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Information Sharing and Banking Efficiency in Africa: A Disaggregated Panel Data Analysis

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Information Sharing and Banking Efficiency in Africa: A Disaggregated Panel Data Analysis

Simplice A. Asongu & Nicholas M. Odhiambo

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Abstract

The study assesses the how information sharing by means of mobile phones affects banking system efficiency in Africa with particular emphasis on income levels (Middle income versus Low income countries) and legal origins (English Common law versus French Civil law countries). The focus is on 53 African countries with data for the period 1996-2019 and the empirical evidence is based in Quantile regressions which enable the study to assess the nexus throughout the conditional distribution of banking system efficiency. The following findings are established: (i) mobile phone penetration promotes banking system efficiency in the 25th quantile and the median of banking system efficiency in low income countries while for middle income countries; it is significant exclusively in the bottom quantile (i.e. 10th quantile). (ii) With the exception of the highest (i.e. 90th) quantile in which the effect of the mobile phone is not significant in English Common law countries, the impact is significant throughout the conditional distribution of banking system efficiency in Common law countries. (iii) As for French Civil law countries, the nexus is only significant in the median and highest (i.e. 90th) quantile of the conditional distribution of banking system efficiency. Policy implications are discussed.

JEL Classification: G20; G29; L96; O40; O55
Keywords: Allocation efficiency; Information asymmetry**;** Mobile phones

1. Introduction

There are three main motivations for a study on the relevance of mobile phone penetration in mitigating the asymmetry of information for financial allocation efficiency in the African continent. They are: (i) the scope for information and communication technology development; (ii) a strategic need for internal sources of investment to complement external capital flows and (iii) sparse financial allocation efficiency due to asymmetry of information[1] between lenders and borrowers in the banking sector on the one hand and on the other substantially documented concerns about excess liquidity in African financial institutions. The motivations are engaged here in chronological order.

First, on the scope for mobile phone penetration on the African continent, Murphy and Carmody (2015) and Asongu (2017) have recently shown that compared with markets in developed and Asian countries; there is much room left in the African market for the development of mobile phones. According to the narrative, whereas high-end markets are reaching saturation, low-end markets in Africa are offering comparatively substantial investment opportunities.

Second, the literature on African business is consistent with the imperative to improve domestic financial development (Tchamyou, 2019; Taiwo, 2021) especially after failed attempts by privatisation policies to attract foreign capital (Fasakin, 2021). The need for domestic sources of investment aligns with the post-2015 inclusive and sustainable development agenda in the sense that external sources of finance like loans (Asongu et al., 2015) and foreign direct investment (Asongu & Tchamyou, 2015) are associated with exclusive human development and inequality respectively, in Africa.

Third, there is a recent stream of African finance literature documenting that financial allocation inefficiency in the continent is substantially traceable to information asymmetry between lenders and borrowers (see Triki & Gajigo, 2014; Lussuamo & Serrasqueiro, 2020). Furthermore, the introduction of information sharing mechanisms (ISM) has built on the idea that financial allocation inefficiency in the continent can be explained by information asymmetry, notably in terms of concerns about: affordability, physical access and bank lending eligibility (Moyo & Sibindi, 2020; Machokoto, 2021). Hence, in addition to mediating between borrowers and lenders, ISM also enhance market competition, reduce constraints in credit availability and boost efficiency in the allocation of capital (Jappelli &

[1] Unless stated otherwise, 'information asymmetry' refers to information asymmetry between lenders and borrowers. For the purpose of simplicity, we may simply use 'information asymmetry' without further reference to corresponding parties, i.e. lenders and borrowers.

Pagano, 2002). Unfortunately, despite the theoretical advantages of ISM, African financial institutions are still being confronted with stark concerns of surplus liquidity (Saxegaard, 2006; Fouda, 2009; Asongu, 2014a, p.70) and ISM unfavourable affecting financial development (Asongu et al., 2016). The unexpected negative impact substantiates the narrative that the effect of ISM on lending is difficult to establish: "*On the whole, all three models agree on the prediction that information sharing (in one form or another) reduces default rates, whereas the prediction concerning its effect on lending is less clear-cut*" (Jappelli & Pagano, 2002, p. 2020).

In response to the evidence of allocation inefficiency, the literature has failed to emphasise the importance of financial sector efficiency from the perspective of the fundamental goal of financial intermediation which is to transform deposits or liquid liabilities into credit for economic operators (Kablan, 2010; Kiyato, 2009; Al-Obaidan, 2008; Ataullah et al. 2004). In accordance with Asongu and Tchamyou (2014), the main financial efficiency measurements in African literature have focused on Data Envelopment Analysis (DEA) for technical efficiency (Kablan, 2009); cost efficiency (Chen, 2009; Mensah et al., 2012) and profit efficiency (Hauner & Peiris, 2005).

Noticeably, in the light of the objectives for the current study , the literature on the nexus between financial development and information asymmetry leaves space for improvement in four main dimensions, namely, the imperative to: (i) focus on regions where concerns about financial access are comparatively more severe; (ii) investigate the impact on financial access by appreciating financial development in the light of the fundamental role of banks in transforming deposits into credit; (iii) examine the underlying complementarity throughout the conditional distributions of financial allocation efficiency and (v) put emphasis on fundamental features such as income levels and legal origins in order to improve space for policy implications. The highlighted gaps are substantiated in the discourse which follows.

First, this study concentrates on Africa because despite the publicized issues of excess liquidity in the continent's banking sector, minimal literature on information sharing has been devoted to addressing this issue. To the best of our knowledge, the continent has not received the scholarly attention it deserves on the underlying anxiety. This substantially contrasts with the evidence that it is a continent in which the concerns surrounding financial access are most severe (Asongu et al., 2016). We substantiate this by articulating the neglect of allocation efficiency and limited focus on Africa in the information sharing (hereafter IS) literature.

Second, 'financial development'- and IS-specific studies have failed to recognise financial efficiency from the perspective of banks' ability to transform mobilised liquidities

into credit for economic operators. Both African-specific and general IS literatures have not conceived financial development within the framework of allocation efficiency. Whereas the IS literature has already been discussed in the preceding paragraph, two mainstream indicators have been used in the African financial development literature, notably, the: (i) employment of DEA to examine the efficiency of decision-making units[2] and (ii) assessment of cost and profit-linked efficiencies[3] as well as economic efficiency in terms of scale and technical efficiencies[4]. Contrary to the mainstream literature, we use an indicator of financial development efficiency that is in accordance with the policy syndrome of surplus liquidity. The motivation for employing this indicator is that information sharing within banking sector is necessary to improve banking allocation efficiency. Therefore, the financial measurement employed is the ratio of bank credit to bank deposits because ISM reduce informational rents and boost competition in the banking sector which result in allocation efficiency and higher levels of financial lending (Pagano & Jappelli, 1993, p. 2019).

Third, on the imperative of accounting for existing levels of financial development, the study argues that blanket financial allocation efficiency policies may not be effective unless they are contingent on initial levels of financial development and tailored differently across countries with low and high initial levels of financial access. The intuition for this estimation approach is that certain levels of financial development may be required to achieve positive allocation efficiency externalities from ISM. Hence, all the conditional distributions are considered with particular emphasis on countries with low-, medium- and high-levels of financial access. The employment of quantile regressions is distinct from recent studies which have been based on mean values of the dependent variables, namely: Triki and Gajigo (2014) and Tchamyou and Asongu (2017a) who have respectively employed the Generalised Method of Moments (GMM) and Probit models.

Fourth, the inclusion of legal origins and income levels enables the study to provide more room for policy implications between the nexus between information sharing by means

[2] The DEA has been employed by Ataullah et al. (2004) and Kablan (2009) respectively in Pakistan and Africa to assess scale and technical efficiencies.

[3] This is in accordance with a strand of African literature on financial efficiency (Kiyato, 2009; Kablan, 2010). Four main financial efficiency measurements have been used in the literature (see Demirgüç-Kunt & Beck, 2009): "*They include: the ratio of bank deposits (which measures the extent to which savings can fund private credit), the net interest margin (which is the accounting value of a bank's net interest revenues as a share of its total assets), overhead cost (or the accounting value of the bank's overhead cost as a share of its total assets) and, cost/income ratio (which assesses overhead costs relative to revenues)*" (Asongu, 2013a, p.665). Whereas the last-three are concerned with the profitability concept of efficiency, the conception adopted by this study is the first.

[4] The interested reader may refer to Al-Obaidan (2008) who in investigating the nexus between technical efficiency and globalization has recently employed a composite measurement of banking system efficiency.

of mobile phones and banking allocation efficiency can also be contingent on wealth of nations as well as their legal traditions from colonial legacies. Such fundamentals have been documented in the comparative development literature to elicit cross-country differences in economic development (Beck et al., 2003; La Porta et al., 2008; Mlachila et al., 2017).

The rest of the study is structured as follows. Theoretical underpinnings are provided in Section 2 while the data and methodology are discussed in Section 3. Section 4 presents the empirical results while Section 5 concludes with policy implications and future research directions.

2. Theoretical framework

We discuss the theoretical underpinnings motivating the study in two main strands, namely: (i) the link between financial allocation efficiency and information sharing and (ii) the intuition for the relevance of mobile phones in the sharing of information for financial allocation efficiency.

On the first relationship, according to Claus and Grimes (2003), there are two main views in the literature on the theoretical nexus between the sharing of information and financial development. While the second is concerned with mechanisms by which liquidity is provided to banks, the first focuses on the transformation of assets' risk features by banks. However, both strands are consistent with the fact that the main role of financial intermediation is to boost allocation efficiency via (i) optimal channelling of financial resources to borrowers from lenders and (ii) reduction of cost. Moreover, the according to the narrative, ISM are important in sharing information for better financial access and allocation efficiency.

In the second relationship, ICT has been documented to diffuse information between various participants in the markets of developing countries. Some of the accepted advantages have included (i) providing information for more positive engagement between lenders and borrowers (Aminuzzaman et al., 2003) and (ii) increased market participation and reduced marketing cost (Muto & Yamano, 2009, p. 1887). In summary, the intuition motivating the complementarity of mobile phones with ISM within the framework of this study is sound because mobile phones have been shown to reduce issues surrounding the lack of information between lenders and borrowers (Andonova, 2006; Ejemeyovwi, Osabuohien & Bowale, 2021).

With the above insights, the mobile phone can enable information sharing to reduce market power enjoyed by certain financial institutions. Such reduction in market power is facilitated by enhancing openness, transparency and the free-flow of information. Therefore, mobile phones enable the (i) free flow of information between various stakeholders, clients and banks and (ii) direct involvement of borrowers after the lending process. It is important to note that after the lending process, information sharing by means of mobile phones can still be relevant in market discipline by constraining borrowers not to conceal financial activities for which they have been granted loans, not least because accurate information can be obtained by means of a mobile phone. This is essentially because borrowers may be tempted to limit compliance with their financial obligations toward banks in the hope that they may ultimately rely on the informal financial sector as a permanent source of finance.

In the light of the above, the advantages associated with the mobile phone can be used by ISM to keep financial institutions up-to-date as well as encourage them to participate more in the lending process. In essence, when banks receive timely information on the credit histories of clients, they are more predisposed to reduce unnecessary risk aversion that is linked with higher loan cost and lower loan quantity. The fact that banks can simultaneously act on clients' information provided by ISM is consistent with recent literature on the relevance of Information and communication technology (ICT) in reducing the abused of power by big banks (Boulianne, 2009; Diamond, 2010; Grossman et al., 2014) and engagement in collective actions (Pierskalla & Hollenbach, 2013; Weidmann & Shapiro, 2015; Manacorda & Tesei, 2016).

3. Data and Methodology

3.1 Data

The paper assesses a panel of 53 African countries with data for the period 1996-2019[5]. The financial variable is obtained from the Financial Development and Structure Database (FDSD) of the World Bank whereas other variables are from the World Development Indicators (WDI) of the World Bank and the World Governance Indicators (WGI) of the World Bank. The financial efficiency variable is proxied in terms of allocation efficiency, notably, the ability of banks to transform mobilised deposits into credit (Tchamyou et al., 2019). In accordance with the literature from Asongu (2017) and Tchamyou (2017), the mobile phone penetration rate is used as an instrument of information diffusion.

[5] 53 of the 54 existing African countries are chosen because data on South Sudan is not available before 2011.

Seven control variables from recent financial development literature are used to account for variable omission bias, namely: inflation, trade openness, remittances, foreign direct investment, GDP growth and political stability (Huang, 2005; Osabuohein & Efobi, 2013; Asongu, 2014b; Owosu & Odhiambo, 2014; Nyasha & Odhiambo, 2015a, 2015b; Tchamyou, 2020; Tchamyou et al., 2019).

We discuss expected signs. *First*, Huang and Temple (2005) and Do and Levchenko (2004) are supportive of the link between financial development and trade openness. *Second*, Huang (2011) has established a relationship between investment and financial development. *Third*, both theoretical (Huybens & Smith, 1999) and empirical (Boyd et al., 2001) authors agree that very high inflation is linked to less efficient, less active and smaller banks. *Fourth*, the positive connection between financial development and economic growth has been substantially documented both in the theoretical and empirical literature (Greenwood & Jovanovic, 1992; Saint-Paul, 1992; Levine, 1997; Asongu, 2017). Economic growth is very likely to lower the cost of financial intermediation because of the availability of more funds for investment purposes and intensive competition. *Fifth*, remittances can contribute towards improving financial allocation efficiency if those to whom funds are remitted are less involved in the informal economic sector while the effect of political stability is contingent on whether the variable is positively skewed or negatively skewed (Tchamyou, 2021). In the light of above, the expected signs are contingent on both the nature of the control variable as well as on the fundamental characteristics being examined. To put the latter in more perspective, the effect is contingent on whether the sub-sample involves middle income or low income countries and by extension, English Common law or French Civil law countries. *Sixth*, classification of countries into income groups is consistent with Asongu (2014c, p. 364)[6] while the distinction between Common law and Civil law countries is informed by La Porta et al. (2008, p. 289). According to recent African finance literature (Asongu, 2012a), higher income countries are associated with higher levels of financial development compared with their lower income counterparts. This narrative aligns with Jaffee and Levonian (2001) who have established a positive relationship between income levels and the structure of banking systems. As shown by Beck et al. (2003) from both theoretical and empirical angles, common law countries are likely to be endowed with higher levels of financial development because of their comparative advantage political and adaptability channels.

[6] There are four main World Bank per capita income groups: low income, $1,005 or less; lower middle income, $1,006-$3,975; upper middle income, $3,976-$12,275; and high income, $12,276 or more.

The definitions and sources of variables are provided in Appendix 1 whereas Appendix 2 discloses the summary statistics. The correlation matrix is provided in Appendix 3. It is apparent from the descriptive statistics that the means of variables are comparable. Moreover, the corresponding degree of variations implies that we can be confident that reasonable estimated linkages would be derived. The purpose of the correlation matrix is to avoid errors about multicollinearity.

3.2 Methodology

In order to control for existing levels of financial efficiency in the investigation of the complementarity between ISM and mobile phones on financial efficiency, we employ quantile regressions (hereafter, QR). As noted by Keonker and Hallock (2001) and Tchamyou and Asongu (2017b), its application in conditional development literature has consisted of investigating the determinants of financial allocation efficiency throughout the conditional distributions of financial allocation efficiency.

The literature on information sharing comprised an investigation on the link between ISM and financial development by reporting estimated parameters at the conditional mean of financial development (see Triki & Gajigo, 2014; Asongu et al., 2016). Whereas, mean impacts are relevant, this inquiry extends the available stream of studies by employing QR in order to articulate initial levels of financial allocation efficiency. In addition, while Ordinary Least Squares (OLS)-oriented regressions are based on the assumption that financial allocation efficiency and errors are distributed normally, the QR estimation approach is not based on the hypothesis that error terms are normally distributed.

With the QR strategy, parameters are calculated at multiple points of the conditional distribution of financial allocation efficiency. Therefore, the QR technique is motivated by the objective of the present study to distinguish between low- medium- and high-initial levels of financial allocation efficiency.

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

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

where $\theta \in (0,1)$. Contrary to OLS which consists of minimizing the sum of squared residuals, the weighted sum of absolute deviations is minimized with QR. For example, the 10^{th}

quantile or 90th quantile (with θ=0.10 or 0.90 respectively) are obtained by an approximate weighing of the residuals. The conditional quintile of financial access or y_i given x_i is:

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

where unique slope parameters are estimated for each θ^{th} specific quintile. This formulation is analogous to $E(y / x) = x_{i'}\beta$ in the OLS slope where parameters are investigated only at the mean of the conditional distribution of financial access. For the model in Eq. (2), the dependent variable y_i is a financial access indicator while x_i contains: *a constant term, the mobile phone*; *economic growth, inflation, FDI, trade openness, remittances and political stability*.

4. Empirical results

The empirical results are presented in this section in Table 1 which is divided into two main panels. Panel A discloses findings on the nexus between mobile phones and banking allocation efficiency with respect of income levels. In the corresponding panel, the findings on low income are provided on the left hand-side while the findings on middle income countries are disclosed on the right hand-side. In Panel B however, the findings reported are for English Common law countries and French Civil law countries in the left hand-side and right hand-side, respectively. As previously substantiated, these comparative factors, *inter alia*, have been documented in recent ICT literature on the economies externalities of ICT penetration and African development literature (Beegle *et al*., 2016; Asongu *et al*., 2019; Asongu & Tchamyou, 2020). The study deals with five points in the distributions of financial access. The quantiles are motivated by the need to articulate three initial levels of financial access, namely: low (0.10 & 0.25); medium (0.50) and high (0.75 & 0.90) levels of financial access.

It is apparent from Panel A and Panel B that the OLS findings are different from the quantile regressions results both in terms of significance and magnitude of significance. This difference justifies the estimation of the nexus between the mobile phone and banking system efficiency throughout the conditional distribution of banking system efficiency. The following findings are also apparent: (i) mobile phone penetration promotes banking system efficiency in the 25th quantile and the median of banking system efficiency in low income countries while for middle income countries; it is significant exclusively in the bottom quantile (i.e. 10th quantile). (ii) With the exception of the highest (i.e. 90th) quantile in which the effect of the mobile phone is not significant in English Common law countries, the impact is significant

throughout the conditional distribution of banking system efficiency in the sampled Common law countries. (iii) As for French Civil countries, the nexus is only significant in the median and highest (i.e. 90th) quantile of the conditional distribution of banking system efficiency. Most of the control variables are at least significant in one of the estimated quantiles, though the signs vary depending on the sub-samples and contingencies discussed in the data section.

Table 1: Mobile phones, banking system efficiency, income levels and legal origins

Banking System Efficiency

Panel A: Income levels

	Low Income						Middle Income					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	80.285***	39.386***	57.437***	80.603***	94.815***	114.585***	102.54***	75.954***	85.401***	100.728***	124.758***	145.169***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mobile	0.062*	-0.073	0.143**	0.103***	0.022	-0.048	0.033	0.082*	0.068	0.026	0.018	-0.100
	(0.073)	(0.184)	(0.010)	(0.007)	(0.476)	(0.260)	(0.299)	(0.052)	(0.158)	(0.481)	(0.687)	(0.181)
GDPg	0.434	0.963**	0.561	-0.077	0.445***	0.458	-0.753*	-0.438	-0.304	-0.759	-1.135	-0.262
	(0.125)	(0.033)	(0.215)	(0.805)	(0.006)	(0.260)	(0.084)	(0.490)	(0.674)	(0.171)	(0.102)	(0.814)
Inflation	-0.952***	-0.367	-0.557**	-0.956***	-1.027***	-1.361***	-0.228**	-0.075	-0.181	-0.307*	-0.456**	-0.528
	(0.000)	(0.158)	(0.033)	(0.000)	(0.000)	(0.000)	(0.028)	(0.705)	(0.422)	(0.077)	(0.036)	(0.132)
FDI	-0.142*	-0.232	0.019	-0.187	-0.248***	-0.221	-0.517**	0.638	0.070	-0.460	-0.462	-0.269
	(0.069)	(0.232)	(0.920)	(0.166)	(0.006)	(0.404)	(0.049)	(0.207)	(0.902)	(0.297)	(0.403)	(0.762)
Trade	-0.137***	-0.033	-0.110**	-0.122***	-0.144***	-0.169***	-0.223***	-0.428***	-0.315***	-0.190***	-0.246***	-0.175
	(0.000)	(0.458)	(0.016)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.003)	(0.002)	(0.172)
Remittances	-0.410	0.678	-0.210	0.248	0.021	-0.676	-0.446**	0.514	0.021	-0.736**	-1.186***	-1.739***
	(0.232))	(0.250)	(0.722)	(0.545)	(0.948)	(0.159)	(0.018)	(0.169)	(0.959)	(0.024)	(0.004)	(0.009)
Political Sta	-1.956	-1.651	-0.427	-3.014*	-2.961*	-3.886*	6.742***	15.869***	8.590***	4.435*	4.372	10.852**
	(0.184)	(0.510)	(0.865)	(0.084)	(0.084)	(0.069)	(0.001)	(0.000)	(0.004)	(0.054)	(0.129)	(0.020)
Fisher	17.35***						12.05***					
Observations	376	376	376	376	376	376	344	344	344	344	344	344

Panel B: Legal Origins

	English Common Law						French Civil Law					
	OLS	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**	**OLS**	**Q.10**	**Q.25**	**Q.50**	**Q.75**	**Q.90**
Constant	74.568***	31.106***	46.245***	77.807***	88.784***	133.601***	87.346***	62.930***	78.512***	90.006***	105.612***	108.995***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mobile	0.134***	0.107***	0.207***	0.129***	0.169***	-0.029	0.059*	0.047	0.008	0.058*	0.006	0.182***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.691)	(0.079)	(0.105)	(0.842)	(0.086)	(0.870)	(0.005)
GDPg	-0.044	0.478*	0.268	-0.533*	-0.557	0.039	-0.134	-0.503	-0.095	-0.212	-0.476**	0.231
	(0.927)	(0.085)	(0.611)	(0.091)	(0.199)	(0.963)	(0.645)	(0.257)	(0.847)	(0.580)	(0.041)	(0.748)
Inflation	-0.469***	-0.179	-0.200	-0.662***	-0.846***	-0.549*	-0.631***	-0.263**	-0.819***	-0.957***	-1.087***	-1.041***
	(0.000)	(0.305)	(0.562)	(0.000)	(0.009)	(0.091)	(0.006)	(0.025)	(0.002)	(0.000)	(0.000)	(0.007)
FDI	-0.255**	-0.002	-0.380	-0.390	-0.089	-0.172	-0.190	0.637*	0.235	-0.115	-0.204	-1.169**
	(0.035)	(0.982)	(0.366)	(0.215)	(0.273)	(0.576)	(0.249)	(0.092)	(0.500)	(0.669)	(0.504)	(0.023)
Trade	-0.057**	-0.004	-0.014	-0.051	-0.040	-0.185**	-0.142***	-0.210***	-0.202***	-0.184***	-0.193***	0.159*
	(0.047)	(0.635)	(0.694)	(0.282)	(0.505)	(0.015)	(0.000)	(0.000)	(0.000)	(0.000)	(0.005)	(0.061)
Remittances	-1.050***	-0.204	-0.514*	-0.921***	-1.296***	-1.661***	0.148	0.536	0.156	0.130	0.145	-3.181***
	(0.000)	(0.581)	(0.077)	(0.000)	(0.000)	(0.008)	(0.613)	(0.133)	(0.763)	(0.745)	(0.756)	(0.000)
Political Sta	-4.370***	-11.821***	-7.706***	-5.345***	-4.775	5.787	4.955***	12.825***	7.080***	2.447	-2.229	4.025
	(0.002)	(0.000)	(0.000)	(0.001)	(0.138)	(0.153)	(0.002)	(0.000)	(0.003)	(0.191)	(0.289)	(0.253)
Fisher	19.68***						9.06***					
Observations	308	308	308	308	308	308	412	412	412	412	412	412

*,**,***: significance levels of 10%, 5% and 1% respectively. *,**,***: significance levels of 10%, 5% and 1% respectively. GDPg: GDP growth rate. OLS: Ordinary Least Squares. Lower quantiles (e.g., Q 0.1) signify nations where Banking Efficiency is least.

We further discuss the results in three main strands, namely: (i) the relevance of the mobile phone and the nexus with existing literature and (ii) implications for theory and (iii) implications for practice.

The relevance of the mobile can be understood with respect to the manner in which it improves information sharing and by extension, reduces information asymmetry that is necessary to improve the transformation of mobilised deposits into credit for economic stakeholders (governments, households and operators). Mobile phones are instrumental in this process from three main perspectives: (i) decreasing informational rents; (ii) making credit markets contestable and (iii) disciplining borrowers. In essence, the mobile phone is used by ISM to facilitate the diffusion of information that mitigate informational rents and reduce data privileges that are enjoyed by big financial institutions. Large financial institutions can use such privileged information to fix prices above marginal cost in order to enhance their profit margins and limit credit access. Consistent with dominant views in the literature, market power lowers investments, reduces savings, augments financial intermediation inefficiency and reduces possibilities of economic growth (see Stiglitz & Weiss, 1981; Djankov et al., 2007; Boateng et al., 2017). The intuition for the reduction of informational rents by means of the mobile phone aligns with Bergemanny et al. (2015) who have maintained that the interaction between information and market power is essential in determining market quantities and prices.

Drawing in the insights provided in Section 2, from the established overall positive nexus, it can be inferred that the mobile phone is being used as an information sharing mechanism to reduce differences in information deficiency between lenders and borrowers in the banking industry. It follows that contemporary concerns about surplus liquidity (Fouda, 2009; Asongu, 2014a) and investment challenges to African business (Fasakin, 2021; Ikeanyibe, 2021) can be partly addressed by the use of mobile phones as an information sharing instrument, since doing so improves opportunities for credit allocation needed for investment purposes.

Building on the narrative in Section 3, while the study confirms the comparative relevance of English Common law countries in leveraging on mobile phones to drive banking system allocation efficiency, compared to their French Civil law counterparts, such comparative edge is not apparent for Middle Income countries when compared to their Low Income counterparts. Accordingly, such edge of Low Income countries especially in countries where initial levels of banking system allocation efficiency are low, can be traceable to the

fact that low income countries in Africa are in the driver's seat in leveraging more on mobile technologies to connect with banks (Mosheni-Cheraghlou, 2013).

5. Conclusion and future research directions

The study has assessed the how information sharing by means of mobile phones affects banking system efficiency in Africa with particular emphasis on income levels (Middle income versus Low income countries) and legal origins (English Common law versus French Civil law countries). The focus is on 53 African countries with data for the period 1996-2019 and the empirical evidence is based in Quantile regressions. The choice of the estimation strategy in modelling the complementarity between information sharing offices and mobile phones throughout the conditional distribution of financial access indicators is because studies that are based on average values (or the conditional mean) of financial access provided blanket policies. Such extensive policies are unlikely to adequately inform behaviour unless the modelling exercise is contingent on initial levels of financial access and tailored differently across countries with low, intermediate and high initial levels of financial access.

The following findings are established: (i) mobile phone penetration promotes banking system efficiency in the 25^{th} quantile and the median of banking system efficiency in low income countries while for middle income countries; it is significant exclusively in the bottom quantile (i.e. 10^{th} quantile). (ii) With the exception of the highest (i.e. 90^{th}) quantile in which the effect of the mobile phone is not significant in English Common law countries, the impact is significant throughout the conditional distribution of banking system efficiency in English Common law countries. (iii) As for French Civil law countries, the nexus is only significant in the median and highest (i.e. 90^{th}) quantile of the conditional distribution of banking system efficiency.

The main implication for theory is that the mobile phone is an information sharing mechanism that can be used to mitigate potential concerns related to informational rents between borrowers and lenders in the banking industry and thus, is an instrument of information diffusion for improving financial access in the banking industry. This theoretical implication is consistent with Pagano and Jappelli (1993, p. 2019) in the perspective of reducing information asymmetry to curb informational rents and by extension, improving banking system allocation efficiency.

Concerning the implications for practice, it is apparent from the findings that enhancing the ownership of mobile phones especially in Low and Middle Income countries

where initial levels of banking system efficiencies are low, would go a long way to improving banking system efficiency. However, such a policy of enhancing mobile phones is less effective in countries in which initial levels of banking system efficiency are above the median in the corresponding Low and Middle Income countries. Hence, other policy initiatives and information sharing channels should be considered for the above-median Low and Middle Income countries. In the same vein, while the policy of enhancing mobile penetration for banking system efficiency is broadly applicable to English Common law countries, complementary information sharing policies should be considered in French Civil law countries where the incidence of mobile phone penetration on banking system efficiency has not been established to be overwhelmingly significant. In other words, the recommendation of complementary policies for sub-samples and/or quantiles for which the investigated nexus is not significant is based on the fact that the mobile is a necessary but not a sufficient instrument of information sharing in order to improve banking system allocation efficiency.

Future studies can also assess whether established linkages withstand further empirical scrutiny within the framework of country-specific studies. Furthermore, investigating alternative mechanisms by which information asymmetry can be reduced to enhance other development outcomes is worthwhile. In the suggested future research direction, the use of mobile sharing applications should be considered because such applications could provide more insights into what type of information is shared to improve banking system efficiency. Moreover, while credit users or clients are not engaged in this study because of its orientation towards macroeconomic data owing to data availability constraints, it is important for future studies to also consider microeconomic data from which such information on clients can be explored.

Appendices

Appendix 1: Definition of variables

Variables	Signs	Definition of variables	Sources
Banking System Efficiency	BcBd	Bank credit on Bank deposits	World Bank (FDSD)
The Mobile Phone	Mobile	Mobile phone subscriptions (per 100 people)	World Bank (WDI)
Economic Prosperity	GDPg	GDP Growth (annual %)	World Bank (WDI)
Inflation	Infl	Consumer Price Index (annual %)	World Bank (WDI)
Foreign Direct Investment	FDI	Foreign Direct Investment, net inflows (% of GDP)	World Bank (WDI)
Trade openness	Trade	Imports plus Exports in commodities (% of GDP)	World Bank (WDI)
Remittances	Remit	Personal remittances, received (% of GDP)	World Bank (WDI)
Political Stability	PolSta	"*Political stability/no violence (estimate): measured as the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional and violent means, including domestic violence and terrorism*"	World Bank (WGI)
Middle Income	Middle I	Middle and Upper Income Countries ($1,006 or more)	Asongu (2014c, p. 364)
Low Income	Low I	Low Income Countries ($1,005 or less)	
Common Law	Common L	English Common Law Countries	La Porta et al. (2008, p. 289)
Civil Law	Civil L	Civil Law Countries	

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

Appendix 2: Summary Statistics (1996-2019)

Variables		Mean	S.D	Min.	Max.	Observations
Banking System Efficiency (BcBd)		71.019	28.897	13.753	196.078	1105
Mobile Phone	Mobile Phone Penetration	38.387	42.910	0.000	184.298	1206
Control Variables	GDP growth	4.575	7.912	-62.075	149.973	1207
	Inflation	8.736	27.569	-60.496	513.907	1088
	Foreign Direct Investment	4.356	9.233	-8.703	161.824	1191
	Trade Openness	72.819	39.722	17.858	347.997	1147
	Remittances	3.799	7.244	0.0001	98.388	1034
	Political Stability	-0.551	0.917	-3.314	1.282	1060
Income Levels and Legal Origins	Low Income Countries	0.584	0.492	0.000	1.000	1272
	Middle Income Countries	0.415	0.492	0.000	1.000	1272
	English Common Law	0.377	0.484	0.000	1.000	1272
	Civil French Law	0.622	0.484	0.000	1.000	1272

S.D: Standard Deviation. Min: Minimum. Max: Maximum. BcBd: Bank credit on Bank deposits. GDPg: GDP growth.

Appendix 3: Correlation (Uniform sample size: 720)

	BcBd	Mobile	GDPg	Infl	FDI	Trade	Remit	PolSta	Middle I.	Low I.	Common L.	Civil L.
BcBd	1.000											
Mobile	0.109	1.000										
GDPg	-0.035	-0.105	1.000									
Infl	-0.191	-0.122	0.008	1.000								
FDI	-0.155	0.089	0.109	0.026	1.000							
Trade	-0.173	0.227	0.007	-0.092	0.315	1.000						
Remit	-0.073	0.066	0.041	-0.108	0.170	0.122	1.000					
PolSta	0.042	0.148	0.022	-0.202	0.077	0.232	0.024	1.000				
Low I.	-0.170	-0.301	0.102	0.083	0.115	-0.207	-0.075	-0.146	1.000			
Middle I.	0.170	0.301	-0.102	-0.083	-0.115	0.207	0.075	0.146	-1.000	1.000		
Common L.	-0.097	0.129	0.074	0.295	0.102	0.143	-0.011	0.157	-0.066	0.066	1.000	
Civil L.	0.097	-0.129	-0.074	-0.295	-0.102	-0.143	0.011	-0.157	0.066	-0.066	-1.000	1.000

BcBd: Bank credit on bank deposits. Mobile: mobile phone penetration. GDPg: Gross Domestic product growth. Infl: Inflation. FDI: Foreign Direct Investment. Remit: Remittances. PolSta: Political Stability. Middle I.: Middle Income. Low I.: Low Income. Common L.: Common Law. Civil L.: Civil Law.

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