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Article

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Bank concentration, competition, and financial inclusion^{☆,☆☆}

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Abstract

Expanding access to financial services holds the promise to help reduce poverty and foster economic development. However, little is still known about the determinants of the outreach of financial systems across countries. Our study is the first attempt to employ a large panel of countries, several indicators of financial inclusion and a comprehensive set of bank competition measures to study the role of banking system structure as a determinant of cross-country variability in financial outreach for households. We use panel data from 83 countries over a 10-year period to estimate models with both country and time fixed effects. We find that greater banking industry concentration is associated with more access to deposit accounts and loans, provided that the market power of banks is limited. We find evidence that countries in which regulations allow banks to engage in a broader scope of activities are also characterized by greater financial inclusion. Our results are robust to changes in sample, data, and estimation strategy and suggest that the degree of competition is an important aspect of inclusive financial sectors.

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1. Introduction

Greater financial development has been linked to increases in average income as well as the reduction of income inequality. However, most of the empirical cross-country literature on the impact of financial development focuses on financial depth, using measures such as total outstanding deposits and credit to the non-financial private sector rather than the distribution of those financial services across households (e.g. Beck et al., 2007a, 2007b). Only recently have researchers turned their attention to questions of financial inclusion — the extent to which

households and firms can access and make use of formal financial services (see Beck and Demirguc-Kunt, 2008 for a survey).

At the same time, the consolidation of banks around the globe in recent years and the increased scrutiny of banking regulation in the wake of the financial crisis have intensified the policy debates on the influence of concentration and competition in the banking industry on real sector outcomes (e.g., Beck et al., 2014).¹ Within this framework, an area of particular interest among researchers and policymakers has been the potential impact of financial market structure on access to finance. The traditional market power view argues that competition in the banking market reduces the cost of finance and increases the availability of financial services (e.g., Berger and Hannan, 1998). Alternative views argue that competition may have a negative impact on credit. One reason is that competition may interact with the level of asymmetric information in the market. This information hypothesis argues that competitive banking systems can weaken relationship-building by lowering banks' incentive to invest in soft information. Therefore, less compet-

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¹ For example, between 1998 and 2013, the percent of assets held by the largest five banks in the United States increased from 32% to 47%.

itive markets may be associated with more credit availability (Petersen and Rajan, 1995; Dell’Ariccia and Marquez, 2004). This explanation may be less relevant for the financial inclusion at the household level that we study, but a second alternative view relates bank size with greater opportunities for portfolio diversification. Larger banks may also be able to diversify loan portfolio risks more efficiently due to higher economies of scale and scope (Diamond, 1984; Boyd and Prescott, 1986). In addition, larger banks engaging in cross-border activities may obtain additional economies of scale and scope by geographic risk diversification.² Because theory does not unambiguously predict the relationship between competition and credit availability, the issue is ultimately empirical.

Our empirical results are consistent with the latter hypotheses in that we find that big banks are consistent with broad financial inclusion for households as long as the market remains contestable. We also find somewhat weaker evidence that countries in which regulations allow banks to engage in a broader scope of activities are also characterized by greater financial inclusion. Thus, the best policy for improving financial inclusion should focus on improving market contestability (as measured by pricing over marginal cost) rather than limiting the size and scope of banks.³

Interestingly, cross-country empirical research has focused almost entirely on access to finance by firms, a feature of the literature that may respond in part to the lack of sufficient and reliable aggregate level data on households until recently. Using data from a panel of 83 countries, our study is the first one to explore the relationship between the structure of the banking industry and households’ financial inclusion. Measuring competition in the banking sector is challenging, and we rely on multiple bank competition indicators that proxy for market contestability and market power and relate these competition indicators to several different measures of access to finance by individuals.

Broad financial sector outreach is likely to be important for several reasons. For households, borrowing is an important way to cope with emergencies and to pay for household and social expenses such as water, health services and education (Peachey and Roe, 2006). Savings can also be an important way to smooth consumption from one month to the next and to cope with unexpected expenses.⁴ Hence, borrowing and saving may be welfare enhancing even if not always output-increasing. For poor households in particular, financial market imperfections (e.g., informational asymmetries, transaction costs) can lead to

financial constraints due to a lack of collateral, credit histories and connections.

In order to characterize banking sector outreach across countries, we rely on measures of actual use of deposit and credit services collected from the IMF’s Financial Access Survey. Specifically, we employ indicators on the number of borrowers, depositors, loan and deposit accounts per 1000 adults. We interpret higher values of these measures as indicating the use of deposit and credit services by a greater share of the population and by clients with smaller savings and loan account balances. Our choice and interpretation of the measures follow that of Beck et al. (2007a, 2007b) but while the authors carry out their own survey at one point in time only, we benefit from a richer time-series data for a larger set of countries that allows us to explore the relation between different determinants and financial system outreach over time as well as exploit within-country variation of access to finance. We acknowledge that there are other banking services in addition to deposit-taking and lending (such as insurance services) as well as other financial providers beyond commercial banks, namely, microfinance institutions and cooperatives.⁵ These are all natural avenues for future research, however, our current focus on commercial banks has the advantage of providing specific policy implications.

This paper adds to the still evolving literature on financial inclusion in general and financial outreach for households in particular. Efforts to examine how formal financial systems affect the poor remain inadequate with much of the action still revolving around country level studies which suffer from their own set of limitations — including very high costs of implementation and the concerns of whether results found in one specific socio-economic environment can easily be applied to another. Only a few papers investigate the link for a large panel of countries but their emphasis lie on the effect of financial depth measures on inequality (see Demirguc-Kunt and Levine, 2009 for a review). We also add to the broader literature on banking sector competition and access to finance for firms. To our knowledge, we are the first study to employ a large panel of countries, several indicators of financial inclusion and measures of different aspects of bank competition to study the role of banking system structure as a determinant of cross-country variability in financial outreach for households. Our results are robust to a number of specification changes and suggest that the degree of competition is an important aspect of inclusive financial sectors.

The remainder of the paper is organized as follows. Section 2 provides a brief literature review. Section 3 discusses the data

² Dong et al. (2017) show that a banking sector with a small number of large banks is welfare-enhancing because with the entry of new banks, competition stimulates aggregate lending. As the number of banks increases, however, the banking sector’s demand for funds grows which bids up the value of funds causing the deposit rate and thus the cost of bank lending to increase.

³ As we discuss further below, we do not find a strong positive correlation between banking industry concentration and market power.

⁴ Studies show that poor households often seek specific, structured financial tools to achieve their savings goals and refute the old prejudices held that poor households lack the surpluses to save much (e.g., Ashraf et al., 2006; Collins et al., 2009). For example, Collins et al. (2009) study the financial lives of poor households and find a common pattern of intensive use of saving instruments but relatively small average balances.

⁵ Interestingly, Donou-Adonsou and Sylwester (2016) find for a panel of 71 developing countries over the period 2002–2011 that while banks have the ability to reduce poverty, MFIs do not, at least at the aggregate level. One possible explanation provided by the authors is that traditional banks facing competition from MFIs expand lending to the poor at lower costs (see Holden and Prokopenko, 2001; Thanvi, 2010). Authors also point out the much greater size of banks — thus having a greater potential for changes in their provision of financial services to affect the poor. In contrast, the scale of MFIs’ lending is significantly smaller and thus their impact on poverty reduction would tend to be locally contained. Their work suggests that the trickle-down effect from financial development may not work for MFIs as it does for banks.

and presents the econometric methodology. We provide the main results in Section 4 and present robustness tests in Section 5. Section 6 concludes.

2. Related literature

Until recently, due to the lack of household data on a broad cross-section of countries, much of the research on financial outreach has been done at the micro level (see [Karlan and Morduch, 2009](#) for a survey), and therefore the conclusions of the research may only be country or region specific. For example, in a recent field experiment in Nepal, [Prina \(2012\)](#) finds that waiving the fixed cost of opening an account can lead to high take-up and usage rates (82% and 71%, respectively). In a similar experiment in Kenya, however, [Dupas et al. \(2012\)](#) obtain a high take-up rate (63%) but significantly low usage (18%). Their work reveals a set of challenges with the supply of financial services to properly serve the poor citing lack of trust, service quality issues and high withdrawal fees. As documented in [Caskey et al. \(2006\)](#) for Los Angeles, Mexico City, and New York City, and in [Solo \(2008\)](#) for Bogota and Mexico City, such concerns prevent even people living in urban areas with easy access to bank branches from using financial services. In light of these limitations, standard economic theory suggests that prices (e.g., fees, minimum balances) and the quality of service should respond to the degree of competition. It is thus natural to explore whether such relationship exists between bank competition and financial sector outreach. By focusing on individuals' access to deposit and savings accounts, [Marin and Schwabe \(2013\)](#) provide evidence of a positive relation between bank competition and the penetration of bank accounts at the municipal level in Mexico. Yet little is still known about the supply-side determinants of the breadth of financial systems in the household segment across countries.⁶

The link from market structure to degree of competition is not clear as highlighted by the long existing contestability literature (e.g., [Baumol et al., 1982](#); [Panzar and Rosse, 1987](#); [Molyneux et al., 1996](#); [Philippatos and Yildirim, 2007](#)). Specifically, the competitiveness of an industry cannot be measured by market structure indicators alone (such as the number of institutions, Herfindahl or other concentration indexes). Rather, establishing the degree of effective banking competition requires contestability measures (entry and exit indicators) such as requirements for bank licenses and share of licenses denied as well as non-structural measures of competition (market power indicators). The market power indicator that we use is the Lerner index – a measure of pricing above marginal cost – for reasons that

we discuss at length in the next section. While the evidence on the relationship between banking concentration and access to finance yields mixed results, studies using measures of effective competition find that competition improves access. Our work incorporates the lessons from this literature when assessing the effects of banking competition on access and therefore distinguishes us from other empirical studies that rely exclusively on a single measure to proxy for market power.

Our work is also related to a well-developed literature on access to finance by firms. For example, [Cetorelli and Gambera \(2001\)](#) show that more concentrated banking systems increase firms' access to finance. This contrasts with [Beck et al. \(2003\)](#) that finds for a panel of countries that bank concentration increases firms' financing obstacles and decreases the likelihood of receiving bank finance with the effect being exacerbated by more restrictions on banks' activities.⁷ [Claessens and Laeven \(2005\)](#) provides evidence for 16 countries that more competitive banking systems exert a positive effect on firms' access to finance. [Carbo-Valverde et al. \(2009\)](#) shows that the effect of banking sector competition on Spanish firms' access to finance depends crucially on how competition is measured. Their results indicate a negative association between market power and access to finance when the Lerner index is used. However, when using measures of concentration, their findings are reversed; as do we, they also find a positive association between industry concentration and access to finance. Using the Lerner index for a sample of 53 countries, [Love and Pería \(2012\)](#) provide further evidence that competition is positively related to firm's access to finance. In contrast, using both structural (e.g. concentration ratios) and non-structural (e.g., Lerner Index) indicators for a panel of firms from 20 European countries, [Fungáčová et al. \(2017\)](#) find that competition increases the cost of credit and the effect is stronger for smaller firms. More recently, [Chauvet and Jacolin \(2017\)](#) use firm level data for a sample of 55,596 firms in 79 developing and emerging countries to study the effect of financial market structure and financial inclusion on firm performance. Interestingly, they find that more competitive banking systems favor firm growth only at high levels of financial inclusion while bank concentration has a positive impact on firm growth at low levels of financial inclusion. The results from this literature therefore suggest that the structure of the banking system is an aspect of the overall financial system functioning that is worth analyzing in the context of household access to financial services.

3. Methods and data

In order to investigate the relationship between the structure of the banking industry and financial inclusion, we use data from an unbalanced panel of 83 countries over the years 2004–2013. Our main specification explores the relationship between banking industry concentration and several different measures of access to deposit accounts and loans. When studying the effects of banking system structure on access to finance, we need to

⁶ A few recent studies have examined the individual determinants of financial inclusion across countries (see [Demirguc-Kunt and Klapper, 2013](#); [Demirguc-Kunt et al., 2013](#); [Allen et al., 2016](#); [Zins and Weill, 2016](#)). For example, using the 2012 Global Findex database for 123 countries and 124,000 households, [Allen et al. \(2016\)](#) find that the probabilities of owning and using an account at a formal institution are higher for richer, more educated, older, urban, employed individuals. The likelihood of borrowing formally also increases for the same individual characteristics. [Zins and Weill \(2016\)](#) use the same database on 37 African countries and find similar results. They also find that mobile banking is driven by the same determinants than traditional banking.

⁷ [Barth et al. \(2009\)](#) document the importance of bank competition in reducing corruption in lending.

control for other country circumstances that may be correlated with industry concentration but may also determine access to finance. Otherwise, the incorrect conclusion that concentration is (or is not) important could be reached. Specifically, in the base specification, we estimate,

$$INCLUSION_{i,t} = \beta_1 DEPTH_{i,t} + \beta_2 GDP_{i,t} + \beta_3 CONCENTRATION_{i,t-1} + \alpha_i + \lambda_t + \varepsilon_{i,t} \quad (1)$$

where $INCLUSION_{i,t}$ is one of seven different measures of access to either loan or deposit accounts in country i in year t , $DEPTH$ is the natural log of financial depth, GDP is the natural log of real GDP per capita, and $CONCENTRATION$ is the share of assets of either the top three banks or the top five banks, lagged by one year. We use a lagged value of $CONCENTRATION$ in the estimation to facilitate a causal interpretation; α_i and λ_t are country and year-specific fixed effects and $\varepsilon_{i,t}$ is a mean-zero, normal disturbance term. When $INCLUSION$ is a measure of access to deposits, the financial depth measure that we use is M3/GDP; when $INCLUSION$ is a measure of access to loans, the financial depth measure that we use is private credit/GDP. This allows us to better match up a financial depth measure of loans or deposits with similar financial breadth measures.⁸ In additional estimations, we also seek evidence of a non-linear relationship between $CONCENTRATION$ and $INCLUSION$ by including the square of $CONCENTRATION$. We also report results from a robustness check in which we add a lagged dependent variable and estimate Eq. (1) with GMM.

As we explain below, for a smaller sample of countries and years, we use alternative measures of the structure of the banking industry. Specifically, we use measures of regulation of the banking industry that affect industry concentration: restrictions on banking activities (regulatory restrictions on banks' involvement in securities, insurance, and real estate activities) and the fraction of entry applications denied. Finally, we also use the Lerner index, a measure of market power in the banking industry based on pricing over marginal cost. In supplementary estimations, we explore the relationship between these characteristics of industry structure and $INCLUSION$ in similar specifications.

The country-specific effects capture characteristics of the country that do not change over the sample period. This would include several institutional features of the economy that could be relevant to financial inclusion such as quality and availability of credit reporting as well as general institutional quality reflected in characteristics of the legal system (La Porta et al., 1997; Beck and Levine, 2004). The year-specific effect would account for temporary financial shocks that would be common to all countries. The country and year fixed effects should also help us to control for the variation in the demand for financial services across countries or across time. For example, the year fixed effect should control for macroeconomic shocks that are common across all countries that could affect the demand. Simi-

larly, the country fixed effect should control for country-specific characteristics that might influence demand for financial services that we do not include in our estimation.

The interpretation of β_3 is that it captures the marginal impact of banking industry concentration on financial inclusion, after controlling for financial depth and GDP per capita. In all our estimations, we consistently find that financial depth and the level of economic development are strongly and positively related to financial inclusion. The question we seek to answer in this study is more subtle: for a given level of financial development, what characteristics of the banking industry and banking regulation are associated with greater financial inclusion? In other words, for a given financial depth, what factors are associated with greater financial breadth?

The data used comes from three sources. Financial inclusion data is from the International Monetary Fund's Financial Access Survey. Financial depth, GDP per capita, industry concentration ratios, and the Lerner index are from the World Bank's Global Financial Development and World Development Indicators datasets. Both the industry concentration ratios and the Lerner index are derived from Bankscope data. The regulatory measures are from Barth et al. (2001).

We use seven different measures of financial inclusion: number of Depositors, Household Depositors, Household Deposit Accounts, Borrowers, Household Borrowers, Loan Accounts, and Household Loan Accounts. All financial inclusion measures are stated per 1000 adults and reflect relationships with commercial banks. Note that Depositors, Borrowers, and Loan Accounts include financial services offered both to households and nonfinancial firms. None of these measures of financial inclusion are perfect. One issue is that they include deposit and loan relationships of both residents and non-residents of the reporting country. We attempt to mitigate concerns about countries that may have significantly more non-residents with banking relationships affecting our results by (1) estimating a country-specific effect, and (2) showing that our results are robust to removal of countries from the estimation sample that are considered to be off-shore financial centers.

Another concern is that the data for Depositors, Borrowers, and Loan Accounts include financial services offered both to households and nonfinancial firms. Thus, using these measures only allows us to make broad statements about financial inclusion and not statements specific to households and individual access to banking services. Although using measures for Household Depositors and Household Borrowers may seem to resolve this issue, unfortunately, because of the way the data is reported to the IMF, if individuals have deposit or borrowing relationships with multiple banks, they are counted in the data multiple times. The data for Household Deposit Accounts and Household Loan Accounts suffers from a similar problem: even if a borrower or depositor has multiple accounts with the same bank, the data for Household Deposit Accounts and Household Loan Accounts reports all these accounts as separate accounts. Thus, although all measures are reported per 1000 adults, given the presence of non-residents and also the potential for counting the same depositor or borrower multiple times, it is possible that all these variables take on values greater than 1000.

⁸ In some robustness checks, we also use an index of financial development from Svirundzenka (2016) instead of these measures of financial depth and reach similar conclusions. Results of these and any other estimations not reported in detail are available from the authors upon request.

Table 1
Correlation matrix.

	Depositors	Household Depositors	Household Deposit accounts	Borrowers	Household Borrowers	Loan Accounts	Household Loan Accounts
Depositors	1						
Household Depositors	0.9651	1					
Household Deposit Accounts	0.8756	0.9344	1				
Borrowers	0.7356	0.7043	0.8077	1			
Household Borrowers	0.6955	0.6922	0.8217	0.9951	1		
Loan Accounts	0.6431	0.7861	0.5063	0.8579	0.8564	1	
Household Loan Accounts	0.5774	0.7641	0.5027	0.8603	0.8752	0.9932	1

All correlations are significant at the 1% level.

We take into account the characteristics of the data when we interpret our results and perform robustness checks. Although the measures of financial inclusion are imperfect in different ways, they are all strongly correlated, with the correlation coefficients ranging from .50 to .995.⁹ (See Table 1) As to be expected, the strongest correlations are with like concepts: measures of access to deposit accounts are most highly correlated with each other as are measures of access to credit. Thus, we expect similar results across different measures of the same concept, but not necessarily across all measures that we employ.

Summary statistics for the data used appear in Table 2. These summary statistics indicate that there is a great deal of variation in both the measures of financial inclusion as well as characteristics of the banking industry. For example, the average number of Household Borrowers per 1000 adults is 173, but the standard deviation is almost equally as large. Similarly, the banking industry is fairly concentrated with 82% of the assets being held by the five largest banks, on average. However, the five bank asset concentration ratio also has a wide range, going from a low of 30 to a high of 100. We note that the majority of countries in our sample are developing countries, with the mean GDP per capita in the sample being \$6906 (in 2005 U.S. dollars). This is an important characteristic of the data to keep in mind when drawing policy implications. In a developing country context, greater access to deposit accounts and to loans are both likely to be welfare enhancing. In the next section, we explore how the variation in banking industry characteristics are related to the variation in financial inclusion.

4. Results

Tables 3 and 4 report the results of estimation of Eq. (1) for deposit relationships (Table 3) and borrowing relationships (Table 4). Table 3 reports results using three different measures of deposit relationships: Depositors (columns 1–4), Household Depositors (columns 5–8), and Household Deposit Accounts (columns 9–12).

The results are consistent across all three measures of financial access. First, as to be expected, financial depth and GDP per capita are both strongly positively correlated with deposit accounts. Interestingly, after controlling for financial depth,

industry concentration is positively associated with access to bank accounts.¹⁰ The first two columns for each measure of financial access examine the asset concentration of the largest three banks in the country and the last two columns examine the asset concentration of the largest five banks. For both measures of concentration, there is strong evidence that the relationship is nonlinear, with a negative coefficient on the square of the concentration measure entering in all estimations in a statistically significant manner. However, given the magnitudes of the estimated coefficients, even when the industry concentration hits the maximum of 100%, the overall marginal effect of higher concentration is still positive.

As we mentioned earlier, each measure of financial access has some imperfections, however, taken together, these results are consistent with a higher industry concentration being associated with greater access to deposit accounts by both firms and households. The most straightforward measure of access to deposit accounts is used in the last four columns of Table 3, Household Deposit Accounts. Although this measure could increase simply because the same household obtains more deposit accounts (e.g., an increase on the intensive margin), it is the most easy to interpret because it is not confounded by the potential double counting and non-household financial access that are embedded in the other two measures. The results in Column 10 suggest that industry concentration does have a meaningful impact on financial access: A one standard deviation increase in the three-bank concentration ratio is associated with an increase in Household Deposit Accounts of 565 or roughly one-third of a standard deviation.

Table 4 presents the results from similar estimations that use measures of access to loans as the dependent variable. Although there are fewer statistically significant coefficients, these results are generally consistent with those reported in Table 3. Overall, the results in Tables 3 and 4 suggest that a banking industry characterized by higher asset concentrations at the largest banks is associated with greater financial inclusion.

Although one possible interpretation of this result is that a less competitive banking industry provides greater financial inclusion, we note that industry concentration is only one mea-

⁹ Beck et al. (2007a, 2007b) use similar data.

¹⁰ Removing financial depth from the estimations in Tables 3 and 4 provides qualitatively similar results for industry concentration, but a worse fit overall for the estimation (lower R²).

Table 2
Summary statistics.

	Mean	SD	Min	Max	#obs.
Borrowers	181	204	0	1125	594
Household Borrowers	173	159	1	788	292
Loan Accounts	325	309	0	2323	531
Household Loan Accounts	317	304	0	1951	352
Depositors	480	555	0	3368	513
Household Depositors	425	476	1	3342	254
Household Deposit Accounts	1242	1437	1	7776	310
ln (private credit/GDP)	3.31	0.86	0.06	5.31	594
ln (Real GDP/capita)	7.88	1.43	4.97	11.01	594
Three Bank Asset Concentration Ratio	73.58	19.46	21.70	100.00	594
Five Bank Asset Concentration Ratio	82.31	15.32	30.53	100.00	500
Restrictions on Banking Activities	8.02	2.03	3.00	12.00	96
Fraction of Entry Applications Denied	0.16	0.25	0.00	1.00	69
Lerner	0.29	0.16	−0.59	0.94	512

Table 3
Commercial bank concentration and access to bank accounts.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Depositors				Household Depositors				Household Deposit Accounts			
LN (M3/GDP)	100.8*** (35.58)	101.3*** (33.25)	119.5*** (36.87)	94.18*** (36.00)	224.8*** (59.02)	237.7*** (53.55)	225.6*** (63.67)	236.5*** (60.37)	250.3*** (94.20)	270.2*** (90.44)	460.6*** (117.4)	430.3*** (113.6)
LN (GDP/capita)	271.8*** (62.74)	266.0*** (58.63)	273.6*** (65.57)	264.0*** (63.40)	325.2*** (95.28)	351.8*** (86.49)	338.9*** (100.7)	402.3*** (96.54)	978.1*** (217.5)	987.2*** (208.6)	1171*** (250.0)	1105*** (241.8)
% assets top three banks	3.613*** (0.593)	27.51*** (3.059)			3.152*** (0.893)	32.23*** (4.437)			2.208 (1.389)	33.45*** (6.640)		
(%assets top three) ²		−0.164*** (0.0206)				−0.203*** (0.0305)				−0.225*** (0.0469)		
%assets top five banks			6.645*** (0.803)	29.65*** (4.712)			7.470*** (1.166)	39.61*** (7.451)			7.747*** (1.600)	52.57*** (11.11)
(%assets top five) ²				−0.154*** (0.0312)				−0.221*** (0.0507)				−0.300*** (0.0737)
Observations	513	513	408	408	254	254	207	207	310	310	263	263
R-squared	0.342	0.426	0.435	0.474	0.325	0.447	0.447	0.507	0.372	0.425	0.441	0.481
Number of countries	73	73	64	64	41	41	37	37	45	45	39	39

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country and year fixed effects included. Bank concentration ratios lagged one period. Annual data, 2004–2013. Measure of financial access is per 1000 adults.

sure of the competitiveness of the banking industry. A banking industry with only a few large banks may still be “competitive” by other measures. As mentioned in the introduction, a high degree of industry concentration does not necessarily imply that the market is not contestable, and this observation is evident in our data. For example, a fixed effects regression explaining the Lerner index shows that industry concentration is positively and significantly related as one might expect if higher industry concentration is associated with less competition. However, the regression explains only four percent of the variation in the Lerner index, suggesting that industry concentration is only one dimension of the competitiveness of the banking market.¹¹

To explore other measures of banking industry structure and competitiveness, we exploit data from [Barth et al. \(2001\)](#) on bank regulation. Specifically, we use an index on restrictions on bank-

ing activities to capture the scope of activities in which banks are legally permitted to engage. The higher this index is, the more restrictions imposed by regulators and the smaller the scope of banking activities. Although theoretically greater restrictions on banking activities could result in smaller banks, this measure of the structure of the banking industry is not significantly correlated with asset concentration. We also use the fraction of entry applications to the banking industry that are denied as an alternative measure of industry competition. The greater the fraction of applications that are denied, the higher the barriers to entry and the less competitive the industry. Finally, we also employ a third measure of industry competitiveness, the Lerner index, in estimations similar to those presented in [Tables 3 and 4](#). The Lerner index is a measure of pricing over marginal cost so a higher Lerner is associated with greater market power of the individual banks and less competition in the banking industry.

A drawback to using the banking regulation measures from [Barth et al. \(2001\)](#) is that their use dramatically reduces the sam-

¹¹ Results for this and any other estimation discussed in the paper but not reported in detail are available from the authors upon request.

Table 4

Commercial bank concentration and access to loans.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Borrowers				Household Borrowers			
LN (Private Credit/GDP)	50.18*** (10.25)	50.55*** (10.26)	78.24*** (11.59)	79.00*** (11.63)	126.1*** (14.45)	128.3*** (14.48)	146.3*** (17.10)	145.5*** (17.08)
LN (GDP/capita)	139.6*** (29.02)	139.0*** (29.03)	164.1*** (30.49)	163.4*** (30.51)	88.85*** (33.58)	92.42*** (33.57)	96.39*** (36.57)	101.1*** (36.67)
% assets top three banks	0.397 (0.241)	1.869 (1.583)			−0.355 (0.313)	2.557 (1.951)		
(%assets top three) ²		−0.00986 (0.0105)				−0.0196 (0.0130)		
%assets top five banks			1.103*** (0.326)	−0.743 (2.358)			1.202** (0.473)	4.730* (2.699)
(%assets top five) ²				0.0117 (0.0148)				−0.0230 (0.0173)
Observations	594	594	500	500	292	292	255	255
R-squared	0.369	0.370	0.430	0.431	0.558	0.562	0.606	0.609
Number of countries	83	83	73	73	48	48	44	44
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Loan Accounts				Household Loan Accounts			
LN (Private Credit/GDP)	198.5*** (35.77)	201.8*** (35.74)	236.3*** (42.56)	236.0*** (42.59)	238.9*** (41.28)	240.4*** (41.25)	267.7*** (48.06)	266.9*** (48.05)
LN (GDP/capita)	289.3*** (73.17)	294.3*** (73.06)	304.0*** (86.47)	306.3*** (86.60)	263.5*** (79.34)	260.7*** (79.28)	246.8*** (88.33)	248.4*** (88.30)
% assets top three banks	−0.0516 (0.704)	6.945* (4.083)			−0.549 (0.784)	5.690 (4.906)		
(%assets top three) ²		−0.0482* (0.0277)				−0.0427 (0.0331)		
%assets top five banks			2.249** (0.983)	7.085 (7.236)			1.534 (1.038)	10.14 (7.847)
(%assets top five) ²				−0.0312 (0.0462)				−0.0552 (0.0499)
Observations	531	531	437	437	352	352	302	302
R-squared	0.210	0.215	0.243	0.243	0.239	0.243	0.271	0.275
Number of countries	81	81	70	70	51	51	47	47

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Country and year fixed effects included. Bank concentration ratios lagged one period. Annual data, 2004–2013. Measure of financial access is per 1000 adults.

ple size. Thus, a fixed effects estimation could be very costly in terms of degrees of freedom. Fortunately, Hausman tests indicate that a random effects specification is appropriate at the 5% significance level for this smaller data set. Even so, the sample sizes for the deposit account estimations similar to those in Table 3 are too small to generate consistent statistically significant results for either the financial depth measure or these additional measures of industry structure and competitiveness; we do not have much confidence in these results and do not report them in detail.

We do have slightly larger sample sizes for estimations using borrowing-based measures of financial inclusion. Table 5 reports the results when the alternative measures of industry structure are used to explain access to bank loans. Although none of them are significant in explaining Borrowers or Household Borrowers, there is some evidence that more restrictions on banking activities is associated with less access to Loan Accounts and Household Loan Accounts. Furthermore, the

coefficients on entry applications denied suggests that a less competitive banking industry that results from greater barriers to entry also is associated with fewer Loan Accounts and Household Loan Accounts. That result is also supported by the coefficient on the Lerner index in the estimation of Household Loan Accounts which suggests too that lower levels of competition (higher Lerner) is associated with fewer Household Loan Accounts.

In total, these results provide some insight into possible reasons for the positive correlations between industry concentration and financial inclusion that appear in Tables 3 and 4. Specifically, the fact that greater bank scope is associated with greater financial inclusion suggests that the economies of scale associated with larger banks that could facilitate portfolio diversification may benefit greater financial access. However, that benefit only accrues when the banking sector retains some competitiveness.

To investigate that interpretation further, we test it directly by supplementing the estimations in Table 3 with the Lerner index

Table 5
Access to commercial bank loans and regulation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Borrowers		Household Borrowers			Loan Accounts			Household Loan Accounts			
LN (Private Credit/GDP)	77.10*** (25.85)	47.49* (26.71)	58.72*** (11.31)	80.71*** (23.15)	49.31* (25.68)	146.6*** (16.06)	113.4*** (30.75)	87.27** (42.22)	187.2*** (31.67)	102.3*** (33.11)	120.8** (59.85)	261.2*** (40.12)
LN (GDP/capita)	69.46*** (16.30)	85.49*** (16.74)	88.11*** (12.23)	43.63*** (15.06)	69.64*** (18.41)	32.39** (14.89)	93.88*** (21.74)	128.4*** (23.34)	84.06*** (22.66)	81.85*** (23.11)	83.01*** (31.78)	41.06 (28.89)
Restrictions on Banking Activities	2.335 (4.491)			−1.500 (5.611)			−15.62* (8.393)			−23.95** (9.725)		
Fraction Entry Applications Denied		25.71 (30.60)			20.61 (34.21)			−119.9* (71.52)			−222.9** (106.0)	
Lerner Index			8.200 (24.32)			−18.50 (32.61)			−65.37 (85.29)			−185.1* (102.8)
Observations	96	69	512	51	39	245	94	63	440	67	44	282
Number of countries	65	54	70	38	30	38	64	52	65	44	36	40

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Country and year random effects included.

and its interaction with industry concentration.¹² Although both industry concentration and the Lerner index are measures of industry structure, they do measure different aspects of bank competition. Specifically, having high industry concentration does not necessarily mean that the banking market is not competitive. It is possible for a market with only a few large banks to be competitive. In that case, market contestability may measure a different aspect of competition that could be relevant in determining a bank's willingness to provide services broadly to the household sector. When the Lerner index is high and prices are significantly above marginal cost, the incentive to provide service to new markets is less. So, we would expect that while the presence of large banks may be associated with economies of scale that would increase the provision of financial services to households, lower levels of market contestability would decrease those incentives.

If our reasoning above is correct, the interaction term between the Lerner index and industry concentration should be negative: when the banking industry is not competitive (higher Lerner index), greater industry concentration has a negative impact on financial access. Focusing again on the estimations for Household Deposit Accounts (column 5 of Table 6), the estimated coefficients suggest that greater industry concentration negatively impacts financial inclusion when the Lerner index is greater than .41. A value of .41 for the Lerner index is the 90th percentile for the estimation sample. Conversely, the results also suggest that decreases in competitiveness (increases in the Lerner index) are associated with lower rates of financial inclusion when the three bank asset concentration ratio exceeds 71%, or about the median for the estimation sample.

These results are broadly consistent with the idea that larger banks with greater scope can aid financial inclusion, provided that the banking industry retains some level of competitiveness. Although we cannot test this directly, it suggests the sensible

result that economies of scale are beneficial, up to the point at which they are associated with a severe lack of competition. Interestingly, there is not a strong association between the Lerner index and industry concentration. In the sample used to estimate the results discussed above (column 5 of Table 6), there are 26 observations with a Lerner index above .41. The three bank asset concentration ratio associated with those observations has an average of 74%, but a range of 37–100. These numbers are only slightly larger than those for the remaining observations with a Lerner index below .41 (average of 70 with a range of 20–100).

For a subset of developing countries in our sample, the IMF's Financial Access Survey also provides the number of mobile money accounts per 1000 adults. These are accounts with resident mobile money service providers and are primarily accessed by mobile phones. Interestingly, when we use this as our measure of financial inclusion in this smaller sample, we find that financial depth is negatively related to increased use of mobile money accounts, suggesting that this type of financial access may be filling a gap in a less financially developed economy. Furthermore, bank concentration is negatively related to mobile money accounts, consistent with this type of financial service being a substitute for commercial bank accounts. While the small sample size prohibits us from drawing strong conclusions from this result, it does give a more complete picture of financial access. Our results suggest that bigger banks may be consistent with greater access to *bank* services, but in the absence of a well-developed financial sector, individuals seek access to financial services offered by non-banks.¹³

5. Robustness checks

We next conduct a number of robustness checks. In this section we describe estimations that allow us to determine that our

¹² We also examined the results in Table 2 in a similar way. As before, there were only a few significant coefficients on the main variables of interest. Those that were significant were consistent with the interpretation we provide for Table 5.

¹³ Ouma et al. (2017) finds for selected countries in sub Saharan Africa that the availability and usage of mobile phones to provide financial services not only increases the likelihood of saving at the household level but also has a positive impact on the amounts saved.

Table 6
Concentration, competition and deposits.

	(1)	(2)	(3)	(4)	(5)	(6)
	Depositors		Household Depositors		Household Deposit Accounts	
LN(M3/GDP)	88.27** (40.03)	90.15** (43.02)	217.9** (83.81)	223.7** (98.43)	431.0*** (129.1)	443.5*** (133.0)
LN(GDP/capita)	351.3*** (77.93)	374.5*** (87.72)	469.7*** (140.7)	484.7*** (165.9)	1076*** (241.8)	1220*** (261.5)
% assets top three banks	6.703*** (0.996)		10.36*** (1.649)		12.75*** (2.394)	
% assets top three banks*lerner	−9.947*** (2.969)		−22.85*** (5.208)		−31.28*** (7.249)	
lerner	695.7** (223.2)	779.5** (346.6)	1956*** (430.1)	1236** (574.2)	2233** (570.2)	1599** (729.4)
%assets top five banks		9.488*** (1.187)		10.95*** (1.764)		13.85*** (2.603)
%assets top five banks*lerner		−9.990** (4.073)		−14.08** (6.858)		−22.75** (8.883)
Observations	436	374	217	182	264	244
R-squared	0.389	0.463	0.409	0.482	0.443	0.468
Number of countries	61	58	31	31	34	33

Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Country and year fixed effects included.

results are robust to (1) changes in the sample, (2) considering the possibility of measurement error in the concentration and competition measures, (3) using an alternative data source for industry concentration data, (4) examining differences in financial inclusion and competition rather than levels, (5) including a lagged dependent variable, and (6) instrumental variables estimation.

We start by exploring how changes in the sample would affect our results and remove countries from the estimation sample that are considered off-shore financial centers (OFCs). OFCs are jurisdictions that oversee a disproportionate level of financial activity by non-residents. Given that our access to finance measures include both residents and non-residents of the reporting country, distortions in these measures can be severe for OFCs. In order to classify a country as an OFC in our sample, we use two different classifications. One classification is from the Federal Financial Institutions Examination Council (FFIEC) and a second classification is from [Rose and Spiegel \(2007\)](#). [Rose and Spiegel \(2007\)](#) produces a larger set of OFCs; the countries classified by the FFIEC as OFCs are a subset of the Rose and Spiegel countries.¹⁴ We also develop a third sample for robustness checks that removes OECD countries because the depth of their financial systems may also cause these countries to skew the results. In total, we construct three samples for our sensitivity analysis, (1) exclude OFCs using the FFIEC definition only, (2) exclude OFCs as defined in [Rose and Spiegel \(2007\)](#), and (3) remove OECD countries from the sample. For-

tunately, our original estimation sample did not contain many observations from countries considered to be OFCs and removing them from the sample does not materially change our results. Similarly, removing OECD countries from the sample also generates similar results to those reported in [Tables 3 and 4](#), with more banking system concentration exerting a positive effect on access to finance as long as the market remains competitive.

We also investigate whether estimating the measures of concentration and competition with error affects our results. We do this by using the rank order of the concentration and competition measures rather than the variables themselves as independent variables. Results replicating [Tables 3 and 4](#) using rank values are reported in [Appendix Tables A1 and A2](#) (lowest value is given a rank of 1). Neither using the rank order of asset concentration ratios and that of the Lerner index alter our initial findings. Results are actually strengthened in the case of borrowing measures of access to finance. Results for the interaction of the Lerner index and asset concentration ratios are also robust to using ranks of both measures.

As a subsequent robustness test, we investigate whether our specific measures of banking system concentration affect the results. So far, we have used the share of assets of either the top three banks or the top five banks from the World Bank's Global Financial Development Indicators dataset constructed from Bankscope data. Alternative measures of industry concentration for a smaller sample of countries is available from the [Barth et al. \(2001\)](#) data. This data is based on regulators' responses to a survey and contains a measure of industry concentration based on assets as well as one based on deposits.¹⁵ This too confirms our initial results that concentration and com-

¹⁴ [Rose and Spiegel \(2007\)](#) build their list of OFCs based on three sources (which have significant overlap), (i) the "Report of the Working Group on Off-shore Centres of the Financial Stability Forum, (ii) Countries and Territories with Offshore Financial Centers from [Errico and Musalem \(1999\)](#) and (iii) the "International and Offshore Financial Centers" from IMF (2004) (Available at <http://www.imf.org/external/np/mfd/2004/eng/031204.pdf>). Authors impose further that the OFC hosts at least \$10 million in total assets.

¹⁵ In the 2011 survey, regulators in each of the reporting countries were asked: "Of commercial banks in your country, what percent of total deposits (assets) was held by the five largest banks at the end of 2008, 2009 and 2010?"

Table 7
GMM dynamic panel estimation.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Depositors		Household Depositors				Household Deposit Accounts					
Lagged Depositors	0.443*** (0.137)	0.318** (0.126)	0.407*** (0.150)	0.585*** (0.136)								
Lagged Household Depositors					0.905*** (0.110)	0.951*** (0.0961)	0.818*** (0.119)	0.862*** (0.0990)				
Lagged Household Deposit Accounts									0.332*** (0.0852)	0.370*** (0.0777)	0.368*** (0.0857)	0.380*** (0.0788)
LN (M3/GDP)	31.98 (42.69)	30.49 (38.92)	104.9** (44.91)	56.92 (40.95)	−58.69 (85.31)	−54.34 (74.39)	−3.044 (95.78)	−16.94 (79.39)	94.77 (113.9)	94.06 (103.6)	168.7 (149.7)	119.8 (137.9)
LN (GDP/capita)	−30.08 (76.26)	5.453 (69.58)	84.42 (78.39)	29.14 (71.31)	−204.6 (125.4)	−171.0 (109.4)	−118.0 (135.4)	−89.41 (111.8)	726.1*** (269.4)	571.2** (246.1)	1013*** (295.3)	875.1*** (272.4)
%assets top three banks	5.553*** (0.566)	37.13*** (2.561)			5.653*** (0.965)	36.80*** (4.208)			8.442*** (1.400)	51.35*** (5.933)		
(%assets top three) ¹		−0.224*** (0.0178)				−0.224*** (0.0296)				−0.324*** (0.0438)		
%assets top five banks			8.834*** (0.714)	58.81*** (4.382)			8.379*** (1.153)	69.09*** (8.058)			10.76*** (1.496)	74.44*** (9.897)
(%assets top five) ²				−0.340*** (0.0295)				−0.415*** (0.0547)				−0.434*** (0.0668)
Observations	373	373	288	288	177	177	136	136	229	229	191	191
Number of countries	64	64	56	56	28	28	26	26	36	36	33	33

Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. Bank concentration ratios lagged one period. Annual data, 2004–2013. Measure of financial access is per 1000 adults

Table 8
GMM dynamic panel estimation using twice lagged bank concentration and polity as instruments.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Depositors				Household depositors				Household deposit accounts			
Lagged Depositors	0.456** (0.210)	0.702*** (0.0795)	0.513*** (0.191)	0.741*** (0.0543)								
Lagged Household Depositors					0.707*** (0.102)	0.758*** (0.115)	0.744*** (0.137)	0.754*** (0.0994)				
Lagged Household Deposit Accounts									0.767*** (0.0594)	0.758*** (0.0609)	0.740*** (0.0525)	0.733*** (0.0478)
LN (M3/GDP)	203.4*** (66.24)	76.28 (60.39)	60.59 (117.5)	−15.23 (115.0)	56.94 (94.44)	−14.81 (77.95)	−104.7 (127.1)	−20.67 (97.82)	183.3 (159.0)	145.1 (141.9)	50.56 (217.2)	89.22 (228.7)
LN (GDP/capita)	484.5* (259.5)	346.3*** (133.6)	309.9 (201.6)	328.2*** (116.1)	529.0** (265.0)	510.1** (202.2)	316.7* (183.3)	432.7** (171.6)	475.6 (447.9)	228.6 (349.1)	400.3 (396.6)	−50.64 (224.3)
% assets top three banks	11.25** (5.102)	38.49*** (13.49)			11.40* (5.844)	40.84*** (15.15)			11.33 (7.977)	40.88* (22.30)		
(%assets top three) ²		−0.224*** (0.0816)				−0.235** (0.0967)				−0.242* (0.132)		
% assets top five banks			10.42* (5.520)	59.67*** (19.78)			9.877* (5.642)	83.88*** (22.44)			10.08 (6.799)	79.28** (36.90)
(%assets top five) ²				−0.349*** (0.123)				−0.519*** (0.144)				−0.473** (0.232)
Observations	161	161	134	134	76	76	70	70	96	96	81	81
Number of countries	27	27	24	24	13	13	13	13	16	16	15	15

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Bank concentration ratios lagged one period. Annual data, 2004–2013. Measure of financial access is per 1000 adults.

petition in the banking system matter for improved access to all forms of financial services (see [Appendix Table A3](#)).

Although omitted variables should not be a major concern given our model specification, as an additional robustness check we estimate a variation of the specifications reported in [Table 6](#) that uses the first difference of financial inclusion and the first difference of asset concentration. We interact the difference of asset concentration with the level of market power as measured by the Lerner index on the idea that the difference in concentration should matter more when banks have more market power (i.e., a difference-in-difference approach.) The results are reported in [Appendix Table A4](#). Once again, these results generally confirm that bank size has a positive effect on access to finance as long as banks do not have too much market power.¹⁶

As an additional robustness test, we also allowed for the possibility that a lagged dependent variable has explanatory power. We estimate a dynamic panel data model using GMM estimation as recommended by [Arellano and Bond \(1991\)](#). The results of this estimation for access to deposit accounts are reported in [Table 7](#). As might be expected, the lagged dependent variable features a positive and statistically significant coefficient. In all specifications, the coefficients on bank concentration are positive and statistically significant and the coefficients on the square of bank concentration retain their negative and statistically significant signs. Therefore, the results for deposits are robust to this alternative specification, in spite of the fact that its use reduces our sample size. Results for access to loans are not robust to this alternative specification and we do not report them in detail here.

In our final robustness check, we consider the potential for endogeneity. We note that if financial inclusion causes bank concentration, the bias is likely to reduce the size of our positive coefficients because the most logical argument would have financial inclusion causing lower bank concentration. Nonetheless, we still attempt to determine if our conclusions would be affected by endogeneity. To do this, we use the extent of democracy in the country as measured by the POLITY variable in the POLITY IV data base maintained by the Center for Systemic Peace. POLITY is an index of democracy, with higher values indicating that a country is more democratic. We use it on the

idea that more democratic societies should have lower levels of bank concentration and, indeed, we confirm there is a negative and statistically significant correlation between POLITY and the measures of bank concentration we employ. In [Table 8](#), we present the results of modifying the GMM results in [Table 7](#) by considering bank concentration as endogenous and using the POLITY variable as an instrument for bank concentration. Specifically, bank concentration and bank concentration squared are instrumented for with POLITY as well as their twice-lagged values. Our sample size is considerably reduced by this procedure so we present this only as supplementary to our main results. However, in spite of the further reduction in sample, the results in [Table 8](#) confirm our earlier conclusions.

6. Conclusion

Using a large cross-section of countries, our study offers new evidence on the relationship between the structure of the banking industry and financial inclusion for individuals. We find that greater banking industry concentration is associated with more access to deposit accounts and loans, provided that the market power of banks is limited. We find somewhat weaker evidence that countries in which regulations allow banks to engage in a broader scope of activities are also characterized by greater financial inclusion. These relationships control for the effects of overall economic and financial sector development, do not depend on the particular measure of access to finance used, and are robust to a number of sensitivity tests. Thus, our results indicate that big banks are consistent with broad financial inclusion as long as the market remains contestable. Although we do not provide a direct test of the mechanism, these results are consistent with theories that emphasize the importance of portfolio diversification facilitated by economies of scale and scope.

Of course, there may be other reasons to limit the concentration in the banking industry and keep banks smaller, such as the potential threat to financial stability that very large banks may pose. However, our work suggests that a tradeoff in reducing concentration in the banking industry may be a reduction in economies of scale that help to increase financial inclusion.

¹⁶ We also attempted some additional specifications, but data availability dramatically reduced the sample size and we were unable to obtain statistically significant results. Specifically, we used market capitalization as an alternative measure of financial development and also attempted to include access to finance by firms and the percent of assets in government-owned banks as additional independent variables. Firm access to finance could affect financial inclusion via a trickle-down effect that boosts the demand for labor and reduces poverty. (Gine and Townsend, 2004; , 2007a,b) Additionally, a large presence of state-owned banks may also be indicative of a non-competitive banking sector. ([Barth et al., 2004](#); [Berger et al., 2004](#)). Unfortunately, these efforts resulted in very few observations (between 20 and 80) and we were unable to obtain statistically significant coefficients for many of the variables.

Appendix. Variable definitions

Variable	Variable definition	Source
Borrowers at commercial banks per 1000 adults	Total number of resident customers that are nonfinancial corporations (public and private) and households who obtained loans from commercial banks for every 1000 adults in the reporting country.	Financial Access Survey, IMF
Household Borrowers at commercial banks per 1000 adults	Total number of households who obtained loans from commercial banks for every 1000 adults in the reporting country.	Financial Access Survey, IMF
Depositors with commercial banks per 1000 adults	Total number of Deposit Account holders that are resident nonfinancial corporations (public and private) and households in commercial banks for every 1000 adults in the reporting country.	Financial Access Survey, IMF
Household Depositors with commercial banks per 1000 adults	Total number of Household Deposit Account holders with commercial banks for every 1000 adults in the reporting country.	Financial Access Survey, IMF
Deposit Accounts with commercial banks per 1000 adults	Total number of Deposit Accounts that are held by resident nonfinancial corporations (public and private) and households in commercial banks for every 1000 adults in the reporting country	Financial Access Survey, IMF
Household Deposit Accounts with commercial banks per 1000 adults	Total number of Deposit Accounts held by households in commercial banks for every 1000 adults in the reporting country	Financial Access Survey, IMF
Loan Accounts with commercial banks per 1000 Adults	Total number of Loan Accounts that are obtained by resident nonfinancial corporations (public and private) and households from commercial banks for every 1000 adults in the reporting country.	Financial Access Survey, IMF
Household Loan Accounts with commercial banks per 1000 Adults	Total number of Household Loan Accounts with commercial banks for every 1000 adults	Financial Access Survey, IMF
3-Bank asset concentration	Assets of three largest banks as a share of total commercial banking assets. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax, discontinued operations and other assets.	Global Financial Development Database (based on Bankscope, Bureau van Dijk (BvD))
5-Bank asset concentration	Assets of five largest banks as a share of total commercial banking assets. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax, discontinued operations and other assets.	Global Financial Development Database (based on Bankscope, Bureau van Dijk (BvD))
GDP per Capita	GDP per Capita in constant 2005 US\$	World Development Indicators, World Bank
Private credit	The claims on private sector by deposit money banks and other financial institutions as a share of GDP	World Development Indicators, World Bank
M3 — Liquid liabilities in millions USD (2010 constant)	Absolute value of liquid liabilities in 2010 US million dollars. They are the sum of currency and deposits in the central bank (M0), plus transferable deposits and electronic currency (M1), plus time and savings deposits, foreign currency transferable deposits, certificates of deposit, and securities repurchase agreements (M2), plus travelers checks, foreign currency time deposits, commercial paper, and shares of mutual funds or market funds held by residents.	International Financial Statistics (IFS) — IMF
Lerner index	A measure of market power in the banking market. It compares output pricing and marginal costs (that is, markup). An increase in the Lerner index indicates a deterioration of the competitive conduct of financial intermediaries.	Global Financial Development Database (based on Bankscope, Bureau van Dijk (BvD))
Fraction of entry applications denied	The degree to which applications to enter banking system are denied.	Financial Regulation Database, Barth et al. (2001)
Restrictions on banking activities	Includes, (i) the extent to which banks may engage in underwriting, brokering and dealing in securities, and all aspects of the mutual fund industry, (ii) the extent to which banks may engage in insurance underwriting and selling, and (iii) the extent to which banks may engage in real estate investment, development and management.	Financial Regulation Database, Barth et al. (2001)

Table A1

Using rank order of concentration ratio, deposits.

	(1)	(2)	(3)	(4)
	Depositors			
LN (M3/GDP)	100.3*** (36.33)	109.8*** (35.17)	137.9*** (38.68)	112.2*** (39.03)
LN (GDP/capita)	262.2*** (64.01)	259.5*** (61.90)	253.3*** (68.50)	243.5*** (67.66)
Rank of % assets top three banks	0.0703*** (0.0164)	0.380*** (0.0581)		
(Rank of %assets top three) ²		−0.000113*** (2.03e-05)		
Rank of %assets top five banks			0.132*** (0.0225)	0.372*** (0.0794)
(Rank of %assets top five) ²				−0.000109*** (3.47e-05)
Observations	513	513	408	408
R-squared	0.314	0.360	0.382	0.400
Number of countries	73	73	64	64

	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Household Depositors				Household Deposit Accounts			
LN(M3/GDP)	225.5*** (60.21)	221.6*** (57.76)	246.1*** (67.36)	202.6*** (68.40)	241.3** (97.48)	251.5*** (94.70)	473.4*** (125.6)	395.0*** (128.1)
LN(GDP/capita)	328.7*** (97.26)	319.3*** (93.32)	306.6*** (106.5)	327.4*** (105.0)	945.5*** (226.4)	1024*** (220.7)	1106*** (267.7)	1127*** (264.5)
Rank of % assets top three banks	0.0515** (0.0253)	0.420*** (0.0891)			0.0192 (0.0416)	0.512*** (0.132)		
(Rank of %assets top three) ²		−0.000136*** (3.17e-05)				−0.000189*** (4.80e-05)		
Rank of %assets top five banks			0.159*** (0.0358)	0.493*** (0.136)			0.166*** (0.0487)	0.618*** (0.190)
(Rank of %assets top five) ²				−0.000162** (6.37e-05)				−0.000224** (9.13e-05)
Observations	254	254	207	207	295	295	248	248
R-squared	0.297	0.357	0.381	0.405	0.354	0.393	0.401	0.418
Number of countries	41	41	37	37	43	43	37	37

Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. Country and year fixed effects. Similar to specifications reported in Table 3 except rank of industry concentration used, with lowest concentration given rank of 1.

Table A2

Using rank order of concentration ratio, loans.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Borrowers				Household Borrowers			
LN (Private Credit/GDP)	49.80*** (10.24)	52.14*** (10.24)	79.83*** (11.63)	79.09*** (11.70)	126.7*** (14.44)	128.7*** (14.45)	144.0*** (17.39)	138.2*** (17.14)
LN (GDP/capita)	139.5*** (29.04)	138.7*** (28.91)	161.8*** (30.40)	163.0*** (30.47)	90.00*** (33.55)	91.24*** (33.46)	88.11** (36.65)	107.8*** (36.48)
Rank of % assets top three banks	0.00964 (0.00640)	0.0649*** (0.0248)			−0.0119 (0.00830)	0.0426 (0.0363)		
(Rank of %assets top three) ²		−2.03e-05** (8.82e-06)				−1.97e-05 (1.28e-05)		
Rank of %assets top five banks			0.0272*** (0.00783)	0.0481 (0.0324)			0.0196 (0.0119)	0.175*** (0.0523)
(Rank of %assets top five) ²				−9.26e-06 (1.39e-05)				−7.14e-05*** (2.34e-05)
Observations	594	594	500	500	292	292	255	255
R-squared	0.368	0.375	0.430	0.431	0.559	0.564	0.598	0.617
Number of cnum	83	83	73	73	48	48	44	44

Table A2 (Continued)

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Loan Accounts				Household Loan Accounts			
LN (Private Credit/GDP)	198.7*** (36.20)	199.4*** (36.04)	237.4*** (43.31)	229.8*** (43.09)	239.1*** (41.26)	237.9*** (41.22)	268.9*** (48.18)	262.3*** (48.35)
LN (GDP/capita)	285.4*** (74.37)	294.6*** (74.15)	290.4*** (87.99)	312.7*** (87.79)	264.7*** (79.34)	261.2*** (79.28)	244.5*** (88.48)	238.7*** (88.44)
Rank of % assets top three banks	−0.00283 (0.0196)	0.135** (0.0655)			−0.0181 (0.0214)	0.0846 (0.0797)		
(Rank of %assets top three) ²		−5.15e-05** (2.33e-05)				−3.85e-05 (2.88e-05)		
Rank of %assets top five banks			0.0481* (0.0257)	0.293*** (0.102)			0.0290 (0.0263)	0.169 (0.107)
(Rank of %assets top five) ²				−0.000116** (4.64e-05)				−6.56e-05 (4.86e-05)
Observations	521	521	427	427	352	352	302	302
R-squared	0.202	0.211	0.232	0.245	0.239	0.244	0.268	0.274
Number of cnum	80	80	69	69	51	51	47	47

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country and year fixed effects. Similar to specifications reported in Table 4 except rank of industry concentration used, with lowest concentration given rank of 1.

Table A3

Bank Concentration and Bank Loans, alternative data source.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Borrowers				Household Borrowers			
LN (Private Credit/GDP)	49.72* (27.01)	39.90 (27.39)	56.99** (27.04)	40.53 (29.09)	83.43*** (31.30)	68.43** (31.97)	92.01*** (31.01)	71.23** (34.95)
LN (GDP/capita)	82.12*** (17.43)	85.95*** (17.52)	78.04*** (17.40)	84.26*** (17.85)	51.30*** (18.08)	52.96*** (17.82)	46.19*** (17.79)	51.38*** (18.12)
%assets top five banks	0.898* (0.512)	3.474* (1.935)			1.101* (0.610)	3.903* (2.199)		
(%assets top five) ²		−0.0228 (0.0166)				−0.0288 (0.0213)		
%deposits top five banks			0.932* (0.480)	2.951* (1.566)			0.849* (0.493)	2.747 (1.672)
(%deposits top five) ²				−0.0192 (0.0142)				−0.0190 (0.0160)
Observations	92	92	93	93	47	47	48	48
Number of countries	61	61	61	61	34	34	34	34
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Loan Accounts				Household Loan Accounts			
LN (Private Credit/GDP)	110.3** (46.78)	71.41 (45.24)	112.0** (45.64)	68.59 (44.86)	111.8** (55.04)	71.58 (53.39)	111.5** (54.82)	71.68 (54.67)
LN (GDP/capita)	112.0*** (27.12)	124.1*** (26.13)	112.6*** (26.67)	126.9*** (25.79)	102.0*** (29.93)	115.0*** (28.84)	103.8*** (29.86)	116.4*** (29.13)
%assets top five banks	1.560 (1.085)	17.70*** (4.169)			2.870** (1.163)	16.23*** (4.377)		
(%assets top five) ²		−0.126*** (0.0325)				−0.112*** (0.0361)		
%deposits top five banks			2.213** (0.989)	14.07*** (3.349)			2.972*** (1.084)	11.83*** (3.607)
(%deposits top five) ²				−0.0972*** (0.0269)				−0.0774** (0.0305)
Observations	88	88	90	90	62	62	62	62
Number of countries	58	58	58	58	40	40	40	40

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Country and year random effects included. Replicates estimations in Table 4 but uses estimates of bank concentration from survey of bank regulators (from Barth et al.). Results in smaller sample, especially for deposits (not shown).

Table A4

Difference in Deposit Accounts and difference in concentration.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Difference in depositors		Difference in Household Depositors		Difference in Household Deposit Accounts	
LN (M3/GDP)	−5.944 (8.711)	−11.97 (8.886)	−0.000301 (15.59)	−27.83 (18.96)	−52.95*** (17.37)	−62.46*** (18.98)
LN (GDP/capita)	0.945 (3.481)	2.217 (3.810)	9.758* (5.249)	10.75 (7.509)	14.93* (7.988)	11.88 (9.349)
D.% assets top three banks	11.84*** (0.977)		21.28*** (1.322)		24.63*** (2.191)	
D.% assets top three banks*lerner	−30.68*** (3.457)		−53.68*** (4.225)		−61.85*** (7.049)	
Lerner	25.08 (29.13)	9.479 (29.96)	7.653 (60.86)	−106.2 (80.00)	−85.26 (78.82)	−132.5 (89.94)
D.% assets top five banks		16.64*** (1.122)		21.54*** (1.641)		23.16*** (2.412)
D.% assets top five banks*lerner		−53.00*** (5.489)		−79.29*** (9.795)		−74.59*** (13.20)
Observations	374	310	180	142	231	210
R-squared	0.322	0.461	0.629	0.624	0.402	0.379

Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. Includes year, but not country specific fixed effects

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