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Is information diffusion a threat to market power for financial access? Insights from the African banking industry

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Is information diffusion a threat to market power for financial access? Insights from the African banking industry**Simplice Asongu , Enowbi Batuo, Jacinta Nwachukwu & Vanessa Tchamyou**

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Abstract

This study assesses how information diffusion dampens the adverse effect of market power on the price and quantity of loans provided by a panel of 162 banks from 39 African countries for the period 2001-2011. The empirical evidence is based on three endogeneity-robust estimation techniques, namely: (i) Two Stage Least Squares (2SLS), (ii) Generalised Method of Moments (GMM) and (iii) Instrumental Variable Quantile Regressions (QR). Three key results emerge. *First*, from the GMM results, a mobile phone penetration rate of 54.29, rising to 57 per 100 people are predicted to neutralise the adverse effect of market power on the average loan price and quantity respectively. *Second*, from the QR, mobile phone penetration rates of 56.20, 52.04 and 42.76 per 100 people is needed to nullify the negative effect of market power on loan quantity at the 0.10th, 0.25th and 0.90th quintiles respectively. *Third*, a considerably lower internet penetration rate of 9.49 per 100 people is required to counteract the negative impact of market power on loan quantity at the 0.90th quintile.

JEL Classification: G20; G29; L96; O40; O55

Keywords: Financial access; Market power; Information asymmetry; ICT; Africa

1. Introduction

There are four principal motivations for examining whether information diffusion threatens market power in order to enhance financial access in the African banking industry.

First, compared to the rest of the world, there is a higher potential for penetration of mechanisms of information technology in Africa. Consistent with recent literature, whereas high-end economies in North America, Europe and Asia are witnessing saturation points in the growth of information and communication technology (ICT), there is yet considerable room for ICT penetration in Africa (Penard et al., 2012; Asongu, 2015). This implies that policy can leverage on such penetration potential to address development concerns, *inter alia* limited financial access.

Second, banks in Africa are characterised by issues of surplus liquidity (Saxegaard, 2006; Fouda, 2009; Asongu, 2014), which is paradoxical in the light of the experience of households and corporations with limited access to credit (Bartels et al., 2009; Tuomi, 2011; Darley, 2012). Some of the documented determinants of surplus liquidity include: lack of borrowing collateral, absence of bank accounts, lack of credit histories, absence of good infrastructure that may oblige bank branches in remote areas to hold cash in excess of statutory limits and the abuse of market power by big banks (Tchamyou & Asongu, 2016).

Third, information diffusion can reduce market power or limit data privileges and informational rents previously enjoyed by big banks. Big banks can use such advantages to set the price of loans above marginal costs in order to increase their profit margins. This intuition is consistent with Bergemann et al. (2015) who have argued that the interaction of market power and information is crucial in comprehending the distribution of quantities and prices that result in economic equilibrium.

Fourth, recent literature has suggested that financial institutions in the African banking industry may be abusing their market power in order to limit access to finance (Boateng et al., 2016). In other words, such financial intermediaries may be more concerned with enjoying a ‘quiet life’¹ instead of increasing financial access (Asongu et al., 2016a). Unfortunately, Africa has not been given the scholarly attention it deserves. This is essentially because, as the continent with the most severe financial access issues, studies devoted to assessing the influence of market power in the African banking industry are sparse (see Table 1).

¹ The Quiet Life Hypothesis (QLH) postulates that financial institutions with high market power would invest less to enhance financial access. According to the assumption, instead of using their favourable market position to enhance intermediation efficiency, such banks tend to exploit such ‘market power’ to increase their gains or enjoy a ‘quiet life’ (see Coccoresse & Pellicchia, 2010).

This inquiry therefore aims to complement existing literature and policy challenges by merging the four strands above in assessing how information diffusion dampens the potentially negative effect of market power on financial access in the African banking industry. The results are linked to have policies which should enhance access to mobilised deposits in the banking sector for both households and small businesses. This leads to increased consumption, investment, productivity, employment and ultimately economic prosperity.

The rest of the investigation is structured as follows. Section 2 discusses linkages between information flow, market power and financial access. The data and methodology are covered in Section 3 while Section 4 presents the empirical results. Section 5 concludes with future research directions.

2. Information Diffusion, Market Power and Financial Access

2.1. Information diffusion and theoretical underpinnings

By playing a fundamental role in information diffusion, ICT improves governance and reduces the abuse of government power by facilitating transparency, openness and the free-flow of information between various institutions and departments in the government (see Hellstrom, 20008). For example, in accordance with the narrative, mobile telephony enables: (i) the free flow of information between citizens and authorities and (ii) direct involvement of citizens in processes of governance. In summary, advantages of a mobile phone can also be reaped in the banking industry because by making financial institutions more connected and up-to-date, it encourages customers to be more participative in the process of lending. Such could decrease the informational rents previously enjoyed by big banks.

Ultimately, information flow has the potential for decreasing the asymmetry between lenders and borrowers. On the one hand, ex-ante of lending, information distribution can mitigate the adverse selection of banks (especially big banks) by enabling them to be better informed about borrowers' creditworthiness. On the other, ex-post of lending, the potential for moral hazard can be substantially limited because the circulation of information improves transparency and accountability. Such should prevent borrowers from concealing activities for which they borrowed funds as well as the earning there-from.

In the light of the above, the role of ICT in reducing market power in the banking industry is not so different from how ICT decreases the abuse of power by the ruling elite. On the potential role of ICT in decreasing market power, Snow (2009, pp. 337-339) has

documented some theoretical underpinnings. According to Snow, the historic dearth of ICT provided those with power and authority with privileged information and communication facilities that substantially constrained transparency and promoted corruption.

Conversely, the rapid diffusion of information (by means of ICT) has shrunk the secrecy barriers and rents by *inter alia*: altering cost-benefit calculations and increasing oversight. These propositions are founded on the intuition that information monopoly among the elite in government or banking industry is an avenue for the abuse of power. Hence, the decentralisation of information through ICT reduces opportunities for those in government and banking circles to take advantage of their privileged positions. The theoretical foundations are broadly in line with the growing number of papers on the interconnections between ICT, governance and the abuse of power on the one hand (see Boulianne, 2009; Diamond, 2010; Grossman et al., 2014) and on the other, the evolving stream of literature on the relevance of ICT in collective action against the abuse of power (Pierskalla & Hollenbach, 2013; Weidmann & Shapiro, 2015; Manacorda & Tesei, 2016).

2.2. Market power and financial access

Issues surrounding the relationship between market and financial access have occupied an important part of scholarly research over the past three decades (Stiglitz & Weiss, 1981; Maudo & Fernandez de Guevara, 2007; Boateng et al., 2016). Such an interest from scholars was for the most part inspired by the inefficiencies associated with market power, notably: net losses in social and economic welfare (Maudo & Fernandez de Guevara, 2007). According to dominant narratives in the literature, market power reduces investment, lowers savings, increases financial intermediation inefficiency and decreases avenues of economic prosperity (see Stiglitz & Weiss, 1981; Djankov et al., 2007).

More recent evidence however suggests that in relation to banks with substantial market power, smaller banks are associated with lower interest margins (Beck & Hesse, 2006; Ahokposi, 2013). This suggestion is in line with Beck and Hesse (2006) and Ngigi (2013ab) who established that bank size substantially affects differences in cost of loans with associated interest rate spreads/margins.

Table 1: Summary of empirical literature on the abuse of market power

Author(s)	Regions (Period)	Abuse of market power?
Tu & Chen (2000)	Taiwan (1986-1999)	Yes
Weill (2004)	Europe (1994-1999)	No
Maudos & de Guevara (2007)	Europe (1993-2002)	No
Koetter & Vins (2008)	Germany (1996-2006)	Yes
Koetter et al. (2008)	USA (1986-2006)	No
Pruteanu-Podpiera et al. (2008)	Czech Republic (1994-2005)	No
Schaeck & Cihak (2008)	Europe & USA (1995-2005)	Yes
Al-Jarrah & Gharaibeh (2009)	Jordan (2001-2005)	No
Solis & Maudos (2008)	Mexico (1993-2005)	No (for deposit market) Yes (for loans market)
Al-Muharrami & Mathews (2009)	Arab Gulf (1993-2002)	No
Fan & Marton (2011)	SEE (1998-2008)	No
Fu & Heffernan (2009)	China (1985-2002)	No
Delis & Tsionas (2009)	Europe (1996-2006)	Yes
Fu & Heffernan (2009)	China (1985-2002)	No
Punt & van Rooij(2009)	EU (1992-1997)	No
Ariss (2010)	A sample of developing countries (1999-2005)	Yes (cost efficiency) No (profit efficiency)
Coccorese & Pellicchia (2010)	Italy (1992-2007)	Yes
Tetsushi et al. (2012)	Japan (1974-2005)	Yes
Titko & Dauylbaev (2015)	Baltic countries (2007-2013)	No

Sources: Coccorese and Pellicchia (2010); Titko and Dauylbaev (2015) and Authors. SEE: South East European countries. EU: Europe Union.

From a theoretical perspective it is expected that banks with higher market power are more likely to maintain lower margins of interest because of economies of scale and other inherent advantages associated with size. Large sized banks may however, pursue objectives of financial intermediation inefficiency with the core purpose of increasing their profit margins (see Mitchell & Onvural, 1996). Unfortunately, the African continent is not receiving the scholarly attention it deserves in the literature on market power, despite being the continent with the most severe constraints to financial access. As summarised in Table 1, with the exception of the study by Ariss (2010) which has sampled a few African countries, the bulk of the literature on market power has not involved the continent.

3. Data and Methodology

3.1 Data

This study examines 39 countries consisting of a panel of 162 banks with data for the period 2001-2011². The data sources are World Development Indicators of the World Bank and Bankscope. The adopted periodicity, number of countries and number of banks are due to constraints in the availability of data. Market power is proxied with the Lerner index, which represents the ability of banks to set prices above marginal cost. Banks with a higher index are associated with greater market power. The choice of the Lerner index is consistent with recent literature (Ariss, 2010; Boateng et al., 2016). Steps to computing the index used in this study can be found in Boateng et al. (2016).

Following recent African ICT literature (Tchamyou, 2015), we use two ICT indicators, namely: the mobile phone penetration rate (per 100 people) and the internet penetration rate (per 100 people). The adoption of these variables is consistent with stylized facts on the high penetration potential of ICT in Africa (see Penard et al., 2012). The dependent variables used in approximation of financial access are: loan price and loan quantity. These are measured respectively with '*price charged on loans*' and '*the logarithms of outstanding loan balances*' (Coccorese & Pellicchia, 2010).

Consistent with discussion in the recent African banking literature (see Asongu & Le Roux, 2016), three categories of control variables are used. These include: (i) market-oriented characteristics (comprising GDP per capita growth; Inflation and Population density); (ii) bank-related features (involving the number of Bank branches and the Deposit/Asset ratio) and (iii) the unobserved firm heterogeneity such as '*compliance with Sharia finance*' (Non-Islamic versus (vs) Islamic); size (large vs. small) and ownership structure (foreign vs. domestic). The expected signs are discussed in what follows.

First, GDP per capita growth which takes business cycle fluctuations into account should positively influence loan quantity. Conversely, the expected effect on the price of loans is not easy to establish because such impact is contingent on both market dynamism and expansion. Hence, it is proposed that diminishing GDP per capita can influence both loan quantity and loan price in a scenario of decreasing demand. A negative impact may be

² The sampled countries are: Algeria, Angola, Benin, Burkina Faso, Botswana, Burundi, Cameroon, Cape Verde, Central African Republic, Côte d'Ivoire, Eritrea, Equatorial Guinea, Ethiopia, Gabon, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda and Zambia.

expected from GDP per capita because over the past decade, GDP has been growing less proportionately than population growth (see Asongu, 2013).

Second, we expect the density of the population to positively impact both dependent variables. This is because, from intuition, an increasing demand for loans owing to rising population density is likely to raise loan prices.

Third, the quantity (price) of loans should be logically decreased (increased) with inflation, other things being equal. To be sure, the rate of investment with associated demand for loans is expected to decline in periods of economic uncertainty (like rampant inflation). Consequently, the interest charged (or price of the loan) is likely to fall during periods of high inflation. This perception builds on the evidence that investors are more encouraged with less ambiguous economic environments (see Le Roux & Kelsey, 2016; Kelsey & Le Roux, 2016).

Fourth, the number of bank branches is expected to positively affect loan quantity and negatively impact the price of loans.

Fifth, raising the ‘deposit to asset’ ratio is anticipated to increase both the quantity and price of loans. This is primarily because mobilised deposits are the principal source of bank financing. Hence, more liquid liabilities increase interest rate margins and/or quantity of loans, since good organisation and asset-liability management are imperative for the mobilisation of such bank resources.

Sixth, anticipated effects from dummy variables which are used to account for the unobserved heterogeneity are not easy to establish. For instance, regardless of bank size (small versus (vs). big), financial intermediation can be associated with both positive and negative effects resulting from movements in the credit market, although the adverse experience of large financial institutions are expected to be mitigated by their more sophisticated management and coordination systems. Nevertheless, addressing challenges that are naturally linked to the complications of dealing with a larger customer base is likely to be a source of inefficiency for large banks. In the same vein, the influence of heterogeneity in ownership structure (domestic vs. foreign) and ‘*Sharia finance compliance*’ (Non-islamic vs. Islamic) are contingent on a plethora of features such as: organisational mission and capacities as well as market dynamics.

Appendix 1 summarises the expected signs whereas Appendix 2, Appendix 3 and Appendix 4 show the definitions of variables (with their corresponding sources), the summary statistics and the correlation matrix in that order.

3.2 Methodology

3.2.1 Generalised Method of Moments: specification, identification and exclusion restrictions

The adoption of the Generalised Method of Moments (GMM) builds on five principal motivations. The first-two motivations are basic requirements for the choice of the technique whereas the last-three are corresponding advantages of employing the estimation approach. (i) Persistence in the dependent variable is taken into account by the estimation technique. Accordingly, the rule of thumb (0.800) for persistence in loan price and quantity is satisfied because the correlation between these financial access variables and their first lags are respectively 0.845 and 0.996. (ii) The T<N criterion for the GMM strategy is also satisfied because there are 162 banks for a span of 11 years. Therefore, the number of banks (N) is substantially higher than the number of years (T) in each bank. (iii) The estimation approach controls for errors arising from (i) simultaneity and (ii) time-invariant omitted variables in the regression model. (iv) The use of panel data framework helps to control for the unobserved heterogeneity across our bank units. (v) The system GMM estimator addresses inherent biases that are associated with the difference GMM estimator.

The empirical strategy adopted in this study is the Roodman (2009ab) extension of Arellano and Bover (1995). In essence, instead of employing the first-difference of the variables as instruments, the technique uses forward orthogonal deviations that have been documented in restrict instrument proliferation and/or limit over-identification (see Baltagi, 2008; Love & Zicchino, 2006). A *two-step* procedure is adopted in place of the *one-step* process because it corrects for heteroscedasticity.

The following equations in level (1) and first difference (2) summarize the estimation procedure for loan quantity.

$$LQ_{i,t} = \sigma_0 + \sigma_1 LQ_{i,t-\tau} + \sigma_2 ICT_{i,t} + \sigma_3 MP_{i,t} + \sigma_4 Inter_{i,t} + \sum_{h=1}^5 \delta_h W_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

$$LQ_{i,t} - LQ_{i,t-\tau} = \sigma_0 + \sigma_1 (LQ_{i,t-\tau} - LQ_{i,t-2\tau}) + \sigma_2 (ICT_{i,t} - ICT_{i,t-\tau}) + \sigma_3 (MP_{i,t} - MP_{i,t-\tau}) + \sigma_4 (Inter_{i,t} - Inter_{i,t-\tau}) + \sum_{h=1}^5 \delta_h (W_{h,i,t-\tau} - W_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + \varepsilon_{i,t-\tau}, \quad (2)$$

where, $LQ_{i,t}$ is loan quantity of bank i at period t , δ is a constant, τ represents the coefficient of auto-regression, ICT represents information and communication technology (mobile phone or internet penetration), MP denotes Market Power approximated by the Lerner index, $Inter$ is the interaction between ICT and MP. W is the vector of control

variables (*GDP per capita growth, Inflation, Population density, Deposit/Assets, Bank Branches*), η_i are bank-specific effects (*Small banks, Domestic banks and Islamic banks*), ξ_t is the time-specific constant and $\varepsilon_{i,t}$ the error term. Equations (1) and (2) are replicated when the dependent variable is loan price.

It is important to discuss restrictions in identification and exclusion that are essential for a robust GMM specification. In line with the recent literature, we consider all explanatory variables as suspected endogenous or predetermined while the time-invariant omitted variables are considered to be strictly exogenous (see Asongu & Nwachukwu, 2016a). The identification condition is motivated by the awareness that it is not feasible for time-invariant omitted variables or ‘years’ to be endogenous in first-difference (Roodman, 2009b)³.

The statistical validity of the underlying exclusion restriction is investigated with the Difference in Hansen Test (DHT) for the exogeneity of instruments. A failure to reject the null hypothesis of DHT implies that years or time invariant omitted variables explain loan price and quantity exclusively through the suspected endogenous variables. In the standard Instrumental Variable (IV) strategy, a rejection of the null hypothesis corresponding to the Sargan Overidentifying Restrictions (OIR) is taken as a signal of the invalidity of the employed instruments (see Beck et al., 2003; Asongu & Nwachukwu, 2016b). This is not the case with the GMM with forward orthogonal deviations which employs the DHT as information criterion for exclusion restriction. Therefore, in the findings that are provided in Section 4, the exclusion restriction assumption is confirmed if the alternative hypothesis of the DHT corresponding to IV (year, eq(diff)) is rejected.

3.2.2 Instrumental Quantile regressions

The modelling strategy covered with the GMM strategy is based on mean values of loan price and loan quantity. This represents a shortfall of the implied blanket policies. Moreover, the underlying blanket policies may not be effective across countries with high, intermediate and low existing levels of financial access unless they are related to their initial levels of loan price and quantity. It is important to note that modelling exclusively at the conditional mean of loan price and quantity is addressed with the *Quantile Regressions (QR)* estimation technique because it examines the linkages throughout the conditional distributions

³ Hence, the process for treating *ivstyle* (years) is ‘iv(years, eq(diff))’ while the *gmmstyle* is used for predetermined variables.

of the dependent variable (see Keonker & Hallock, 2001; Billger & Goel, 2009; Okada & Samreth, 2012). Such an approach to understanding credit access has recently been used in clarifying the nexus between information sharing and financial access in Africa (see Asongu et al., 2016b). In the light of the above points, empirical studies that examine such effects with Ordinary Least Squares (OLS) are based on the assumption that the errors terms are normally distributed. This proposition does not hold in the QR approach. Furthermore, assessing the robustness of parameter estimates at several points on the conditional distribution of loan price and quantity is consistent when outliers are apparent (Koenker & Bassett, 1978).

The θ^{th} quintile estimator of financial access is obtained by solving the following optimization problem, which is presented without subscripts for simplicity in Eq. (3)

$$\min_{\beta \in R^k} \left[\sum_{i \in \{i: y_i \geq x_i' \beta\}} \theta |y_i - x_i' \beta| + \sum_{i \in \{i: y_i < x_i' \beta\}} (1 - \theta) |y_i - x_i' \beta| \right], \quad (3)$$

where $\theta \in (0,1)$. Contrary to OLS that is fundamentally based on minimizing the sum of squared residuals, with QR, it is the weighted sum of absolute deviations that is minimised. For example, the 25th or 90th quintiles (with $\theta=0.25$ or 0.90 respectively) are examined by approximately weighing the residuals. The conditional quintile of credit access or y_i given x_i is expressed as followed:

$$Q_y(\theta / x_i) = x_i' \beta_\theta, \quad (4)$$

where unique slope parameters are modelled for each θ^{th} specific quintile. This formulation is analogous to $E(y / x) = x_i' \beta$ in the OLS slope where parameters are examined only at the mean of the conditional distribution of loan price and loan quantity. In Eq. (4), the dependent variable y_i is the financial access variable (consisting of loan quantity and loan price respectively) whereas x_i contains a constant term, *mobile phone penetration, internet penetration, GDP per capita growth, Inflation, Population density, Deposit/Assets, Number of Bank Branches, and bilateral dummy variables representing Small banks, domestic banks and Islamic banks.*

The issue of endogeneity is addressed by instrumenting the ICT variables with their first lags. For instance, the instrumentation process of mobile phone penetration is disclosed in Eq. (5) below.

$$Mobile_{i,t} = \alpha + \delta_j (Mobile_{i,t-1}) + \varepsilon_{i,t}, \quad (5)$$

where $Mobile_{i,t}$, is the mobile phone penetration rate of bank i at period t , α is a constant, $Mobile_{i,t-1}$, represents the mobile penetration indicator for bank i at the previous period $t-1$, and $\varepsilon_{i,t}$ the error term.

The instrumentation process in Eq. (5) which is replicated for internet penetration consists of regressing an ICT variable on its first lags and then saving the fitted values which are then employed as the independent variables of interest in the OLS and QR. The specifications are Heteroscedasticity and Autocorrelation Consistent (HAC) in terms of standard errors. Moreover, through instrumentation, the OLS approach is transformed to a Two Stage Least Squares (2SLS) that accounts for both simultaneity and the unobserved heterogeneity.

4. Empirical results

Table 2 below presents the GMM results whereas Tables 3-4 show the findings corresponding to the Quantile regressions. Consistent variations in the estimated coefficients from the Two Stage Least Squares and Quantile regressions (in terms of sign, size and magnitude of significance) justify our decision to adopt the Quantile regression method.

For each dimension of financial access in Table 2, there are four specifications: two related to mobile phone penetration and two linked to internet penetration. Both ICT variables have two sub-specifications corresponding to full and partial samples. Whereas the partial sample is from 2005 to 2011, the full sample is for the period 2001-2011. The prime motivation underpinning the partial sample is that it helps to restrict instrument proliferation or over-identification since N is held constant while T is reduced. Four principal information criteria are employed to examine the validity of the GMM model with forward orthogonal deviations⁴ and the findings are discussed based on these information criteria.

The results are discussed in terms of marginal impacts, net effects and thresholds at which the policy variables (mobile phone penetration and internet penetration) influence market power to increase financial access in terms of loan price and loan quantity. For ICT to enhance financial access, marginal effects from interactions with market power should be

⁴ “First, the null hypothesis of the second-order Arellano and Bond autocorrelation test (AR(2)) in difference for the absence of autocorrelation in the residuals should not be rejected. Second the Sargan and Hansen overidentification restrictions (OIR) tests should not be significant because their null hypotheses are the positions that instruments are valid or not correlated with the error terms. In essence, while the Sargan OIR test is not robust but not weakened by instruments, the Hansen OIR is robust but weakened by instruments. In order to restrict identification or limit the proliferation of instruments, we have ensured that instruments are lower than the number of cross-sections in most specifications. Third, the Difference in Hansen Test (DHT) for exogeneity of instruments is also employed to assess the validity of results from the Hansen OIR test. Fourth, a Fischer test for the joint validity of estimated coefficients is also provided” (Asongu & De Moor, 2016, p.9).

negative and positive for loan price and loan quantity respectively. For example in the partial sample regression in third column of Table 2, the net impact on average loan prices of using mobile phones to effect changes in market power is positive (0.014)⁵. By contrast, the corresponding marginal effect (or conditional impact of market power) is negative (-0.0007). The implication is that a threshold of 54.285 (i.e., 0.038/0.0007) penetration per 100 people is required to reverse the sign of the unconditional effect of market power (0.038) from positive to negative. With respect to the average loan quantity regression, a threshold of 57 penetration per 100 people (i.e., 0.114/0.002) is required to counteract the positive impact of market power. These estimated cut-off points are within the mobile phone penetration range of 0.000 to 147.202 provided by the summary statistics. Interestingly, Internet penetration has no apparent impact on both loan price and quantity in all the regressions. Most of the significant control variables display the expected signs. .

The following findings can be established in Table 3 on the role of the mobile phones in mitigating the adverse effect of market power on financial access. There are no statistically significant relationships apparent from the ‘loan price’-oriented regressions. By contrast, from the ‘loan quantity’-related regressions, there are positive marginal effects and net negative effects reported for the bottom and 0.90th quintiles. The corresponding thresholds beyond which the unconditional negative effects of market power on loan quantity could be reversed to positive are 56.202, 52.040 and 42.761 penetration per 100 people at the 0.10th, 0.25th and 0.90th quintiles respectively. Most of the significant control variables have the expected signs.

The following findings can be established in Table 4 on the role of internet penetration in reducing market power for financial access. Again, whereas no significantly relevant results are apparent from ‘loan price’-oriented regressions, for ‘loan quantity’-related regressions, there is a positive marginal effect and net a negative effect only in the 0.90th quintile. The corresponding threshold beyond which the unconditional negative impact of market power on loan quantity could be reversed is 9.485 per 100 people penetration. Again, most of the significant control variables have the expected signs.

⁵ The net effect on the average loan price is computed from the interaction between mobile phones and market power on the one hand and unconditional market power effects on the other: That is $0.014 = ([-0.0007 \times 34.107] + 0.038)$. Where the mean value of mobile phone penetration is 34.107, the unconditional effect of market power equals 0.038 and the corresponding conditional impact of it estimated to be -0.0007.

Table 2: Financial access effects of reducing market power with ICT (GMM-IV)

	Dependent variable: Financial Access							
	Loan Price Effects				Loan Quantity Effects			
	Mobile Phone Penetration		Internet Penetration		Mobile Phone Penetration		Internet Penetration	
	Full Sample	Partial Sample	Full Sample	Partial Sample	Full Sample	Partial Sample	Full Sample	Partial Sample
Constant	0.028** (0.013)	-0.204** (0.014)	0.042*** (0.001)	-0.013 (0.767)	0.502*** (0.000)	0.153 (0.439)	0.261*** (0.000)	-0.064 (0.699)
Price of Loans (-1)	0.580*** (0.000)	0.549*** (0.000)	0.571*** (0.000)	0.778*** (0.000)	---	---	---	---
Quantity of Loans (-1)	---	---	---	---	0.959*** (0.000)	1.026*** (0.000)	0.992*** (0.000)	1.012*** (0.000)
Market Power	0.009 (0.296)	0.038** (0.023)	-0.012 (0.204)	0.009 (0.516)	-0.062 (0.330)	0.114** (0.041)	-0.080 (0.127)	0.042 (0.498)
Mobile	0.0001 (0.230)	0.0002 (0.155)	---	---	-0.001 (0.107)	0.001** (0.043)	---	---
Internet	---	---	-0.0001 (0.688)	-0.00005 (0.916)	---	---	-0.001 (0.624)	0.001 (0.430)
Mobile×Market Power	-0.0003 (0.127)	-0.0007*** (0.006)	---	---	0.0001 (0.897)	-0.002*** (0.009)	---	---
Internet×Market Power	---	---	0.0008 (0.261)	-0.0001 (0.845)	---	---	-0.002 (0.430)	-0.001 (0.718)
GDPpcg	0.0001 (0.676)	0.0008 (0.105)	0.0001 (0.730)	0.00007 (0.838)	0.004*** (0.005)	0.007*** (0.001)	0.005*** (0.001)	0.006*** (0.004)
Inflation	0.0001** (0.031)	-0.0000004 (0.995)	0.0002*** (0.002)	0.0001* (0.098)	-0.0001 (0.207)	-0.00009 (0.336)	0.00003 (0.723)	-0.00004 (0.598)
Pop. density	0.00003** (0.011)	-0.000001 (0.959)	0.00002*** (0.002)	0.00002** (0.037)	-0.0001 (0.229)	0.00006 (0.424)	0.00006 (0.183)	0.00004 (0.590)
Deposit/Assets	0.024 (0.102)	0.042 (0.123)	0.029* (0.051)	0.086** (0.011)	-0.165* (0.095)	0.156 (0.162)	-0.189** (0.014)	0.150 (0.197)
Bank Branches	-0.0003 (0.342)	-0.001** (0.033)	-0.001*** (0.001)	-0.001** (0.035)	0.003* (0.074)	-0.002 (0.297)	0.001 (0.456)	-0.004** (0.026)
Net effect of Mobile	na	0.014	---	---	na	0.045	---	---
Threshold of Mobile	na	54.285	---	---	na	nsa	---	---
Net effect of Internet	---	---	na	na	---	---	na	na
Threshold of Internet	---	---	na	na	---	---	na	na
AR(1)	(0.000)	(0.057)	(0.000)	(0.159)	(0.001)	(0.001)	(0.001)	(0.000)
AR(2)	(0.080)	(0.168)	(0.129)	(0.497)	(0.025)	(0.341)	(0.029)	(0.823)
Sargan OIR	(0.000)	(0.012)	(0.000)	(0.002)	(0.000)	(0.055)	(0.000)	(0.019)
Hansen OIR	(0.009)	(0.400)	(0.010)	(0.258)	(0.018)	(0.101)	(0.005)	(0.149)
DHT for instruments								
(a) Instruments in levels								
H excluding group	(0.147)	(0.103)	(0.125)	(0.405)	(0.303)	(0.225)	(0.219)	(0.104)
Dif(null, H=exogenous)	(0.013)	(0.744)	(0.016)	(0.233)	(0.013)	(0.127)	(0.004)	(0.324)
(b) IV (years, eq(diff))								
H excluding group	(0.044)	(0.267)	(0.165)	(0.435)	(0.177)	(0.156)	(0.005)	(0.141)
Dif(null, H=exogenous)	(0.031)	(0.706)	(0.004)	(0.133)	(0.019)	(0.164)	(0.179)	(0.349)
Fisher	66.03***	32.29***	53.45***	28.60***	797.57***	2774.03***	1613.18***	2248.70***
Instruments	42	41	42	41	42	41	42	41
Banks	135	108	135	107	137	108	137	107
Observations	646	139	633	138	656	139	643	138

*, **, ***: significance levels of 10%, 5% and 1% respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments' Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) and AR(2) tests and; b) the validity of the instruments in the OIR and DHT tests. na: not applicable due to the insignificance of marginal effects. nsa: not specifically applicable because the threshold effect is contrary to theoretical underpinnings. Mean value of Mobile is 34.107. Mean value of Internet is 7.268. Range of Mobile: 0.000 to 147.202. Range of Internet is 0.037 to 51.000.

Table 3: Financial Access Effects of reducing Market Power with Mobile Phone (2SLS and IV QR)

	Dependent variable: Financial Access											
	Loan Price Effects						Loan Quantity Effects					
	2SLS	Q.10	Q.25	Q.50	Q.75	Q.90	2SLS	Q.10	Q.25	Q.50	Q.75	Q.90
Constant	0.117*** (0.000)	0.056 (0.274)	0.107*** (0.000)	0.104*** (0.001)	0.120*** (0.000)	0.166*** (0.000)	6.083*** (0.000)	4.455*** (0.000)	5.941*** (0.000)	5.874*** (0.000)	5.382*** (0.000)	6.614*** (0.000)
Market Power (IV)	-0.014 (0.770)	0.014 (0.879)	-0.032 (0.513)	0.008 (0.865)	-0.0001 (0.997)	-0.055 (0.383)	-4.758*** (0.000)	-4.159*** (0.002)	-5.152*** (0.005)	-4.719* (0.076)	-2.875* (0.070)	-2.694*** (0.000)
Mobile (IV)	-0.0002 (0.742)	0.0002 (0.871)	-0.0002 (0.662)	0.00004 (0.950)	0.0002 (0.758)	-0.0001 (0.867)	-0.053*** (0.004)	-0.037** (0.043)	-0.051** (0.041)	-0.054 (0.135)	-0.028 (0.190)	-0.029*** (0.001)
Mobile(IV) ×Market Power(IV)	0.0002 (0.797)	-0.0005 (0.805)	0.0007 (0.518)	-0.0001 (0.932)	-0.0005 (0.678)	0.0002 (0.849)	0.101*** (0.002)	0.074** (0.019)	0.099** (0.022)	0.096 (0.126)	0.061 (0.100)	0.063*** (0.000)
GDPpcg	-0.0007* (0.088)	-0.0007 (0.276)	0.0001 (0.801)	-0.0005 (0.293)	-0.0006 (0.333)	-0.00008 (0.919)	-0.008 (0.515)	0.013 (0.190)	-0.036** (0.030)	-0.031 (0.262)	-0.004 (0.789)	-0.009 (0.125)
Inflation	0.0001 (0.138)	0.00005 (0.214)	0.0001** (0.029)	0.0001** (0.028)	0.0003*** (0.000)	0.001*** (0.000)	0.002* (0.076)	0.002*** (0.000)	0.006*** (0.001)	0.004 (0.184)	0.002 (0.260)	0.0008* (0.077)
Pop. Density	0.00002 (0.116)	0.00004* (0.061)	0.00004*** (0.000)	0.00001 (0.259)	0.00001 (0.447)	-0.00001 (0.480)	-0.0008*** (0.008)	-0.0003* (0.068)	0.0002 (0.494)	-0.0001 (0.871)	-0.001* (0.098)	-0.0008* (0.077)
Deposit/Assets	0.005 (0.555)	0.009 (0.504)	0.003 (0.660)	0.004 (0.665)	0.012 (0.264)	0.004 (0.724)	2.095*** (0.000)	1.058*** (0.000)	1.746*** (0.000)	2.234*** (0.000)	2.370*** (0.000)	1.243*** (0.000)
Bank Branches	-0.002*** (0.000)	-0.002*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)	-0.001*** (0.002)	-0.002*** (0.002)	-0.065*** (0.000)	-0.016** (0.031)	-0.061*** (0.000)	-0.067*** (0.002)	-0.087*** (0.000)	-0.073*** (0.000)
Small Banks	0.008** (0.030)	0.015* (0.058)	0.004 (0.238)	0.001 (0.677)	0.011** (0.028)	0.011 (0.102)	-0.809*** (0.000)	-0.674*** (0.000)	-1.306*** (0.000)	-0.752*** (0.003)	-0.527*** (0.003)	-0.430*** (0.000)
Domestic Banks	0.003 (0.333)	-0.004 (0.425)	0.0004 (0.877)	0.006* (0.079)	0.006 (0.155)	0.007 (0.265)	0.308*** (0.005)	0.021 (0.824)	0.240* (0.092)	0.516** (0.015)	0.510*** (0.000)	0.425*** (0.000)
Islamic Banks	-0.022*** (0.003)	0.0001 (0.992)	-0.022*** (0.007)	-0.038*** (0.000)	-0.014 (0.242)	-0.027** (0.034)	-0.417** (0.034)	0.283 (0.144)	-0.166 (0.653)	-0.302 (0.585)	-0.529 (0.139)	-1.142*** (0.000)
Net effect of the Mobile	na	na	na	na	na	na	-1.019	-1.419	-1.487	na	na	-0.361
Threshold of Mobile	na	na	na	na	na	na	47.108	56.202	52.040	na	na	42.761
Pseudo R ² /R ²	0.124	0.098	0.094	0.075	0.075	0.068	0.218	0.089	0.115	0.156	0.132	0.130
Fisher	8.29***						27.50***					
Observations	620	620	620	620	620	620	620	620	620	620	620	620

***, **, *: significance levels of 1%, 5% and 10% respectively. IV: Instrumented Variable. 2SLS: Two Stage Least Squares. R² (Pseudo R²) for OLS (Quantile Regressions). Lower quantiles (e.g., Q 0.1) signify nations where financial access is least. na: not applicable due to the insignificance of marginal effects and/or unconditional effect of market power. Mean value of IVMobile is 37.019. Range of IVMobile: 4.332 to 152.599.

Table 4: Financial Access Effects of reducing Market Power with the Internet (2SLS and IV QR)

	Dependent variable: Financial Access											
	Loan Prices Effects						Loan Quantity Effects					
	2SLS	Q.10	Q.25	Q.50	Q.75	Q.90	2SLS	Q.10	Q.25	Q.50	Q.75	Q.90
Constant	0.128*** (0.000)	0.065** (0.019)	0.111*** (0.000)	0.120*** (0.000)	0.162*** (0.000)	0.174*** (0.000)	4.485*** (0.000)	3.597*** (0.000)	2.924*** (0.005)	3.473*** (0.000)	4.321*** (0.000)	7.650*** (0.000)
Market Power (IV)	-0.024 (0.499)	-0.0004 (0.992)	-0.027 (0.501)	-0.013 (0.700)	-0.043 (0.231)	-0.060 (0.282)	-1.833* (0.071)	-2.463* (0.067)	-0.317 (0.845)	-0.410 (0.764)	-1.045 (0.130)	-2.637*** (0.000)
Internet (IV)	-0.001 (0.436)	0.0001 (0.955)	-0.002 (0.452)	-0.001 (0.560)	-0.001 (0.627)	-0.003 (0.338)	-0.069 (0.318)	-0.083 (0.350)	0.052 (0.632)	0.049 (0.585)	-0.020 (0.654)	-0.131*** (0.000)
Internet(IV)×Market Power(IV)	0.002 (0.520)	-0.0008 (0.867)	0.003 (0.479)	0.002 (0.600)	0.001 (0.685)	0.005 (0.428)	0.157 (0.204)	0.182 (0.261)	-0.078 (0.687)	-0.022 (0.892)	0.094 (0.252)	0.278*** (0.000)
GDPpcg	-0.0007* (0.096)	-0.0007 (0.309)	-0.0004 (0.459)	-0.0006 (0.247)	-0.0002 (0.703)	0.0002 (0.794)	-0.014 (0.262)	0.012 (0.164)	-0.013 (0.457)	0.001 (0.964)	-0.017 (0.262)	-0.026** (0.030)
Inflation	0.0001 (0.123)	0.00005 (0.220)	0.0001 (0.175)	0.0001** (0.046)	0.0003*** (0.000)	0.0005*** (0.000)	0.002 (0.100)	0.002*** (0.000)	0.005** (0.010)	0.003 (0.244)	0.001 (0.317)	0.0008 (0.145)
Pop. Density	0.00002** (0.032)	0.00004* (0.066)	0.00004** (0.013)	0.00003* (0.075)	0.000008 (0.637)	0.000008 (0.700)	-0.001*** (0.002)	-0.001*** (0.000)	-0.00004 (0.923)	-0.00006 (0.920)	-0.001*** (0.005)	-0.001*** (0.000)
Deposit/Assets	-0.0001 (0.989)	0.010 (0.479)	-0.003 (0.766)	-0.0003 (0.976)	-0.003 (0.746)	0.005 (0.726)	2.099*** (0.000)	1.228*** (0.000)	2.091*** (0.000)	2.279*** (0.000)	2.641*** (0.000)	0.264 (0.165)
Bank Branches	-0.002*** (0.000)	-0.003*** (0.000)	-0.003*** (0.000)	-0.002*** (0.000)	-0.002*** (0.003)	-0.002** (0.018)	-0.070*** (0.000)	-0.022** (0.034)	-0.037** (0.048)	-0.101*** (0.000)	-0.095*** (0.000)	-0.078*** (0.000)
Small Banks	0.008* (0.057)	0.014* (0.067)	0.008 (0.154)	0.004 (0.429)	0.002 (0.634)	0.011 (0.211)	-0.785*** (0.000)	-0.672*** (0.000)	-1.313*** (0.000)	-0.905*** (0.000)	-0.572*** (0.000)	-0.689*** (0.000)
Domestic Banks	0.003 (0.306)	-0.006 (0.251)	0.001 (0.819)	0.008* (0.060)	0.008 (0.111)	0.011 (0.145)	0.332*** (0.003)	-0.004 (0.965)	0.267 (0.118)	0.370** (0.044)	0.621*** (0.000)	0.566*** (0.000)
Islamic Banks	-0.030*** (0.000)	-0.0006 (0.972)	-0.025* (0.053)	-0.040*** (0.004)	-0.050*** (0.001)	-0.035 (0.108)	-0.432* (0.092)	0.227 (0.419)	-0.068 (0.881)	-0.512 (0.344)	-0.499 (0.163)	-1.220*** (0.000)
Net effect of the Internet	na	na	na	na	na	na	na	na	na	na	na	-0.466
Threshold of Internet	na	na	na	na	na	na	na	na	na	na	na	9.485
Pseudo R ² /R ²	0.131	0.103	0.095	0.082	0.077	0.072	0.201	0.079	0.104	0.149	0.113	0.116
Fisher	7.64***						25.45***					
Observations	601	601	601	601	601	601	601	601	601	601	601	601

***, **, *: significance levels of 1%, 5% and 10% respectively. IV: Instrumented Variable. 2SLS: Two Stage Least Squares. R² (Pseudo R²) for OLS (Quantile Regressions). Lower quantiles (e.g., Q 0.1) signify nations where financial access is least. na: not applicable due to the insignificance of marginal effects and/or unconditional effect of market power. Mean value of IVInternet is 7.809. Range of IVInternet is 0.786 to 57.230.

5. Conclusions and future research directions

This study has assessed how information diffusion dampens the adverse effect of market power on financial access. It focuses on a panel of 162 banks from 39 African countries for the period 2001-2011. The empirical evidence is based on three simultaneity-robust estimation techniques, namely: (i) Two-Stage Least Squares (2SLS), (ii) Generalised Method of Moments (GMM) and (iii) Instrumental Variable Quantile Regressions (QR). The following key results are identified. *First*, from the GMM findings, a mobile phone penetration rate of 54.285 and 57 per 100 people neutralises the positive effect of market power on loan price and quantity in that order. *Second*, from the QR, mobile phone penetration rates of 56.202, 52.040 and 42.761 per 100 people nullify the estimated negative effect of market power on loan quantity provided by the formal banking sector at the 0.10th, 0.25th and 0.90th quintiles respectively while the corresponding counteracting threshold of internet penetration is considerably lower at 9.485 per 100 people only at the 0.90th quintile. On average, between 2009 and 2011: (i) countries that do not meet the mobile phone penetration thresholds are Eritrea, Burundi, Ethiopia, Madagascar, Malawi, Mozambique, Niger, Rwanda and Sierra Leon and (ii) countries that meet the internet penetration threshold are Algeria, Angola, Cape Verde, Ghana, Kenya, Mauritius, Morocco, Namibia, Nigeria, Senegal, Seychelles, South Africa, Sudan, Swaziland, Tanzania, Tunisia, Uganda and Zambia.

The decision to complement an estimation technique, such as the GMM-IV approach which is based on conditional mean values of the dependent variable with a QR method that is based on multiple points of the conditional distribution of the dependent variable is apparent from our findings. These have revealed that blanket policies of information diffusion for the purpose of dampening market power for financial access may not be effective unless they are contingent on the initial levels of financial access across countries.

A likely explanation as to why information diffusion reduces the adverse impact of market power on access to credit is related to the fact that innovative schemes such as mobile banking has helped to decrease the overly reliance on the formal banking sector for loans. Such could encourage banks, especially the large size financial institutions to lower (raise) the price (quantity) of loans in the formal credit market.

In the light of the above, the broad implications of this study are twofold: *First*, policies designed to boost ICT penetration in Africa would disproportionately increase the quantity of loan provided by the formal banking sector by reducing their market power in the

African financial industry. *Second*, the statistically insignificant coefficient reported in the QR regressions for loan price is taken as an indication that ICT could be supplemented with other tools such as information sharing offices (involving public credit registries and private credit bureaus). Such complementarity should also be contingent on the initial levels of financial access in the country concerned. In summary, by adopting measures of universal ICT access, policy makers can substantially increase access to credit by households and corporations. Such universal access schemes may include the liberalisation of the ICT sector aimed at speeding up internet connections at relatively low prices.

Future inquiries devoted to improve extant literature can focus on alternative instruments with which market power can be dampened in order to enhance financial access in the African banking industry. For instance, the roles of information sharing offices, mobile banking and financial sector competition can be considered.

Appendices

Appendix 1: Summary of expected signs

	Variables	Expected sign on loan	Expected sign on loan
		price	quantity
Bank-oriented features	Deposit/Asset ratio	+	+
	Bank Branches	-	+
Market-related characteristics	GDP per capita growth	Uncertain	+
	Population density	+	+
	Inflation	+	-
Characteristics of the unobserved heterogeneity	Small versus(vs). Big banks	Uncertain	Uncertain
	domestic vs. foreign banks	Uncertain	Uncertain
	Islamic vs. non-Islamic banks	Uncertain	Uncertain

Appendix 2: Variable Definitions

Variables	Signs	Variable Definitions	Sources
Mobile Phones	Mobile	Mobile phone subscriptions (per 100 people)	WDI (World Bank)
Internet Penetration	Internet	Internet penetration (per 100 people)	WDI (World Bank)
Market Power	Lerner index	The ratio of the 'difference between the Marginal Cost and Price' on the Price	Authors' calculation and BankScope
Loan Quantity	Quantity	Logarithm of Loans Quantity	BankScope
Price (charged on Loans or Quantity)	Price	(Gross Interest and Dividend income +Total Non-Interest Operating Income)/Total Assets	BankScope
GDP per capita	GDP	GDP per capita growth (annual %)	WDI (World Bank)
Inflation	Infl.	Consumer Price Index (annual %)	WDI (World Bank)
Populaton density	Pop.	People per square kilometers of land area	WDI (World Bank)
Deposits/Assets	D/A	Deposits on Total Assets	BankScope
Bank Branches	Bbrchs	Number of Bank Branches (Commercial bank branches per 100 000 adults)	BankScope
Small Banks	Ssize	Ratio of Bank Assets to Total Assets (Assets in all Banks for a given period) ≤ 0.50	Authors' calculation and BankScope
Large Banks	Lsize	Ratio of Bank Assets to Total Assets (Assets in all Banks for a given period) >0.50	Authors' calculation and BankScope
Domestic/Foreign banks	Dom/Foreign	Domestic/Foreign banks based on qualitative information: creation date, headquarters, government/private ownership, % of foreign ownership, year of foreign/domestic ownership...etc	Authors' qualitative content analysis.
Islamic/Non-Islamic	Islam/NonIsl.	Islamic/Non-Islamic banks based on financial statement characteristics (trading in derivatives and interest on loan payments...etc)	Authors' qualitative content analysis; Beck et al. (2010); Ali (2012).

WDI: World Development Indicators. GDP: Gross Domestic Product. The following are dummy variables: Ssize, Lsize, Open, Close, Dom/Foreign and Islam/NonIsl.

Appendix 3: Summary Statistics

		Mean	S.D	Minimum	Maximum	Observations
ICT	Mobile	34.107	32.409	0.000	147.202	1776
	Internet	7.268	8.738	0.037	51.000	1757
Market Power	Lerner	0.513	0.587	0.032	0.969	893
Dependent variables	Price of Loans	0.338	0.929	0.000	25.931	1045
	Quantity of Loans (ln)	3.747	1.342	-0.045	6.438	1091
Market variables	GDP per capita growth	13.912	96.707	-15.306	926.61	1782
	Inflation	10.239	22.695	-9.823	325.00	1749
	Population density	81.098	106.06	2.085	633.52	1782
Bank level variables	Deposits/Assets	0.664	0.198	0.000	1.154	1052
	Bank Branches	6.112	6.158	0.383	37.209	1129
	Small Size	0.804	0.396	0.000	1.000	1255
	Large Size	0.195	0.396	0.000	1.000	1255
	Domestic	0.753	0.431	0.000	1.000	1782
Dummy variables	Foreign	0.246	0.431	0.000	1.000	1782
	Islamic	0.037	0.188	0.000	1.000	1782
	Non-Islamic	0.962	0.188	0.000	1.000	1782

Ln: Logarithm. GDP: Gross Domestic Product. S.D: Standard Deviation. GDP: Gross Domestic Product.

Appendix 4: Correlation Matrix

Market-Level Controls			Bank-Level Controls				Dummy-Controls				ICT		Lerner			
GDP	Infl.	Pop.	D/A	Bbrchs	Price	Quantity	Ssize	Lsize	Dom.	Foreign	Islam	NonIsl.	Mobile	Internet	Lerner	
1.000	0.136	0.007	-0.008	-0.068	-0.014	-0.026	-0.0002	0.0002	0.034	-0.034	0.0001	-0.0001	-0.261	-0.122	-0.016	GDP
	1.000	-0.028	0.037	-0.236	0.256	-0.009	0.046	-0.046	0.028	-0.028	-0.050	0.050	-0.315	-0.238	-0.062	Inf.
		1.000	0.112	0.410	-0.029	-0.125	-0.098	0.098	-0.045	0.045	-0.088	0.088	0.056	0.335	0.035	Pop.
			1.000	-0.041	0.080	0.306	-0.041	0.041	-0.062	0.062	-0.210	0.210	-0.087	-0.036	0.021	D/A
				1.000	-0.266	-0.227	-0.078	0.078	0.135	-0.135	-0.051	0.051	0.610	0.747	0.109	Bbrchs
					1.000	-0.075	0.094	-0.094	0.016	-0.016	-0.097	0.097	-0.206	-0.219	0.082	Price
						1.000	-0.171	0.171	0.052	-0.052	-0.067	0.067	-0.096	-0.118	-0.038	Quantity
							1.000	-1.000	0.026	-0.026	-0.020	0.020	0.146	0.089	-0.056	Ssize
								1.000	-0.026	0.026	0.020	-0.020	-0.146	-0.089	0.056	Lsize
									1.000	-1.000	0.089	-0.089	0.151	0.039	0.147	Dom.
										1.000	-0.089	0.089	-0.151	0.039	-0.147	Foreign
											1.000	-1.000	-0.045	-0.039	0.006	Islam
												1.000	0.045	-0.032	-0.006	NonIsl.
													1.000	0.634	0.089	Mobile
														1.000	0.048	Internet
															1.000	Lerner

Info: Information. GDP: GDP per capita growth. Infl: Inflation. Pop: Population growth. D/A: Deposit on Total Assets. Bbrchs: Bank branches. Ssize: Small banks. Lsize: Large banks. Domestic: Domestic banks. Foreign: Foreign banks. Islam: Islamic banks. NonIsl: Non-Islamic banks. Price: Price of Loans. Quantity: Quantity of Loans. ICT: Information and Communication Technology. Mobile: mobile phone penetration. Internet: internet penetration. Lerner: Market Power

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