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Technology-driven information sharing and conditional financial development in Africa

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Technology-driven information sharing and conditional financial development in Africa

Forthcoming in: Information Technology for Development

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Technology-driven information sharing and conditional financial development in Africa

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Abstract

Information technology is increasingly facilitating mechanisms by which information asymmetry between lenders and borrowers in the financial sector can be reduced in order to enhance financial access for human and economic development in developing countries. We examine conditional financial development from ICT-driven information sharing in 53 African countries for the period 2004-2011, using contemporary and non-contemporary quantile regressions. ICT is measured with mobile phone penetration and internet penetration whereas information sharing offices are public credit registries and private credit bureaus. The following findings are established. First, there are positive effects with positive thresholds from ICT-driven information sharing on financial depth (money supply and liquid liabilities) and financial activity (at banking and financial system levels). Second, for financial intermediation efficiency, the positive effects from mobile-driven information sharing are apparent exclusively in certain levels of financial efficiency. Third, with regard to financial size, mobile-driven information sharing is positive with a negative threshold, whereas, internet-driven information sharing is positive exclusively among countries in the bottom half of financial size. Positive thresholds are defined as decreasing negative or increasing positive estimated effects from information sharing offices and vice-versa for negative thresholds. Policy implications are discussed.

JEL Classification: G20; G29; O16; O55; C52
Keywords: Information Sharing; Financial Development; Quantile regression

1. Introduction

Information technology has been established to improve development in a multitude of ways, *inter alia*: living standards (Chavula, 2013); better life for all (Kivuneki *et al*., 2011; Ponelis & Holmner, 2013ab); welfare externalities (Carmody, 2013; Qureshi, 2013bc); economic growth (Qureshi, 2013a; Levendis & Lee, 2013); sustainable growth (Byrne, 2011) and financial access (Kamel, 2005) in developing countries. Furthermore, compared to the rest of the world, the potential for information and communication technology (ICT) in Africa is higher. Consistent with recent literature, whereas high-end countries in Asia, Europe and North America are currently experiencing saturation points in the growth of ICT (e.g. mobile phone and internet penetrations), there is great room for its penetration in Africa (see Penard et al., 2012; Asongu & Nwachukwu, 2016a). It implies that policy can harness such potential for penetration in order to tackle development issues, *inter alia*: limited financial access.

According to IFAD (2011), less than 20 percent of households, on average, have access to financial services in Africa. Most of the population rely on financial services from the informal financial sector which is not incorporated into the conception and definition of the financial system. Limited communication infrastructure, poor transport facilities and low population densities contribute to the lack of formal financial services in extensive regions across the continent. In areas where such formal services are available, small and medium size businesses as well as low-income households have difficulties meeting lending eligibility requirements such as the ability to provide collateral and strict documentation. Even when such requirements are met, high minimum saving requirements and cost barriers (e.g. high transaction fees) can still substantially limit access to finance.

With the above background, access to finance in Africa has been substantially hampered by concerns of surplus liquidity (Saxegaard, 2006; Asongu, 2014a, p.70). Over the past decade and a half, the African financial intermediary landscape has witnessed the introduction of private credit bureaus and public credit registries as instruments of information sharing in order to mitigate information asymmetry between lenders and borrowers (Triki & Gajigo, 2014). Information asymmetry is concerned with the study of transactional decisions in which one party of the transaction is more informed than the other. Such imbalance or asymmetry of information creates disequilibrium of power in transactions such that one party can easily take advantage of the better information he/she possesses or charge a higher price for a particular transaction in

order to compensate for the lack of complete information about the transaction. In the former situation where one party has more or better information, the party is liable to moral hazard: which is the use of such information against the interest of the other party. Conversely in the latter situation where the other party lacks information, he/she is pushed to charge higher transaction costs because of adverse selection. In the case of a bank transaction, the lender is confronted with an issue of adverse selection before the lending transaction, while the borrower has an issue of moral hazard after the lending transaction. Information sharing offices are credit agencies that share information on borrowers' default (i.e. negative information) and borrowers' repayment (i.e. positive information) histories with lenders (or banks) in order to reduce adverse selection on the part of lenders. These information sharing offices also discipline borrowers in order to avoid moral hazard. Throughout the study, we use 'information sharing' to denote the activity of information sharing offices.

The prime motivation for introducing these information sharing offices[1] has been to mitigate moral hazard and adverse selection in bank lending. Accordingly, policies favouring underlying information sharing offices have built on substantially documented evidence that basic financial access is constrained by a series of factors that are endogenous to information asymmetry, notably: affordability, physical access and eligibility to bank lending (Batuo & Kupukile, 2010; Allen *et al*., 2011). In essence, information sharing offices play the role of brokers in financial intermediation. Hence, by sharing information, information sharing offices facilitate: increased credit and market competition, reduced credit constraints and efficient capital allocation (Jappelli & Pagano, 2002). Unfortunately, recent evidence suggests that, *inter alia*: (i) the concern about surplus liquidity is still very severe in African financial institutions (Fouda, 2009) and (ii) public credit registries and private credit bureaus are weighing negatively on financial intermediary development on the continent (Asongu *et al*., 2016). In essence, the relationship between the sharing of information and bank lending has been an open debate in empirical and theoretical literature (Jappelli & Pagano, 2002)[2].

[1] We use 'information sharing offices' interchangeably with 'private credit bureaus' and public credit registries' throughout the study.

[2] "*On the whole, all three models agree on the prediction that information sharing (in one form or another) reduces default rates, whereas the prediction concerning its effect on lending is less clear-cut*" (Jappelli & Pagano, 2002, p. 2020).

In light of the above, one may reasonably infer that financial institutions on the continent have been taking advantage of information sharing offices to pursue a 'quiet life': using shared information from information sharing offices for higher profits margins instead of intermediation efficiency. Financial intermediation efficiency within the context of mitigating surplus liquidity refers to the ability of banks to transform mobilized deposits into credit for economic operators. Quiet life is the short form of the Quiet Life Hypothesis. According to Coccorese and Pellecchia (2010), the Quiet Life Hypothesis is an assumption that financial establishments with relatively higher market power would invest little in pursuing financial intermediation efficiency. On the contrary, they would use their advantage to grant fewer loans at affordable prices to borrowers because they would rather prefer to exploit opportunities for higher profit margins or a 'quiet life'

To the best of our knowledge, the interesting body of literature (which we substantially engage in Section 2) on the role of information sharing offices in financial development has left room for improvement in at least four areas, notably, the need: to narrow inquiries to scopes with severe issues of financial access; for holistic financial development indicators; to leverage on the potential for ICT-driven information sharing for enhanced financial access and to account for initial conditions in financial development.

First, from the dimension of scope, despite the substantially documented issues of surplus liquidity in Africa, as far as we have reviewed, little scholarly focus has been devoted to the African continent which is experiencing severe issues of limited financial access. Moreover, studies on the continent have been limited in scope with a selected number of countries. To put this point in perspective, Galindo and Miller (2001) have involved no African country, Love and Mylenko (2003) have positioned their inquiry on four countries, Barth et al. (2009) have targeted nine countries and Triki and Gajigo (2014) have focused on 42 countries for the period 2006-2009. This line of inquiry focuses on 53 African countries for the period 2004-2011. Therefore, positioning the inquiry on Africa is motivated by the scarce literature on the continent. This is in spite of policy concerns about whether financial institutions on the continent have been tailoring information from information sharing offices to enhancing allocation activity and efficiency (Triki & Gajigo, 2014) on the one hand and recommendations for more scholarly research on the subject (Singh *et al*., 2009, p. 13) on the other hand.

Second, on the measurement of financial development, it is interesting to note that the broad and African-specific literature on information asymmetry (Ivashina, 2009; Tanjung *et al*., 2010; Houston *et al*., 2010) and information sharing have specifically been oriented towards the measurement of constraints in access to finance. We steer clear of the mainstream literature by employing all financial dimensions documented by the Financial Development and Structure Database of the World Bank. These include financial dynamics of depth, efficiency, activity and size. Financial depth represents money supply in the overall economy and liquidity liabilities (or financial system deposits) in the banking sector. Financial system efficiency is the ability of financial institutions to transform mobilised deposits into credit for economic operators. Financial activity denotes the ability of financial institutions to grant credit to economic operators. Financial size represents Deposit bank assets as a proportion of Total assets (Central bank assets plus Deposit bank assets). We have already observed that the fundamental aim of information sharing offices is to boost financial intermediation efficiency. Increasing efficiency by reducing informational rents and boosting competition ultimately results in more financial activity or lending (Pagano & Jappelli, 1993, p. 2019). It should be noted that financial efficiency is generally the ratio of financial activity to financial depth (credit/deposit ratio).

Third, ICT can improve the role of information sharing offices in reducing information asymmetry between lenders and borrowers. Ex-ante of borrowing, ICT can enable information sharing offices to provide banks with timely and more comprehensive information on borrowers' credit histories. In the same vein, ex-post of borrowing, ICT can also enable information sharing offices to monitor and discipline the borrower. Hence, in the former and latter cases, ICT can enable information sharing offices reduce adverse selection and moral hazard respectively. This intuition is in accordance with Bergemanny et al. (2015) who have argued that information is crucial in understanding access to commodities. To the best of our knowledge, there is currently no study on Africa on the role of ICT-driven information sharing in financial development.

Fourth, on the need to account for initial levels of financial development, we argue that blanket policies of financial development from modelling exercises based on mean values of the dependent variable are unlikely to be effective unless they are contingent on initial levels of financial development and tailored differently across countries with high- medium- and low-levels of financial development. The underpinning idea is that certain initial conditions of financial development may be required for the benefits of financial development from

information sharing by information sharing offices. To the end, any resulting threshold effect (in terms of increasing or decreasing marginal returns from information sharing offices estimates) should validate the hypothesis of initial conditions and hence, avail more room for policy implications. The use of quantile regressions to account for initial conditions steers clear of two studies closest to the present line of inquiry, which have based their empirical strategies on mean values of financial development, notably: Triki and Gajigo (2014) and Asongu *et al*. (2016) have respectively adopted Probit models and Generalised Method of Moments.

Four research gaps are apparent from the above narratives, notably: the little scholarly focus on financial access in Africa; failure to engage information sharing offices in the literature on linkages between information asymmetry and financial development; the essence of assessing how information sharing offices can leverage on ICT to enhance financial development and the need to account for initial levels of financial access in the problem statement. We attempt to address the research gaps by answering the following question: how do ICT-driven information sharing offices affect financial development when existing levels of financial development matter in Africa? Addressing the research question is important because it provides insights into how barriers to offering financial services can be lifted to enable small businesses and households maximise their earnings and savings for enhanced productivity, job-creation, contribution to higher income and ultimately, growth. Therefore the objective of this study is to investigate how information sharing offices use ICT to improve financial development.

The positioning of this study contributes to the bulk of literature on the relevance of information technology for inclusive development, notably: socio-economic development in rural areas (Baro & Endouware, 2013); poverty concerns in urban areas (Omole, 2013) as well as community development issues in rural areas (Breytenbacha *et al*., 2013); education, social and human development (Shraima & Khlaifb, 2010; Gudmundsdottir, 2010; Nkansah & Urwin, 2010; Negash, 2010; Brunello, 2010; Krauss, 2013); social change and development outcomes (Brouwer & Brito, 2012; Mira & Dangersfield, 2012; Islama & Meadeb, 2012); enhancement of institutions (Asongu & Nwachukwu, 2016a) and inclusive human development (Asongu & Nwachukwu, 2016b). Hence, this inquiry complements that growing body of literature on distributional externalities (Cozzens, 2011). Whereas the underlying stream of literature has been engaged in both developed (Thakar, 2012) and developing (Sonne, 2012; Gupta & Jain,

2012) countries, we are more concerned with African countries because issues of financial access are more severe in the continent.

By contributing to the macroeconomic literature on the use of information technology for non-exclusive outcomes, this inquiry deviates from mainstream microeconomic and corporate information technology literature on the management of technology for business avenues. Some recent streams of the highlighted literature have included: entrepreneurial opportunities for the ageing population (Kohlbacher *et al*., 2015); targeting of entrepreneurial innovators who are continuously innovating because of better skills and financial resources (Best, 2015) and opportunity discovery and creation within the framework of disruptive innovation (Hang *et al*., 2015; Wan *et al*., 2015).

The rest of the study is structured as follows. Section 2 covers the theoretical and empirical literature. The data and methodology are discussed in Section 3. Section 4 presents the results and discussions while Section 5 concludes with implications.

2. Theoretical highlights and the empirical literature

Consistent with Claus and Grimes (2003), there are two main strands in the literature documenting the theoretical basis for an association between information sharing and existence of financial intermediaries. The first strand articulates the provision of liquidity by financial intermediaries whereas the second is concerned with the ability of financial intermediaries to transform the risk features of assets. Both strands build on the fundamental role of financial intermediation which is to increase allocation efficiency by mitigating the cost of channelling mobilised resources from borrowers to lenders. Corresponding theories on the role of financial intermediaries build on the literature of imperfect market information. In essence, financial intermediaries have the primary task of reducing information and transaction costs arising from information asymmetry between borrowers and lenders. Hence, the relevance of information sharing offices builds on the need for mechanisms by which the mitigation of information asymmetry can be enhanced in the financial sector. It is logical to conceive that the role of information sharing offices is naturally facilitated by ICT.

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 non-compliance 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.

Consistent with Asongu *et al*. (2016), a substantial bulk of empirical studies on information asymmetry has focused on: the role of information sharing among creditors and the impacts of creditors' rights to more information. The latter has principally been concerned with the influence of stronger creditors' rights in, *inter alia*: (i) bank risk-taking by Houston *et al*. (2010) and Acharya *et al*. (2011); (ii) bankruptcy with notable works from Claessens and Klapper (2005), Djankov *et al*. (2007) and Brockman and Unlu (2009) and (iii) capital structure by El Ghoul *et al*. (2012). The former strand has been concerned with assessing how reducing information asymmetry: enhances the availability of credit (Djankov *et al*., 2007; Brown *et al*., 2009; Triki & Gajigo, 2014); reduces defaulting rates (Jappelli & Pagano, 2002); decreases the cost of credit (Brown *et al*., 2009); affects antitrust intervention (Coccorese, 2012); influences corrupt lending (Barth *et al*., 2009) and affects bank loans that are syndicated (Ivashina, 2009; Tanjung *et al*., 2010).

Noticeably, the engaged literature is skewed towards developed and developing countries where issues of financial access are comparatively less severe. In other words, whereas a substantial body of literature has focused on the Organisation of Economic Cooperation and Development economies and the emerging countries of Latin America and Asia, not much is known about Africa, a continent that has been documented to host firms and citizens with comparatively lower levels of access to finance (Asongu *et al*., 2016). In what follows, we engage literature within the context of Africa for the most part.

Galindo and Miller (2001) investigate macroeconomic evidence on the underlying issues to conclude that relatively advanced economies with credit registries enjoy less financial restrictions compared to less developed economies with credit bureaus. In particular, well-performing public credit registries contribute substantially to firms' decreasing sensitivity to

investment decisions for ‘cash flows availability’: a typical financial constraint proxy. The authors also establish that there has been about a 50% performance reduction by credit registries, notably: on the sensitivity of investment decisions to internal funds.

Love and Mylenko (2000) have used a combination of credit registries (private and public) and of firm-oriented data from the World Bank Business Environment Survey to assess two main concerns, notably, whether as a result of more financial sharing from banks and the perception of managers, credit registries are negatively related to constraints in the financing of credit. The results have shown that private credit bureaus are associated with lower financing constraints and a higher sharing of financing from banks, while public credit registries do not have any significant effect on reducing financing constraints.

Barth *et al*. (2009) have examined the effect of: (i) information sharing and (ii) borrower and lender competition on ‘lending corruption’ via information sharing offices using the World Bank Business Environment Survey data from 56 countries covering 4000 firms and private credit in 129 countries. The authors show two main results. First, corruption in lending is mitigated by banking competition and information sharing plays a positive role in the mitigating effect. Second, the ownership structure of firms and banks, firm competition and the legal environment have substantial impacts on corrupt lending.

Triki and Gajigo (2014) have assessed two main concerns: the effect of information sharing offices in firms’ access to finance and the impact of the design of public credit registries on the degree of financing constraint. Their results reveal that financial access is relatively higher in economies with private credit bureaus compared to those with public credit registries or no information sharing offices and substantial heterogeneity exists in access to finance and the design of information sharing offices with public credit registries, among countries.

Asongu *et al*. (2016) have examined policy thresholds of information sharing in financial development and concluded as follows. Private credit bureaus and public credit registries exert negative impacts on financial depth, with the relatively higher magnitude from the latter. Private credit bureaus have a negative effect on banking system efficiency while the impact of public credit registries is insignificant. Private credit bureaus and public credit registries both have negative effects on financial activity, with a higher magnitude from the former. Effects of information sharing offices are positive on financial size, with the impact from private credit bureaus lower in magnitude.

As discussed in the introduction, the present line of inquiry complements the engaged literature in three main dimensions, notably, in the need to narrow inquiries to scope with severe issues of financial access; for holistic financial development indicators; and to account for initial conditions in financial development. To these ends, the empirical evidence is based on 53 African countries, using all dimensions identified by the financial development and structure database of the World Bank and Quantile Regressions to articulate existing levels of financial development in the investigated nexuses.

3. Data and Methodology

3.1 Data

Consistent with Asongu *et al*. (2016), we investigate a panel of 53 African countries with data for the period 2004-2011 from the Financial Development and Structure Database and African Development Indicators of the World Bank. The starting- and ending-years are constrained by data availability. In essence, data on information sharing offices (public credit registries and private credit bureaus) from the World Bank are only available from the year 2004. The most updated year in the Financial Development and Structure Database is 2011.

In line with the motivation of the inquiry, financial indicators from the Financial Development and Structure Database are transformed to obtained variables of depth, efficiency, activity and size. The computation which is consistent with Asongu (2013) is also motivated by the need to avail room for more policy implications. The criteria for selecting the financial development indicators are motivated by the need to incorporate all the four dimensions identified by the Financial Development and Structure Database, namely: depth, efficiency, activity and size.

First, financial depth encompasses: (i) financial system deposits or liquid liabilities and (ii) monetary depth denoting the monetary base plus time, savings and demand deposits as percentage of GDP. It is important to distinguish these measures because a great chunk of the monetary base in African countries circulates outside the formal financial sector. Second, financial intermediation efficiency in the context of this study refers to the ability of financial institutions to fulfil their fundamental mission of converting mobilised resources into credit for economic operators. Two indicators are used, namely: (i) financial-system-efficiency (‘financial system credit on financial system deposits’) and (ii) banking-system-efficiency (with bank credit

on bank deposits). Third, financial intermediary activity represents the ability of banks to grant credit to economic operators. Two measurements are used to this end, namely: (i) financial system activity (with 'private credit by domestic banks and other financial institutions') and (ii) banking system activity (with 'private domestic credit by deposit banks'). Fourth, financial size is measured as the ratio of 'deposit bank assets' to 'total assets' ('deposit bank assets on central bank assets plus deposit bank assets').

Whereas ICT is measured with mobile phone penetration and internet penetration (see Tchamyou, 2016), ICT-driven 'information sharing offices', which are the independent variables of interest are derived by instrumenting information sharing offices with ICT proxies, namely: mobile phone penetration and internet penetration. The instrumentation procedure which is consistent with recent literature on globalisation-driven debts (Asongu et al., 2015) and globalisation-driven peace and stability (Amavilah et al., 2017), is discussed in Section 3.2.1

In accordance with Asongu *et al*. (2016), control variables include: foreign aid, trade, GDP growth, public investment and inflation. The covariates have also been amply documented in financial development studies (Huang, 2005; Osabuohein *et al*., 2013; Asongu, 2014b; Owosu & Odhiambo, 2014; Nyasha & Odhiambo, 2015a, 2015b; Asongu & Nwachukwu, 2017). First, like with remittances (Aggarwal *et al*., 2011; Efobi *et al*., 2014), development assistance that is utilised effectively in recipient countries and survives the capture of consultancy services in donor countries, has a high likelihood of improving financial development in the recipient countries.

Second, a substantial body of the literature has concluded on a positive growth-finance nexus (Greenwood & Jovanovic, 199; Saint-Paul, 1992; Levine, 1997; Jaffee & Levonian , 2001; Asongu, 2002, 2015). Third, a strand of the literature is supportive of the view that openness-friendly policies (especially in trade) are likely to engender a positive outcome in financial development (Do & Levchenko, 2004; Huang & Temple, 2005). Fourth, the relationship between financial development and investment is expected to be positive (see Huang, 2011). Fifth, some principal domestic macroeconomic policies like the maintenance of higher investment and low/stable inflation are conducive for financial development (Huybens & Smith, 1999; Boyd *et al*., 2001; Huang, 2011).

Note should be taken of the fact that, expected signs of discussed covariates cannot be established with certainty because the underpinning financial variables are conflicting by

definition and measurement. For instance, the second variable or financial intermediation efficiency is defined and appreciated as the ratio of the third (financial activity) and first (financial depth), notably, credit/deposit ratio.

Sources and definitions of variables are provided in Appendix 1, the summary statistics in Appendix 2, whereas the correlation matrix is presented in Appendix 3. Two points are note worthy from the summary statistics: the means of variables are comparable and the substantial degree of variation is an indication that reasonable estimated linkages would emerge. The objective of the correlation matrix is to mitigate potential concerns of multicollinearity that could considerably bias estimated coefficients. We notice that the issues of high degree of substitution are apparent exclusively between financial development variables. Fortunately, the concern about multicollinearity is not of nature to bias estimated coefficients for two main reasons. On the one hand, the financial development variables are used exclusively as dependent variables. On the other hand, the financial variables are employed in distinct specifications.

In what follows, we assess how information sharing offices mitigate information asymmetry between lenders and borrowers in order to enhance financial development when existing levels of financial development matter in the assessment.

3.2 Methodology

3.2.1 Derivation of ICT-driven 'information sharing' factor loadings.

Consistent with recent literature (Asongu et al., 2015; Amavilah et al., 2017), factor loadings are derived in Eq. (1) by instrumentation information sharing offices with ICT.
The instrumentation procedure is as follows in Eq. (1) below.

$$PCR_{i,t} = \alpha + \delta_j \left(Mobile_{i,t} \right) + \varepsilon_{i,t} \quad , \qquad (1)$$

where $PCR_{i,t}$, denotes public credit registries (PCR) in country i at period t, α is a constant, $Mobile_{i,t}$, represents mobile phone penetration in country i at period t, and $\varepsilon_{i,t}$ the error term.

The process of instrumentation in Eq. (1) entails regressing the public credit registries on mobile phone penetration and later saving the corresponding fitted values that are subsequently employed as the principal independent variables in the Quantile estimations. It is important to note that the instrumentation processes is Heteroscedasticity and Autocorrelation Consistent (HAC) in standard errors. The derived factor loading is named 'mobile phone'-driven public

credit registries[3]. The instrumentation processes is replicated for the remaining three pairs of ICT and information sharing offices, such that we also have: 'mobile phone'-driven private credit bureaus; internet-driven public credit registries and internet-driven private credit bureaus.

As shown in Table 1, in addition to deriving ICT-driven information sharing proxies in Panel A, we also test for the strength of the factor loadings in Panel B. With the exception of internet-driven private credit bureaus that are not significant, the other ICT-driven information sharing proxies are overwhelmingly significant. Fortunately, this does not pose a serious concern to the inquiry because not all the factor loadings are employed in the regressions of interest because of issues of perfect multicollineairity. As apparent in Appendix 3, there is a perfect multicollinearity between ICT-driven public credit registries and ICT-driven private credit bureaus. Hence, in the empirical analysis, only the former are employed as the independent variable of interest.

3.2.2 Empirical specification

We have motivated this inquiry with the need to account for initial levels of financial development. For this purpose, we are consistent with conditional development literature (Billger & Goel, 2009; Okada & Samreth, 2012) in examining the effect of information sharing offices on financial development throughout the distributions of financial development dynamics (Keonker & Hallock, 2001). Within this framework, conditional financial development means the effects of ICT-driven information sharing on financial development are conditioned on the level of financial development.

Previous studies on information sharing have assessed the nexus between information sharing offices and financial development by reporting parameter estimates at the conditional mean of financial access indicators (Triki & Gajigo, 2014; Asongu *et al*., 2016). While mean effects are important, we extend the underlying stream of information sharing offices literature by employing a Quantile Regression technique which distinguishes initial levels of financial development. Moreover, whereas 'Ordinary Least Squares'-related regressions are founded on the hypothesis that error terms and financial development variables are normally distributed, the Quantile Regression strategy is not based on such an assumption of normally distributed error terms.

[3] 'Mobile phone'-driven and mobile-driven are used interchangeably throughout the study.

The Quantile Regression technique estimates parameters at mutliple points of the conditional distribution of financial development. Hence, the strategy aligns with our motivation to distingush countries of low- medium- and high-initial financial development using contemporary and non-contemporary Quantile Regressions. In essence, the policy relevance of the Quantile Regression approach builds on the motivation that blanket policies on the role of information sharing in financial development may not be effective unless they are contingent on initial levels of financial development and tailored differently across countries with low, intermediate and high levels of financial development.

The θth quantile estimator of a financial development dynamic is obtained by solving for the optimization problem in Eq. (2), which is disclosed without subscripts for ease of presentation and simplicity.

$$\min_{\beta \in R^k} \left[\sum_{i \in \{i: y_i \geq x_{i'}\beta\}} \theta \left| y_i - x_{i'}\beta \right| + \sum_{i \in \{i: y_i < x_{i'}\beta\}} (1-\theta) \left| y_i - x_{i'}\beta \right| \right], \tag{2}$$

where $\theta \in (0,1)$. As opposed to Ordinary Least Squares which is fundamentally based on minimizing the sum of squared residuals, with Quantile Regression, the weighted sum of absolute deviations are minimised. For instance, the 25th or 75th quantiles (with θ=0.25 or 0.75 respectively) are assessed by approximately weighing the residuals. The conditional quintile of financial development or y_i given x_i is:

$$Q_y(\theta / x_i) = x_{i'}\beta_\theta \tag{3}$$

where unique slope parameters are modelled for each θth specific quintile. This formulation is analogous to $E(y / x) = x_{i'}\beta$ in the Ordinary Least Squares slope where parameters are examined only at the mean of the conditional distribution of financial development. For the model in Eq. (3) the dependent variable y_i is a financial development indicator while x_i contains a constant term, *ICT-driven information sharing*, *foreign aid*, *trade*, *GDP growth*, *public investment*, and *inflation.*

4. Empirical Analysis

Table 2, Table 3, Table 4 and Table 5 which are related to mobile-driven information sharing respectively present findings corresponding to financial dynamics of depth, efficiency, activity and size. While the left-hand-side of the tables corresponds to contemporary estimations, the right-hand-side entails non-contemporary regressions. The interest of lagging the independent variables in the right-hand-side by one year is to have some bite on endogeneity (see Mlachila *et al*., 2014, p. 21). Consistent differences in information sharing offices estimated coefficients between Ordinary Least Squares and quantiles (in terms of sign, significance and magnitude of significance) justify the relevance of adopted empirical strategy. The findings are discussed paying particular emphasis on the effects of independent variables of interest throughout the distributions of the dependent variables. 'Throughout the distributions' implies that consideration is given to countries with low, intermediate and high initial levels of financial development.

Given that the effects of ICT-driven information sharing are examined throughout the conditional distributions of underlying financial development dynamics, corresponding tendencies may take several patterns, namely: U-shaped, inverted U-shaped, S-shaped and positive or negative threshold shapes. Thresholds within the context of this study are in accordance with Asongu (2014b). Positive thresholds are established when corresponding estimates from ICT-driven information sharing consistently display decreasing negative magnitudes and/or increasing positive magnitudes throughout the conditional distributions of a given financial development dynamic. Conversely, negative thresholds are denoted by consistent increasing negative or decreasing positive magnitudes from estimated ICT-driven information sharing coefficients. Hence, evidence of a threshold tendency confirms the intuition of modelling based on initial financial development conditions, with the view that financial development benefits from information sharing may consistently increase or decrease concurrently with increasing initial levels of financial development.

From Table 2, the following findings can be established. First, mobile-driven information sharing has positive effects with positive thresholds in both Panel A on money supply and Panel B on liquid liabilities. The positive threshold effect is consistent across contemporary and non-contemporary specifications. Second, the evidence of a positive threshold established in Table 2 is also apparent in Table 4 on financial activity across panels (banking system activity and financial system activity) and specifications (contemporary and non-contemporary). Third, in

Table 3, positive effects from mobile-driven information sharing are apparent exclusively in the 50th and 75th quintiles for banking system efficiency and top quintiles for financial system efficiency. Fourth, in Table 5, the mobile-driven information sharing is positive with a negative threshold (or decreasing positive magnitude) from the 25th to the 75th quintiles in contemporary regressions and from the 10th to the 75th quintiles in non-contemporary regressions. Most of the significant control variables have the expected signs.

Table 6, Table 7, Table 8 and Table 9 which are related to internet-driven information sharing respectively present findings corresponding to financial dynamics of depth, efficiency, activity and size. While the left-hand-side of the tables corresponds to contemporary estimations, the right-hand-side entails non-contemporary regressions.

In Table 6, it is apparent that internet-driven information sharing has positive effects with positive thresholds in both Panel A on money supply and Panel B on liquid liabilities. The positive threshold effect is consistent across contemporary and non-contemporary specifications. Second, the evidence of the positive threshold established in Table 6 is also apparent in Table 8 on financial activity across panels (banking system activity and financial system activity) and specifications (contemporary and non-contemporary). Third, in Table 7 on financial efficiency, positive effects from internet-driven information sharing are apparent from the most part between the 25th and 75th quintiles. Fourth, in Table 9, internet-driven information sharing is positive exclusively in the bottom quintiles of financial size. Most of the significant control variables have the expected signs.

We now further discuss the findings in three main strands, namely discussion on: the Quiet Life Hypothesis; comparative assessment with existing literature; and relevance of findings in the post-2015 development agenda.

First, the established positive effects of ICT-driven information sharing on financial development (especially from dynamics of efficiency, activity and size) attest to a non-acceptance of the Quiet Life Hypothesis. In our view, non-acceptance is preferable to rejection because, the cost and profit functions of financial institutions have to be assessed for a genuine assessment of the Quiet Life Hypothesis in the African banking industry. Hence, it is reasonable to infer that African financial institutions are taking advantage of ICT-driven information sharing offices to improve financial access across the continent. This inference does not negate the fact that underlying financial institutions are also using ICT-driven information sharing offices to

increase their profit margins. In essence, financial access and increasing profit margins move hand-in-glove. In line with the fundamental objectives of ICT-driven information sharing offices, we might be tempted to go a step further to inferring that ICT-driven information sharing offices are relevant in stimulating competition and mitigating the abuse of market power by big banks, notably through reducing informational rents, sharing information to stimulate competition and rendering credit markets contestable (Pagano & Jappelli, 1993, p. 2019). The overwhelming positive role of ICT-driven information sharing offices in financial access is also a response to an evolving stream of African business literature which is consistent on the position that lack of financial access is one of the most important challenges to doing business on the continent (Bartels *et al*., 2009; Kolstad & Wiig, 2011; Tuomi, 2011; Darley, 2012; Tchamyou & Asongu, 2017). It follows that encouraging information sharing offices in Africa would improve financial access.

Second, it is important to discuss our findings in the light of the engaged literature: (1) They are consistent with Singh *et al*. (2009) who have concluded that countries in sub-Saharan Africa which promote information sharing by means of information sharing offices are very likely to experience higher levels of private domestic credit as a share of GDP (or financial activity). (2) Our results are also broadly consistent with Galindo and Miller (2001) in the perspective that economies with relatively improved credit registries enjoy less financial restrictions compared to their counterparts with less developed information sharing offices.

Third, consistent with the post-2015 development agenda, it would be interesting if policy could employ ICT-driven information sharing offices to mitigate information asymmetry not just for 'financial access' but also for 'inclusive financial access'. This recommendation essentially builds on three counts: (i) finance is needed to boost growth (Asongu, 2015); (ii) inclusive finance is essential for quality of growth, which entails poverty and income-inequality reductions (Asongu & De Moor, 2015) and (iii) an April 2015 World Bank report has revealed that poverty has been decreasing in all continents of the world with the exception of Africa (World Bank, 2015), despite the continent having experienced two decades of growth resurgence (Fosu, 2015). Therefore while according to the World Bank, 45% of countries in sub-Saharan Africa are off-track from achieving the Millennium Development Goal of reducing extreme poverty, tailoring ICT-driven information sharing offices for 'inclusive financial access' would

go a long way to helping lagging countries catch-up during the post-2015 sustainable development agenda.

5. Conclusion, policy implications, caveats and future research directions

The objective of this study has been to investigate how information sharing offices use ICT to improve financial development. To achieve this, we have examined conditional financial development from ICT-driven information sharing in African countries using contemporary and non-contemporary quantile regressions. ICT is measured with mobile phone penetration and internet penetration whereas information sharing offices are public credit registries and private credit bureaus. In summary, the following findings have been established. First, there are positive effects with positive thresholds from ICT-driven information sharing on financial depth (money supply and liquid liabilities) and financial activity (at banking and financial system levels). Second, for financial intermediation efficiency, the positive effects from mobile-driven information sharing are apparent exclusively in certain levels of financial efficiency. Third, with regard to financial size, mobile-driven information sharing is positive with a negative threshold, whereas, internet-driven information sharing is positive exclusively among countries in the bottom half of financial size. Positive thresholds are defined as decreasing negative or increasing positive magnitudes from ICT-driven information sharing estimates and vice-versa for negative thresholds. From a practical standpoint, the fact that some findings are contingent on specific financial development quintiles implies that the financial development benefits from the association between information sharing offices and ICT cannot be achieved until specific levels of financial development are reached.

Four main inferences are note worthy from the results. First, African financial institutions are taking advantage of ICT-driven information sharing to improve financial access across the continent. Second, initial conditions in financial development are essential to achieve incremental benefits from ICT-driven information sharing. Third, increasing ICT-driven information sharing across the continent could address one of the most important challenges to doing business in Africa: the lack of financial access. Fourth, sampled countries could tailor ICT-driven information sharing offices to mitigate information asymmetry not exclusively for ‘financial access’ but also for ‘inclusive financial access’ in accordance with the challenges of the post-2015 African development agenda.

The main policy implication from the study is that information sharing increases financial system depth (deposits), financial system activity (credit) as well as financial allocation efficiency or the ability of financial intermediaries to transform underlying mobilised deposits into credit for economic operators. Therefore, ICT-driven information sharing offices can be tailored towards reducing surplus liquidity issues on the continent by enhancing financial allocation efficiency with more proportionate action on countries with low initial levels of financial development. The applicability of this policy recommendation is distinct from the extant literature because the policy measure is not blanket/broad but depends on existing levels of financial development.

Information sharing offices could benefit from increased synchronisation of information by means of updated information and communication technologies and 'knowledge economy'-driven human resources in order to tackle voluntary and involuntary holding of surplus liquidity by African financial institutions. First, as concerns voluntary holding of surplus liquidity, underlying 'information and communication technologies'- and 'knowledge economy'-orientations would enhance the ability of information sharing offices to: (i) ease constraints of banks in updating their positions in central banks so that they are not required to keep reserves above statutory limits; (ii) overcome transportation issues that oblige bank branches in remote zones to hold excess reserves; and (iii) ease interbank lending, especially for purposes of contingency.

Second, information sharing offices with the underlying instruments could also be tailored towards avoiding involuntary holding of excess liquidity by: (i) dwarfing the inability of financial institutions to lend in scenarios of regulated interest rates; (ii) facilitating investment of banks in bond markets; (iii) increasing lending competition between banks; and (iv) broadening investment opportunities for banks in regional stock markets. Underlying information and communication technologies and knowledge economy instruments include, *inter alia*, reliable high-speed internet access and state of the art information systems in banks and information sharing offices; regular training of information sharing offices' staff; recruitment of more qualified personnel and capitalization on mobile banking for inclusive development benefits.

In order to enhance financial sector development and facilitate regional/continental catch-up that is essential for policy harmonization, in the implementation of above suggested policies, more priority should be given to countries with low initial levels of development. This

is essentially because we have established for the most part that beneficial effects from ICT-driven information sharing offices increase more proportionately with higher levels of financial development.

As a research limitation, the investigated influence on financial development is not exhaustive because some information technology dimensions have not been considered. Accordingly, other information technology dimensions (e.g., in terms of infrastructure, strategy, policy, governance, and/or management, etc.) can respond to the growing usage of mobile phone and internet information sharing services in order to boost financial development. This caveat can be addressed by future research as more data on the underlying information technology dimensions become available. Other inquires devoted to improving extant literature in the light of the sustainable development agenda could focus, *inter alia*, on assessing mechanisms by which information sharing offices can promote 'inclusive financial' access and examining alternative information technology instruments with which the inclusive effects of information sharing offices can be consolidated.

Table 1: Derivation of factor loadings

	Dependent Variables: Information Sharing Offices			
	Public Credit Registries		Private Credit Bureaus	
	Panel A: ICT-driven Information Sharing			
Constant	-0.240	0.538	−1.364	**3.186***
	(0.698)	(0.355)	(0.254)	**(0.074)**
Mobile Phones	**0.065****	---	**0.151****	---
	(0.029)		**(0.026)**	
Internet	---	**0.237***	---	0.162
		(0.088)		(0.106)
Adjusted R^2	0.119	0.132	0.116	0.008
Fisher	**52.076*****	**57.730*****	**50.480*****	**4.171****
Observations	377	374	376	373
Countries	51	51	51	51

	Panel B: Testing the Strength of ICT-driven Information Sharing Factor Loadings			
	Public Credit Registries (PCR)		Private Credit Bureaus (PCB)	
Constant	0.000	0.000	0.000	0.000
	(1.000)	(1.000)	(1.000)	(1.000)
Mobile.PCR	**1.000****	---	---	---
	(0.029)			
Internet.PCR	---	**1.000***	---	---
		(0.088)		
Mobile.PCB	---	---	**1.000****	---
			(0.026)	
Internet.PCB	---	---	---	1.000
				(0.106)
Adjusted R^2	0.119	0.132	0.116	0.008
Fisher	**52.076*****	**57.730*****	**50.480*****	**4.171****
Observations	377	374	376	373
Countries	51	51	51	51

*,**,***: significance levels of 10%, 5% and 1% respectively. PCR: Public Credit Registries.PCB: Private Credit Bureaus. Mobile.PCR: 'Mobile phone'-driven Public Credit Registries. Internet.PCR: Internet-driven Public Credit Registries. Mobile.PCB: 'Mobile phone'-driven Private Credit Bureaus. InternetPCB: Internet-driven Private Credit Bureaus. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 2: 'Mobile phones'-driven Information Sharing and Financial Depth

Financial Depth

Panel A: Overall Economic Depth (Money Supply)

	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	**24.361*** **	**15.698*** **	**15.682*** **	**14.023*** **	**19.277*** **	4.250	**25.001*** **	**14.689*** **	**15.933*** **	**17.620*** **	**20.346*** **	10.194
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.753)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.630)
Mobile.PCR	**4.580*** **	**2.304*** **	**3.190*** **	**3.535*** **	**5.649*** **	**8.995*** **	**5.087*** **	**2.418*** **	**3.911*** **	**4.565*** **	**6.060*** **	**9.921*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.002)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.001)**
GDP growth	-0.149	-0.166	**-0.327** **	**-0.487*** **	**0.350* **	**2.292*** **	-0.083	-0.114	-0.229	**-0.485** **	-0.192	**1.836** **
	(0.548)	(0.407)	**(0.038)**	**(0.002)**	**(0.096)**	**(0.000)**	(0.762)	(0.686)	(0.170)	**(0.036)**	(0.369)	**(0.020)**
Inflation	-0.022	**0.024* **	0.012	-0.002	0.010	0.024	-0.048	0.029	0.015	-0.014	-0.027	0.007
	(0.207)	**(0.084)**	(0.333)	(0.898)	(0.672)	(0.660)	(0.157)	(0.150)	(0.313)	(0.510)	(0.197)	(0.934)
Public Invt.	0.036	-0.139	0.217	**0.870*** **	0.150	-0.268	-0.032	-0.043	0.260	0.262	**0.401* **	0.054
	(0.895)	(0.558)	(0.185)	**(0.000)**	(0.471)	(0.602)	(0.912)	(0.874)	(0.135)	(0.246)	**(0.059)**	(0.942)
Foreign Aid	-0.183	0.116	0.148	-0.019	-0.104	-0.215	-0.186	0.128	0.102	0.056	-0.136	-0.196
	(0.295)	(0.343)	(0.120)	(0.851)	(0.565)	(0.730)	(0.297)	(0.391)	(0.312)	(0.712)	(0.461)	(0.841)
Trade	0.020	**-0.046** **	-0.027	**0.040* **	**0.062** **	**0.387*** **	0.027	-0.034	-0.028	0.041	**0.076** **	**0.264* **
	(0.591)	**(0.048)**	(0.163)	**(0.075)**	**(0.042)**	**(0.000)**	(0.500)	(0.224)	(0.172)	(0.209)	**(0.019)**	**(0.079)**
Pseudo R^2/R^2	0.215	0.113	0.127	0.161	0.178	0.235	0.229	0.110	0.133	0.163	0.192	0.239
Fisher	**11.57*** **						**10.49*** **					
Observations	294	294	294	294	294	294	258	258	258	258	258	258

Panel B: Financial System Depth (Liquid Liabilities)

	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	**17.239*** **	6.536	**9.446*** **	**8.393*** **	**13.498*** **	3.736	**17.519*** **	6.308	**8.582*** **	**9.723*** **	**15.286*** **	3.247
	(0.001)	(0.106)	**(0.000)**	**(0.004)**	**(0.001)**	(0.748)	**(0.001)**	(0.304)	**(0.003)**	**(0.002)**	**(0.000)**	(0.821)
Mobile.PCR	**4.773*** **	**2.416*** **	**2.824*** **	**4.006*** **	**7.271*** **	**8.014*** **	**5.366*** **	**2.698*** **	**3.605*** **	**4.718*** **	**7.349*** **	**8.684*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.004)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
GDP growth	-0.004	-0.008	**-0.185* **	**-0.394** **	**0.439** **	**1.911*** **	0.032	-0.028	-0.140	**-0.432** **	**0.591*** **	**1.785*** **
	(0.984)	(0.965)	**(0.080)**	**(0.017)**	**(0.029)**	**(0.000)**	(0.902)	(0.935)	(0.488)	**(0.016)**	**(0.004)**	**(0.000)**
Inflation	0.002	**0.043*** **	**0.028*** **	0.009	0.031	0.024	-0.013	**0.048** **	**0.031** **	0.001	0.014	0.009
	(0.866)	**(0.002)**	**(0.002)**	(0.653)	(0.161)	(0.565)	(0.554)	**(0.047)**	**(0.027)**	(0.925)	(0.485)	(0.862)
Public Invt.	0.084	-0.089	**0.436*** **	**0.583*** **	0.156	-0.308	0.057	0.072	**0.463** **	**0.362** **	0.252	-0.222
	(0.734)	(0.573)	**(0.000)**	**(0.000)**	(0.395)	(0.425)	(0.833)	(0.817)	**(0.011)**	**(0.037)**	(0.197)	(0.652)
Foreign Aid	-0.196	0.074	**0.163** **	0.089	-0.100	-0.229	-0.190	0.120	0.146	0.114	-0.187	-0.188
	(0.237)	(0.554)	**(0.012)**	(0.398)	(0.555)	(0.678)	(0.264)	(0.536)	(0.148)	(0.330)	(0.295)	(0.767)
Trade	0.016	-0.022	**-0.040*** **	0.034	0.029	**0.333*** **	0.022	-0.031	-0.034	**0.046* **	0.026	**0.324*** **
	(0.639)	(0.377)	**(0.005)**	(0.144)	(0.334)	**(0.000)**	(0.584)	(0.372)	(0.111)	**(0.073)**	(0.412)	**(0.000)**
Pseudo R^2/R^2	0.253	0.117	0.099	0.156	0.240	0.253	0.271	0.113	0.103	0.166	0.261	0.258
Fisher	**14.31*** **						**13.87*** **					
Observations	294	294	294	294	294	294	258	258	258	258	258	258

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial depth is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Mobile.PCR: 'Mobile phone'-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 3: 'Mobile phones'-driven Information Sharing and Financial Efficiency

Financial Efficiency

Panel A: Banking System Efficiency

	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	**91.682*****	**52.712*****	**82.275*****	**87.819*****	**104.04*****	**136.08*****	**90.547*****	**69.672*****	**77.491*****	**84.603*****	**102.89*****	**125.48*****
	(0.000)	**(0.872)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Mobile.PCR	1.548	0.171	0.527	**2.475*****	**2.901****	1.031	1.465	-1.825	0.187	**2.182****	**3.617****	2.712
	(0.102)	(0.872)	(0.619)	**(0.007)**	**(0.030)**	(0.598)	(0.185)	(0.158)	(0.881)	**(0.042)**	**(0.011)**	(0.235)
GDP growth	0.328	**0.985****	0.331	-0.403	-0.316	-0.231	0.349	**0.871****	0.580	-0.177	-0.480	0.609
	(0.377)	**(0.052)**	(0.446)	(0.297)	(0.592)	(0.771)	(0.323)	**(0.030)**	(0.155)	(0.660)	(0.421)	(0.461)
Inflation	**-0.0008*****	**0.0007*****	**-0.0003**	**-0.0005*****	**-0.001*****	**-0.002*****	**-0.036***	**-0.036*****	**-0.038****	-0.014	**-0.029*****	**-0.045*****
	(0.000)	**(0.001)**	**(0.862)**	**(0.003)**	**(0.000)**	**(0.000)**	**(0.065)**	**(0.001)**	**(0.038)**	(0.133)	**(0.003)**	**(0.003)**
Public Invt.	**-0.902****	**-0.632***	**-0.792****	-0.163	-0.494	**-1.037***	**-0.815****	-0.644	-0.415	-0.025	-0.445	**-1.100****
	(0.017)	**(0.095)**	**(0.048)**	(0.624)	(0.375)	**(0.050)**	**(0.027)**	(0.177)	(0.313)	(0.937)	(0.277)	**(0.039)**
Foreign Aid	**-0.432***	-0.111	**-0.446***	-0.208	-0.412	**-1.059***	**-0.373***	**-0.590****	-0.333	-0.201	-0.361	-0.740
	(0.061)	(0.685)	**(0.088)**	(0.377)	(0.261)	**(0.085)**	**(0.089)**	**(0.032)**	(0.235)	(0.415)	(0.254)	(0.185)
Trade	**-0.177*****	**-0.138****	**-0.255*****	**-0.241*****	**-0.201*****	-0.160	**-0.164*****	**-0.212*****	**-0.249*****	**-0.184*****	**-0.193*****	-0.175
	(0.001)	**(0.012)**	**(0.000)**	**(0.000)**	**(0.005)**	(0.151)	**(0.002)**	**(0.001)**	**(0.000)**	**(0.001)**	**(0.004)**	(0.134)
Pseudo R^2/R^2	0.095	0.083	0.077	0.060	0.056	0.107	0.093	0.115	0.074	0.049	0.070	0.128
Fisher	**11.47*****						**4.62*****					
Observations	299	299	299	299	299	299	265	265	265	265	265	265

Panel B: Financial System Efficiency

	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	**106.90*****	**69.703*****	**84.788*****	**99.192*****	**113.19*****	**178.69*****	**104.62*****	**70.552*****	**79.708*****	**93.993*****	**112.28*****	**150.47*****
	(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.PCR	**3.885****	-1.433	-0.091	1.086	**4.450*****	**13.653*****	**4.394****	**-2.164***	-0.135	1.459	**4.403*****	**19.087*****
	(0.018)	(0.286)	(0.936)	(0.122)	**(0.000)**	**(0.001)**	**(0.023)**	**(0.055)**	(0.892)	(0.190)	**(0.002)**	**(0.000)**
GDP growth	0.088	0.625	0.099	**-0.826*****	-0.784	0.503	0.340	**1.398*****	**0.542***	-0.315	-0.562	0.655
	(0.847)	(0.310)	(0.833)	**(0.005)**	(0.151)	(0.747)	(0.436)	**(0.002)**	**(0.099)**	(0.448)	(0.333)	(0.659)
Inflation	**-0.118****	**-0.209*****	-0.039	**-0.109*****	-0.147	-0.122	**-0.186***	**-0.629*****	**-0.234*****	**-0.234****	**-0.150*****	-0.160
	(0.032)	**(0.000)**	(0.365)	**(0.003)**	(0.117)	(0.232)	**(0.054)**	**(0.000)**	**(0.000)**	**(0.015)**	**(0.000)**	(0.208)
Public Invt.	**-1.169****	-0.638	-0.477	-0.083	-0.597	-2.419	**-1.174****	-0.549	-0.168	-0.043	-0.598	-0.902
	(0.016)	(0.310)	(0.262)	(0.737)	(0.228)	(0.191)	**(0.020)**	(0.140)	(0.615)	(0.909)	(0.255)	(0.169)
Foreign Aid	**-0.698****	**-0.629***	**-0.546****	**-0.455****	-0.344	-1.328	**-0.617****	**-0.673****	**-0.491****	-0.418	-0.257	-0.974
	(0.021)	**(0.091)**	**(0.048)**	**(0.011)**	(0.298)	(0.246)	**(0.033)**	**(0.014)**	**(0.025)**	(0.106)	(0.463)	(0.396)
Trade	**-0.306*****	**-0.200****	**-0.278*****	**-0.277*****	**-0.308*****	**-0.703*****	**-0.293*****	**-0.219*****	**-0.239*****	**-0.228*****	**-0.296*****	**-0.611*****
	(0.000)	**(0.013)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.004)**
Pseudo R^2/R^2	0.151	0.069	0.081	0.072	0.052	0.140	0.150	0.109	0.081	0.062	0.060	0.175
Fisher	**5.47*****						**4.58*****					
Observations	294	294	294	294	294	294	258	258	258	258	258	258

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial efficiency is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Mobile.PCR: 'Mobile phone'-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 4: 'Mobile phones'-driven Information Sharing and Financial Activity

Financial Activity

Panel A: Banking System Activity

	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	**16.939*** **	**8.533*** **	**7.122*** **	**9.010*** **	**17.735*** **	**19.764** **	**16.653*** **	**8.986*** **	**7.119** **	**9.395*** **	**19.797*** **	**18.431*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.001)**	**(0.001)**	**(0.011)**	**(0.000)**	**(0.000)**	**(0.011)**	**(0.000)**	**(0.000)**	**(0.002)**
Mobile.PCR	**4.502*** **	**1.215*** **	**2.130*** **	**3.618*** **	**7.574*** **	**9.445*** **	**5.161*** **	**1.195*** **	**1.845*** **	**4.216*** **	**8.440*** **	**9.353*** **
	(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	0.077	0.001	-0.031	-0.207	**0.846*** **	0.362	0.153	0.015	-0.046	-0.153	**0.529** **	**0.981*** **
	(0.698)	(0.992)	(0.793)	(0.213)	**(0.000)**	(0.253)	(0.463)	(0.897)	(0.821)	(0.157)	**(0.016)**	**(0.000)**
Inflation	-0.020	**0.014***	0.006	-0.005	0.032	-0.018	-0.043	0.002	0.003	-0.004	-0.005	-0.033
	(0.244)	**(0.097)**	(0.527)	(0.793)	(0.239)	(0.494)	(0.176)	(0.827)	(0.813)	(0.694)	(0.819)	(0.140)
Public Invt.	**-0.426** **	0.059	-0.140	0.099	-0.129	-0.199	**-0.468** **	0.045	-0.075	0.110	-0.026	**-0.751*** **
	(0.025)	(0.551)	(0.189)	(0.497)	(0.592)	(0.504)	**(0.023)**	(0.533)	(0.628)	(0.308)	(0.903)	**(0.000)**
Foreign Aid	**-0.239***	-0.028	0.105	0.097	-0.351	-0.335	-0.207	-0.061	0.043	0.103	-0.254	-0.278
	(0.081)	(0.695)	(0.145)	(0.332)	(0.113)	(0.415)	(0.135)	(0.375)	(0.660)	(0.157)	(0.206)	(0.331)
Trade	-0.013	**-0.065*** **	-0.023	-0.022	**-0.068***	0.063	-0.008	**-0.063*** **	-0.001	-0.024	**-0.079** **	**0.127*** **
	(0.656)	**(0.000)**	(0.118)	(0.310)	**(0.076)**	(0.218)	(0.798)	**(0.000)**	(0.930)	(0.129)	**(0.024)**	**(0.000)**
Pseudo R^2/R^2	0.283	0.091	0.077	0.103	0.213	0.357	0.303	0.089	0.062	0.108	0.244	0.398
Fisher	**11.74*** **						**10.75*** **					
Observations	294	294	294	294	294	294	258	258	258	258	258	258

Panel B: Financial System Activity

	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	**22.567*** **	**8.512*** **	**7.214*** **	**8.539*** **	**17.642*** **	**32.995** **	**21.907*** **	**9.185*** **	**6.638*** **	**9.219*** **	**18.985*** **	**35.855** **
	(0.000)	**(0.000)**	**(0.004)**	**(0.001)**	**(0.003)**	**(0.022)**	**(0.000)**	**(0.000)**	**(0.005)**	**(0.000)**	**(0.003)**	**(0.033)**
Mobile.PCR	**5.956*** **	**1.114*** **	**1.877*** **	**3.670*** **	**8.564*** **	**14.140*** **	**6.912*** **	**1.184*** **	**1.896*** **	**4.201*** **	**9.035*** **	**16.733*** **
	(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	0.112	0.009	-0.045	-0.191	**0.606** **	0.202	0.187	0.023	-0.088	-0.152	**0.507***	-0.341
	(0.656)	(0.944)	(0.764)	(0.208)	**(0.031)**	(0.743)	(0.472)	(0.858)	(0.604)	(0.204)	**(0.083)**	(0.629)
Inflation	-0.013	**0.017** **	0.007	-0.002	0.030	-0.009	-0.036	0.006	0.005	-0.002	-0.001	-0.053
	(0.483)	**(0.027)**	(0.539)	(0.879)	(0.320)	(0.866)	(0.275)	(0.583)	(0.685)	(0.860)	(0.947)	(0.418)
Public Invt.	**-0.479** **	0.089	-0.052	0.087	-0.052	0.144	**-0.538** **	0.058	-0.063	0.127	-0.006	0.751
	(0.044)	(0.306)	(0.719)	(0.524)	(0.846)	(0.750)	**(0.045)**	(0.482)	(0.638)	(0.284)	(0.982)	(0.158)
Foreign Aid	**-0.385** **	-0.020	0.101	0.124	-0.296	-0.404	**-0.338***	-0.071	0.094	0.103	-0.197	-0.418
	(0.026)	(0.782)	(0.261)	(0.194)	(0.238)	(0.615)	**(0.050)**	(0.345)	(0.263)	(0.203)	(0.459)	(0.611)
Trade	**-0.081***	**-0.069*** **	-0.026	-0.020	-0.074	-0.165	-0.074	**-0.067*** **	-0.001	-0.024	**-0.079***	-0.215
	(0.055)	**(0.000)**	(0.165)	(0.322)	(0.104)	(0.144)	(0.101)	**(0.000)**	(0.930)	(0.175)	**(0.093)**	(0.165)
Pseudo R^2/R^2	0.259	0.072	0.062	0.084	0.169	0.307	0.277	0.072	0.051	0.087	0.193	0.341
Fisher	**8.52*** **						**8.09*** **					
Observations	296	296	296	296	296	296	260	260	260	260	260	260

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial activity is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Mobile.PCR: 'Mobile phone'-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 5: 'Mobile phones'-driven Information Sharing and Financial Size

	Financial Size											
	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	**73.623*** **	**49.190*** **	**62.741*** **	**82.988*** **	**95.353*** **	**96.664*** **	**72.890*** **	**47.151*** **	**58.743*** **	**82/694*** **	**93.626*** **	**97.206*** **
	(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.PCR	**2.638*** **	0.084	**3.349*** **	**1.973*** **	**0.660*** **	0.224	**2.830*** **	**5.029*** **	**4.112*** **	**2.181*** **	**1.002*** **	0.236
	(0.000)	(0.911)	**(0.000)**	**(0.002)**	**(0.000)**	(0.277)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.229)
GDP growth	-0.116	0.084	-0.528	-0.030	**-0.228*** **	-0.028	0.060	0.145	-0.352	0.156	0.033	-0.011
	(0.658)	(0.911)	(0.102)	(0.907)	**(0.001)**	(0.683)	(0.820)	(0.771)	(0.396)	(0.358)	(0.681)	(0.830)
Inflation	**-0.063** **	0.022	**-0.054** **	**-0.097*** **	**-0.068*** **	**-0.073*** **	**0.0005*** **	**0.001*** **	**0.0008*** **	**0.0003*** **	-0.00001	**-0.0003*** **
	(0.048)	(0.638)	**(0.042)**	**(0.003)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.820)	**(0.000)**
Public Invt.	**0.656*** **	0.949	**0.572*** **	0.311	**0.287*** **	**0.220*** **	**0.572*** **	**0.852*** **	**0.410***	0.232	0.216***	0.062
	(0.000)	(0.127)	**(0.004)**	(0.178)	**(0.000)**	**(0.001)**	**(0.000)**	**(0.004)**	**(0.096)**	(0.126)	(0.008)	(0.241)
Foreign Aid	**-0.583*** **	-0.533	**-0.592*** **	**-0.669*** **	**-0.805*** **	**-0.429*** **	**-0.512*** **	-0.315	**-0.400** **	**-0.714*** **	**-0.672*** **	**-0.295*** **
	(0.000)	(0.129)	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.208)	**(0.040)**	**(0.000)**	**(0.000)**	**(0.000)**
Trade	0.031	-0.021	**0.074** **	0.033	0.014	**0.019** **	0.041	-0.008	**0.122*** **	0.036	0.006	**0.014***
	(0.301)	(0.814)	**(0.049)**	(0.340)	(0.141)	**(0.041)**	(0.174)	(0.898)	**(0.009)**	(0.108)	(0.628)	**(0.059)**
Pseudo R^2/R^2	0.295	0.175	0.229	0.208	0.211	0.116	0.264	0.176	0.214	0.200	0.182	0.095
Fisher	**33.28*** **						**29.98*** **					
Observations	295	295	295	295	295	295	263	263	263	263	263	263

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial size is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Mobile.PCR: 'Mobile phone'-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 6: Internet-driven Information Sharing and Financial Depth

Financial Depth

Panel A: Overall Economic Depth (Money Supply)

	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	**14.030*** **	**8.899** **	**10.330*** **	**13.784*** **	**15.297*** **	1.748	**14.404*** **	**10.265** **	**10.505*** **	**16.377*** **	**15.257*** **	**16.061* **
	(0.000)	**(0.045)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.845)	**(0.000)**	**(0.011)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.063)**
Internet.PCR	**8.545*** **	**6.009*** **	**6.533*** **	**7.960*** **	**10.300*** **	**14.078*** **	**9.567*** **	**6.331*** **	**7.465*** **	**9.033*** **	**13.181*** **	**15.173*** **
	(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	**-0.352* **	-0.258	**-0.365*** **	**-0.620*** **	**-0.329** **	0.241	-0.289	-0.160	**-0.290* **	**-0.567** **	-0.105	-0.497
	(0.062)	(0.370)	**(0.005)**	**(0.003)**	**(0.045)**	(0.610)	(0.139)	(0.649)	**(0.077)**	**(0.010)**	(0.560)	(0.220)
Inflation	**-0.058*** **	-0.011	**-0.024** **	**-0.061** **	**-0.067*** **	**-0.076* **	**-0.078*** **	-0.007	**-0.026** **	**-0.072*** **	**-0.088*** **	**-0.133*** **
	(0.000)	(0.582)	**(0.022)**	**(0.015)**	**(0.000)**	**(0.096)**	**(0.000)**	(0.773)	**(0.031)**	**(0.000)**	**(0.000)**	**(0.000)**
Public Invt.	0.366	0.064	**0.324** **	**0.680*** **	**0.774*** **	**1.387*** **	0.137	-0.039	0.214	0.257	**0.339** **	**1.166*** **
	(0.143)	(0.836)	**(0.016)**	**(0.000)**	**(0.000)**	**(0.001)**	(0.566)	(0.896)	(0.219)	(0.229)	**(0.031)**	**(0.002)**
Foreign Aid	0.014	0.184	**0.164** **	-0.040	-0.115	-0.007	0.023	0.100	0.100	0.028	-0.053	-0.209
	(0.888)	(0.336)	**(0.024)**	(0.729)	(0.310)	(0.983)	(0.833)	(0.565)	(0.247)	(0.837)	(0.643)	(0.404)
Trade	0.025	-0.024	-0.023	0.021	0.022	**0.131* **	0.038	-0.018	-0.800	0.018	0.013	0.035
	(0.408)	(0.541)	(0.157)	(0.419)	(0.306)	**(0.070)**	(0.223)	(0.540)	(0.691)	(0.577)	(0.587)	(0.612)
Pseudo R^2/R^2	0.571	0.206	0.238	0.316	0.432	0.516	0.581	0.204	0.239	0.322	0.439	0.522
Fisher	**47.59*** **						**32.58*** **					
Observations	290	290	290	290	290	290	256	256	256	256	256	256

Panel B: Financial System Depth (Liquid Liabilities)

	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	**9.466*** **	0.716	**7.004*** **	**6.144*** **	**6.091* **	5.685	**9.777*** **	1.063	**8.120*** **	**6.672*** **	**7.133** **	4.718
	(0.004)	(0.815)	**(0.006)**	**(0.005)**	**(0.064)**	(0.417)	**(0.007)**	(0.725)	**(0.003)**	**(0.001)**	**(0.011)**	(0.446)
Internet.PCR	**7.989*** **	**5.655*** **	**6.226*** **	**7.347*** **	**11.341*** **	**15.832*** **	**8.814*** **	**6.753*** **	**6.630*** **	**9.017*** **	**13.016*** **	**17.188*** **
	(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	-0.239	-0.220	**-0.501*** **	**-0.455*** **	0.081	0.322	-0.207	-0.091	**-0.294* **	**-0.418*** **	-0.004	0.261
	(0.194)	(0.228)	**(0.001)**	**(0.000)**	(0.666)	(0.345)	(0.278)	(0.645)	**(0.073)**	**(0.001)**	(0.976)	(0.369)
Inflation	**-0.037*** **	0.003	-0.022	-0.030	**-0.042** **	**-0.070*** **	**-0.051*** **	0.008	-0.019	**-0.048*** **	**-0.071*** **	**-0.097*** **
	(0.001)	(0.775)	(0.101)	(0.176)	**(0.027)**	**(0.003)**	**(0.000)**	(0.595)	(0.149)	**(0.000)**	**(0.000)**	**(0.000)**
Public Invt.	**0.421* **	0.102	**0.408** **	**0.696*** **	**0.643*** **	**1.091*** **	0.250	0.063	0.053	**0.398*** **	**0.529*** **	**0.904*** **
	(0.073)	(0.605)	**(0.020)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.282)	(0.746)	(0.767)	**(0.000)**	**(0.0000)**	**(0.000)**
Foreign Aid	-0.078	0.092	**0.161* **	0.057	-0.083	-0.197	-0.072	0.057	0.116	0.074	-0.084	-0.182
	(0.457)	(0.435)	**(0.076)**	(0.453)	(0.551)	(0.528)	(0.511)	(0.618)	(0.186)	(0.300)	(0.433)	(0.428)
Trade	0.021	0.009	-0.024	0.017	0.026	0.003	0.033	-0.004	-0.008	0.024	0.023	0.036
	(0.440)	(0.741)	(0.259)	(0.336)	(0.317)	(0.942)	(0.262)	(0.860)	(0.722)	(0.157)	(0.276)	(0.471)
Pseudo R^2/R^2	0.567	0.235	0.235	0.335	0.443	0.501	0.567	0.226	0.232	0.340	0.456	0.499
Fisher	**37.09*** **						**27.52*** **					
Observations	290	290	290	290	290	290	256	256	256	256	256	256

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial depth is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Internet.PCR: Internet-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 7: Internet-driven Information Sharing and Financial Efficiency

Financial Efficiency

Panel A: Banking System Efficiency

	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	**92.603*** **	**44.075*** **	**77.175*** **	**92.241*** **	**110.54*** **	**134.78*** **	**90.295*** **	**46.825*** **	**71.759*** **	**83.519*** **	**107.14*** **	**140.19*** **
	(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.PCR	**1.351***	**2.074***	**1.781** **	**2.502*** **	**2.383***	-0.519	**1.654***	2.003	**2.082** **	**3.436*** **	**2.802** **	0.269
	(0.089)	**(0.065)**	**(0.018)**	**(0.006)**	**(0.052)**	(0.743)	**(0.071)**	(0.183)	**(0.037)**	**(0.000)**	**(0.026)**	(0.919)
GDP growth	0.255	**1.111** **	0.434	-0.507	-0.489	**1.024***	0.295	**1.268*** **	0.578	-0.075	-0.391	-0.139
	(0.485)	**(0.011)**	(0.220)	(0.191)	(0.382)	**(0.094)**	(0.403)	**(0.001)**	(0.133)	(0/834)	(0.477)	(0.864)
Inflation	**-0.0009*** **	**0.0007*** **	**-0.00009**	**-0.0008*** **	**-0.001*** **	**-0.002*** **	**-0.042** **	0.009	**-0.042** **	**-0.019** **	**-0.038*** **	**-0.059*** **
	(0.000)	**(0.000)**	**(0.569)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.045)**	(0.446)	**(0.023)**	**(0.020)**	**(0.000)**	**(0.000)**
Public Invt.	**-0.834** **	-0.555	**-0.725** **	0.029	-0.849	**-1.218*** **	**-0.713** **	-0.701	-0.442	0.072	-0.450	**-1.267** **
	(0.024)	(0.184)	**(0.047)**	(0.931)	(0.103)	**(0.007)**	**(0.038)**	(0.151)	(0.303)	(0.808)	(0.225)	**(0.018)**
Foreign Aid	**-0.467** **	0.094	-0.354	-0.314	-0.491	**-1.267*** **	**-0.390** **	0.054	-0.193	-0.239	**-0.555***	-0.0125
	(0.026)	(0.740)	(0.100)	(0.181)	(0.107)	**(0.007)**	**(0.049)**	(0.880)	(0.460)	(0.268)	**(0.059)**	(0.105)
Trade	**-0.179*** **	**-0.123***	**-0.249*** **	**-0.292*** **	**-0.217*** **	-0.117	**-0.166*** **	-0.131	**-0.236*** **	**-0.211*** **	**-0.202*** **	-0.173
	(0.001)	**(0.076)**	**(0.000)**	**(0.000)**	**(0.002)**	(0.194)	**(0.003)**	(0.123)	**(0.000)**	**(0.000)**	**(0.001)**	(0.14)
Pseudo R^2/R^2	0.092	0.092	0.083	0.063	0.050	0.106	0.095	0.098	0.079	0.052	0.064	0.117
Fisher	**10.17*** **						**4.54*** **					
Observations	295	295	295	295	295	295	263	263	263	263	263	263

Panel B: Financial System Efficiency

	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	**114.56*** **	**36.701*** **	**78.495*** **	**97.682*** **	**114.91*** **	**178.08*** **	**112.29*** **	**59.472*** **	**76.040*** **	**92.695*** **	**114.97*** **	**166.09*** **
	(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.PCR	**1.819***	**3.428*** **	**2.389*** **	**1.835*** **	**2.106***	-0.470	**2.052***	0.817	**1.664** **	**2.543*** **	**2.772*** **	1.234
	(0.089)	**(0.001)**	**(0.005)**	**(0.006)**	**(0.053)**	(0.879)	**(0.076)**	(0.488)	**(0.049)**	**(0.001)**	**(0.002)**	(0.769)
GDP growth	-0.204	**1.001*** **	0.171	**-0.883*** **	-0.863	-0.737	0.070	**1.365*** **	**0.577***	-0.288	-0.676	-0.591
	(0.647)	**(0.000)**	(0.603)	**(0.002)**	(0.102)	(0.610)	(0.871)	**(0.000)**	**(0.095)**	(0.316)	(0.101)	(0.721)
Inflation	**-0.167*** **	-0.027	-0.042	**-0.122*** **	**-0.183** **	**-0.249*** **	**-0.243** **	**-0.431*** **	**-0.344*** **	**-0.306*** **	**-0.188*** **	**-0.316*** **
	(0.003)	(0.349)	(0.196)	**(0.001)**	**(0.041)**	**(0.006)**	**(0.018)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.002)**
Public Invt.	**-0.967** **	-0.460	-0.473	-0.054	-0.721	-1.204	**-0.949** **	**-0.819***	-0.355	0.145	-0.471	-1.268
	(0.029)	(0.304)	(0.181)	(0.829)	(0.115)	(0.181)	**(0.031)**	**(0.053)**	(0.332)	(0.545)	(0.186)	(0.197)
Foreign Aid	**-0.983*** **	0.298	**-0.461** **	**-0.447*** **	-0.323	-1.753	**-0.931*** **	-0.359	-0.356	**-0.319***	**-0.399***	-1.566
	(0.005)	(0.258)	**(0.030)**	**(0.009)**	(0.288)	(0.166)	**(0.008)**	(0.270)	(0.106)	**(0.071)**	**(0.088)**	(0.276)
Trade	**-0.305*** **	-0.091	**-0.264*** **	**-0.270*** **	**-0.255*** **	**-0.373***	**-0.292*** **	**-0.171** **	**-0.225*** **	**-0.252*** **	**-0.279*** **	-0.325
	(0.000)	(0.103)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.054)**	**(0.000)**	**(0.019)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.122)
Pseudo R^2/R^2	0.128	0.084	0.092	0.077	0.045	0.097	0.125	0.095	0.086	0.068	0.053	0.093
Fisher	**5.43*** **						**4.71*** **					
Observations	290	290	290	290	290	290	256	256	256	256	256	256

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial efficiency is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Internet.PCR: Internet-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 8: Internet-driven Information Sharing and Financial Activity

Financial Activity

Panel A: Banking System Activity

	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	**12.298*** **	**4.029*** **	**3.098** **	**6.854** **	**12.557*** **	**17.507* **	**11.854*** **	**4.830*** **	**3.254*** **	**7.506** **	**10.492*** **	16.403
	(0.000)	**(0.001)**	**(0.033)**	**(0.039)**	**(0.000)**	**(0.058)**	**(0.001)**	**(0.000)**	**(0.006)**	**(0.048)**	**(0.000)**	(0.102)
Internet.PCR	**6.583*** **	**3.251*** **	**4.952*** **	**6.839*** **	**9.945*** **	**11.257*** **	**7.479*** **	**3.579*** **	**5.526*** **	**7.647*** **	**10.755*** **	**11.688*** **
	(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	-0.166	-0.025	-0.041	-0.184	-0.089	-0.214	-0.093	-0.006	-0.073	-0.167	**0.309** **	-0.081
	(0.309)	(0.744)	(0.676)	(0.332)	(0.595)	(0.670)	(0.572)	(0.926)	(0.323)	(0.456)	**(0.026)**	(0.862)
Inflation	**-0.061*** **	-0.004	**-0.020** **	**-0.046* **	**-0.055*** **	**-0.093** **	**-0.084*** **	-0.004	**-0.021*** **	**-0.050*** **	**-0.071*** **	**-0.116*** **
	(0.000)	(0.417)	**(0.014)**	**(0.069)**	**(0.001)**	**(0.040)**	**(0.000)**	(0.446)	**(0.004)**	**(0.009)**	**(0.000)**	**(0.001)**
Public Invt.	-0.139	0.032	-0.117	0.224	0.085	0.039	-0.270*	-0.009	**-0.251*** **	0.122	-0.067	-0.039
	(0.361)	(0.720)	(0.232)	(0.231)	(0.564)	(0.917)	(0.064)	(0.903)	**(0.001)**	(0.553)	(0.546)	(0.919)
Foreign Aid	**-0.197* **	0.025	0.060	0.046	-0.076	-0.265	-0.172	0.001	0.061	0.058	-0.074	-0.244
	(0.077)	(0.608)	(0.296)	(0.700)	(0.503)	(0.567)	(0.128)	(0.976)	(0.198)	(0.658)	(0.421)	(0.547)
Trade	-0.008	**-0.037*** **	-0.015	-0.042	**-0.047* **	-0.005	0.001	**-0.040*** **	-0.001	-0.038	-0.033	0.007
	(0.741)	**(0.000)**	(0.252)	(0.133)	**(0.067)**	(0.935)	(0.952)	**(0.000)**	(0.925)	(0.221)	(0.123)	(0.923)
Pseudo R^2/R^2	0.514	0.211	0.207	0.246	0.390	0.437	0.525	0.205	0.206	0.250	0.404	0.453
Fisher	**27.79*** **						**24.10*** **					
Observations	290	290	290	290	290	290	256	256	256	256	256	256

Panel B: Financial System Activity

	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	**22.045*** **	**4.012*** **	1.336	**6.590* **	**13.223*** **	19.433	**21.762*** **	**5.014*** **	0.926	5.984	**10.639*** **	16.852
	(0.000)	**(0.002)**	(0.405)	**(0.055)**	**(0.000)**	(0.118)	**(0.001)**	**(0.000)**	(0.616)	(0.158)	**(0.000)**	(0.104)
Internet.PCR	**6.836*** **	**3.181*** **	**4.763*** **	**6.803*** **	**9.186*** **	**12.742*** **	**7.723*** **	**3.596*** **	**5.634*** **	**8.177*** **	**10.886*** **	**13.311*** **
	(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	-0.252	-0.031	-0.070	-0.190	-0.097	-0.131	-0.183	-0.008	-0.066	-0.150	0.139	0.307
	(0.264)	(0.719)	(0.533)	(0.351)	(0.606)	(0.844)	(0.439)	(0.909)	(0.573)	(0.544)	(0.418)	(0.524)
Inflation	**-0.072*** **	-0.002	**-0.017* **	**-0.044* **	**-0.048** **	**-0.093** **	**-0.099*** **	**-0.020** **	-0.016	**-0.048** **	**-0.074*** **	**-0.111*** **
	(0.000)	(0.677)	**(0.071)**	**(0.083)**	**(0.012)**	**(0.042)**	**(0.000)**	**(0.017)**	(0.165)	**(0.018)**	**(0.000)**	**(0.001)**
Public Invt.	-0.107	0.060	-0.019	0.211	0.085	0.079	-0.254	0.007	-0.118	0.128	0.0009	-0.271
	(0.604)	(0.562)	(0.858)	(0.269)	(0.609)	(0.877)	(0.222)	(0.932)	(0.369)	(0.576)	(0.995)	(0.458)
Foreign Aid	**-0.501** **	0.043	**0.153** **	0.083	-0.034	-0.268	**-0.480** **	0.006	**0.174** **	0.066	-0.037	-0.207
	(0.015)	(0.444)	**(0.017)**	(0.501)	(0.786)	(0.666)	**(0.026)**	(0.899)	**(0.017)**	(0.657)	(0.740)	(0.649)
Trade	**-0.075* **	**-0.040*** **	-0.007	-0.040	**-0.049* **	-0.054	-0.063	**-0.044*** **	0.0002	-0.035	-0.037	-0.009
	(0.065)	**(0.000)**	(0.602)	(0.151)	**(0.081)**	(0.579)	(0.148)	**(0.000)**	(0.989)	(0.310)	(0.156)	(0.901)
Pseudo R^2/R^2	0.334	0.164	0.168	0.204	0.312	0.324	0.334	0.160	0.165	0.207	0.326	0.331
Fisher	**19.41*** **						**18.60*** **					
Observations	292	292	292	292	292	292	258	258	258	258	258	258

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial activity is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Internet.PCR: Internet-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Table 9: Internet-driven Information Sharing and Financial Size

	Financial Size											
	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	**75.140*** **	**42.963*** **	**67.704*** **	**87.290*** **	**97.758*** **	**97.020*** **	**73.824*** **	**41.394*** **	**65.379*** **	**86.730*** **	**96.515*** **	**99.836*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0..000)**	**(0.000)**	**(0.002)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Internet.PCR	**2.280*** **	**3.461** **	**2.463*** **	0.940	0.336	-0.069	**2.453*** **	3.895	**2.698** **	**1.302*** **	0.267	-0.013
	(0.000)	**(0.025)**	**(0.004)**	(0.141)	(0.136)	(0.645)	**(0.000)**	(0.149)	**(0.025)**	**(0.006)**	(0.275)	(0.956)
GDP growth	-0.292	-0.362	**-0.721** **	-0.128	**-0.275*** **	0.043	-0.075	-0.133	**-0.664***	-0.039	-0.111	-0.023
	(0.239)	(0.498)	**(0.016)**	(0.661)	**(0.003)**	(0.381)	(0.768)	(0.904)	**(0.073)**	(0.827)	(0.151)	(0.740)
Inflation	**-0.097*** **	**-0.204*** **	**-0.090*** **	**-0.114*** **	**-0.076*** **	**-0.073*** **	**0.0002*** **	**0.001** **	**0.0003***	**0.0001***	**-**	**-**
											0.0001* **	**0.0003*** **
	(0.004)	**(0.000)**	**(0.001)**	**(0.001)**	**(0.000)**	**(0.000)**	**(0.0009)**	**(0.012)**	**(0.056)**	**(0.099)**	**(0.000)**	**(0.000)**
Public Invt.	**0.841*** **	**0.880** **	**0.579***	**0.568** **	**0.402*** **	**0.225*** **	**0.742*** **	**0.888** **	**0.474***	**0.533*** **	**0.236*** **	0.009
	(0.000)	**(0.012)**	**(0.059)**	**(0.029)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.045)**	**(0.076)**	**(0.001)**	**(0.003)**	(0.887)
Foreign Aid	**-0.696*** **	**-0.363**	**-0.955*** **	**-0.936*** **	**-0.923*** **	**-0.482*** **	**-0.630*** **	-0.414	**-0.659*** **	**-0.846*** **	**-0.785*** **	**-0.382*** **
	(0.000)	**(0.181)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	(0.236)	**(0.001)**	**(0.000)**	**(0.000)**	**(0.000)**
Trade	0.034	**0.138** **	**0.094** **	0.023	-0.001	**0.025*** **	0.045	0.129	**0.110***	0.012	0.015	0.004
	(0.257)	**(0.043)**	**(0.028)**	(0.541)	(0.937)	**(0.000)**	‘(0.148)	(0.183)	**(0.058)**	(0.617)	(0.276)	(0.625)
Pseudo R^2/R^2	0.278	0.188	0.214	0.193	0.197	0.114	0.245	0.171	0.190	0.187	0.167	0.092
Fisher	**29.04*** **						**25.68*** **					
Observations	291	291	291	291	291	291	261	261	261	261	261	261

*,**,***: significance levels of 10%, 5% and 1% respectively. OLS: Ordinary Least Squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quintiles (e.g., Q 0.1) signify nations where financial size is least. GDP: Gross Domestic Product. Public Invt: Public Investment. Internet.PCR: Internet-driven Public Credit Registries. Values in bold denote significant estimated coefficients and the Fisher statistics.

Appendices

Appendix 1: Variable Definitions

Variables	Signs	Variable Definitions	Sources
Economic Financial Depth	M2	Money Supply (% of GDP)	World Bank (FDSD)
Financial System Depth	Fdgdp	Liquid Liabilities (% of GDP)	World Bank (FDSD)
Banking System Efficiency	BcBd	Bank credit on Bank deposits	World Bank (FDSD)
Financial System Efficiency	FcFd	Financial credit on Financial deposits	World Bank (FDSD)
Banking System 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)
Financial Size	Dbacba	Deposit bank assets on Central bank assets plus Deposit bank assets	World Bank (FDSD)
Information Sharing Offices	PCR	Public credit registry coverage (% of adults)	World Bank (WDI)
	PCB	Private credit bureau coverage (% of adults)	World Bank (WDI)
ICT	Mobile	Mobile phone penetration (per 100 people)	World Bank (WDI)
	Internet	Internet penetration (per 100 people)	World Bank (WDI)
ICT-driven Information Sharing Offices	MobPCR	'Mobile phone'-driven Public Credit Registries	Authors' calculation
	IntPCR	Internet-driven Public Credit Registries	Authors' calculation
	MobPCB	'Mobile phone'-driven Private Credit Bureaus	Authors' calculation
	IntPCB	Internet-driven Private Credit Bureaus	Authors' calculation
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)

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

Appendix 2: Summary Statistics (2004-2011)

	Variables	Mean	S.D	Min.	Max.	Observations
Financial Development	Economic Financial Depth (M2)	34.279	22.294	6.363	112.83	377
	Financial System Depth (Fdgdp)	28.262	21.066	2.926	92.325	377
	Banking System 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
	Financial Size (Dbacba)	78.073	20.255	4.032	99.949	399
ICT	Mobile Phone Penetration	36.659	32.848	0.214	171.51	420
	Internet Penetration	6.822	8.852	0.031	51.00	414
ICT-driven Information Sharing	'Mobile Phone'-driven PCR	2.178	2.039	-0.226	9.346	377
	Internet-driven PCR	2.187	2.148	0.574	12.639	374
	'Mobile Phone'-driven PCB	4.268	4.759	-1.332	20.961	376
	Internet-driven PCB	4.302	1.460	3.211	11.492	373
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

S.D: Standard Deviation. Min: Minimum. Max: Maximum. M2: Money Supply. Fdgdp: Financial deposits(liquid liabilities). 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. Dbacba: Deposit bank assets on central bank assets plus deposit bank assets. ICT: Information and Communication Technology. GDPg: GDP growth.

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Appendix 3: Correlation Matrix

Financial Development Dynamics							ICT-driven Information Sharing				Control Variables					
Financial Depth		Fin. Efficency		Fin. Activity		Fin. Size	ICT-driven PCR		ICT-driven PCB							
M2	Fdgdp	BcBd	FcFd	Prcb	Pcrbof	Dbacba	MobPCR	IntPCR	MobPCB	IntPCB	GDPg	Inflation	PubIvt	NODA	Trade	
1.000	0.974	0.015	0.047	0.758	0.624	0.355	0.477	0.692	0.488	0.706	-0.103	-0.069	0.042	-0.170	0.145	M2
	1.000	0.054	0.150	0.846	0.733	0.410	0.516	0.699	0.528	0.712	-0.088	-0.051	0.059	-0.195	0.157	Fdgdp
		1.000	0.872	0.482	0.474	0.321	0.118	0.126	0.120	0.129	-0.001	-0.035	-0.191	-0.109	-0.141	Bcbd
			1.000	0.567	0.710	0.275	0.176	0.122	0.176	0.122	-0.071	-0.073	-0.169	-0.126	-0.209	FcFd
				1.000	0.927	0.466	0.502	0.647	0.509	0.655	-0.097	-0.068	-0.067	-0.212	0.074	Pcrb
					1.000	0.405	0.472	0.512	0.478	0.520	-0.094	-0.058	-0.062	-0.203	0.012	Pcrbof
						1.000	0.424	0.350	0.423	0.349	-0.049	-0.115	0.220	-0.493	0.108	Dbacba
							1.000	0.670	1.000	0.673	-0.137	-0.051	0.062	-0.314	0.257	MobPCR
								1.000	0.673	1.000	-0.077	0.022	-0.048	-0.262	0.166	IntPCR
									1.000	0.674	-0.138	-0.051	0.061	-0.312	0.264	MobPCB
										1.000	-0.086	0.023	-0.051	-0.257	0.179	IntPCB
											1.000	-0.110	0.157	0.147	0.100	GDPg
												1.000	-0.082	0.0006	0.006	Inflation
													1.000	-0.078	0.062	PubIvt
														1.000	-0.011	NODA
															1.000	Trade

M2: Money Supply. Fdgdp: Financial deposits(liquid liabilities). 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. Dbacba: Deposit bank assets on central bank assets plus deposit bank assets. Info: Information. PCR: Public Credit Registries. PCB: Private Credit Bureaus. ICT: Information and Communication Technology. MobPCR: 'Mobile Phone'-driven PCR. IntPCR: Internet-driven PCR. MobPCB: 'Mobile Phone'-driven PCB. IntPCB: Internet-driven PCB. GDPg: GDP growth. Popg: Population growth. PubIvt: Public Investment. NODA: Net Official Development Assistance. Fin: Financial.

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