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At what levels of financial development does information sharing matter?

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Abstract

Background: The purpose of this study is to investigate how an increase in information-sharing bureaus affects financial access.

Methods: We employed contemporary and non-contemporary interactive quantile regressions in 53 African countries for the period 2004–2011. Information-sharing bureaus are proxied with public credit registries and private credit offices. Financial development dynamics involving depth (at overall economic and financial system levels), efficiency (at banking and financial system levels), activity (from banking and financial system perspectives), and size are used.

Results: Two key findings are established. First, the effect of an increase in private credit bureaus is not clearly noticeable on financial access, probably because private credit agencies are still to be established in many countries. Second, an increase in public credit registries for the most part improves financial allocation efficiency and activity (or credit) between the 25th and 75th quartiles.

Conclusions: As a main policy implication, countries in the top and bottom ends of the financial efficiency and activity distributions are unlikely to benefit from enhanced financial allocation efficiency as a result of an increase in public credit registries.

Keywords: Information sharing, Financial development, Quantile regression

JEL classification: G20, G29, O16, O55, C52

Background

The purpose of this study is to assess how an increase in information-sharing offices affects financial access when existing levels of financial development are taken into account. Recent literature reveals that less than 20% of African households have access to financial services (see IFAD 2011; Asongu et al. 2017). This widespread narrative indicates that a great part of the population on the continent depends on the informal sector for financial services. Some factors limiting access to finance include low population densities in many areas, poor facilities in transport, and limited communication infrastructure. In regions where financial services from the formal sector are available, low-income households and small businesses are for the most part unable to meet certain basic lending requirements, like strict documentation and collateral provision. Even in situations where such conditions are met, cost barriers (like substantial transaction fees) and high minimum deposits of savings could still overwhelmingly restrict financial access.

The above concerns have led to issues of surplus liquidity or excess cash in African formal financial institutions (see Saxegaard 2006; Fouda 2009; Asongu 2014a, p. 70). The authors have suggested measures to curb both the voluntary and involuntary holding of excess liquidity by banks. First, voluntary holding of excess cash can be reduced by: (i) helping banks to track their positions at the central bank to prevent them from keeping reserves above statutory limits; (ii) consolidating institutions that are favorable to interbank lending; and (iii) improving infrastructure to prevent remote bank branches from holding excess reserves essentially due to transportation problems. Second, involuntary keeping of surplus cash can be kept at minimum by: (i) reducing the incapacity of banks to lend in scenarios where interest rates are regulated; (ii) creating conducive conditions for commercial banks to invest surplus liquidity in bond markets; (iii) increasing investment avenues for regional banks via promotion of regional stock exchange markets; and (iv) reducing lending contraction of banks through instruments that encourage competition and mitigate information asymmetry. This line of inquiry is closest to the final point (iii) of the first strand, regarding the improvement of infrastructure.

Over the past decade, information-sharing bureaus have been introduced across the African continent in order to enhance financial access by limiting information asymmetry. Unfortunately, recent empirical literature has been based on the assumption that information-sharing agencies may not be increasing financial access as theoretically anticipated (see Triki and Gajigo 2014). For instance, Asongu et al. (2016) concluded that the effects of information-sharing bureaus have mostly been negative on financial development dynamics in terms of depth, allocation efficiency, and activity. Moreover, as we shall demonstrate in the literature review that follows, there has been very limited scholarly focus on the role of information-sharing agencies on financial access in the African continent.

This study addresses the highlighted gaps by investigating the levels of financial development for which an increase in information-sharing bureaus can most enhance financial access. The interest in considering initial levels of financial development arises because the findings of Asongu et al. (2016) were based on the average values of financial development. It is important to include countries with low, intermediate, and high levels of financial development in the modeling exercise, because blanket policies based on the mean values of financial access may not succeed unless they are contingent on initial levels of financial development and tailored differently across countries with different levels of financial access (see Henderson et al. 2013). In the light of the above insights, the quantile regression empirical strategy is adopted, because existing studies on information sharing have examined the relationship between information-sharing bureaus and financial development using parameter estimates based on the conditional means of financial development variables (Triki and Gajigo 2014; Asongu et al. 2016).

The emphasized research gaps are addressed by answering the following question: can we identify the existing levels of financial development in Africa for which increases in information-sharing bureaus show a strong positive effect on financial access? Addressing this research inquiry is important, because the findings should inform policy makers on ways to lift financial access barriers to enable households and small corporations to maximize their savings and earnings for more productivity, more employment, and higher economic growth. Hence, the contribution of this study is to complement existing literature by investigating how increases in information-sharing offices influence financial access when existing levels of development are considered in

the modeling exercise. One of the main results stemming from the econometric analysis is that an increase in public credit registries improves financial efficiency in countries in the middle range of the financial development distribution. This result is intuitive, because for poorly developed financial systems, increasing information-sharing bureaus may in some respects decrease the pace of development, whereas for more developed financial systems, the impact of information sharing may already have been taken into account. It is important to note that some initial conditions (e.g. good infrastructure, saving accounts for the majority of the population and high penetration of information and communication technology) that are essential for information-sharing bureaus to improve financial access may not be apparent in countries with poorly developed financial systems.

The rest of the study is structured as follows. Section 2 discusses the stylized facts, theoretical underpinnings, and empirical literature. The data and methodology are covered in Section 3. The empirical results are presented and discussed in Section 4. Section 5 concludes with future research directions.

Stylized facts, theoretical underpinnings, and empirical literature
Stylized facts
Information-sharing bureaus or credit reference agencies (private credit bureaus and/or public credit registries) are institutions that collect information on the obligations of commercial and individual borrowers from various sources, namely direct investigation and public sources (for businesses), banks and credit card companies (for individuals), and retail lenders (Tchamyou and Asongu 2017). Once the data are collected, the information is consolidated after cross-checking to provide a comprehensive credit report. Such a report is useful for potential creditors. Data from a credit history report can encompass both positive and negative information: (i) positive information (entailing details on all opened and closed credits and repayment behavior) and (ii) negative information (which comprises default data for the most part).

Information-sharing bureaus are essential to enhance financial access in any economy, because they enable the mitigation of the information asymmetry that restricts lenders from offering credit. On the one hand, adverse selection issues are attenuated with information from credit histories. On the other, moral hazard issues are also controlled by limiting default rates and increasing repayment rates. Ultimately, the incremental volume in lending is essential for sectors with limited financial access like micro, small, and medium corporations.

Prior to 2008, information-sharing bureaus were confined to a few countries in the Organisation for Economic Cooperation and Development and Latin America (see Mylenko 2008). However, the growth of information and communication technology has considerably increased the presence of such information credit offices in sub-Saharan Africa, NorthAfrica, and Central and Eastern Europe. In sub-Saharan Africa, with the exception of South Africa, very few countries possessed well-functioning information-sharing bureaus before 2008. Some nations like Mozambique, Nigeria, and Rwanda have instituted credit offices with the prime objective of boosting banking sector supervision. Greater articulation of controls is made on higher lending rates, and due to lack of appropriate technology and incentives, such credit offices often did not

provide timely and accurate information. Before 2008, numerous initiatives were implemented throughout Africa in order to institute private credit bureaus, given demands for data from supervising authorities to consolidate risk management practices on the one hand, and from financial institutions on the other. In response, many countries introduced information-sharing bureaus, including Ghana, Nigeria, Tanzania, Uganda, and Zambia.

Theoretical highlights

As documented by Claus and Grimes (2003), two principal strands exist in the theoretical underpinnings of the literature on the linkage between financial intermediaries and information sharing. The first strand investigates liquidity provision by financial institutions, while the second focuses on the capacity of financial intermediaries to modify the risk characteristics of assets. Both strands are founded on the essential economic role of financial intermediation, which is to augment efficiency in allocation by reducing the cost of conveying mobilized deposits from depositors to borrowers. The theories underlying the mission of financial intermediation are based on the literature of imperfect information in the market. Accordingly, the primary task of financial intermediation is to reduce transaction and information costs arising from information asymmetry between lenders and borrowers. Therefore, the establishment of information-sharing bureaus is a channel through which such information can be consolidated. These underpinnings are consistent with the pioneering literature on the relevance of information sharing in financial intermediary efficiency; most notably on models of credit rationing (see Williamson 1986; Stiglitz and Weiss 1981; Jaffee and Russell 1976), ex-post and ex-ante information asymmetry (Diamond and Dybvig 1983), communication on potential borrowers to investors by banks (Leland and Pyle 1977), and diversification with financial intermediaries (Diamond 1984).

The association between information-sharing bureaus and financial access can be seen from the view of adverse selection (from lenders) on the one hand and the perspective of moral hazard (from borrowers) on the other. Information-sharing agencies provide lenders of financial institutions with borrower information and credit histories that enable the reduction of substantial interest rates, which were the previous consequence of adverse selection on the part of financial institutions. When borrowers are granted credit, they automatically become liable to moral hazard, because their economic activities related to granted credit could be concealed in order to reduce compliance with their financial obligations towards the bank or lender. The responsibility therefore falls on the credit bureaus to discipline borrowers on the severe consequences of not complying with their periodic financial obligations. It is within this framework that information-sharing bureaus reduce moral hazard in borrowers, essentially by educating them on the perils of debt defaults and resorting to the informal financial sector as a sustainable alternative to the formal banking sector.

Empirical literature

A considerable bulk of the empirical studies on information sharing has been oriented towards the impact of creditors' rights to more data on the one hand and the impact of reducing information asymmetry among creditors on the other. The former orientation has for the most part focused on the influence that stronger creditors' rights have on,

inter alia: capital structure (El Ghoul et al. 2012); bankruptcy (Claessens and Klapper 2005; Djankov et al. 2007); and more risk-taking by financial institutions (Houston et al. 2010; Acharya et al. 2011). This last orientation has revolved around investigating how sharing information consolidates credit availability (Djankov et al. 2007; Brown et al. 2009; Triki and Gajigo 2014), mitigates rates of default (Jappelli and Pagano 2002), reduces credit cost (Brown et al. 2009), affects syndicated bank loans (Ivashina 2009; Tanjung et al. 2010), impacts antitrust intervention (Coccorese 2012), and affects corrupt lending (Barth et al. 2009).

The above literature indicates that inquiries have for the most part been dedicated to developed countries, which have comparatively less severe barriers to financial access. However, while a substantial body of studies has been oriented toward the Organisation of Economic Cooperation countries, and on emerging nations in Asia and Latin America, very little scholarly work has been devoted to Africa, a continent with substantially higher constraints to financial access (Asongu et al. 2017).

Macroeconomic evidence on the influence of reducing information asymmetry has been investigated by Galindo and Miller (2001), who concluded that developed countries with credit registries are associated with lower levels of financial restrictions in comparison with their less developed counterparts with credit bureaus. Specifically, public credit registries that are performing well contribute considerably to help reduce the sensitivity of decisions in investment for "cash flow availability," a characteristic proxy for financial constraint.

A combination of private credit bureaus and public credit offices was employed by Love and Mylenko (2003) with firm-based data from the World Bank Business Environment Survey. They investigated whether financial access constraints are negatively related to credit registries. The findings show that private credit bureaus are linked to higher financial access, whereas public credit registries have no significant impact on decreasing constraints in financial access.

Barth et al. (2009) have investigated the effects of (i) information sharing and (ii) borrower and lender competition on "lending corruption" through information-sharing bureaus using the World Bank Business Environment Survey from 59 nations. The data set consisted of 4000 corporations and private credit agencies in 129 nations. Two main findings are established. First, corrupt lending is reduced by competition in banking and by reducing information asymmetry. Second, competition among firms and the legal environment have had a considerable effect on corrupt lending.

Triki and Gajigo (2014) investigated two principal issues, namely: (i) the impact of information-sharing bureaus on corporations' access to finance and (ii) the effect of the design of public credit registries on the extent of constraints on financial access. The following key findings are apparent. First, access to finance is comparatively greater in countries with higher numbers of private credit bureaus relative to countries with public credit registries or no information-sharing offices. Second, there is considerable heterogeneity in financial access and on the design of information-sharing bureaus with public credit agencies.

Information-sharing thresholds were investigated by Asongu et al. (2016), who established that information-sharing bureaus have negative effects on financial depth, with the impact from public credit registries comparatively more noticeable. Private credit bureaus have a higher negative impact on banking system efficiency, whereas public

credit registries have an insignificant effect. Information-sharing bureaus have negative effects on financial activity, with the impact from public credit registries being comparatively higher. The positive influence of private credit bureaus on financial size is comparatively low.

Methods

Data

As outlined above, this study examines a panel of 53 African countries with data for the period 2004–2011 from World Development Indicators and the Financial Development and Structure Database of the World Bank. The periodicity is constrained by data availability. Consistent with Asongu (2013), four financial development variables are used, namely: depth, efficiency, activity, and size. First, financial depth embodies (i) overall economic depth $(M2/GDP)$[1] representing the monetary base plus demand, savings, and time deposits; and (ii) financial system deposits $(Fdgdp)$. Distinguishing between these measures is important, because a substantial bulk of the monetary base in developing nations does not circulate within the formal banking sector. Second, financial allocation efficiency measures the ability of financial intermediaries to transform mobilized deposits into credit for economic agents. Two measurements of efficiency are used, namely: (i) banking system efficiency (using "bank credit on bank deposits: $Bcbd$") and (ii) financial system efficiency (using "financial system credit on financial system deposits: $Fcfd$"). Third, financial activity is measured as the ability of financial institutions to provide credit to economic agents. Two indicators are also used for this dimension of financial development, namely (i) banking system activity (with "private domestic credit by deposit banks: $Pcrb$") and (ii) financial system activity (with "private credit by domestic banks and other financial institutions: $Pcrbof$"). Fourth, financial size is the as the ratio of "deposit bank assets" to "total assets" ("deposit bank assets on central bank assets plus deposit bank assets: $Dbacba$"). Note that financial ratios that are dependent variables are mostly dimensions identified by the Financial Development and Structure Database of the World Bank.

Consistent with recent information asymmetry literature, information-sharing bureaus are measured by assessing public credit bureaus and private credit registries (Triki and Gajigo 2014; Asongu et al. 2016). Asongu et al. (2016) have documented six distinguishing characteristics between public credit bureaus and private credit registries, notably: purpose, coverage, status, ownership, data sources used, and access. First, whereas private credit registries are made up of public institutions that are constituted within the framework of supervising the banking sector, public credit bureaus are created in response to the need and demand for information on borrowers in the banking market. Hence, data from private credit registries, usually employed to examine the creditworthiness of clients, could also be acknowledged as a collateral benefit or by-product of private credit registries. Second, while the coverage engendered by private credit registries is restricted in terms of information (or data) type and history provided, public credit bureaus extend beyond the scope of large corporations and include small and medium size enterprises (SMEs) that are characterized by richer data and longer histories. Third, whereas public credit bureaus are fundamentally established for profit making, private credit registries are not primarily focused on profits. Fourth, on the issue of ownership, whereas public

credit registries belong to governments and/or central banks, the ownership of private credit bureaus revolve outside highlighted establishments (central banks and governments) to include lenders, lenders' associates, and independent third parties. Fifth, while the data used by private credit registries are sourced from non-bank and bank financial establishments, data from public credit bureaus entails private credit registries, tax authorities, courts and utilities, to sources employed by private credit registries for information. Sixth, access to private credit registries (public credit bureaus) is restricted to providers of information (open to all lender types).

The control variables are also consistent with the recent information asymmetry literature (Asongu et al. 2016), namely, inflation, public investment, GDP growth, trade, and foreign aid. The selected covariates have also been substantially documented in the financial development literature (Osabuohien and Efobi 2013; Huang 2005; Asongu 2014b; Asongu 2015).

First, foreign aid like remittances (Aggarwal et al. 2011; Efobi et al. 2015) could increase financial development if it is not associated with activities that decrease its flow within a country, such as funds captured by developed countries for consultancy services and deposited by corrupt officials from developing countries in tax havens that are under the jurisdictions of developed countries.

Second, there is an abundance of literature that has established a positive growth-finance relationship (see Saint Paul 1992; Greenwood and Jovanovic 1990; Owusu and Odhiambo 2014; Nyasha and Odhiambo 2015a, b). According to these studies, economic growth is linked to decreasing costs in financial intermediation, which is the outcome of higher compensation that entails growing the financial resources devoted to investment. Moreover, the importance of income levels in financial development has been established in both broad (Levine 1997) and Africa-specific (Asongu 2012) studies. Whereas Asongu has shown that countries with high income are linked to greater financial development levels in Africa, Jaffee and Levonian (2001) concluded that higher-income countries are associated with more developed banking system structures. The engaged narrative needs to balance the fact that growth may be linked to financial crises that ultimately reduce financial development (Asongu et al. 2016).

Third, there is a branch of the literature sympathetic to the perspective that policies that are friendly to openness (like trade) are positively linked to financial development (see Huang and Temple 2005; Do and Levchenko 2004).

Fourth, the nexus between investment and financial development has been assessed by Huang (2011), who found a positive connection.

Fifth, some main domestic macroeconomic policies, such as the maintenance of stable and/or low inflation levels, are needed for financial development (Huang, 2011; Boyd et al. 2001; Huybens and Smith 1999). Accordingly, Huybens and Smith (1999) and Boyd et al. (2001) have respectively shown theoretically and empirically that nations with chaotic and/or high inflation are very likely to be associated with smaller, less efficient, and less active financial institutions.

It is important to note that the expected signs of covariates cannot be established without uncertainty, because the corresponding financial development variables conflict in terms of definition and measurement. For example, financial efficiency is measured as the ratio of financial activity (credit) to financial depth (deposits). The definitions and sources of the variables are disclosed in Appendix 1, the summary statistics in Appendix 2, and the correlation matrix in Appendix 3.

Methodology

Consistent with the research question, which is to assess the existing financial development levels for which the influence of information-sharing offices on financial access matters, the study accounts for the existing levels of financial development by employing a quantile regression estimation technique that has been documented to account for initial levels in dependent variables (see Billger and Goel 2009; Okada and Samreth 2012; Asongu and Nwachukwu 2017) with information-sharing bureaus being examined throughout the conditional distributions of the outcome variable (Koenker and Hallock 2001).

Previous literature on information sharing has examined the relationship between information-sharing bureaus and financial development by engaging parameter estimates at the conditional mean of the financial development variables (Triki and Gajigo 2014; Asongu et al. 2016). Whereas mean impacts are relevant, the underlying literature is extended by employing quantile regressions that distinguish existing levels of financial access. Furthermore, while ordinary least squares (OLS) regressions are based on the hypothesis that financial access variables and error terms are normally distributed, such an assumption of error terms that are normally distributed does not hold with quantile regressions.

The quantile regression models parameter estimates at numerous points of the conditional distribution of financial access. Therefore, the technique is in conformity with the motivation of distinguishing between nations with high, intermediate, and low initial levels of financial development.

The θth quantile estimator of a financial access variable is derived by solving the optimization problem in Eq. (1), which is shown without subscripts for simplicity and ease of presentation.

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

where $\theta \in (0,1)$. As opposed to OLS, which is fundamentally based on minimizing the sum of squared residuals, with quantile regressions the weighted sum of the absolute deviations is minimized. For instance, the 25th or 75th quartiles (with $\theta = 0.25$ or 0.75 respectively) are estimated by approximately weighting the residuals. The conditional quintile of financial development or y_i given x_i is:

$$Qy(\theta / x_i) = x_i' \beta o \tag{2}$$

where unique slope parameters are modeled for each θth specific quintile. This formulation is analogous to $E(y/x) = x_i \cdot \beta$ in the OLS slope, where parameters are investigated only at the mean of the conditional distribution of financial development. For the model in Eq. (2), the dependent variable y_i is a financial development indicator, while x_i contains a constant term, foreign aid, trade, GDP growth, public investment, and inflation. As specified in Eq. (2), the linearity in quantiles is appropriate under the assumption of homoscedasticity. This is essentially because if there is heteroscedasticity in the error process, then the quantiles will possess nonlinearities of different degrees.

Results and Discussion

Financial development and public credit registries

Tables 1, 2, 3, and 4 respectively disclose results corresponding to financial depth, financial allocation efficiency, financial activity, and financial size. Irrespective of tables, the left-handside (LHS) presents contemporary estimations, whereas the right-handside (RHS) presents non-contemporary estimations. The motivation for lagging the independent variables on the RHS by one year is to account for endogeneity (see Mlachila et al. 2014; Asongu et al. 2016). The consistent variations in information-sharing estimates between OLS and quantile regressions (with respect to sign, significance, and magnitude of significance) is a justification for the relevance of the problem statement, notably investigating the impact of increasing information-sharing offices on financial development where existing levels of financial development matter.

The findings are explained at three levels, namely, in terms of marginal effect, net effect, and thresholds. The net effect of increasing public credit registries in the 0.10th quintile on the LHS of Table 1 is computed with conditional and unconditional effects of public credit registries. Accordingly, the marginal or conditional effect (from the interaction) is 0.052, while the unconditional impact of public credit registries is −0.945. Hence, the corresponding net effect of increasing public credit registries is −0.832 ($[2.155 \times 0.052] + -0.945$)[2]. Given that the conditional or marginal impact is positive, the corresponding threshold in public credit registries at which the negative unconditional effect changes from negative to positive is 18.173 (0.945/0.052). The positive threshold is feasible, because it is within the public credit registries' range (minimum to maximum) as disclosed by the summary statistics (0.00 to 49.80).

It is important to note that whereas the computation of net effects requires statistically significant unconditional and conditional effects, a threshold may be apparent even when only the conditional effect is significant. Consistent with Asongu and De Moor (2017), the notion of threshold is in accordance with Cummins (2000) on the minimum level/threshold in language proficiency before rewards are acquired in a second language. In addition, the definition of threshold is also supported by the critical mass theory, which has been abundantly documented in the literature on economic development (see Roller and Waverman 2001; Ashraf and Galor 2013). A recent application of the threshold or critical mass theory based on interaction variables can be found in Batuo (2015). Therefore, from the perspective of this study, the concept of threshold is not different from: (i) the minimum requirement for the reaping of positive effects (Cummins 2000); (ii) conditions for U-shape and inverted U-shape dynamics (Ashraf and Galor 2013) and (iii) critical mass for positive impacts (Roller and Waverman 2001; Batuo 2015).

Two key results can be established from Table 1 on linkages between financial depth and public credit registries. First, in Panel A on money supply, (i) there are positive thresholds (from contemporary and noncontemporary regressions) in the 10th decile with corresponding negative net effects; and (ii) there is a synergy effect in the 25th quartile on the LHS. It is important to note that threshold values and net effects are disclosed at the bottom of the panels. Second, in Panel B, most significant results are apparent between the 10th decile and 50th quartile with (i) both negative (positive) net effects in the 10th (25th) decile (quartile) and (ii) both positive and synergy effects in the 10th decile and 25th quartile and consistent synergy impacts in the 50th quartile.

The following findings can be established from Table 2 on linkages between financial efficiency and public credit registries. In Panel A (on banking system efficiency) and Panel B

Table 1 Financial Depth and Public Credit Registries (PCR)

	Financial Depth											
	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
Panel A: Overall Economic Depth (Money Supply)												
Constant	38.302***	19.220***	22.628***	21.499***	37.550***	75.910***	38.659***	19.908***	20.312***	20.804***	40.514***	72.342***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)
PCR	1.188**	−0.945***	0.303	1.137***	2.119***	3.145**	1.362**	−0.014	1.398***	1.373***	1.845***	2.696
	(0.032)	(0.000)	(0.159)	(0.000)	(0.000)	(0.029)	(0.014)	(0.959)	(0.000)	(0.000)	(0.000)	(0.194)
PCR × PCR	0.003	0.052***	0.024***	0.004	−0.014	−0.047	0.0009	0.013**	0.002	0.011	−0.010	−0.040
	(0.770)	(0.000)	(0.000)	(0.403)	(0.190)	(0.141)	(0.935)	(0.021)	(0.631)	(0.307)	(0.401)	(0.405)
GDP growth	−0.476*	−0.216	−0.610***	−0.684***	−0.527**	0.161	−0.392	−0.224	−0.432*	−0.542**	−0.620**	0.048
	(0.056)	(0.374)	(0.000)	(0.000)	(0.037)	(0.806)	(0.158)	(0.457)	(0.053)	(0.029)	(0.011)	(0.961)
Inflation	−0.056***	0.012	−0.012	−0.025	−0.049*	−0.118	−0.079***	0.011	−0.010	−0.037*	−0.088***	−0.146
	(0.002)	(0.390)	(0.380)	(0.191)	(0.051)	(0.135)	(0.008)	(0.698)	(0.603)	(0.070)	(0.000)	(0.219)
Public Invt.	0.222	0.030	0.366**	0.870***	1.139***	−0.254	0.172	−0.048	0.310	0.768***	1.019***	−0.226
	(0.468)	(0.880)	(0.045)	(0.000)	(0.000)	(0.672)	(0.600)	(0.845)	(0.157)	(0.000)	(0.000)	(0.780)
Foreign Aid	−0.635***	−0.034	−0.100	−0.234***	−0.761***	−1.375	−0.653***	−0.087	−0.068	−0.243*	−0.743***	−1.314
	(0.000)	(0.743)	(0.256)	(0.008)	(0.000)	(0.171)	(0.000)	(0.477)	(0.514)	(0.068)	(0.001)	(0.298)
Trade	−0.012	−0.038	−0.016	0.042*	−0.023	−0.115	−0.005	−0.037	−0.002	0.060*	−0.012	−0.054
	(0.734)	(0.111)	(0.482)	(0.053)	(0.547)	(0.393)	(0.891)	(0.205)	(0.917)	(0.070)	(0.746)	(0.775)
Net Effects	na	−0.832	na	na	na	na	na	na	na	na	na	na
Thresholds	na	18.173	Synergy	na	na	na	na	1.076	na	na	na	na
Pseudo R²/R²	0.222	0.054	0.072	0.146	0.211	0.233	0.223	0.047	0.068	0.145	0.200	0.224
Fisher	27.88***						15.21***					
Observations	295	295	295	295	295	295	259	259	259	259	259	259

Table 1 Financial Depth and Public Credit Registries (PCR) *(Continued)*

	Panel B: Financial System Depth (Liquid Liabilities)											
Constant	32.242***	13.860***	14.292***	13.412***	37.863***	60.561***	32.423***	12.728***	13.787***	14.585***	37.179***	61.396***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
PCR	0.738	−0.889***	−0.203	0.394	2.083***	2.283*	0.903	−0.758**	0.804***	0.236	1.811**	1.938*
	(0.166)	(0.008)	(0.198)	(0.143)	(0.001)	(0.052)	(0.107)	(0.013)	(0.000)	(0.508)	(0.016)	(0.078)
PCR × PCR	0.013	0.050***	0.033***	0.018***	−0.016	−0.033	0.011	0.046***	0.014***	0.041***	−0.010	−0.029
	(0.226)	(0.000)	(0.000)	(0.003)	(0.245)	(0.207)	(0.383)	(0.000)	(0.001)	(0.000)	(0.536)	(0.235)
GDP growth	−0.362	−0.192	−0.443***	−0.443**	−0.747***	−0.497	−0.305	−0.229	−0.343*	−0.374*	−0.355	−0.577
	(0.139)	(0.518)	(0.000)	(0.014)	(0.022)	(0.352)	(0.260)	(0.486)	(0.059)	(0.085)	(0.302)	(0.282)
Inflation	−0.039**	0.023	0.002	−0.007	−0.059*	−0.124*	−0.055**	0.018	0.003	−0.025	−0.075**	−0.172**
	(0.014)	(0.189)	(0.830)	(0.740)	(0.068)	(0.052)	(0.022)	(0.413)	(0.817)	(0.180)	(0.028)	(0.016)
Public Invt.	0.315	0.105	0.513***	0.999***	0.966***	0.358	0.300	0.013	0.321**	0.934***	0.880***	0.006
	(0.278)	(0.662)	(0.000)	(0.000)	(0.001)	(0.461)	(0.350)	(0.959)	(0.046)	(0.000)	(0.000)	(0.989)
Foreign Aid	−0.690***	−0.223*	−0.065	−0.219**	−0.882***	−1.380*	−0.705***	−0.213*	−0.010	−0.281**	−0.776**	−1.254
	(0.000)	(0.075)	(0.314)	(0.029)	(0.002)	(0.092)	(0.000)	(0.084)	(0.886)	(0.021)	(0.013)	(0.108)
Trade	−0.012	−0.031	0.003	0.054**	−0.025	0.010	−0.005	−0.004	0.0003	0.063**	−0.021	0.082
	(0.710)	(0.271)	(0.850)	(0.031)	(0.617)	(0.924)	(0.880)	(0.888)	(0.985)	(0.034)	(0.720)	(0.449)
Net Effects	na	−0.781	na	na	na	na	na	−0.568	0.834	na	na	na
Thresholds	na	17.78	6.151	Synergy	na	na	na	16.478	Synergy	Synergy	na	na
Pseudo R²/R²	0.231	0.049	0.060	0.127	0.200	0.246	0.228	0.041	0.055	0.124	0.195	0.238
Fisher	20.46***				12.07***							
Observations	295	295	295	295	295	295	259	259	259	259	259	259

*, **, ***: significance levels of 10, 5 and 1% respectively. *GDPg* GDP growth rate, *Public Invt* public investment, *OLS* ordinary least squares. R² for OLS and Pseudo R² for quantile regression. Lower quantiles (e.g., Q. 0.1) signify nations where financial depth is least. *na* not applicable because corresponding estimates needed for computation are not significant. P values in parenthesis

Table 2 Financial Efficiency and Public Credit Registries (PCR)

| | Financial 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
	Panel A: Banking System Efficiency											
Constant	94.940***	51.283***	75.054***	97.130***	108.35***	136.29***	92.993***	53.000***	74.958***	90.832***	107.44***	141.33***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCR	1.553***	1.476**	2.380***	1.695***	1.846***	0.219	1.798***	1.716**	2.513***	1.739***	1.996**	0.406
	(0.003)	(0.021)	(0.001)	(0.003)	(0.009)	(0.813)	(0.001)	(0.017)	(0.001)	(0.001)	(0.033)	(0.748)
PCR × PCR	−0.022**	−0.004	−0.033**	−0.020	−0.028*	−0.009	−0.026**	−0.020	−0.033	−0.019	−0.031	−0.011
	(0.038)	(0.738)	(0.037)	(0.146)	(0.072)	(0.605)	(0.028)	(0.182)	(0.062)	(0.100)	(0.126)	(0.677)
GDP growth	0.274	0.754**	0.089	−0.416	−0.290	0.604	0.308	1.295***	0.544	0.097	−0.570	−0.199
	(0.459)	(0.046)	(0.836)	(0.825)	(0.589)	(0.332)	(0.394)	(0.000)	(0.202)	(0.781)	(0.425)	(0.811)
Inflation	−0.0008***	0.0008***	0.00009	−0.0007***	−0.001***	−0.002***	−0.035*	0.022***	−0.031	−0.013*	−0.032***	−0.058***
	(0.000)	(0.000)	(0.650)	(0.000)	(0.000)	(0.000)	(0.064)	(0.001)	(0.091)	(0.083)	(0.003)	(0.000)
Public Invt.	−0.897**	−0.422	−0.364	−0.630*	−0.909*	−1.151***	−0.806**	−0.461	−0.441	−0.593	−0.528	−1.307**
	(0.010)	(0.236)	(0.422)	(0.074)	(0.065)	(0.003)	(0.015)	(0.410)	(0.327)	(0.068)	(0.258)	(0.012)
Foreign Aid	−0.531***	0.094	−0.249	−0.334	−0.524*	−1.244***	−0.442**	0.093	−0.217	−0.242	−0.487	−1.322**
	(0.007)	(0.663)	(0.364)	(0.120)	(0.075)	(0.002)	(0.018)	(0.759)	(0.412)	(0.219)	(0.143)	(0.012)
Trade	−0.200***	−0.182***	−0.243***	−0.274***	−0.197***	−0.144*	−0.191***	−0.227***	−0.252***	−0.229***	−0.194**	−0.172
	(0.000)	(0.000)	(0.000)	(0.000)	(0.004)	(0.096)	(0.000)	(0.002)	(0.000)	(0.000)	(0.016)	(0.121)
Net Effects	1.505	na	1.632	na	1.785	na	1.741	na	na	na	na	na
Thresholds	−70.590	na	−72.121	na	−65.928	na	−69.153	na	na	na	na	na
Pseudo R²/R²	0.123	0.105	0.107	0.098	0.065	0.105	0.136	0.127	0.121	0.097	0.079	0.117
Fisher	12.30***						6.31***					
Observations	300	300	300	300	300	300	266	266	266	266	266	266

Table 2 Financial Efficiency and Public Credit Registries (PCR) *(Continued)*

	Panel B: Financial System Efficiency											
Constant	118.54***	52.173***	80.562***	102.34***	115.69***	172.58***	116.25***	50.204***	76.552***	99.911***	109.99***	170.07***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCR	0.725	1.690**	2.147***	1.386***	1.539*	−0.676	0.906	1.993***	2.359***	1.924***	2.018**	−0.823
	(0.248)	(0.016)	(0.002)	(0.003)	(0.053)	(0.747)	(0.183)	(0.008)	(0.001)	(0.000)	(0.015)	(0.778)
PCR × PCR	−0.006	−0.010	−0.027*	−0.016	−0.023	0.003	−0.008	−0.022	−0.031*	−0.024***	−0.032*	0.025
	(0.633)	(0.460)	(0.072)	(0.137)	(0.191)	(0.942)	(0.553)	(0.168)	(0.055)	(0.006)	(0.076)	(0.681)
GDP growth	−0.216	0.851***	0.125	−0.818***	−0.999	−0.838	0.053	1.543***	0.595	0.049	−0.661	−0.684
	(0.631)	(0.005)	(0.780)	(0.008)	(0.115)	(0.464)	(0.902)	(0.000)	(0.119)	(0.849)	(0.274)	(0.681)
Inflation	−0.161***	−0.148***	−0.031	−0.114***	−0.172	−0.257***	−0.235**	−0.150**	−0.246***	−0.291***	−0.164***	−0.323***
	(0.004)	(0.000)	(0.463)	(0.003)	(0.112)	(0.001)	(0.022)	(0.014)	(0.000)	(0.000)	(0.000)	(0.004)
Public Invt.	−0.976**	−0.530	−0.528	−0.374	−0.838	−1.287*	−0.958**	−0.339	−0.418	−0.479**	−0.517	−1.283
	(0.020)	(0.149)	(0.223)	(0.175)	(0.130)	(0.075)	(0.023)	(0.439)	(0.318)	(0.045)	(0.317)	(0.208)
Foreign Aid	−1.116***	0.072	−0.431*	−0.556***	−0.510	−1.678*	−1.045***	0.194	−0.239	−0.445***	−0.288	−1.637
	(0.002)	(0.769)	(0.092)	(0.001)	(0.133)	(0.071)	(0.004)	(0.531)	(0.338)	(0.002)	(0.357)	(0.212)
Trade	−0.315***	−0.172***	−0.261***	−0.283***	−0.231***	−0.288*	−0.305***	−0.234***	−0.250***	−0.299***	−0.225***	−0.320
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.053)	(0.000)	(0.001)	(0.000)	(0.000)	(0.002)	(0.116)
Net Effects	na	na	2.088	na	na	na	na	na	2.292	1.872	1.949	na
Thresholds	na	na	−79.518	na	na	na	na	na	−76.096	−80.166	−63.062	na
Pseudo R²/R²	0.127	0.094	0.114	0.105	0.054	0.099	0.126	0.114	0.117	0.100	0.060	0.094
Fisher	8.87***						7.28***					
Observations	295	295	295	295	295	295	259	259	259	259	259	259

*, **, ***: significance levels of 10, 5 and 1% respectively. *GDPg* GDP growth rate, *Public Invt* public investment, *OLS* ordinary least squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial efficiency is least. *na* not applicable because corresponding estimates needed for computation are not significant. *P* values in parenthesis

Table 3 Financial Activity and Public Credit Registries (PCR)

Financial 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
Panel A: Banking System Activity												
Constant	30.823***	8.230***	11.792***	13.919***	34.575***	77.176***	30.625***	8.482***	11.204***	12.937***	32.985***	78.545***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCR	0.962**	−0.298*	0.404**	2.059***	2.207***	2.246*	1.232**	0.238**	0.967***	2.255***	2.477***	2.588**
	(0.044)	(0.072)	(0.038)	(0.000)	(0.000)	(0.053)	(0.015)	(0.029)	(0.000)	(0.000)	(0.000)	(0.018)
PCR x PCR	0.008	0.026***	0.021***	−0.011**	−0.017*	−0.027	0.005	0.001	0.012***	−0.010	−0.024***	−0.035
	(0.382)	(0.000)	(0.000)	(0.011)	(0.068)	(0.248)	(0.636)	(0.357)	(0.009)	(0.109)	(0.003)	(0.121)
GDP growth	−0.247	−0.036	−0.162	−0.221*	−0.250	−1.261**	−0.160	−0.027	−0.156	−0.062	−0.153	−1.315***
	(0.209)	(0.806)	(0.317)	(0.082)	(0.318)	(0.010)	(0.463)	(0.810)	(0.408)	(0.663)	(0.407)	(0.003)
Inflation	−0.057***	0.010	−0.004	−0.017	−0.048*	−0.168***	−0.079***	0.008	−0.005	−0.018	−0.068***	−0.203***
	(0.001)	(0.234)	(0.744)	(0.258)	(0.050)	(0.001)	(0.004)	(0.443)	(0.754)	(0.127)	(0.000)	(0.000)
Public Invt.	−0.225	0.156*	0.173	0.281**	−0.158	−0.039	−0.249	0.090	0.191	0.141	−0.305*	−0.693*
	(0.172)	(0.076)	(0.289)	(0.013)	(0.445)	(0.926)	(0.154)	(0.159)	(0.310)	(0.226)	(0.053)	(0.096)
Foreign Aid	−0.691***	−0.058	−0.149*	−0.171**	−0.630***	−1.503**	−0.686***	−0.057	−0.045	−0.129*	−0.449***	−1.297**
	(0.000)	(0.380)	(0.054)	(0.014)	(0.001)	(0.021)	(0.000)	(0.235)	(0.609)	(0.095)	(0.002)	(0.014)
Trade	−0.044*	−0.046***	−0.035*	−0.016	−0.060*	−0.205***	−0.040	−0.049***	−0.042*	−0.004	−0.045*	−0.170**
	(0.096)	(0.000)	(0.076)	(0.351)	(0.072)	(0.009)	(0.163)	(0.000)	(0.063)	(0.821)	(0.080)	(0.014)
Net Effects	na	−0.241	0.449	2.183	2.170	na	na	na	0.992	na	2.425	na
Thresholds	na	11.461	Synergy	−187.181	−129.823	na	na	na	Synergy	na	−103.208	na
Pseudo R²/R²	0.286	0.059	0.065	0.140	0.221	0.281	0.291	0.056	0.070	0.144	0.226	0.284
Fisher	28.97***						16.35***					
Observations	295	295	295	295	295	295	259	259	259	259	259	259

Table 3 Financial Activity and Public Credit Registries (PCR) *(Continued)*

	Panel B: Financial System Activity											
Constant	41.611***	7.677***	11.309***	13.722***	35.390***	78.668***	41.452***	7.924***	10.568***	13.352***	34.324***	79.159***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCR	0.570	−0.142	0.522***	2.066***	2.409***	2.257	0.822	0.193	0.912***	2.175***	2.553***	2.631
	(0.316)	(0.371)	(0.002)	(0.000)	(0.000)	(0.186)	(0.183)	(0.173)	(0.000)	(0.000)	(0.000)	(0.175)
PCR × PCR	0.016	0.020***	0.020***	−0.011***	−0.023*	−0.027	0.014	0.004	0.013***	−0.007	−0.026***	−0.036
	(0.163)	(0.000)	(0.000)	(0.007)	(0.064)	(0.421)	(0.324)	(0.101)	(0.000)	(0.259)	(0.008)	(0.372)
GDP growth	−0.349	−0.012	−0.125	−0.230*	−0.219	−1.256**	−0.258	−0.035	−0.185	−0.088	−0.177	−1.325*
	(0.179)	(0.927)	(0.356)	(0.055)	(0.468)	(0.045)	(0.364)	(0.812)	(0.148)	(0.551)	(0.454)	(0.087)
Inflation	−0.073***	0.015*	0.001	−0.015	−0.046	−0.168***	−0.101***	0.011	−0.036*	−0.018	−0.068***	−0.202**
	(0.000)	(0.050)	(0.877)	(0.300)	(0.135)	(0.008)	(0.003)	(0.441)	(0.089)	(0.145)	(0.001)	(0.017)
Public Invt.	−0.178	0.174**	0.233*	0.312***	−0.227	−0.080	−0.220	0.141	0.263*	0.183	−0.359*	−0.567
	(0.420)	(0.037)	(0.083)	(0.004)	(0.408)	(0.885)	(0.354)	(0.423)	(0.096)	(0.163)	(0.081)	(0.397)
Foreign Aid	−1.032***	−0.026	−0.049	−0.170**	−0.643***	−1.506*	−1.026***	−0.011	−0.020	−0.141*	−0.428**	−1.273
	(0.000)	(0.675)	(0.451)	(0.010)	(0.009)	(0.073)	(0.000)	(0.862)	(0.767)	(0.083)	(0.020)	(0.171)
Trade	−0.105**	−0.052***	−0.054***	−0.018	−0.060	−0.217**	−0.100**	−0.048***	−0.036**	−0.008	−0.054	−0.184
	(0.010)	(0.000)	(0.001)	(0.273)	(0.169)	(0.032)	(0.023)	(0.000)	(0.045)	(0.657)	(0.102)	(0.132)
Net Effects	na	na	0.565	2.042	2.359	na	na	na	0.940	na	2.496	na
Thresholds	na	7.100	Synergy	−187.181	−104.739	na	na	na	Synergy	na	−98.192	na
Pseudo R²/R²	0.187	0.054	0.059	0.119	0.174	0.213	0.186	0.051	0.063	0.122	0.178	0.210
Fisher	19.41***						11.35***					
Observations	297	297	297	297	297	297	261	261	261	261	261	261

*,**,***: significance levels of 10, 5 and 1% respectively. *GDPg* GDP growth rate, *Public Invt* public investment, *OLS* ordinary least squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q. 0.1) signify nations where financial activity is least. *na* not applicable because corresponding estimates needed for computation are not significant. *P* values in parenthesis

Table 4 Financial Size and Public Credit Registries (PCR)

	Financial size											
	Contemporary						Non-Contemporary					
	OLS	Q0.10	Q0.25	Q0.50	Q0.75	Q0.90	OLS	Q0.10	Q0.25	Q0.50	Q0.75	Q0.90
Constant	80.591***	49.414***	73.926***	93.805***	98.821***	95.953***	79.225***	41.011***	75.023***	91.065***	97.709***	98.665***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCR	1.201***	1.514	1.489***	0.660*	0.330**	0.173	1.329***	2.956***	1.422***	0.755**	0.321***	0.142
	(0.000)	(0.171)	(0.000)	(0.092)	(0.027)	(0.134)	(0.000)	(0.000)	(0.000)	(0.029)	(0.008)	(0.349)
PCR × PCR	-0.021***	-0.018	-0.026***	-0.010	-0.006*	-0.004*	-0.025***	-0.081***	-0.026***	-0.016	-0.006**	-0.003
	(0.000)	(0.360)	(0.002)	(0.269)	(0.051)	(0.090)	(0.000)	(0.000)	(0.005)	(0.103)	(0.011)	(0.284)
GDP growth	-0.293	-0.358	-0.761***	-0.361	-0.294***	-0.002	-0.098	-0.023	-0.571*	-0.246	-0.024	-0.131*
	(0.242)	(0.669)	(0.006)	(0.185)	(0.000)	(0.956)	(0.700)	(0.974)	(0.085)	(0.232)	(0.684)	(0.074)
Inflation	-0.087***	-0.022	-0.084***	-0.118***	-0.076***	-0.074***	0.0004***	0.001***	0.0005***	0.0001*	-0.00005*	-0.0003***
	(0.006)	(0.713)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.062)	(0.067)	(0.000)
Public Invt.	0.756***	0.693	0.466*	0.569**	0.377***	0.424***	0.700***	0.768***	0.314	0.562***	0.302***	0.241***
	(0.000)	(0.153)	(0.083)	(0.019)	(0.000)	(0.000)	(0.000)	(0.010)	(0.109)	(0.006)	(0.000)	(0.000)
Foreign Aid	-0.844***	-0.629*	-1.088***	-1.020***	-0.938***	-0.487***	-0.767***	-0.256	-0.942***	-0.968***	-0.884***	-0.417***
	(0.000)	(0.096)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.157)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.021	0.139	0.080**	-0.024	-0.006	0.022**	0.029	0.136**	0.077**	0.001	-0.004	0.004
	(0.489)	(0.224)	(0.026)	(0.497)	(0.624)	(0.010)	(0.358)	(0.038)	(0.046)	(0.959)	(0.715)	(0.647)
Net Effects	1.155	na	1.432	na	0.317	na	1.275	2.781	1.365	na	0.308	na
Thresholds	-57.190	na	-57.269	na	-55.000	-43.250	-53.160	-36.493	-54.962	na	-53.500	na
Pseudo R²/R²	0.271	0.120	0.208	0.203	0.210	0.121	0.239	0.122	0.186	0.190	0.177	0.097
Fisher	22.27***						23.61***					
Observations	296	296	296	296	296	296	264	264	264	264	264	264

*, **, ***: significance levels of 10, 5 and 1% respectively. *GDPg* GDP growth rate, *Public Invt* public investment, *OLS* ordinary least squares. R² for OLS and Pseudo R² for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial size is least. *na* not applicable because corresponding estimates needed for computation are not significant. *P* values in parenthesis

(on financial system efficiency), most of the significant estimates are between the 25th and 75th quartiles, with positive net effects and negative thresholds that are not within range.

The main outcome from Table 3 on linkages between financial activity and public credit registries is shown in Panel A (on banking system activity) and Panel B (on financial system activity). It is noteworthy that most of the significant estimates are between the 25th and 75th quartiles, with positive net effects and negative thresholds that are not within range.

In Table 4 on the connections between financial size and public credit registries, most of the significant estimates are between the 25th and 75th quartiles, with positive net effects and negative thresholds that are not within range.

Most of the significant control variables have the expected signs. It is important to note that some of the signs may vary from one table to another, because the financial development variables are by definition inconsistent. The financial development variable of Table 2 (financial efficiency) is the ratio of the financial development variable in Table 3 (financial credit) to the financial development variable in Table 1 (financial deposits).

Financial development and private credit bureaus

Tables 5, 6, 7, and 8 respectively disclose results corresponding to financial depth, financial allocation efficiency, financial activity, and financial size. Irrespective of tables, the left-hand side (LHS) presents contemporary estimations whereas the right-hand side (RHS) presents non-contemporary estimations. Contrary to the findings in Tables 1, 2, 3 and 4 on public credit registries, the marginal, threshold, and net effects of private credit bureaus in Tables 5, 6, 7 and 8 are not clearly apparent. In order to examine why findings corresponding to private credit bureaus are not significant, we assess country-specific averages of information-sharing offices, which we disclosed in Appendix 4. From these country-specific averages, we can reasonably infer that the findings on private credit bureaus are not very significant because of issues in degrees of freedom. Hence, the concluding implications that follow are essentially based on findings connected to public credit registries.

Conclusion

The purpose of this study was to investigate how increases in information-sharing bureaus affect financial access. For this purpose, we employ contemporary and noncontemporary interactive quantile regressions in 53 African countries for the period 2004–2011. Information-sharing bureaus are proxied by public credit registries and private credit bureaus. Financial development dynamics associated with depth (at overall economic and financial system levels), efficiency (at banking and financial system levels), activity (from banking and financial system perspectives), and size are used. The following findings were established.

First, the incidence of increasing private credit bureaus is not very apparent on financial access, probably because private credit bureaus are still to be established in many countries. Second, an increase in public credit registries improves financial allocation efficiency and activity (or credit) between the 25th and 75th quartiles for the most part. This result is intuitive, because for poorly developed financial systems, an increase in information-sharing bureaus may in some cases decrease the pace of development, whereas for more developed financial systems, information sharing may already have been taken into account.

As a main policy implication, countries in the top (or highest levels of financial development) and bottom (or lowest levels of financial development) ends of the financial efficiency

and activity distributions are unlikely to benefit from enhanced financial allocation efficiency owing to an increase inpublic credit registries. While the absence of positive net effects in the top quantiles may be traced to diseconomies of scale in public credit registries, the absence of positive net impacts in the bottom quantiles could be traceable to the fact that certain levels of financial efficiency and activity are required before the benefits of an increase in public credit registries can be achieved in terms of increasing financial access.

On the relationship between established findings and the literature, two angles are apparent. On the one hand, the findings are broadly consistent with those of Singh et al. (2009), who found that African countries with information-sharing mechanisms for banks are associated with higher levels of financial development. The findings are also aligned with those of Galindo and Miller (2001) in the view that credit registries are more likely to enhance financial development compared with credit bureaus in less-developed countries. On the other hand, our results appear not to be broadly in line with those of Love and Mylenko (2003), who argued that whereas the presence of private registries is associated with a higher share of bank lending and lower constraints on finance, public registries do not have a significant effect on financing constraints. Our results also do not align with those of Triki and Gajigo (2014), who concluded that private credit bureaus are more positively sensitive to finance access, compared with public credit registries. Asongu et al. (2016) found that information-sharing offices negatively affect financial access for the most part, while Asongu et al. (2017) concluded that financial development dynamics respond more positively to private credit bureaus relative to public credit registries.

There are three main shortcomings that merit emphasis. First, we have not reported quantile regression coefficients with which to substantiate the analysis in the study. Accordingly, we adopted a minimalist approach in the interpretation of estimated coefficients. The minimalist approach is based on the understanding that net effects are computed from corresponding significant estimated coefficients and policy inferences are based on net effects. The tables and regressions proliferate very rapidly, and corresponding combinations of "tests of equality of quantile regression coefficients" substantially increase the number of tables we have to produce. Second, measurement error can typically be worse in panel data models. Third, while we have used lagged values of the regressors in order to have some "bite" on endogeneity, there are more formal approaches such as instrumentation with lagged values. This implies that the quantile regressions with contemporaneous regressors are even more likely to be affected by simultaneity bias. We have maintained both contemporary and non-contemporary regressions, because both are still affected by simultaneity bias.

Future studies can improve the extant literature by assessing how the established findings can be improved with information and communication technologies. Moreover, investigating how countries at the top and bottom ends of the financial access distributions can benefit from an increase in public credit registries is also worthwhile. A more robust quantile estimator with which to investigate these suggested lines of inquiry is proposed by Canay (2011). This estimator considers country-specific heterogeneity that is ignored in the current analysis.

Endnotes

[1]M2 equals Money Supply.

Table 5 Financial Depth and Private Credit Bureaus (PCB)

	Financial Depth											
	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
	Panel A: Overall Economic Depth (Money Supply)											
Constant	38.016***	19.796***	21.722***	23.010***	36.259***	36.275***	38.973***	20.436***	23.215***	22.705***	34.242***	54.493***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCB	0.489	0.285	0.096	0.104	0.146	2.616**	0.215	0.177	0.077	0.155	0.216	0.775
	(0.347)	(0.253)	(0.602)	(0.604)	(0.805)	(0.041)	(0.658)	(0.544)	(0.723)	(0.627)	(0.691)	(0.628)
PCB x PCB	−0.007	0.001	0.003	0.002	−0.002	−0.046*	−0.002	0.003	0.004	0.001	−0.003	−0.019
	(0.395)	(0.717)	(0.242)	(0.562)	(0.843)	(0.055)	(0.740)	(0.511)	(0.290)	(0.796)	(0.753)	(0.523)
GDP growth	−0.557**	−0.153	−0.470***	−0.702***	−0.562	−0.252	−0.465	−0.206	−0.385*	−0.607**	−0.694**	−0.548
	(0.035)	(0.556)	(0.001)	(0.000)	(0.106)	(0.590)	(0.119)	(0.451)	(0.060)	(0.013)	(0.047)	(0.358)
Inflation	−0.079***	0.017	−0.001	−0.028	−0.066*	−0.166***	−0.113***	0.012	−0.011	−0.043**	−0.105***	−0.222***
	(0.000)	(0.240)	(0.919)	(0.140)	(0.077)	(0.001)	(0.006)	(0.503)	(0.465)	(0.036)	(0.002)	(0.002)
Public Invt.	0.266	0.012	0.595***	0.974***	0.917***	−0.013	0.177	−0.027	0.423**	0.736***	0.799**	0.086
	(0.431)	(0.953)	(0.000)	(0.000)	(0.009)	(0.979)	(0.621)	(0.905)	(0.019)	(0.001)	(0.034)	(0.898)
Foreign Aid	−0.697***	−0.030	−0.102	−0.247***	−0.768**	−0.977	−0.724***	−0.112	−0.147	−0.169	−0.678**	−1.296
	(0.000)	(0.793)	(0.194)	(0.004)	(0.011)	(0.110)	(0.000)	(0.380)	(0.119)	(0.221)	(0.031)	(0.147)
Trade	0.033	−0.063**	−0.046**	0.026	0.064	0.526***	0.040	−0.048	−0.037	0.050	0.140**	0.395***
	(0.432)	(0.015)	(0.014)	(0.187)	(0.225)	(0.000)	(0.362)	(0.109)	(0.106)	(0.129)	(0.014)	(0.001)
Net Effects	na	na	na	na	na	2.421	na	na	na	na	na	na
Thresholds	na	na	na	na	na	−56.869	na	na	na	na	na	na
Pseudo R²/R²	0.111	0.099	0.094	0.115	0.094	0.229	0.115	0.099	0.085	0.105	0.096	0.215
Fisher	9.92***						10.05***					
Observations	296	296	296	296	296	296	260	260	260	260	260	260

Table 5 Financial Depth and Private Credit Bureaus (PCB) (Continued)

	Panel B: Financial System Depth (Liquid Liabilities)											
Constant	28.531***	13.335***	16.601***	13.681***	24.483***	29.317***	29.251***	15.609***	17.954***	14.476***	26.685***	43.948***
	(0.000)	(0.005)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
PCB	0.435	0.262	0.150	0.060	1.188**	1.789*	0.144	0.306	-0.051	-0.015	0.358	0.498
	(0.337)	(0.459)	(0.301)	(0.819)	(0.013)	(0.060)	(0.732)	(0.257)	(0.778)	(0.956)	(0.522)	(0.707)
PCB × PCB	-0.002	0.003	0.004	0.007	-0.012	-0.028	0.002	0.002	0.009***	0.009*	0.001	-0.009
	(0.734)	(0.540)	(0.066)	(0.130)	(0.161)	(0.118)	(0.704)	(0.514)	(0.002)	(0.074)	(0.861)	(0.718)
GDP growth	-0.371	-0.122	-0.366***	-0.479**	-0.621**	-0.082	-0.301	-0.149	-0.331*	-0.339	-0.530	-0.757*
	(0.131)	(0.729)	(0.008)	(0.018)	(0.023)	(0.833)	(0.280)	(0.691)	(0.080)	(0.100)	(0.131)	(0.085)
Inflation	-0.050***	0.030	0.008	-0.006	-0.041	-0.139***	-0.077**	0.025	0.001	-0.019	-0.067*	-0.206***
	(0.004)	(0.147)	(0.409)	(0.800)	(0.166)	(0.000)	(0.015)	(0.321)	(0.897)	(0.266)	(0.062)	(0.001)
Public Invt.	0.329	0.111	0.532***	1.032***	0.984***	0.012	0.283	0.087	0.363**	0.985***	0.729*	0.196
	(0.281)	(0.658)	(0.000)	(0.000)	(0.000)	(0.978)	(0.395)	(0.763)	(0.033)	(0.000)	(0.051)	(0.723)
Foreign Aid	-0.599***	-0.213	-0.115*	-0.134	-0.427*	-0.899*	-0.628***	-0.170	-0.058	-0.151	-0.461	-1.178*
	(0.000)	(0.147)	(0.072)	(0.234)	(0.067)	(0.051)	(0.000)	(0.256)	(0.488)	(0.188)	(0.155)	(0.060)
Trade	0.034	-0.049	-0.040**	0.034	0.048	0.481***	0.041	-0.067*	-0.048**	0.036	0.071	0.410***
	(0.389)	(0.171)	(0.015)	(0.192)	(0.251)	(0.000)	(0.324)	(0.073)	(0.027)	(0.185)	(0.222)	(0.000)
Net Effects	na	na	na	na	na	na	na	na	na	na	na	na
Thresholds	na	na	na	na	na	na	na	na	5.666	1.666	na	na
Pseudo R²/R²	0.158	0.111	0.113	0.146	0.158	0.212	0.166	0.105	0.108	0.152	0.159	0.201
Fisher	18.25***						20.16***					
Observations	296	296	296	296	296	296	260	260	260	260	260	260

*, **, ***: significance levels of 10%, 5% and 1% respectively. *GDPg* GDP growth rate. *Public Invt* public investment, *OLS* ordinary least squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial depth is least. *na* not applicable because corresponding estimates needed for computation are not significant

Table 6 Financial Efficiency and Private Credit Bureaus (PCB)

	Financial 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
Panel A: Banking System Efficiency												
Constant	88.443***	44.574***	80.573***	93.307***	98.604***	109.59***	87.666***	45.151***	76.586***	90.431***	102.67***	111.74***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCB	0.741	0.808	0.612	0.748	0.847*	1.229	0.560	0.695	−0.481	0.111	0.806	0.829
	(0.155)	(0.053)	(0.275)	(0.123)	(0.099)	(0.465)	(0.351)	(0.201)	(0.402)	(0.832)	(0.186)	(0.563)
PCB x PCB	−0.004	−0.009	−0.003	−0.0007	−0.004	−0.013	−0.001	−0.005	0.016	0.009	−0.004	−0.008
	(0.633)	(0.194)	(0.760)	(0.928)	(0.628)	(0.638)	(0.873)	(0.582)	(0.126)	(0.342)	(0.705)	(0.724)
GDP growth	0.355	0.695***	0.591	−0.177	−0.396	0.094	0.407	1.104***	0.694	−0.0003	−0.396	0.353
	(0.312)	(0.002)	(0.202)	(0.621)	(0.354)	(0.927)	(0.234)	(0.001)	(0.127)	(0.999)	(0.392)	(0.700)
Inflation	−0.0007***	0.0008***	0.00004	−0.0004***	−0.001***	−0.002***	−0.035*	0.017	−0.036*	−0.013	−0.033***	−0.051***
	(0.000)	(0.000)	(0.844)	(0.003)	(0.000)	(0.000)	(0.074)	(0.134)	(0.075)	(0.135)	(0.000)	(0.000)
Public Invt.	−0.787**	−0.349	−1.099**	0.163	−0.249	−1.021	−0.760**	−0.394	−0.966**	0.101	−0.361	−1.337
	(0.030)	(0.218)	(0.018)	(0.601)	(0.408)	(0.490)	(0.033)	(0.314)	(0.048)	(0.749)	(0.295)	(0.140)
Foreign Aid	−0.255	0.141	−0.430	−0.426**	−0.341	0.029	−0.221	0.132	−0.113	−0.329	−0.432**	−0.369
	(0.178)	(0.551)	(0.128)	(0.041)	(0.101)	(0.962)	(0.220)	(0.679)	(0.799)	(0.138)	(0.045)	(0.397)
Trade	−0.165***	−0.104**	−0.241***	−0.290***	−0.115**	−0.041	−0.152***	−0.118*	−0.238***	−0.249***	−0.130**	0.050
	(0.001)	(0.028)	(0.000)	(0.000)	(0.020)	(0.776)	(0.003)	(0.089)	(0.001)	(0.000)	(0.014)	(0.646)
Net Effects	na	na	na	na	na	na	na	na	na	na	na	na
Thresholds	na	na	na	na	na	na	na	na	na	na	na	na
Pseudo R²/R²	0.154	0.107	0.090	0.091	0.112	0.138	0.146	0.115	0.094	0.074	0.109	0.141
Fisher	12.43***						5.92***					
Observations	301	301	301	301	301	301	267	267	267	267	267	267

Table 6 Financial Efficiency and Private Credit Bureaus (PCB) (Continued)

Panel B: Financial System Efficiency

Constant	102.50*** (0.000)	38.143*** (0.000)	82.274*** (0.000)	104.06*** (0.000)	112.69*** (0.00)	127.76*** (0.000)	100.61*** (0.000)	40.685*** (0.000)	77.337*** (0.000)	101.21*** (0.000)	109.93*** (0.000)	114.81*** (0.000)
PCB	-0.047 (0.949)	1.317*** (0.000)	0.665 (0.216)	0.142 (0.699)	0.179 (0.753)	-2.391*** (0.000)	-0.628 (0.421)	1.024* (0.052)	0.106 (0.866)	0.072 (0.686)	-0.311 (0.558)	-2.035** (0.012)
PCB × PCB	0.023 (0.122)	-0.017*** (0.002)	-0.003 (0.718)	0.015** (0.021)	0.035*** (0.000)	0.094*** (0.000)	0.034** (0.031)	-0.011 (0.204)	0.005 (0.655)	0.016** (0.040)	0.044*** (0.000)	0.086*** (0.000)
GDP growth	0.079 (0.851)	1.002*** (0.000)	0.710 (0.123)	-0.594** (0.029)	-0.928 (0.100)	-0.142 (0.921)	0.392 (0.341)	1.403*** (0.000)	0.927* (0.062)	-0.069 (0.826)	-0.733 (0.136)	0.163 (0.885)
Inflation	-0.136** (0.027)	0.006 (0.781)	-0.251*** (0.000)	-0.103*** (0.002)	-0.161* (0.099)	-0.130 (0.165)	-0.220* (0.071)	-0.133*** (0.008)	-0.430*** (0.000)	-0.393*** (0.000)	-0.172*** (0.000)	-0.191** (0.029)
Public Invt.	-0.934** (0.033)	-0.149 (0.561)	-1.189*** (0.007)	0.010 (0.967)	-0.057 (0.906)	-0.934 (0.617)	-0.968** (0.031)	-0.235 (0.503)	-0.953* (0.082)	-0.026 (0.925)	-0.270 (0.395)	-0.789 (0.372)
Foreign Aid	-0.411* (0.063)	0.265 (0.194)	-0.384 (0.166)	-0.545*** (0.001)	-0.351 (0.234)	-0.355 (0.650)	-0.389* (0.064)	0.276 (0.379)	-0.283 (0.392)	-0.396** (0.031)	-0.336 (0.204)	-0.129 (0.856)
Trade	-0.274*** (0.000)	-0.099*** (0.007)	-0.248*** (0.000)	-0.343*** (0.000)	-0.267*** (0.000)	-0.198 (0.274)	-0.255*** (0.000)	-0.115* (0.092)	-0.202** (0.023)	-0.312*** (0.000)	-0.216*** (0.000)	-0.114 (0.492)
Net Effects	na	1.245	na	na	na	-1.994	na	na	na	na	na	-1.671
Thresholds	na	-195.117	na	Synergy	Synergy	25.436	18.470	na	na	Synergy	7.068	23.662
Pseudo R²/R²	0.346	0.105	0.089	0.114	0.207	0.374	0.365	0.107	0.095	0.104	0.219	0.399
Fisher	7.55***						6.60***					
Observations	296	296	296	296	296	296	260	260	260	260	260	260

*, **, ***: significance levels of 10, 5 and 1% respectively. *GDPg* GDP growth rate, *Public Invt* public investment, *OLS* ordinary least squares. R^2 for OLS and Pseudo R^2 for quantile regression. Lower quantiles (e.g., Q. 0.1) signify nations where financial efficiency is least. *na* not applicable because corresponding estimates needed for computation are not significant

Table 7 Financial Activity and Private Credit Bureaus (PCB)

	Financial Activity						Non-Contemporary					
	Contemporary											
	OLS	Q.10	Q.25	Q.50	Q.75	Q.90	OLS	Q.10	Q.25	Q.50	Q.75	Q.90
Panel A: Banking System Activity												
Constant	25.192***	7.428***	12.450***	17.646***	25.475***	27.240***	25.625***	8.163***	11.685***	17.506***	26.786***	30.470***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)
PCB	0.367	0.531***	0.363**	-0.028	1.619***	1.501**	0.073	0.595***	0.256	-0.151	0.637*	1.123
	(0.368)	(0.000)	(0.018)	(0.919)	(0.000)	(0.048)	(0.853)	(0.000)	(0.154)	(0.558)	(0.032)	(0.204)
PCB × PCB	0.001	-0.003**	-0.0004	0.010**	-0.015***	-0.017	0.006	-0.004***	0.001	0.012***	0.002	-0.010
	(0.859)	(0.014)	(0.858)	(0.039)	(0.006)	(0.239)	(0.330)	(0.001)	(0.551)	(0.006)	(0.686)	(0.485)
GDP growth	-0.211	-0.024	-0.146	-0.301	-0.583***	-1.163***	-0.106	-0.046	-0.049	-0.167	-0.357*	-1.283***
	(0.266)	(0.835)	(0.179)	(0.151)	(0.005)	(0.001)	(0.633)	(0.708)	(0.805)	(0.378)	(0.057)	(0.002)
Inflation	-0.066***	0.010	-0.005	-0.024	-0.048**	-0.156***	-0.101**	-0.001	-0.072***	-0.027*	-0.072***	-0.195***
	(0.002)	(0.162)	(0.612)	(0.345)	(0.028)	(0.000)	(0.025)	(0.897)	(0.004)	(0.092)	(0.000)	(0.000)
Public Invt.	-0.193	0.152**	0.037	0.284	0.260	-0.057	-0.250	0.093	0.107	0.084	-0.010	-0.141
	(0.318)	(0.027)	(0.706)	(0.122)	(0.170)	(0.887)	(0.227)	(0.222)	(0.543)	(0.618)	(0.953)	(0.786)
Foreign Aid	-0.510***	-0.026	-0.103	-0.114	-0.336**	-0.684	-0.528***	-0.047	-0.088	-0.063	-0.343**	-0.721
	(0.000)	(0.643)	(0.108)	(0.337)	(0.039)	(0.133)	(0.000)	(0.380)	(0.304)	(0.545)	(0.032)	(0.204)
Trade	0.007	-0.044***	-0.039***	-0.050*	-0.005	0.361***	0.014	-0.041***	-0.029	-0.039	0.011	0.374***
	(0.830)	(0.000)	(0.009)	(0.068)	(0.850)	(0.000)	(0.682)	(0.000)	(0.166)	(0.121)	(0.708)	(0.000)
Net Effects	na	0.518	na	na	1.555	na	na	0.578	na	na	na	na
Thresholds	na	-177.000	na	2.800	-107.933	na	na	-148.750	na	-12.583	na	na
Pseudo R²/R²	0.239	0.136	0.113	0.130	0.193	0.275	0.245	0.136	0.108	0.131	0.193	0.279
Fisher	12.67***						12.30***					
Observations	296	296	296	296	296	296	260	260	260	260	260	260

Table 7 Financial Activity and Private Credit Bureaus (PCB) *(Continued)*

	Panel B: Financial System Activity											
Constant	30.696***	7.516***	11.177***	16.807***	23.312***	30.262***	30.778***	7.726***	9.975***	16.269***	25.055***	31.868***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCB	-0.144	0.550***	0.426***	-0.103	0.863***	1.963***	-0.690	0.615***	0.287*	-0.147	0.462	1.636***
	(0.798)	(0.000)	(0.004)	(0.676)	(0.007)	(0.000)	(0.211)	(0.000)	(0.058)	(0.569)	(0.160)	(0.001)
PCB × PCB	0.018*	-0.004**	-0.002	0.011***	0.012**	0.029***	-0.002	-0.005***	0.001	0.012***	0.021***	0.003
	(0.097)	(0.026)	(0.431)	(0.009)	(0.028)	(0.009)	(0.810)	(0.004)	(0.672)	(0.006)	(0.000)	(0.642)
GDP growth	-0.194	-0.052	-0.155	-0.324*	-0.633***	-0.848**	-0.069	-0.043	-0.052	-0.190	-0.416*	-0.824**
	(0.393)	(0.677)	(0.171)	(0.058)	(0.003)	(0.021)	(0.796)	(0.816)	(0.750)	(0.317)	(0.065)	(0.046)
Inflation	-0.067***	-0.002	-0.002	-0.022	-0.042*	-0.149***	-0.107**	-0.021*	-0.084***	-0.024	-0.069***	-0.178***
	(0.003)	(0.844)	(0.844)	(0.330)	(0.052)	(0.001)	(0.031)	(0.081)	(0.000)	(0.122)	(0.001)	(0.000)
Public Invt.	-0.183	0.012	0.165**	0.269	0.453**	-0.278	-0.251	0.103	0.208	0.215	0.088	-0.373
	(0.403)	(0.141)	(0.035)	(0.104)	(0.025)	(0.522)	(0.291)	(0.232)	(0.153)	(0.204)	(0.671)	(0.461)
Foreign Aid	-0.617***	-0.020	-0.041	-0.052	-0.265	-0.695	-0.636***	-0.010	-0.024	-0.022	-0.263	-0.689
	(0.000)	(0.753)	(0.524)	(0.623)	(0.121)	(0.155)	(0.000)	(0.861)	(0.728)	(0.829)	(0.116)	(0.189)
Trade	-0.048	-0.048***	-0.038**	-0.046*	-0.007	0.346***	-0.036	-0.040***	-0.019	-0.037	0.014	0.348***
	(0.211)	(0.000)	(0.012)	(0.063)	(0.821)	(0.000)	(0.371)	(0.001)	(0.251)	(0.146)	(0.673)	(0.000)
Net Effects	na	0.533	na	na	0.913	na	0.593	na	na	na	na	na
Thresholds	8.000	-137.500	9.363	Synergy	na	23.793	-123.000	na	12.250	na	Synergy	na
Pseudo R²/R²	0.347	0.117	0.098	0.111	0.196	0.388	0.377	0.117	0.094	0.110	0.210	0.394
Fisher	7.46***						7.14***					
Observations	298	298	298	298	298	298	262	262	262	262	262	262

*, **, ***: significance levels of 10, 5 and 1% respectively. *GDPg* GDP growth rate, *Public Invt* public investment, *OLS* ordinary least squares. R² for OLS and Pseudo R² for quantile regression. Lower quantiles (e.g., Q. 0.1) signify nations where financial activity is least. *na* not applicable because corresponding estimates needed for computation are not significant

Table 8 Financial Size and Private Credit Bureaus (PCB)

	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	78.027***	52.663***	74.301***	84.765***	96.725***	98.146***	76.926***	44.224***	71.822***	85.454***	96.035***	98.959***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PCB	0.592***	1.196***	0.565**	0.354*	0.144	0.010	0.537***	1.182***	0.540	0.310	0.134	0.024
	(0.000)	(0.003)	(0.046)	(0.082)	(0.288)	(0.879)	(0.000)	(0.000)	(0.132)	(0.152)	(0.345)	(0.705)
PCB × PCB	−0.005***	−0.010*	−0.004	−0.003	−0.001	0.0005	−0.004**	−0.0089**	−0.003	−0.002	−0.001	0.0001
	(0.002)	(0.094)	(0.414)	(0.369)	(0.589)	(0.630)	(0.011)	(0.014)	(0.579)	(0.510)	(0.601)	(0.908)
GDP growth	−0.249	−0.259	−0.739***	−0.220	−0.216***	0.051	−0.031	0.042	−0.341	0.060	−0.024	0.033
	(0.337)	(0.606)	(0.009)	(0.167)	(0.004)	(0.323)	(0.908)	(0.948)	(0.300)	(0.706)	(0.763)	(0.482)
Inflation	−0.094***	−0.011	−0.084***	−0.108***	−0.070***	−0.072***	0.0004***	0.001***	0.0006***	0.0003***	−0.0001***	−0.0003***
	(0.008)	(0.718)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.006)	(0.000)
Public Invt.	0.881***	0.924***	0.518**	0.666***	0.370***	0.102	0.770***	0.760**	0.444**	0.540***	0.204**	0.034
	(0.000)	(0.004)	(0.018)	(0.000)	(0.000)	(0.187)	(0.000)	(0.015)	(0.019)	(0.000)	(0.014)	(0.642)
Foreign Aid	−0.736***	−0.766***	−1.103***	−0.738***	−0.834***	−0.423***	−0.666***	−0.289*	−0.870***	−0.780***	−0.668***	−0.364***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.093)	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.035	0.067	0.075**	0.035*	0.002	0.011	0.044	0.114**	0.081**	0.025	0.009	0.004
	(0.245)	(0.282)	(0.017)	(0.081)	(0.851)	(0.261)	(0.152)	(0.028)	(0.029)	(0.224)	(0.486)	(0.648)
Net Effects	0.570	1.153	na	na	na	na	0.520	1.148	na	na	na	na
Thresholds	−118.400	−119.600	na	na	na	na	−134.250	−147.750	na	na	na	na
Pseudo R²/R²	0.289	0.175	0.230	0.224	0.209	0.123	0.249	0.163	0.207	0.204	0.176	0.102
Fisher	61.62***						65.49***					
Observations	297	297	297	297	297	297	265	265	265	265	265	265

*, **, ***: significance levels of 10, 5 and 1% respectively. *GDPg* GDP growth rate, *Public Invt* public investment, *OLS* ordinary least squares. R² for OLS and Pseudo R² for quantile regression. Lower quantiles (e.g., Q 0.1) signify nations where financial size is least. *na* not applicable because corresponding estimates needed for computation are not significant

Appendix 1

Table 9 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
Information Asymmetry	Public Credit registries (PCR)	2.155	5.812	0	49.8	381
	Private Credit Bureaus (PCB)	4.223	13.734	0	64.8	380
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	24,411	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, *GDPg* GDP growth

Appendix 2

Table 10 Correlation Analysis (Uniform sample size: 291)

Financial Development Dynamics							Info. Asymmetry		Other variables					
Financial Depth		Financial Efficiency		Financial Activity		Fin. Size								
M2	Fdgdp	BcBd	FcFd	Prcb	Pcrbof	Dbacba	PCR	PCB	GDPg	Inflation	Publvt	NODA	Trade	
1.000	0.970	0.094	0.103	0.821	0.629	0.398	0.416	0.147	−0.104	−0.080	0.055	−0.295	0.140	M2
	1.000	0.130	0.220	0.886	0.754	0.452	0.409	0.303	−0.091	−0.063	0.070	−0.320	0.149	Fdgdp
		1.000	0.859	0.490	0.495	0.243	0.154	0.303	−0.016	−0.144	−0.169	−0.133	−0.176	Bcbd
			1.000	0.583	0.743	0.242	0.067	0.510	−0.056	−0.097	−0.149	−0.179	−0.189	FcFd
				1.000	0.922	0.478	0.448	0.439	−0.092	−0.089	−0.055	−0.343	0.093	Pcrb
					1.000	0.413	0.293	0.556	−0.088	−0.073	−0.057	−0.324	0.019	Pcrbof
						1.000	0.249	0.343	−0.061	−0.142	0.198	−0.403	0.210	Dbacba
							1.000	−0.140	−0.026	−0.081	0.068	−0.154	0.207	PCR
								1.000	−0.101	−0.035	−0.047	−0.329	0.084	PCB
									1.000	−0.169	0.129	0.122	0.037	GDPg
										1.000	−0.081	−0.0004	−0.006	Inflation
											1.000	0.059	0.130	Publvt
												1.000	−0.309	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, *GDPg* GDP growth, *Popg* population growth, *Publvt* Public Investment, *NODA* Net Official Development Assistance, *Info* information

Appendix 3

Table 11 Definitions of variables

Variables	Signs	Definitions of variables	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 Asymmetry	PCR	Public credit registry coverage (% of adults)	World Bank (WDI)
	PCB	Private credit bureau coverage (% of adults)	World Bank (WDI)
Economic Prosperity	GDPg	GDP Growth (annual %)	World Bank (WDI)
Inflation	Infl	Consumer Price Index (annual %)	World Bank (WDI)
Public Investment	Publvt	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 4

Table 12 Country-specific average values from information sharing bureaus

	Public Credit Registries	Private Credit Bureaus
1) Algeria	0.216	0 .000
2) Angola	2.412	0.000
3) Benin	8.037	0.000
4) Botswana	0 .000	48.150
5) Burkina Faso	1.750	0.000
6) Burundi	0.212	0.000
7) Cameroon	2.312	0.000
8) Cape Verde	17.042	0.000
9) Central African Republic	1.412	0.000
10) Chad	0.400	0.000
11) Comoros	0.000	0.000
12) Congo Democratic Republic	0.000	0.000
13) Congo Republic	3.400	0.000
14) Côte d'Ivoire	2.487	0.000
15) Djibouti	0.200	0.000

Table 12 Country-specific average values from information sharing bureaus *(Continued)*

16) Egypt	2.062	5.271
17) Equatorial Guinea	2.566	0.000
18) Eritrea	0.000	0.000
19) Ethiopia	0.087	0.000
20) Gabon	12.716	0.000
21) The Gambia	0.000	0.000
22) Ghana	0.000	1.700
23) Guinea	0.000	0.000
24) Guinea-Bissau	1.000	0.000
25) Kenya	0.000	1.750
26) Lesotho	0.000	0.000
27) Liberia	0.280	0.000
28) Libya	na	na
29) Madagascar	0.162	0.000
30) Malawi	0.000	0.000
31) Mali	2.812	0.000
32) Mauritania	0.187	0.000
33) Mauritius	27.866	0.000
34) Morocco	1.200	4.812
35) Mozambique	1.637	0.000
36) Namibia	0.000	50.362
37) Niger	0.825	0.000
38) Nigeria	0.025	0.000
39) Rwanda	0.425	0.275
40) Sao Tome & Principe	0.000	0.000
41) Senegal	3.787	0.000
42) Seychelles	0.000	0.000
43) Sierra Leone	0.000	0.000
44) Somalia	na	na
45) South Africa	0.000	57.312
46) Sudan	0.000	0.000
47) Swaziland	0.000	40.216
48) Tanzania	0.000	0.000
49) Togo	2.550	0.000
50) Tunisia	15.975	0.000
51) Uganda	0.000	0.512
52) Zambia	0.000	0.975
53) Zimbabwe	0.000	0.000

na not applicable because of missing observations

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SAA wrote the manuscript while JCN participated in the revision of the manuscript. Both authors read and approved the final manuscript.

Competing interests
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