public investment may decrease financial development because of corruption and lobbying that are linked to procurement of public contracts. Moreover, a balance of trade deficit (surplus) is more likely to negatively (positively) affect financial development. The position that very high inflation is associated with less efficient banks is held by both theoretical (Huybens & Smith, 1999) and empirical (Boyd et al., 2001) articles. There is a consensus in the literature that economic prosperity in terms of GDP growth is linked to higher levels of financial development because of, *inter alia* greater

competition and availability of more funds for the purpose of investment (Jaffee & Levonian 2001; Levine, 1997; Saint-Paul, 1992; Greenwood & Jovanovic, 1992).

On the dummy variables, the classification into legal origins and income levels respectively builds on La Porta et al. (2008, p. 289) and Asongu (2014d, p. 364)[4].English common law countries are expected to enjoy higher levels of financial access vis-à-vis their French civil counterparts because of political and adaptability channels (Beck et al., 2003). The stance of Jaffee and Levonian (2001) that high income countries enjoy better levels of financial access is broadly consistent with a within-Africa framework where middle income countries are associated with higher levels of financial development compared to their low income counterparts (Asongu, 2012a). Appendix 2 provides the definitions of variables as well as their corresponding sources. The summary statistics are disclosed in Appendix 3 whereas Appendix 4 provides the correlation matrix. The correlation matrix enables the study to avoid concerns of multicollinearity that could bias estimated coefficients. The high correlation between financial development variables is resolved by employing the financial development variables in distinct specifications.

3.2 Methodology

In accordance with the motivation of the inquiry, the study accounts for existing levels of financial development in the modelling approach with the quantile regressions (QR) estimation technique. With the estimation strategy, the investigated relationships are established throughout the conditional distributions of the dependent variable or financial access (Koenker & Hallock, 2001; Billger & Goel, 2009; Okada & Samreth, 2012). This enables the study to articulate countries with low, intermediate and high levels of financial access.

[4]There are four main World Bank income groups: (i) high income, $12,276 or more; (ii) upper middle income,$3,976-$12,275; (iii) lower middle income, $1,006-$3,975 and (iv) low income, $1,005 or less.

The extant literature on the sharing of information for better financial access has estimated parameters at the conditional mean of financial development (see Triki & Gajigo, 2014; Asongu et al., 2016). While mean effects are important, it is also relevant to complement the existing literature with conditional impacts because policy recommendations based on blanket policies may not succeed unless they are contingent on initial levels of financial development and tailored varyingly across countries with low, intermediate and high levels of financial development (Asongu & Nwachukwu, 2017). Moreover, whereas techniques based on mean effects like Ordinary Least Squares (OLS) assume the presence of normally distributed error terms, the hypothesis of such normality is inconsistent with the QR technique[5].

The θ^{th} quantile estimator of financial development is obtained by solving for the optimization problem in Eq. (1), which is disclosed without subscripts for ease of presentation and simplicity.

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

where $\theta\in(0,1)$. As opposed to OLS which is fundamentally based on minimizing the sum of squared residuals, with QR, the weighted sum of absolute deviations is minimised. For instance the 10th decile or 90th decile (with θ=0.10 or 0.90 respectively) are minimised by approximately weighing the residuals. The conditional quintile of financial development or y_i given x_i is:

$$Q_y(\theta / x_i) = x_{i'}\beta_\theta \quad (2)$$

where unique slope parameters are modelled for each θ^{th} specific quantile. This formulation is analogous to $E(y/x) = x_{i'}\beta$ in the OLS slope where parameters are examined only at the

[5] The statement is meant to articulate the perspective that estimated techniques (such as OLS) that are based on the presence of normally distributed error terms are more simplistic and less consistent with reality.

mean of the conditional distribution of financial development. For the model in Eq (2) the dependent variable y_i is a financial access indicator whereas x_i contains a constant term, *ICT*, *Propositions, ICT×Proposition*, *foreign aid*, *trade*, *GDP growth*, *public investment*, *inflation, middle income* and *Common law*. The specifications are tailored to have some bite on endogeneity by controlling for: the unobserved heterogeneity in terms of fixed effects and simultaneity with non-contemporary specifications.

Consistent with Brambor et al. (2006) on the pitfalls of interactive regressions, estimates from the interactions are considered as conditional and marginal effects. Moreover, the overall or net effect is computed with conditional and unconditional impacts. In order to ensure that our empirical analysis does not suffer from spurious results owing to concerns of "non-stationarity", we perform unit root tests and confirm that the variables are overwhelmingly stationary[6].

4. Empirical results

4.1 Presentation of results

The results are presented in two main sections: one on mobile phones and the other on the internet. The first (second) table of each section presents findings for financial allocation efficiency (financial activity). The left-hand-side (LHS) of each table presents contemporary regressions whereas the right-hand-side (RHS) shows non-contemporary regressions. The interest of lagging the independent variables on the RHS by one period is to have some bite on endogeneity (see Mlachila et al., 2014, p. 21). For each table, the baseline estimations in Panel A entail interactions between financial formalization and banking system finance, whereas Panel B entails robustness with financial informalization and financial system

[6] The variables are overwhelmingly stationary with the Fisher-type (Choi 2001) test. The following tests could not be performed because they require highly balanced datasets: The Levin–Lin–Chu (2002), Harris–Tzavalis (1999), Breitung (2000), Breitung and Das 2005) and The Hadri (2000). Im–Pesaran–Shin (2003) could also not be performed because of insufficient observations. The Fisher-type unit root tests results are available upon request.

finance. Regardless of the tables, consistent differences in mean estimated effects (from OLS) and conditional estimated impacts (from quantiles) justify the choice of the estimated technique.

4.1.1 The Mobile Phone, Conflicts in Financial Intermediation and Financial Development

The findings are discussed in terms of net effects which are computed with (i) the unconditional effect of financial sector development and (ii) the conditional or marginal effect with ICT. For example, in the 75th quartile of Panel A in Table 2, the unconditional effect of financial formalization (or Prop. 5) is -58.92 while the conditional impact with the mobile phone is (Mobile × Prop. 5) is 1.419. The corresponding net effect is -6.900 ([36.659 ×1.419] + -58.92)[7].

The following findings can be established from Table 2 on linkages between 'mobile phones, conflicts on financial intermediation and allocation efficiency'. In Panel A, the net effect of mobile phones in financial formalization for allocation efficiency in the banking system is negative in the 75th quartile on LHS and RHS; and also positive in the 50th quartile of the RHS. In Panel B, the net effect of mobile phones in financial informalization for allocation efficiency in the financial system is negative in the 50th and 75th quartiles in both contemporary and non-contemporary regressions.

The following findings can be established from Table 3 on linkages between 'mobile phones, conflicts in financial intermediation and financial activity'. In Panel A, the net effect of mobile phones on formalization for financial activity in the banking system is consistently positive with a positive threshold from the 25th quartile to the 90th decile. The fact that corresponding unconditional and conditional effects are consistently positive is evidence of synergy effects. In Panel B, the net effect of mobile phones in financial informalization for

[7]36.659 is the mean value of mobile phone penetration.

financial activity in the financial system is negative with a consistent negative threshold on the RHS and a negative threshold from the 10^{th} decile to the 75^{th} quartile on the LHS.

Positive thresholds are established when net effects consistently display decreasing negative magnitudes and/or increasing positive magnitude throughout the conditional distributions of finance. Conversely, negative thresholds are denoted by persistently increasing negative or decreasing positive net effects. Hence, evidence of a threshold tendency confirms the intuition of modelling based on existing levels of financial access, with the view that the financial development benefits from financial sector development and ICT may steadily increase or decrease concurrently with increasing initial levels of financial access.

"Insert Table 2 here"

"Insert Table 3 here"

Most of the significant control variables display the anticipated signs. The unexpected negative effect of Common Law countries which is contrary to the law and finance theory of Beck et al. (2003) can be explained by recent literature on the law-finance nexus in Africa which suggests that French Civil Law countries dominate their English Common Law counterparts in terms of allocation efficiency because of inflation uncertainty (see Asongu, 2012b). This is based on the fact, French Civil Law countries, which are in common currency unions for the most part, have opted for monetary stability instead of monetary independence.

4.1.2 The Internet, Conflicts in Financial Intermediation and Financial Development

The following findings can be established from Table 4 on linkages between 'internet penetration, conflicts in financial intermediation and allocation efficiency'. In Panel A, the net

effect of internet penetration in financial formalization for allocation efficiency in the banking system is positive in the (i) 10^{th} decile and 25^{th} quartile on the LHS and (ii) 10^{th} decile and 50^{th} quartile on the RHS. In Panel B, the net effect of internet penetration in financial informalization for allocation efficiency in the financial system is consistently negative with an inverted U-shape, for the most part.

The following findings can be established from Table 5 on linkages between 'internet penetration, conflicts in financial intermediation and financial activity'. In Panel A, the net effect of internet penetration in financial formalization for financial activity in the banking system is consistently positive with a positive threshold from the 10^{th} decile to the 75^{th} quartile, for the most part. The fact that corresponding unconditional and conditional effects are consistently positive is evidence of synergy effects. In Panel B, the net effect of 'internet penetration in financial informalization for financial activity in the financial system' is negative with a consistent negative threshold. Most of the significant control variables display the expected signs.

"Insert Table 4 here"

"Insert Table 5 here"

4.2 Further discussion of the main policy implications

From a cross examination of Tables 2-5, two main consistent findings are apparent. On the one hand, the net effect of 'ICT in financial formalization for financial activity in the banking system' is consistently positive with positive thresholds. On the other, the net effect of 'ICT in financial informalization for financial activity in the financial system' is negative with a consistent negative threshold. These findings are broadly consistent with Asongu and Nwachukwu (2017) from the perspective of information sharing offices by means of public credit registries and private credit bureaus. Policy can increase the synergy effects from the

positive thresholds by leveraging on four main dimensions, namely, encouraging: mobile finance, partially integrated savings, ICT-banking and the use of credit registries as complementary information sharing mechanisms. The proposed policy directions are measures that can be tailored towards leveraging the synergy between ICT and financial formalization in order to enhance financial access. We engage the suggested policy directions chronologically.

First, in the encouragement of mobile finance, policy should build on three principal advantages of mobile banking: (i) ICT endows users with the option of storing currency or value in an internet-connected mobile phone. Real accounts that are linked to the formal banking sector should be preferred to pseudo bank accounts that depend on users' mobile operators, (ii) ICT enables users to convert stored value by cashing-in and/or cashing-out. Furthermore, such a conversion is associated with a formal bank account and the stored value can be used by banks to increase financial access.

Second, partially-integrated savings accounts should be encouraged in place of savings bank accounts. 'Partially integrated'-ICT savings that earn interest depend on the availability of bank accounts in formal banking establishments. Basic savings entail the employment of a standard ICT mobile transfer system like the M-PESA to store money. Policy should encourage the former option because it generates interest rates on the one hand and on the other hand, can be used to finance economic operators.

Third, overall, ICT-banking should be encouraged in the formal banking sector. For instance, when a mobile phone with a savings account is connected to the internet and the formal banking sector, the following advantages can be leveraged: (i) Given that the subscriber identity module (SIM) is similar to a smartcard (or virtual bank card), the ICT can be employed to store value; (ii) ICT-banking can also be used as an automated teller machine (ATM) because it permits instant access to bank accounts used for transactions' (iii) and by

enabling communications and transactions with formal banking institutions, ICT-banking also serves as a point of sale (POS) terminal.

Fourth, information sharing offices can be employed to complement ICT in enhancing interbank development and financial access. Examples of such credit offices include private credit bureaus and public credit registries. This recommendation has a twofold motivation. On the one hand, information sharing offices enhance financial sector development in order to boost financial access and on the other, these credit offices also act as disciplining devices by discouraging borrowers from defaulting on their debts in the formal financial sector and resorting to the informal financial sector as a viable alternative to the formal sector.

Another implication of the study that is both theoretical and practical is that information sharing mechanisms which decrease information asymmetry for financial access, promote the formal financial sector to the detriment of the informal financial sector. In other words, the reduction of information asymmetry by means of ICT is more beneficial to formal financial sector development compared to informal financial sector development. Given that monetary policy is ineffective in African countries (Weeks, 2010) partly because a great chunk of money supply circulates outside the formal financial sector, the theoretical/practical implications can be extended with an inference that, the advent of ICT will decrease the shadow/informal financial sector and provide more enabling conditions for monetary policy effectiveness in Africa.

5. Conclusions and further research directions

In this study we have investigated the role of information and communication technology (ICT) in conflicts of financial intermediation for financial access. The empirical evidence is based on contemporary and non-contemporary quantile regressions in 53 African countries for the period 2004-2011. The relevance of the estimation technique builds on the argument that

blanket policy implications based on mean values of financial access may be ineffective unless they are contingent on existing levels of financial access and hence tailored differently across countries with low, intermediate and high levels of financial access.

The following findings are established. *First,* the net effect of ICT in financial formalization for allocation efficiency in the banking system is selectively positive across the conditional distributions. *Second*, the net effect of ICT on financial informalization for allocation efficiency in the financial system is negative, with the negative connection more apparent in internet-oriented regressions. *Third*, the net effect of ICT in financial formalization for financial activity in the banking system is consistently positive with positive thresholds. The fact that corresponding unconditional and conditional effects are consistently positive is evidence of synergy effects. *Fourth*, the net effect of ICT in financial informalization for financial activity in the financial system is negative with a consistent negative threshold.

Positive thresholds are established when net effects consistently display decreasing negative magnitudes and/or increasing positive magnitude throughout the conditional distributions of financial access. Conversely, negative thresholds are denoted by persistently increasing negative or decreasing positive net effects. Hence, evidence of a threshold tendency confirms the intuition of modelling based on existing levels of financial access, with the view that the benefits from financial sector development and ICT may steadily increase or decrease concurrently with increasing initial levels of financial access. So, the positive complementarity of ICT and financial formalization is an increasing function of financial activity while the negative complementarity of ICT and financial informalization is a decreasing function of it. Policy measures on how to leverage the synergy between ICT and financial formalization in order to enhance financial access have been discussed.

The introduction of this concept of financial sector development makes a twofold contribution to the extant literature. It responds to the macroeconomic work on calibrating financial development and it contributes to an evolving economic development field of non-traditional financial development by means of ICT. This twofold contribution also doubles as an empirical exercise that provides a practical means of dissociating the complementarity of ICT with various sectors on financial development.

A caveat to the study is that the explanatory powers (i.e. Pseudo R^2) in some quantiles are quite low. While this may be partly traceable to the contingency of the analysis on initial levels of financial development, it also reflects an exploratory dimension of the paper. This leaves room for further studies which could include alternative variables in the conditioning information set to assess how the investigated linkages and corresponding explanatory powers change across specifications, quantiles and financial development dynamics. Future studies can also assess whether the established findings withstand empirical scrutiny within the context of other developing continents like Latin America and South Asia.

Table 1: Summary of propositions

Propositions	Name(s)	Formula	Elucidation	Authors supporting the propositions
Panel A: GDP-based financial development indicators				
Proposition 1	Formal financial development	Bank deposits/GDP	Bank deposits[8] here refer to demand, time and saving deposits in deposit money banks.	Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).
Proposition 2	Semi-formal financial development	(Financial deposits – Bank deposits)/ GDP	Financial deposits[9] are demand, time and saving deposits in deposit money banks and other financial institutions.	Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).
Proposition 3	Informal financial development	(Money Supply – Financial deposits)/GDP		Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).
Proposition 4	Informal and semi-formal financial development	(Money Supply – Bank deposits)/GDP		Demetriades and Hussein (1996), Abu-Bader and Abu-Qarn (2008), Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).
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)[10] .	Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).
Proposition 6	Financial intermediary 'semi-formalization'	(Financial deposits - Bank deposits)/ Money Supply	From 'informal and formal' to *semi-formal* financial development (Semi-formalization)[11].	Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).
Proposition 7	Financial intermediary 'informalization'	(Money Supply – Financial deposits)/ Money Supply	From 'formal and semi-formal' to *informal* financial development (Informalisation)[12].	Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).
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) [13]	Asongu and Nwachukwu (2017), Tchamyou et al. (2017) and Meniago and Asongu (2017).

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 (2015b).

[8] Lines 24 and 25 of the International Financial Statistics (October 2008).
[9] Lines 24, 25 and 45 of the International Financial Statistics (2008).
[10] "*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, 2015b, p. 432).
[11] "*This indicator measures the rate at which the semi-formal financial sector is evolving at the expense of formal and informal sectors*" (Asongu, 2015b, p. 432).
[12] "*This proposition appreciates the degree by which the informal financial sector is developing to the detriment of formal and semi-formal sectors*" (Asongu, 2015b, p. 432).
[13] "*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, 2015b, p. 432).

Table 2: Mobile Phones, Conflicts in Financial Intermediation and Allocation Efficiency

Panel A: Banking System Efficiency and Formalization (Prop. 5)

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**105.05*** **	**52.788*** **	**50.283*** **	**119.07*** **	**144.32*** **	**147.73*** **	**101.77*** **	**49.126*** **	**60.595*** **	**123.50*** **	**139.44*** **	**142.56*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Mobile	**-0.769*** **	**-0.711*** **	-0.225	**-0.849*** **	**-1.023*** **	**-0.926***	**-0.849*** **	**-0.767*** **	**-0.770** **	**-0.981*** **	**-1.097*** **	**-0.797** **
	(0.001)	**(0.000)**	(0.356)	**(0.001)**	**(0.000)**	**(0.087)**	**(0.000)**	**(0.000)**	**(0.041)**	**(0.002)**	**(0.000)**	**(0.017)**
Prop. 5	-17.540	7.266	**37.302** **	-30.037	**-58.92*** **	-25.715	-15.524	**29.200***	19.705	**-39.367***	**-59.25*** **	-18.716
	(0.380)	(0.535)	**(0.022)**	(0.147)	**(0.005)**	(0.588)	(0.356)	**(0.053)**	(0.412)	**(0.085)**	**(0.001)**	(0.580)
Mobile×Prop. 5	**0.989*** **	**0.807*** **	0.364	**1.233*** **	**1.419*** **	0.886	**1.066*** **	**0.791*** **	**1.024** **	**1.373*** **	**1.511*** **	**0.758***
	(0.000)	**(0.000)**	(0.214)	**(0.000)**	**(0.000)**	(0.149)	**(0.000)**	**(0.000)**	**(0.020)**	**(0.000)**	**(0.000)**	**(0.050)**
GDP growth	-0.00004	0.329	0.163	-0.091	-0.243	-0.681	0.134	0.364	0.370	0.456	-0.236	-0.526
	(1.000)	(0.251)	(0.609)	(0.833)	(0.559)	(0.305)	(0.682)	(0.139)	(0.513)	(0.315)	(0.406)	(0.336)
Inflation	**-0.121** **	-0.027	**-0.071***	**-0.125** **	-0.146	**-0.109***	**-0.217** **	**-0.192*** **	**-0.257** **	**-0.239***	**-0.161*** **	**-0.228*** **
	(0.038)	(0.361)	**(0.089)**	**(0.042)**	(0.120)	**(0.079)**	**(0.024)**	**(0.001)**	**(0.010)**	**(0.059)**	**(0.000)**	**(0.001)**
Public Invt.	**-1.386*** **	**-1.008*** **	**-1.767*** **	**-1.453*** **	**-0.761***	-1.500	**-1.427*** **	**-1.344*** **	**-2.027*** **	**-1.532*** **	-0.628	**1.636*** **
	(0.001)	**(0.001)**	**(0.000)**	**(0.001)**	**(0.097)**	(0.182)	**(0.002)**	**(0.005)**	**(0.000)**	**(0.002)**	(0.147)	**(0.000)**
Foreign Aid	-0.101	0.123	-0.002	-0.010	-0.196	-0.283	-0.020	-0.118	0.303	0.022	-0.079	-0.390
	(0.679)	(0.644)	(0.993)	(0.974)	(0.501)	(0.654)	(0.934)	(0.698)	(0.439)	(0.949)	(0.770)	(0.339)
Trade	**-0.124** **	**-0.150** **	**-0.153** **	**-0.193*** **	**-0.125** **	-0.072	**-0.105***	**-0.182*** **	-0.122	**-0.177** **	-0.084	-0.079
	(0.019)	**(0.010)**	**(0.016)**	**(0.005)**	**(0.044)**	(0.582)	**(0.060)**	**(0.009)**	(0.175)	**(0.022)**	(0.124)	(0.426)
Middle Income	3.981	3.524	-1.793	-1.769	4.130	**26.497*** **	4.203	2.281	-2.139	-1.505	4.980	**24.394*** **
	(0.267)	(0.462)	(0.712)	(0.753)	(0.367)	**(0.001)**	(0.271)	(0.681)	(0.753)	(0.185)	(0.253)	**(0.000)**
Common Law	**-6.620** **	-2.027	**-8.187** **	**-8.460***	**-6.651***	**-19.70*** **	**-5.747***	-3.962	-5.043	-7.034	**-7.151** **	**-17.39*** **
	(0.021)	(0.558)	**(0.039)**	**(0.060)**	**(0.080)**	**(0.002)**	**(0.051)**	(0.284)	(0.371)	(0.173)	**(0.037)**	**(0.000)**
Net effects	na	na	na	na	-6.900	na	na	58.197	na	10.965	-3.858	na
Pseudo R^2/R^2	0.186	0.151	0.134	0.111	0.132	0.182	0.188	0.162	0.137	0.109	0.149	0.209
Fisher	**6.30*** **						**8.48*** **					
Observations	316	316	316	316	316	316	280	280	280	280	280	280

Panel B: Financial System Efficiency and Informalization (Prop.7)

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**93.357*** **	**67.257*** **	**72.636*** **	**78.423*** **	**85.845*** **	**127.02*** **	**90.232*** **	**72.376*** **	**72.785*** **	**77.156*** **	**85.086*** **	**132.52*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Mobile	**0.578*** **	**0.240*** **	**0.517*** **	**0.817*** **	**0.914*** **	**0.693*** **	**0.625*** **	**0.320*** **	**0.579*** **	**0.874*** **	**0.884*** **	**0.538*** **
	(0.000)	**(0.006)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.002)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.008)**
Prop.7	33.696	-16.219	28.342	**77.608*** **	**93.077*** **	63.760	**36.809*** **	-19.404	37.031	**76.150*** **	**76.907*** **	25.732
	(0.124)	(0.221)	(0.112)	**(0.000)**	**(0.000)**	(0.150)	**(0.073)**	(0.262)	(0.138)	**(0.000)**	**(0.000)**	(0.579)
Mobile×Prop.7	**-2.851*** **	**-1.680*** **	**-2.511*** **	**-3.226*** **	**-3.374*** **	**-3.768*** **	**-3.240*** **	**-2.189*** **	**-3.242*** **	**-3.786*** **	**-3.364*** **	**-3.458*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
GDP growth	-0.071	0.338	0.585	-0.013	-0.501	-0.858	0.156	**0.526** **	0.328	0.216	-0.212	-0.492
	(0.834)	(0.112)	(0.197)	(0.963)	(0.166)	(0.259)	(0.654)	**(0.034)**	(0.596)	(0.411)	(0.435)	(0.537)
Inflation	-0.089	**-0.136*** **	-0.001	-0.034	0.030	-0.076	-0.159	**-0.201*** **	**-0.383*** **	-0.011	**-0.064** **	-0.141
	(0.142)	**(0.000)**	(0.969)	(0.402)	(0.391)	(0.312)	(0.137)	**(0.000)**	**(0.000)**	(0.682)	**(0.040)**	(0.126)
Public Invt.	**-1.770*** **	**-1.131*** **	**-1.995*** **	**-1.116*** **	**-1.030** **	**-1.300** **	**-1.959*** **	**-2.001*** **	**-1.982*** **	**-1.369*** **	**-0.921** **	**-1.669*** **
	(0.001)	**(0.005)**	**(0.000)**	**(0.000)**	**(0.014)**	**(0.023)**	**(0.001)**	**(0.000)**	**(0.001)**	**(0.000)**	**(0.025)**	**(0.001)**
Foreign Aid	-0.045	0.001	0.191	0.166	0.072	-0.702	0.044	0.306	0.542	0.246	-0.022	-0.323
	(0.872)	(0.995)	(0.530)	(0.420)	(0.771)	(0.304)	(0.872)	(0.342)	(0.206)	(0.186)	(0.925)	(0.516)
Trade	**-0.193*** **	**-0.137** **	**-0.157** **	**-0.298*** **	**-0.287*** **	**-0.251***	**-0.166*** **	**-0.170*** **	-0.137	**-0.262*** **	**-0.219*** **	-0.207
	(0.001)	**(0.013)**	**(0.012)**	**(0.000)**	**(0.000)**	**(0.051)**	**(0.008)**	**(0.009)**	(0.134)	**(0.000)**	**(0.000)**	(0.153)
Middle Income	**6.575***	0.626	-1.111	3.467	**7.099***	**25.788*** **	**6.959***	5.367	-0.621	**5.995***	**9.129*** **	**32.376*** **
	(0.082)	(0.876)	(0.835)	(0.349)	**(0.076)**	**(0.004)**	**(0.083)**	(0.290)	(0.933)	**(0.084)**	**(0.000)**	**(0.000)**
Common Law	**-10.85*** **	**-6.576** **	**-12.06*** **	**-9.699*** **	**-12.00*** **	**-19.83*** **	**-9.848*** **	**-6.948***	**-10.951***	**-11.00*** **	**-11.44*** **	**-27.04*** **
	(0.001)	**(0.048)**	**(0.005)**	**(0.001)**	**(0.000**	**(0.001)**	**(0.003)**	**(0.056)**	**(0.073)**	**(0.000)**	**(0.000)**	**(0.000)**
Net effects	na	na	na	-40.653	-30.610	na	-81.969	na	na	-62.640	-46.413	na
Pseudo R^2/R^2	0.476	0.151	0.145	0.177	0.236	0.382	0.494	0.161	0.153	0.187	0.247	0.390
Fisher	**11.08*** **						**17.57*** **					
Observations	316	316	316	316	316	316	280	280	280	280	280	280

*,**,***: significance levels of 10%, 5% and 1% respectively. GDPg: GDP growth rate. Public Invt: Public Investment. Mobile: Mobile phone penetration rate. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial activity is least. It is important to note that because of unbalanced panel and corresponding issues in degrees of freedom, the estimation output may not contain all the 53 sampled countries.

Table 3: Mobile Phones, Conflicts in Financial Intermediation and Financial Activity

Panel A: Banking System Activity and Formalization

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**-11.992****	**-5.577*****	**-3.962***	0.485	1.593	3.348	**-10.406****	**-4.505****	-0.289	-0.497	-1.996	1.888
	(0.012)	**(0.000)**	**(0.056)**	(0.898)	(0.811)	(0.656)	**(0.017)**	**(0.015)**	(0.909)	(0.919)	(0.824)	(0.645)
Mobile	-0.194	**-0.363*****	**-0.343*****	**0.452*****	**-0.422*****	**-0.663*****	**-0.213***	**-0.474*****	**-0.443*****	**-0.446*****	**-0.377*****	**-0.685*****
	(0.118)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.067)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.007)**	**(0.000)**
Prop.5	**43.963*****	**22.786*****	**20.804*****	**28.245*****	**34.965*****	**35.176*****	**41.307*****	**21.444*****	**16.261*****	**31.297*****	**42.108*****	**29.210*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.002)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.000)**
Mobile×Prop5	**0.428*****	**0.495*****	**0.514*****	**0.711*****	**0.723*****	**1.155*****	**0.482*****	**0.635*****	**0.632*****	**0.708*****	**0.691*****	**1.300*****
	(0.006)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
GDP growth	-0.094	**-0.169*****	**-0.216*****	**-0.181***	-0.006	0.025	-0.028	**-0.203*****	**-0.155****	-0.041	-0.025	**0.217****
	(0.522)	**(0.004)**	**(0.002)**	**(0.098)**	(0.961)	(0.887)	(0.856)	**(0.001)**	**(0.048)**	(0.753)	(0.881)	**(0.033)**
Inflation	-0.028	**-0.041*****	-0.009	-0.010	0.006	-0.010	-0.057	**-0.064*****	**-0.091*****	**-0.160*****	-0.020	**-0.024****
	(0.185)	**(0.000)**	(0.226)	(0.471)	(0.715)	(0.590)	(0.207)	**(0.000)**	**(0.000)**	**(0.000)**	(0.283)	**(0.048)**
Public Invt.	**-0.836*****	**-0.185****	**-0.053**	**-0.299*****	**-0.399****	**-0.508****	**-0.932*****	**-0.177***	-0.108	**0.376*****	**-0.719*****	**-0.417*****
	(0.000)	**(0.010)**	**(0.490)**	**(0.002)**	**(0.016)**	**(0.028)**	**(0.000)**	**(0.096)**	(0.276)	**(0.003)**	**(0.001)**	**(0.001)**
Foreign Aid	0.013	-0.033	0.002	-0.048	-0.207	-0.261	0.016	-0.006	0.042	-0.075	-0.197	**-0.197***
	(0.897)	(0.451)	(0.962)	(0.538)	(0.125)	(0.214)	(0.879)	(0.906)	(0.491)	(0.465)	(0.252)	**(0.098)**
Trade	-0.006	-0.011	**-0.023****	**-0.049*****	**-0.061*****	-0.046	0.002	-0.009	-0.011	**-0.047****	-0.036	-0.015
	(0.806)	(0.206)	**(0.029)**	**(0.004)**	**(0.009)**	(0.146)	(0.943)	(0.452)	(0.425)	**(0.032)**	(0.257)	(0.386)
Middle Income	**3.524****	**-2.350*****	-1.258	0.307	**6.827*****	**16.609*****	**3.323***	**-2.086****	-1.681	0.403	3.953	**16.254*****
	(0.023)	**(0.000)**	(0.146)	(0.827)	**(0.001)**	**(0.000)**	**(0.050)**	**(0.021)**	(0.127)	(0.827)	(0.139)	**(0.000)**
Common Law	**-6.308*****	**-5.577*****	-0.735	**-7.499*****	**-8.750*****	**-6.279****	**-5.611*****	-0.720	-0.895	**-6.753*****	**-9.651*****	**-4.920*****
	(0.001)	**(0.000)**	(0.305)	**(0.000)**	**(0.000)**	**(0.019)**	**(0.006)**	(0.364)	(0.343)	**(0.000)**	**(0.000)**	**(0.001)**
Net effects	59.653	40.932	39.646	54.309	61.469	77.517	72.954	63.137	57.757	77.783	87.478	114.566
Pseudo R^2/R^2	0.499	0.236	0.244	0.270	0.364	0.495	0.496	0.231	0.220	0.259	0.364	0.506
Fisher	**32.56*****						**32.37*****					
Observations	316	316	316	316	316	316	280	280	280	280	280	280

Panel B: Financial System Activity and Informalization (Prop.7)

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**37.090*****	**15.777*****	**11.885*****	**28.366*****	**40.958*****	**50.009*****	**34.904*****	**15.068*****	**15.364*****	**28.602*****	**34.649*****	**39.799*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Mobile	**0.430*****	**0.187*****	**0.299*****	**0.445*****	**0.602*****	**0.543*****	**0.497*****	**0.175*****	**0.331*****	**0.488*****	**0.694*****	**0.745*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Prop.7	**-41.73*****	**-17.72*****	**-7.000***	**-23.91*****	**-34.93*****	**-42.11*****	**-36.30*****	**-15.02*****	**-10.70*****	**-23.96*****	**-31.58*****	**-29.21*****
	(0.000)	**(0.000)**	**(0.063)**	**(0.000)**	**(0.005)**	**(0.002)**	**(0.000)**	**(0.000)**	**(0.003)**	**(0.000)**	**(0.000)**	**(0.007)**
Mobile×Prop.7	**-1.452*****	**-0.750*****	**-1.016*****	**-1.419*****	**-1.816*****	**-1.575*****	**-1.691*****	**-0.676*****	**-1.369*****	**-1.590*****	**-1.924*****	**-2.161*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
GDP growth	-0.070	**-0.144****	-0.092	-0.053	-0.041	0.303	0.024	**-0.117****	-0.124	-0.098	0.199	**0.319****
	(0.661)	**(0.024)**	(0.321)	(0.561)	(0.830)	(0.105)	(0.888)	**(0.033)**	(0.114)	(0.409)	(0.155)	**(0.044)**
Inflation	**-0.042***	**-0.041*****	-0.005	-0.009	-0.001	-0.015	-0.071	**-0.066*****	**-0.055*****	**-0.155*****	-0.012	-0.024
	(0.073)	**(0.000)**	(0.562)	(0.462)	(0.954)	(0.449)	(0.163)	**(0.000)**	**(0.000)**	**(0.000)**	(0.459)	(0.170)
Public Invt.	**-1.082*****	**-0.358*****	**-0.254*****	**-0.384*****	**-0.710*****	**-1.080*****	**-1.243*****	**-0.349*****	**-0.256*****	**-0.435*****	**-0.529*****	**-0.702*****
	(0.000)	**(0.000)**	**(0.009)**	**(0.000)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.007)**	**(0.000)**	**(0.001)**	**(0.000)**
Foreign Aid	0.002	-0.034	0.091	-0.031	-0.177	-0.382	0.027	-0.040	0.056	-0.007	-0.143	-0.265
	(0.980)	(0.534)	(0.145)	(0.637)	(0.325)	(0.118)	(0.807)	(0.473)	(0.318)	(0.938)	(0.261)	(0.110)
Trade	-0.036	-0.010	-0.012	**-0.057*****	**-0.080****	**-0.062***	-0.023	-0.009	-0.008	**-0.047****	**-0.056****	**-0.060****
	(0.169)	(0.283)	(0.338)	**(0.000)**	**(0.016)**	**(0.075)**	(0.435)	(0.432)	(0.467)	**(0.020)**	**(0.027)**	**(0.032)**
Middle Income	**4.108****	**-1.527***	-0.990	**2.206***	**7.351****	**14.029*****	**4.084****	**-1.422***	**-1.889***	1.849	**4.480****	**14.74*****
	(0.013)	**(0.068)**	(0.347)	**(0.062)**	**(0.011)**	**(0.000)**	**(0.023)**	**(0.071)**	**(0.053)**	(0.266)	**(0.036)**	**(0.000)**
Common Law	**-9.272*****	-0.984	-1.360	**-10.16*****	**-12.02*****	**-13.07*****	**-8.546*****	0.253	**-2.098****	**-8.770*****	**-11.55*****	**-11.24*****
	(0.000)	(0.185)	(0.131)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.746)	**(0.013)**	**(0.000)**	**(0.000)**	**(0.000)**
Net effects	-94.958	-66.964	-73.709	-117.080	-154.166	-145.522	-147.329	-39.801	-60.886	-82.274	-157.907	-171.099
Pseudo R^2/R^2	0.691	0.202	0.202	0.292	0.483	0.636	0.700	0.199	0.199	0.292	0.485	0.639
Fisher	**29.73*****						**35.56*****					
Observations	316	316	316	316	316	316	280	280	280	280	280	280

*,**,***: significance levels of 10%, 5% and 1% respectively. GDPg: GDP growth rate. Public Invt: Public Investment. Mobile: Mobile phone penetration rate. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial activity is least. It is important to note that because of unbalanced panel and corresponding issues in degrees of freedom, the estimation output may not contain all the 53 sampled countries.

Table 4: Internet, Conflicts in Financial Intermediation and Allocation Efficiency

Panel A: Banking System Efficiency and Formalisation (Prop.5)

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**98.208*** **	**37.605*** **	**51.371*** **	**105.51*** **	**126.72*** **	**151.38*** **	**95.510*** **	**26.070***	**49.412*** **	**122.79*** **	**125.53*** **	**137.53*** **
	(0.000)	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.052)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Internet	**-4.673*** **	**-3.016*** **	**-2.524**	**-6.365*** **	**-6.757*** **	**-5.743** **	**-5.393*** **	**-2.383***	-2.347	**-9.068*** **	**-7.844*** **	**-6.754*** **
	(0.004)	**(0.001)**	**(0.173)**	**(0.000)**	**(0.000)**	**(0.011)**	**(0.007)**	**(0.091)**	(0.337)	**(0.000)**	**(0.000)**	**(0.004)**
Prop.5	-7.063	**22.069***	**31.430** **	-7.222	-17.214	-27.938	-7.955	**49.439*** **	**32.740** **	**-31.400** **	-22.635	-15.791
	(0.690)	**(0.064)**	**(0.042)**	(0.529)	(0.464)	(0.415)	(0.608)	**(0.002)**	**(0.049)**	**(0.042)**	(0.347)	(0.575)
Internet×Prop.5	**5.894*** **	**3.812*** **	**3.791***	**8.265*** **	**8.210*** **	**5.840** **	**6.906*** **	**3.065***	3.597	**11.506*** **	**9.746*** **	**7.149*** **
	(0.002)	**(0.000)**	**(0.083)**	**(0.000)**	**(0.000)**	**(0.022)**	**(0.004)**	**(0.067)**	(0.219)	**(0.000)**	**(0.000)**	**(0.006)**
GDP growth	0.026	**0.394***	0.177	0.005	-0.066	0.152	0.176	**0.483***	0.351	0.397	0.014	-0.173
	(0.934)	**(0.066)**	(0.607)	(0.983)	(0.893)	(0.771)	(0.580)	**(0.082)**	(0.229)	(0.240)	(0.978)	(0.598)
Inflation	**-0.126** **	-0.013	**-0.078***	**-0.119*** **	-0.026	-0.070	**-0.220** **	**-0.234*** **	**-0.337*** **	**-0.219** **	**-0.139*** **	**-0.180*** **
	(0.031)	(0.684)	**(0.091)**	**(0.002)**	(0.568)	(0.131)	**(0.029)**	**(0.001)**	**(0.000)**	**(0.015)**	**(0.001)**	**(0.000)**
Public Invt.	**-1.352*** **	**-1.073*** **	**-1.558*** **	**-1.478*** **	**-0.840***	**-1.468*** **	**-1.333*** **	**-1.455*** **	**-1.981*** **	**-1.136*** **	-0.936	**-1.725*** **
	(0.002)	**(0.009)**	**(0.001)**	**(0.000)**	**(0.096)**	**(0.002)**	**(0.002)**	**(0.007)**	**(0.000)**	**(0.001)**	(0.101)	**(0.000)**
Foreign Aid	-0.122	0.209	0.008	-0.048	-0.425	**-0.828***	-0.028	0.136	0.338	-0.186	-0.219	**-0.615** **
	(0.571)	(0.508)	(0.976)	(0.794)	(0.178)	**(0.073)**	(0.890)	(0.706)	(0.248)	(0.451)	(0.496)	**(0.026)**
Trade	**-0.152*** **	**-0.140** **	**-0.141** **	**-0.242*** **	**-0.277*** **	-0.131	**-0.128** **	-0.123	**-0.117***	**-0.242*** **	**-0.254*** **	-0.039
	(0.005)	**(0.024)**	**(0.046)**	**(0.000)**	**(0.000)**	(0.195)	**(0.024)**	(0.160)	**(0.092)**	**(0.000)**	**(0.002)**	(0.649)
Middle Income	3.562	3.268	-3.102	0.112	8.076	**24.701*** **	3.193	-3.642	-2.936	-1.329	**10.656***	**20.673*** **
	(0.340)	(0.537)	(0.553)	(0.975)	(0.154)	**(0.000)**	(0.418)	(0.569)	(0.574)	(0.774)	**(0.070)**	**(0.000)**
Common Law	-4.776	-2.771	-6.769	**-8.455*** **	**-10.842** **	**-14.65*** **	-4.167	-5.733	-4.929	-5.641	**-8.144***	**-20.14*** **
	(0.105)	(0.492)	(0.128)	**(0.003)**	**(0.019)**	**(0.009)**	(0.161)	(0.234)	(0.261)	(0.128)	**(0.098)**	**(0.000)**
Net effects	na	48.101	57.292	na	na	na	na	70.348	na	47.093	na	na
Pseudo R^2/R^2	0.184	0.140	0.144	0.129	0.113	0.189	0.187	0.152	0.144	0.122	0.131	0.211
Fisher	**4.73*** **						**4.16*** **					
Observations	312	312	312	312	312	312	278	278	278	278	278	278

Panel B: Financial System Efficiency and Informalization (Prop.7)

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**111.62*** **	**51.626*** **	**74.537*** **	**100.36*** **	**114.31*** **	**120.75*** **	**106.06*** **	**61.859*** **	**77.825*** **	**91.770*** **	**106.93*** **	**123.61*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Internet	**2.507*** **	**2.576*** **	**2.705*** **	**2.708*** **	**3.287*** **	**5.225*** **	**3.233*** **	**2.717*** **	**2.972*** **	**3.074*** **	**5.438*** **	**5.334*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Prop. 7	**-7.966**	**-15.160**	**7.017**	**34.803** **	26.419	**51.414***	**-1.491**	**-23.585***	**-2.176**	**38.768*** **	**44.235** **	**45.065** **
	(0.736)	**(0.130)**	**(0.642)**	**(0.037)**	(0.386)	**(0.054)**	**(0.945)**	**(0.083)**	**(0.922)**	**(0.004)**	**(0.035)**	**(0.042)**
Internet×Prop.7	**-16.36*** **	**-13.86*** **	**-13.81*** **	**-13.91*** **	**-18.13*** **	**-32.95*** **	**-20.09*** **	**-16.23*** **	**-14.82*** **	**-16.42*** **	**-29.32*** **	**-34.12*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
GDP growth	-0.008	**0.454** **	**-0.705***	-0.042	-0.664	-0.226	0.220	**0.555*** **	0.335	0.361	-0.131	-0.066
	(0.981)	**(0.011)**	**(0.091)**	(0.905)	(0.306)	(0.537)	(0.523)	**(0.009)**	(0.383)	(0.220)	(0.761)	(0.859)
Inflation	**-0.137** **	-0.044	**-0.173*** **	**-0.090***	-0.043	**-0.084** **	**-0.213***	**-0.243*** **	**-0.250** **	**-0.145***	**-0.125*** **	**-0.155*** **
	(0.022)	(0.111)	**(0.001)**	**(0.097)**	(0.465)	**(0.026)**	**(0.067)**	**(0.000)**	**(0.010)**	**(0.063)**	**(0.001)**	**(0.000)**
Public Invt.	**-1.713*** **	**-0.725***	**-1.658*** **	**-1.556*** **	-1.086	**-1.203*** **	**-1.817*** **	**-1.553*** **	**-1.924*** **	**-1.312*** **	-0.315	**-1.289*** **
	(0.002)	**(0.061)**	**(0.000)**	**(0.000)**	(0.132)	**(0.000)**	**(0.002)**	**(0.001)**	**(0.000)**	**(0.000)**	(0.492)	**(0.000)**
Foreign Aid	-0.284	0.097	-0.036	-0.016	-0.134	-0.131	0.179	0.439	0.209	-0.057	-0.330	-0.192
	(0.268)	(0.690)	(0.900)	(0.952)	(0.753)	(0.700)	(0.456)	(0.145)	(0.590)	(0.784)	(0.228)	(0.413)
Trade	**-0.277*** **	**-0.113** **	**-0.206*** **	**-0.331*** **	**-0.378*** **	**-0.345*** **	**-0.249*** **	**-0.127***	**-0.152***	**-0.294*** **	**-0.382*** **	**-0.377*** **
	(0.000)	**(0.037)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.050)**	**(0.088)**	**(0.000)**	**(0.000)**	**(0.000)**
Middle Income	**7.662***	1.319	2.808	2.889	**15.345** **	**41.633*** **	**7.305***	2.673	-1.325	4.945	**13.125** **	**41.378*** **
	(0.063)	(0.728)	(0.583)	(0.571)	**(0.035)**	**(0.000)**	**(0.092)**	(0.565)	(0.849)	(0.219)	**(0.014)**	**(0.000)**
Common Law	**-7.512** **	-0.656	-4.777	**-10.222** **	**-11.491***	**-10.43*** **	**-6.594***	-4.787	-5.428	**-8.105** **	**-10.608** **	**-9.695** **
	(0.032)	(0.844)	(0.255)	**(0.015)**	**(0.061)**	**(0.009)**	**(0.065)**	(0.178)	(0.359)	**(0.015)**	**(0.015)**	**(0.011)**
Net effects	-119.573	-109.712	-87.194	-60.091	na	-173.370	-87.194	-138.544	-103.278	-73.249	-155.786	-187.701
Pseudo R^2/R^2	0.431	0.165	0.163	0.159	0.173	0.416	0.446	0.165	0.156	0.153	0.197	0.444
Fisher	**7.83*** **						**28.049*** **					
Observations	312	312	312	312	312	312	278	278	278	278	278	278

*,**,***: significance levels of 10%, 5% and 1% respectively. GDPg: GDP growth rate. Public Invt: Public Investment. Mobile: Mobile phone penetration rate. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial activity is least. It is important to note that because of unbalanced panel and corresponding issues in degrees of freedom, the estimation output may not contain all the 53 sampled countries.

Table 5: Internet, Conflicts in Financial Intermediation and Financial Activity,

Panel A: Banking System Activity and Formalization (Prop. 5)

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**-10.160****	**-7.415*****	-1.341	4.524	2.884	-0.122	-7.813	**-7.589*****	-1.036	4.550	2.909	-2.670
	(0.021)	**(0.000)**	(0.399)	(0.396)	(0.285)	(0.985)	(0.136)	**(0.000)**	(0.675)	(0.294)	(0.533)	(0.646)
Internet	-1.234	**-1.701*****	**-2.173*****	**-4.953*****	**-5.331*****	**-3.558*****	-1.968	**-1.771*****	**-2.218*****	**-5.909*****	**-5.883*****	**-2.720*****
	(0.276)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.236)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Prop.5	**36.65*****	**22.999*****	**13.268*****	**20.376*****	**26.751*****	**37.257*****	**32.463*****	**21.686*****	**-12.78*****	**14.854****	**21.022*****	**38.064*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.004)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.010)**	**(0.002)**	**(0.000)**
Internet×Prop.5	**3.020****	**2.710*****	**3.834*****	**7.549*****	**8.356*****	**6.092*****	**4.202****	**3.060*****	**4.190*****	**9.017*****	**9.321*****	**5.429*****
	(0.026)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.036)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
GDP growth	-0.139	**-0.121****	**-0.140*****	-0.185	-0.103	-0.108	-0.072	**-0.131*****	**-0.073**	**-0.107*****	0.144	-0.124
	(0.238)	**(0.048)**	**(0.006)**	(0.270)	(0.193)	(0.356)	(0.537)	**(0.001)**	**(0.270)**	**(0.000)**	(0.305)	(0.229)
Inflation	**-0.049*****	**-0.049*****	**-0.047*****	-0.031	-0.006	**-0.039*****	**-0.075****	**-0.065*****	**-0.093*****	-0.038	-0.019	**-0.072*****
	(0.008)	**(0.000)**	**(0.000)**	(0.181)	(0.460)	**(0.005)**	**(0.039)**	**(0.000)**	**(0.000)**	(0.244)	(0.177)	**(0.000)**
Public Invt.	**-0.531*****	-0.151	**-0.150****	**-0.325***	**-0.361*****	**-0.472*****	**-0.677*****	**-0.192****	**-0.285*****	**-0.411*****	**-0.441*****	**-0.391*****
	(0.000)	(0.147)	**(0.028)**	**(0.056)**	**(0.000)**	**(0.001)**	**(0.000)**	**(0.018)**	**(0.005)**	**(0.002)**	**(0.001)**	**(0.000)**
Foreign Aid	0.031	0.034	**0.161*****	-0.026	0.068	-0.006	0.059	0.070	**0.175*****	0.075	0.150	**-0.194****
	(0.655)	(0.591)	**(0.000)**	(0.823)	(0.293)	(0.946)	(0.406)	(0.104)	**(0.005)**	(0.405)	(0.137)	**(0.018)**
Trade	-0.001	-0.013	**-0.015***	**-0.045***	**-0.041*****	**-0.043***	0.012	0.0006	0.001	-0.025	-0.010	0.024
	(0.984)	(0.173)	**(0.072)**	**(0.085)**	**(0.001)**	**(0.061)**	(0.563)	(0.935)	(0.916)	(0.214)	(0.643)	(0.194)
Middle Income	0.672	**-2.077***	-0.227	0.160	1.130	**7.416*****	0.428	**-1.956*****	-1.246	0.905	2.022	**4.056*****
	(0.614)	**(0.057)**	(0.770)	(0.942)	(0.357)	**(0.000)**	(0.762)	**(0.007)**	(0.281)	(0.594)	(0.333)	**(0.006)**
Common Law	**-4.341*****	**-1.990****	**-2.592*****	**-5.679*****	**-9.974*****	**-5.083*****	**-3.990****	**-1.810*****	**-2.932*****	**-4.156*****	**-9.859*****	**-7.112*****
	(0.005)	**(0.018)**	**(0.000)**	**(0.001)**	**(0.000)**	**(0.005)**	**(0.013)**	**(0.001)**	**(0.001)**	**(0.002)**	**(0.000)**	**(0.000)**
Net effects	57.252	41.486	39.423	71.875	83.755	78.816	61.129	42.561	43.438	76.367	84.609	75.100
Pseudo R^2/R^2	0.684	0.302	0.318	0.392	0.539	0.614	0.705	0.314	0.318	0.404	0.544	0.638
Fisher	**42.01*****						**46.35*****					
Observations	312	312	312	312	312	312	278	278	278	278	278	278

Panel B: Financial System Activity and Informalization (Prop. 7)

	Contemporary						Non-Contemporary					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	**39.402*****	**13.525*****	**10.803*****	**25.167*****	**39.865*****	**51.217*****	**36.786*****	**13.129*****	**10.365*****	**25.294*****	**39.809*****	**48.574*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Internet	**2.511*****	**1.526*****	**2.393*****	**2.821*****	**3.453*****	**4.601*****	**3.170*****	**1.770*****	**2.823*****	**3.379*****	**4.100*****	**5.103*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Prop.7	**-50.44*****	**-14.17*****	**-6.302***	**-20.30*****	**-32.86*****	**-30.53*****	**-44.34*****	**-14.45*****	**-5.536**	**-19.61*****	**-32.20*****	**-32.29*****
	(0.000)	**(0.000)**	**(0.065)**	**(0.002)**	**(0.000)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.106)**	**(0.008)**	**(0.000)**	**(0.001)**
Internet×Prop. 7	**-8.876*****	**-5.496*****	**-8.292*****	**-9.322*****	**-13.32*****	**-20.07*****	**-11.41*****	**-5.874*****	**-9.771*****	**-11.66*****	**-16.18*****	**-20.24*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
GDP growth	-0.098	-0.105	-0.133	**-0.232***	0.033	-0.067	-0.015	-0.055	-0.073	-0.092	**0.245***	0.005
	(0.486)	(0.106)	(0.134)	**(0.097)**	(0.809)	(0.622)	(0.914)	(0.342)	(0.287)	(0.575)	**(0.085)**	(0.972)
Inflation	**-0.083*****	**-0.052*****	**-0.044*****	**-0.056*****	**-0.043*****	**-0.078*****	**-0.112****	**-0.079*****	**-0.085*****	**-0.189*****	**-0.068*****	**-0.102*****
	(0.000)	**(0.000)**	**(0.000)**	**(0.008)**	**(0.005)**	**(0.000)**	**(0.010)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Public Invt.	**-0.765*****	**-0.252****	-0.072	-0.228	**-0.476*****	**-0.765*****	**-0.954*****	**-0.361*****	**-0.242****	**-0.501*****	**-0.552*****	**-0.666*****
	(0.000)	**(0.033)**	(0.508)	(0.144)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.001)**	**(0.015)**	**(0.003)**	**(0.000)**	**(0.000)**
Foreign Aid	-0.094	-0.008	0.090	0.012	**-0.173***	**-0.361*****	-0.051	0.027	**0.169****	0.050	**-0.209***	**-0.327*****
	(0.317)	(0.905)	(0.202)	(0.903)	**(0.087)**	**(0.006)**	(0.598)	(0.674)	**(0.012)**	(0.661)	**(0.061)**	**(0.006)**
Trade	**-0.063****	-0.017	**-0.022***	**-0.060****	**-0.101*****	**-0.133*****	**-0.046***	-0.008	-0.008	-0.043	**-0.094*****	**-0.118*****
	(0.018)	(0.119)	**(0.088)**	**(0.012)**	**(0.000)**	**(0.000)**	**(0.091)**	(0.410)	(0.522)	(0.102)	**(0.000)**	**(0.000)**
Middle Income	2.088	-0.669	0.342	1.859	**5.192*****	**10.709*****	1.839	-0.899	-0.269	1.644	**4.807****	**7.210*****
	(0.186)	(0.119)	(0.783)	(0.355)	**(0.007)**	**(0.000)**	(0.273)	(0.341)	(0.826)	(0.452)	**(0.029)**	**(0.002)**
Common Law	**-6.315*****	-1.342	**-1.874***	**-6.343*****	**-9.918*****	**-10.41*****	**-5.844*****	-0.806	**-2.135****	**-5.512*****	**-8.982*****	**-9.933*****
	(0.000)	(0.110)	**(0.057)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.001)**	(0.330)	**(0.027)**	**(0.002)**	**(0.000)**	**(0.000)**
Net effects	-110.992	-51.663	-62.870	-83.894	-123.729	-167.447	-122.179	-54.522	-72.193	-99.154	-142.579	-170.367
Pseudo R^2/R^2	0.736	0.276	0.320	0.411	0.549	0.675	0.754	0.289	0.323	0.407	0.564	0.698
Fisher	**29.81*****						**33.79*****					
Observations	312	312	312	312	312	312	278	278	278	278	278	278

*,**,***: significance levels of 10%, 5% and 1% respectively. GDPg: GDP growth rate. Public Invt: Public Investment. Mobile: Mobile phone penetration rate. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial activity is least. It is important to note that because of unbalanced panel and corresponding issues in degrees of freedom, the estimation output may not contain all the 53 sampled countries.

Appendices

Appendix 1: Segments of the financial system by degree of formality in Paper's context

Paper's context			Tiers	Definitions	Institutions	Principal Clients
Formal financial system	IMF Definition of Financial System from International Financial Statistics (IFS)	Formal Financial sector (Deposit Banks)	Formal banks	Licensed by central bank	Commercial and development banks	Large businesses, Government
Semi-formal and informal financial systems		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: Authors

Appendix 2: Definitions of variables

Variables	Signs	Definitions of variables	Sources
Banking System Efficiency	BcBd	Bank credit on Bank deposits	World Bank (FDSD)
Financial System Efficiency	FcFd	Financial credit on Financial deposits	World Bank (FDSD)
BankingSystem Activity	Prcb	Private domestic credit from deposit banks (% of GDP)	World Bank (FDSD)
Financial System Activity	Prcbof	Private domestic credit from financial institutions (% of GDP)	World Bank (FDSD)
Information and CommunicationTechnology (ICT)	Mobile	Mobile phone subscriptions (per 100 people)	World Bank (WDI)
	Internet	Internet penetration(per 100 people)	World Bank (WDI)
Financial Sector Competition	Prop. 5	Financial Sector Formalization	Asongu (2014a, 2015bc)
	Prop. 7	Financial Sector Informalization	
Economic Prosperity	GDPg	GDP Growth (annual %)	World Bank (WDI)
Inflation	Infl	Consumer Price Index (annual %)	World Bank (WDI)
Public Investment	PubIvt	Gross Public Investment (% of GDP)	World Bank (WDI)
Development Assistance	NODA	Total Net Official Development Assistance (% of GDP)	World Bank (WDI)
Trade openness	Trade	Imports plus Exports in commodities (% of GDP)	World Bank (WDI)
Middle Income	Middle I	Middle and UpperIncome Countries ($1,006 or more)	Asongu (2014d)
Low Income	Low I	Low Income Countries($1,005 or less)	
Common Law	Common L	English Common Law Countries	La Porta et al. (2008)
Civil Law	Civil L	Civil Law Countries	

WDI: World Bank Development Indicators. FDSD: Financial Development and Structure Database.

Appendix 3: Summary Statistics (2004-2011)

	Variables	Mean	S.D	Min.	Max.	Observations
Financial Access	BankingSystem Efficiency (BcBd)	68.118	27.725	14.804	171.85	402
	Financial System Efficiency (FcFd)	68.118	27.725	14.804	171.85	402
	Banking System Activity (Pcrb)	72.722	35.884	22.200	252.88	377
	Financial System Activity (Pcrbof)	21.571	24.154	0.010	149.77	379
Fin. Sector Development	Financial Formalization	0.773	0.168	0.235	1.469	377
	Financial Informalization	0.219	0.168	-0.469	0.764	377
ICT	Mobile Phone Penetration	36.659	32.848	0.214	171.51	420
	Internet Penetration	6.822	8.852	0.031	51.00	414
Control Variables	Economic Prosperity (GDPg)	4.996	4.556	-17.66	37.998	404
	Inflation	7.801	4.720	0	43.011	357
	Public Investment	74.778	1241.70	-8.974	24411	387
	Development Assistance	10.396	12.958	0.027	147.05	411
	Trade Openness (Trade)	80.861	32.935	24.968	186.15	392
Income Levels and Legal Origins	Low Income Countries	0.509	0.500	0.000	1.000	424
	Middle Income Countries	0.490	0.500	0.000	1.000	424
	English Common Law	0.415	0.493	0.000	1.000	424
	Civil Law	0.584	0.493	0.000	1.000	424

S.D: Standard Deviation.Min: Minimum. Max: Maximum. BcBd: Bank credit on Bank deposits. FcFd: Financial credit on Financial deposits. Pcrb: Private domestic credit from deposit banks. Pcrbof: Private domestic credit from deposit banks and other financial institutions. GDPg: GDP growth

Appendix 4: Correlation Analysis (Uniform sample size: 291)

Financial Access				ICT		FS Development		ControlVariables					Fixed Effects				
Fin. Efficiency		Fin. Activity											Income Levels		Legal Origins		
BcBd	FcFd	Prcb	Pcrbof	Mobile	Internet	Prop.5	Prop.7	GDPg	Inflation	PubIvt	NODA	Trade	Middle I.	Low I.	Common L.	Civil L.	
1.000	0.859	0.490	0.495	0.117	0.140	0.119	-0.097	-0.016	-0.144	-0.169	-0.133	-0.176	0.073	-0.073	-0.047	0.047	Bcbd
	1.000	0.583	0.743	0.224	0.149	0.384	-0.365	-0.056	-0.097	-0.149	-0.179	-0.189	0.132	-0.132	0.071	-0.071	FcFd
		1.000	0.922	0.523	0.707	0.591	-0.580	-0.092	-0.089	-0.055	-0.343	0.093	0.401	-0.401	0.136	-0.136	Pcrb
			1.000	0.495	0.558	0.685	-0.676	-0.088	-0.073	-0.057	-0.324	0.019	0.356	-0.356	0.191	-0.191	Pcrbof
				1.000	0.629	0.416	-0.392	-0.192	-0.136	0.088	-0.496	0.195	0.515	-0.515	0.103	-0.103	Mobile
					1.000	0.379	-0.370	-0.082	-0.025	-0.024	-0.373	0.117	0.422	-0.422	0.076	-0.076	Internet
						1.000	-0.983	-0.004	0.008	0.128	-0.246	0.119	0.398	-0.398	0.435	-0.435	Prop.5
							1.000	0.018	-0.061	-0.125	0.224	-0.105	-0.363	0.363	-0.462	0.462	Prop.7
								1.000	-0.169	0.129	0.122	0.037	-0.022	0.022	0.009	-0.009	GDPg
									1.000	-0.081	-0.0004	-0.006	-0.116	0.116	0.152	-0.152	Inflation
										1.000	0.059	0.130	0.079	-0.079	-0.169	0.169	PubIvt
											1.000	-0.309	-0.603	0.603	-0.068	0.068	NODA
												1.000	0.502	-0.502	0.068	-0.068	Trade
													1.000	-1.000	0.087	-0.087	Middle I.
														1.000	-0.087	0.087	Low I.
															1.000	-1.000	Common L.
															-1.000	1.000	Civil L.

BcBd: Bank credit on bank deposits. FcFd: Financial credit on Financial deposits. Pcrb: Private domestic credit from deposit banks.Pcrbof: Private domestic credit from deposit banks and other financial institutions. ICT: Information & Communication Technology. Mobile: Mobile phone penetration. Internet: Internet penetration. Prop.5: Financial Sector Formalization. Prop. 7: Financial Sector Informalization. GDPg: GDP growth. Popg: Population growth. PubIvt: Public Investment. NODA: Net Official Development Assistance. Middle I: Middle Income. Low. I: Low Income. Common L: Common Law: Civil L.: Civil Law. Info: Information.

References

1. Abu-Bader, S., & Abu-Qarn, A. S., (2008). "Financial Development and Economic Growth: Empirical Evidence from Six MENA countries", *Review of Development Economics*, 12(4), pp. 803-817.
2. Adeusi, S. O., Azeez, B. A., & Olanrewaju, H. A., (2012). "The Effect of Financial Liberalization on the Performance of Informal Capital Market", *Research Journal of Finance and Accounting*, 3(6), pp. 1-16.
3. Adjasi, C.K. D., & Biekpe, N. B., (2006). "Stock Market Development and Economic Growth: The Case of Selected African Countries", *African Development Review*, 18(1), pp. 144–161.
4. Aker, J. C., & Fafchamps, M., (2010). "How Does Mobile Phone Coverage Affect FarmGate Prices? Evidence from West Africa", Department of Economics and the Fletcher School, Tufts University.
5. Al-Obaidan, A, M., (2008). "Efficiency Effect of Openness in the Banking Industry of Emerging Markets", *International Research Journal of Finance and Economics*, 17(July), pp.92-104.
6. Alafeef, M., Singh, D., & Ahmad, K., (2011). "Influence of demographic factors on the adoption level of mobile banking applications in Jordan". *Research Journal of Applied Science*, 6 (6), pp. 373–377.
7. Alafeef, M., Singh, D., & Ahmad, K., (2012. "The influence of demographic factors and user interface on mobile banking adoption: a review". *Research Journal of Applied Science*, 12 (20), pp. 2082–2095.
8. Allen, F., Otchere, I., & Senbet, L. W., (2011). "African financial systems: a review", *Review of Development Finance*, 1(2), pp. 79-113.
9. Amin, H., Supinah, R., Aris, M.M., & Baba, R., (2012). "Receptiveness of mobile banking by Malaysian local customers in Sabah: an empirical investigation". *Journal of Internet Banking Commerce*, 17(1), pp. 1-12.
10. Aminuzzaman, S., Baldersheim, H., & Jamil, I., (2003). "Talking back! Empowerment and mobile phones in rural Bangladesh: a study of the village phone scheme of Grameen Bank", *Contemporary South Asia*, 12(3), pp. 327-348.
11. Andonova, V., (2006). "Mobile phones, the Internet and the institutional environment", *Telecommunications Policy*, 30(1), pp. 29-45.
12. Ashraf, Q., & Galor, O., (2013). "The Out of Africa Hypothesis, Human Genetic Diversity, and Comparative Economic Development". *American Economic Review*, 103(1), pp. 1-46.
13. Asongu, S. A. (2012a). "Government quality determinants of stock market performance in Africa", *Journal of African Business*, 13(3), pp. 183-199.
14. Asongu, S. A., (2012b). "Law and finance in Africa", *Brussels Economic Review*, 55(4), pp. 385-408.
15. Asongu, S. A. (2013). "How Has Mobile Phone Penetration Stimulated Financial Development in Africa", *Journal of African Business*, 14(1), pp. 7-18.
16. Asongu, S. A., (2014a). "Correcting Inflation with Financial Dynamic Fundamentals: Which Adjustments Matter in Africa?",*Journal of African Business*, 15(1). pp. 64-73.
17. Asongu, S. A., (2014b). "Knowledge Economy and Financial Sector Competition in African Countries", *African Development Review*, 26(2), pp. 333-346.
18. Asongu, S. A., (2014c). "Financial development dynamic thresholds of financial globalisation: evidence from Africa", *Journal of Economic Studies*, 41(2), pp. 166-195.
19. Asongu, S. A., (2014d). "Globalization (fighting), corruption and development: How are these phenomena linearly and nonlinearly related in wealth effects?", *Journal of Economic Studies*, 41(3), pp. 346-369.

20. Asongu, S. A., (2015a). "Conditional Determinants of Mobile Phones Penetration and Mobile Banking in Sub-Saharan Africa", *Journal of the Knowledge Economy*, DOI: 10.1007%2Fs13132-015-0322-z.
21. Asongu, S. A., (2015b). "Liberalisation and Financial Sector Competition: A Critical Contribution to the Empirics with an African Assessment", *South African Journal of Economics*, 83(3), pp. 425-451.
22. Asongu, S. A., (2015c). "Financial Sector Competition and Knowledge Economy: Evidence from SSA and MENA Countries", *Journal of the Knowledge Economy*, 6(4), pp. 717-748.
23. Asongu, S. A., (2017). "The effect of reducing information asymmetry on loan price and quantity in the African banking industry", *Research in International Business and Finance*, 14(October), pp. 185-197.
24. Asongu, S. A., Anyanwu, J. C., & Tchamyou, V. S., (2017). "Technology-driven information sharing and conditional financial development in Africa", *Information Technology for Development*. DOI: 10.1080/02681102.2017.1311833.
25. Asongu, S. A., & Biekpe, N., (2017). "ICT, information asymmetry and market power in African banking industry", *Research In International Business and Finance*. DOI: 10.1016/j.ribaf.2017.07.121.
26. Asongu, S. A., & Le Roux, S., (2017). "Asongu, S. A., & Le Roux, S., (2017). "Enhancing ICT for inclusive human development in Sub-Saharan Africa", *Technological Forecasting and Social Change*, 118(May), pp. 44–54.
27. Asongu, S. A., & Nwachukwu, J. C., (2017). "The Synergy of Financial Sector Development and Information Sharing in Financial Access: Propositions and Empirical Evidence", *Research in International Business and Finance*, 40 (April), pp. 242-258.
28. Asongu, S. A., Nwachukwu, J. C., & Tchamyou, V. S., (2016). "Information Asymmetry and Financial Development Dynamics in Africa", *Review of Development Finance,* 6(2), pp. 126-138.
29. Arestis, P., Demetriades, P. O., Fattouh, B., & Mouratidis, K., (2002). "The impact of financial liberalisation policies on financial development: evidence from developing countries", *International Journal of Finance and Economics*, 7(2), pp. 109-121.
30. Ataullah, A., Cockerill, T., & Le, H., (2004). "Financial liberalization and bank efficiency: a comparative analysis of India and Pakistan", *Applied Economics*, 36(17), pp. 1915-1924.
31. Aryeetey, E., (2005). "Informal Finance and Private Sector Development in Africa", *Journal of Microfinance*, 7(1), pp. 13-37.
32. Banya, R. & Biekpe, N. (2017). "Banking Efficiency and its determinants in selected Frontier African Markets", *Economic Change and Restructuring*. DOI: DOI: 10.1007/s10644-016- 9200-3.
33. Bartels, F. L., Alladina, S. N., & Lederer, S., (2009), "Foreign Direct Investment in Sub-Saharan Africa: Motivating Factors and Policy Issues", *Journal of African Business*, 10(2), pp. 141-162.
34. Batuo, M. E., (2015). "The role of telecommunications infrastructure in the regional economic growth of Africa", *Journal of Development Areas*, 49(1), pp. 313-330.
35. Batuo, M. E., & Kupukile, M., (2010), "How can economic and political liberalization improve financial development in African countries?",*Journal of Financial Economic Policy*, 2(1), pp. 35-59.
36. Biekpe, N., (2011). "The Competitiveness of Commercial Banks in Ghana", *African Development Review*, 23(1), pp. 75–87.

37. Billger, S. M., & Goel, R. K., (2009), "Do existing corruption levels matter in controlling corruption? Cross-country quantile regression estimates", *Journal of Development Economics*, 90(2), pp. 299-305.
38. Boadi, I., Dana, L. P., Mertens, G., & Mensah, L., (2017). "SMEs' Financing and Banks' Profitability: A "Good Date" for Banks in Ghana?", Journal of African Business, 18(2), pp. 257-277.
39. Bocher, F. T., Alemu, B. A., & Kelbore, Z. G., (2017). "Does access to credit improve household welfare? Evidence from Ethiopia using endogenous regime switching regression", African Journal of Economic and Management Studies, 8(1), pp. 51-65.
40. Boyd, J. H., Levine, R., & Smith, B. D., (2001), "The impact of inflation on financial sector performance", *Journal of Monetary Economics*, 47(2), pp. 221-248.
41. Breitung, J., (2000). The local power of some unit root tests for panel data. *Advances in Econometrics, Volume 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, ed. B. H. Baltagi, 161–178. Amsterdam: JAY Press.
42. Breitung, J., & Das, S., (2005). "Panel unit root tests under cross-sectional dependence", *Statistica Neerlandica* 59(4), pp. 414–433.
43. Brambor, T., Clark, W. M., & Golder, M., (2006). "Understanding Interaction Models: Improving Empirical Analyses", *Political Analysis*, 14 (1), pp. 63-82.
44. Caulderwood, K., (2015). "Mobile Banking Market In Sub-Saharan Africa Could Be Worth$1.3B In Four Years", International Business Times,http://www.ibtimes.com/mobile-banking-market-sub-saharan-africa-could-be-worth-13bfour-years-1788648(Accessed: 24/03/2015).
45. Chan, A., & Jia, T., (2011). "The Role of Mobile Banking in Facilitating Rural Finance: Reducing Inequality in Financial Services between Urban and Rural Areas", Accenture Banking Services, http://www.accenture.com/SiteCollectionDocuments/PDF/PoVMobile-Banking-051611-EN.pdf (Accessed: 02/02/2015).
46. Chapoto, T., & Aboagye, A. Q. Q., (2017). "African innovations in harnessing farmer assets as collateral", *African Journal of Economic and Management Studies*, 8(1), pp. 66-75.
47. Chen, C., (2009). "Bank Efficiency in Sub-Saharan African Middle-Income Countries", *IMF Working Paper*, No. WP/09/14, Washington.
48. Chikalipah, S., (2017). "What determines financial inclusion in Sub-Saharan Africa?" *African Journal of Economic and Management Studies*, 8(1), pp. 8-18.
49. Claus, I., & Grimes, A., (2003). "Asymmetric Information, Financial Intermediation and the Monetary Transmission Mechanism: A Critical Review", *NZ Treasury Working Paper* No. 13/019, Wellington.
50. Cummins, J. (2000). Language, power and pedagogy: Bilingual children in the crossfire. Clevedon, England: Multilingual Matters.
51. Darley, W. K., (2012), "Increasing Sub-Saharan Africa's Share of Foreign Direct Investment: Public Policy Challenges, Strategies, and Implications", *Journal of African Business*, 13(1), pp. 62-69.
52. Donner, J., & Tellez, C.A., (2008). "Mobile banking and economic development: linking, adoption, impact, and use". *Asian Journal of Communication*, 18 (4), pp. 318–332.
53. Duncombe, R., & Boateng, R., (2009). "Mobile phones and financial services in developing countries: a review of concepts, methods, issues, evidence and future research directions". *Third World Quarterly*, 30(7), pp. 1237–1258.
54. Choi, I. (2001). "Unit root tests for panel data". *Journal of International Money and Finance,* 20(2), pp. 249-272.

55. Demetriades, P. O., & Hussein, K. A., (1996). "Does Financial Development Cause Economic Growth? Time-Series Evidence from Sixteen Countries," *Journal of Development Economics*, 51(2), pp. 387-411.
56. Daniel, A., (2017). "Introduction to the financial services in Africa special issue", *African Journal of Economic and Management Studies*, 8(1), pp. 2-7.
57. Do, Q. T., & Levchenko, A. A., (2004), "Trade and financial development", World Bank Policy *Research Working Paper* No. 3347, Washington.
58. Domeher, D., Musah, G., & Hassan, N., (2017). "Inter-sectoral Differences in the SME Financing Gap: Evidence from Selected Sectors in Ghana", *Journal of African Business*, 18(2), pp. 194-220.
59. Easterly, W., (2005). "What did structural adjustment adjust? The association of policies and growth with repeated IMF and World Bank adjustment loans," *Journal of Development Economics*, 76(1), pp. 1-22.
60. Fanta, A. B., (2017). "Complementarity between Relationship Lending and Collateral in SME Access to Bank Credit: Evidence from Ethiopia", *Journal of African Business*, 17(3), pp. 308-318.
61. Fouda, O. J. P., (2009). "The excess liquidity of banks in Franc zone: how to explain the paradox in the CEMAC", *Revue Africaine de l'Integration*, 3(2), pp. 1-56.
62. Fowowe, B., (2014). "Law and Finance Revisited: Evidence from African Countries", *South African Journal of Economics*, 82(2), pp. 193–208.
63. Gossel, S. J., & Biekpe, N., (2014). "Economic growth, trade and capital flows: A causal analysis of post-liberalised South Africa." T*he Journal of International Trade & Economic Development*, 23(6), pp. 815-836.
64. Greenwood, J., & Jovanovic, B., (1990). "Financial development, growth and distribution of income", *Journal of Political Economy*,98, pp. 1076-1107.
65. Hadri, K. (2000). "Testing for stationarity in heterogeneous panel data". *Econometrics Journal* 3(2), pp. 148–161.
66. Harris, R. D. F., & Tzavalis, E., (1999). "Inference for unit roots in dynamic panels where the time dimension is fixed". *Journal of Econometrics* 91(2), pp. 201–226.
67. Hauner, D., & Peiris, S. J., (2005). "Bank Efficiency and Competition in Low-Income Countries: The Case of Uganda", *IMF Working Paper*, No. WP/05/240, Washington.
68. Huang, Y., (2011). "Private Investment and financial development in a globalised world", *Empirical Economics*, 41(1), pp. 43-56.
69. Huang, Y.,(2005), " What determines financial development?", Bristol University, *Discussion Paper* No. 05/580, Bristol.
70. Huang, Y.,& Temple, J. R. W., (2005), "Does external trade promote financial development?"*CEPR Discussion Paper* No. 5150, London.
71. Huybens, E., & Smith, B. D., (1999), "Inflation, financial markets and long-run real activity", *Journal of Monetary Economics*, 43(2), pp. 283-315.
72. Im, K. S., M. H. Pesaran, M. H., & Shin, Y., (2003). "Testing for unit roots in heterogeneous panels". *Journal of Econometrics,* 115(1), pp. 53–74.
73. IMF (2008, October). "International Financial Statistics Yearbook, 2008", IMF Statistics Department.
74. Iyke, B., N., & Odiambo, N. M., (2017). "Foreign exchange markets and the purchasing power parity theory: Evidence from two Southern African countries", *African Journal of Economic and Management Studies*, 8(1), pp. 89-102.
75. Jaffee, D., & Levonian, M., (2001), "Structure of banking systems in developed and transition economies", *European Financial Management*, 7 (2), pp. 161-181.

76. Jain, Y., (2013). “Mobile banking: a study on adoption and challenges in southern Rajasthan’, India”. *International Journal of Innovation Research and Development*, 2(4), pp. 902–914.
77. Kablan, S., (2009). “Mesure de l'Efficacité des Banquesdans les Pays en Voie de Développement: Le Cas de l'Union Economique et Monetaire Ouest Africaine (UEMOA)”, *African Development Review*, 21(2), pp. 367-369.
78. Kablan, S., (2010). “Banking efficiency and financial development in Sub-Saharan Africa”, *IMF Working Paper* No.10/136, Washington.
79. Kirui, O. K., Okello, J. J., Nyikal, R. A., & Njiraini, G. W., (2013). “Impact of Mobile PhoneBased Money Transfer Services in Agriculture: Evidence from Kenya”, *Quaterly Journal of International Agriculture*, 52(2), pp. 141-162.
80. Koenker, R., & Hallock, F. K., (2001), “Quantile regression”, *Journal of Economic Perspectives*, 15(4), pp.143-156.
81. La Porta, R., Lopez-de-Silanes, F., & Shleifer, A., (2008), “The Economic Consequences of Legal Origin,” *Journal of Economic Literature*, 46(2), pp. 285-332.
82. Levine, R., (1997), “Financial development and economic growth: Views and agenda”, *Journal of Economic Literature*, 35(2), pp. 688-726.
83. Levin, A., Lin, C.-F., & Chu, C.-S. J., (2002). “Unit root tests in panel data: Asymptotic and finite-sample properties”. *Journal of Econometrics* 108(1), pp. 1–24.
84. Maurer, B., (2008, May). “Retail electronic payments systems for value transfers in the developing world”, Department of Anthropology, University of California.
85. Meagher, K., (2013). “Unlocking the Informal Economy: A Literature Review on Linkages Between Formal and Informal Economies in the Developing Countries”, *WIEGO Working Paper* No. 27, Cambridge.
86. Meniago, C., & Asongu, S. A., (2017). “Financial Development and Income Inequality: Does Kuznets curve hypothesis hold in Africa?”, *World Bank Working Paper* No. , Washington D.C.
87. Mensah, E., Abor, J., Aboagye, A.Q.Q., & Adjasi, C. K. D., (2012). Enhancing the Economic Growth of Africa: Does Banking Sector Efficiency Matter?, in Kojo Menyah, Joshua Abor (ed.) *Finance and Development in Africa (Research in Accounting in Emerging Economies, Volume 12 Part B)* Emerald Group Publishing Limited, pp.1 - 23.
88. Mishra, V., & Bisht, S. S., (2013). “Mobile banking in a developing economy: A customer-centric model for policy formulation”, *Telecommunications Policy*, 37(6-7), pp. 503-514.
89. Mlachila, M., Tapsoba, R., & Tapsoba, S. J. A., (2014). “A Quality of Growth Index for Developing Countries: A Proposal”, *IMF Working Paper* No. 14/172, Washington.
90. Muto, M., & Yamano, T., (2009). “The Impact of Mobile Phone Coverage Expansion on Market Participation: Panel Data Evidence from Uganda”, *World Development*, 37(12), pp. 1887-1896.
91. Nyasha, S., & Odhiambo, N. M. (2015a). “Do banks and stock market spur economic growth? Kenya’s experience”, *International Journal of Sustainable Economy*, 7(1), pp. 54-65.
92. Nyasha, S., & Odhiambo, N. M. (2015b). “The Impact of Banks and Stock Market Development on Economic Growth in South Africa: An ARDL-bounds Testing Approach “, *Contemporary Economics*, 9(1), pp. 93-108.
93. Obeng, S. K., & Sakyi, D., (2017). “Macroeconomic determinants of interest rate spreads in Ghana”, *African Journal of Economic and Management Studies*, 8(1), pp. 76-88.

94. Ofori-Sasu, D., Abor, J. Y., & Osei, A. K., (2017). "Dividend Policy and Shareholders' Value: Evidence from Listed Companies in Ghana", *African Development Review*, 29(2), pp. 293–304.
95. Okada, K., & Samreth, S.,(2012), "The effect of foreign aid on corruption: A quantile regression approach", *Economic Letters*, 115(2), pp. 240-243.
96. Osabuohien, E. S., & Efobi, E. R., (2013). "Africa's Money in Africa", *South African Journal of Economics*, 81(2), pp. 292-306.
97. Osah, O., & Kyobe, M., (2017). "Predicting user continuance intention towards M-pesa in Kenya", *African Journal of Economic and Management Studies*, 8(1), pp. 36-50.
98. O'Toole, C. M., (2014). "Does Financial Liberalization Improve Access to Investment Finance in Developing Countries?", *Journal of Globalization and Development,* 5(1), pp. 41-74.
99. Owusu, E. L., & Odhiambo, N. M., (2014). "Stock market development and economic growth in Ghana: an ARDL-bounds testing approach", *Applied Economics Letters*, 21(4), pp. 229-234.
100. Penard, T., Poussing, N., Yebe, G. Z., & Ella, P. N., (2012). "Comparing the Determinants of Internet and Cell Phone Use in Africa : Evidence from Gabon ", *Communications & Strategies*, 86(2), pp. 65-83.
101. Price, G. N., & Elu, J. U., (2014). "Does regional currency integration ameliorate macroeconomic shocks in sub-Saharan Africa? The case of the 2008-2009 global financial crisis", *Journal of Economic Studies*, 41(5), pp. 737-750.
102. Qiang, C. Z., Kuek, S. C., Dymond, A., & Esselaar, S., (2011). "Mobile Applications for Agricultural and Rural Development", ICT Sector Unit, World Bank http://siteresources.worldbank.org/INFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/MobileApplications_for_ARD.pdf (Accessed: 02/02/2015).
103. Rolfe, R. J., & Woodward, D. P.,(2004). "Attracting foreign investment through privatization: the Zambian experience", *Journal of African Business*, 5(1), pp.5-27.
104. Roller, L-H., & Waverman, L. (2001). "Telecommunications infrastructure and economic development: a simultaneous approach", *American Economic Review*, 91(4), pp. 909-923.
105. Safeena, R., Date, H., Kammani, A., & Hundewale, N., (2012). "Technology adoption and Indian consumers: study on mobile banking". *International Journal of Computer Theory and Engineering*, 4(6), pp. 1020–1024.
106. Saint Paul, G., (1992), "Technological choice, financial markets and economic development", *European Economic Review*, 36(4), pp. 763-781.
107. Saleem, Z., & Rashid, K., (2011). "Relationship between customer satisfaction and mobile banking adoption in Pakistan". *International Journal of Trade, Economics and Finance*, 2 (6), pp. 537–544.
108. Saxegaard, M., (2006), "Excess liquidity and effectiveness of monetary policy: evidence from sub-Saharan Africa", *IMF Working Paper* No. 06/115, Washington.
109. Singh, A. B., (2012). "Mobile banking based money order for India Post: Feasible model and assessing demand potential", *Procedia - Social and Behavioral Sciences*, 37(2012), pp. 466-481.
110. Steel, W. F., 2006. "Extending Financial Systems to the poor: What strategies for Ghana",Paper presented at the 7th ISSER-Merchant Bank Annual Economic Lectures, University of Ghana, Legon.
111. Tchamyou, V. S., (2016). "The role of knowledge economy in African business", *Journal of the Knowledge Economy.* DOI: 10.1007/s13132-016-0417-1.

112. Tchamyou, V. S., (2017). "The Role of Information Sharing in Modulating the Effect of Financial Access on Inequality". Faculty of Applied Economics, University ofAntwerp, Antwerp. Unpublished PhD Thesis Chapter.
113. Tchamyou, V. S., & Asongu, S. A., (2017a). "Information Sharing and Financial Sector Development in Africa", *Journal of African Business*, 18(1), pp. 24-49.
114. Tchamyou, V. S., & Asongu, S. A., (2017b). "Conditional market timing in the mutual fund industry", *Research in International Business and Finance*, 42(December), pp. 1355-1366.
115. Tchamyou, V. S., Erreygers, G., & Cassimon, D., (2017). "Inequality, ICT And Financial Access in Africa", Faculty of Applied Economics, University of Antwerp, Antwerp. Unpublished PhD Thesis Chapter.
116. Triki, T., & Gajigo, O., (2014), "Credit Bureaus and Registries and Access to Finance: New Evidence from 42 African Countries", *Journal of African Development,* 16(2), pp.73-101.
117. Tuomi, K., (2011), "The Role of the Investment Climate and Tax Incentives in the Foreign Direct Investment Decision: Evidence from South Africa", *Journal of African Business*, 12(1), pp. 133-147.
118. Wale, L.E., & Makina, D., (2017). "Account ownership and use of financial services among individuals: Evidence from selected Sub-Saharan African economies", *African Journal of Economic and Management Studies*, 8(1), pp. 19-35.
119. Warren, M., (2007). "The digital vicious cycle: links between social disadvantage and digital exclusion in rural areas". Telecommunications Policy, 31(6-7), pp. 374-388.
120. Weeks, J., 2010. "Why Monetary Policy is Irrelevant in Africa South of the Sahara. School of Oriental and African Studies", Center for Development and Policy Research, Development Viewpoint No. 53. http://www.soas.ac.uk/cdpr/publications/dv/file59766.pdf (accessed: 26/04/2012).