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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.

Introduction

Greater financial development has been linked to economic development 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 (e.g. Beck, Demirguc-Kunt, and Levine (2007)). 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 and Degryse (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)). 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 developed and developing countries, our study is the first one to explore the relationship between the structure of the banking industry and households' financial inclusion. , Because measuring competition in the banking sector is challenging, we rely on a wide array of bank competition indicators that proxy for market contestability and market power and relate

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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 percent to 47 percent.

these competition indicators to several different measures of access to finance by 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 (as measured by pricing over marginal cost) is limited.[2] 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. Thus, our results indicate that big banks are consistent with broad financial inclusion as long as the market remains contestable.

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.[3] 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. Until recently however, due to the lack of 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.. Little is still known about the determinants of the breadth of financial systems across countries.

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

[3] 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. (2006b), 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.

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 1,000 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. (2007) 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. These are all natural avenues for future research, however, our current focus on commercial banks has the advantage of providing specific policy implications.

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 (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 a more comprehensive array of indicators, namely, 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 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. 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. 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.

This paper makes several contributions to the literature. First and foremost, it 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 socioeconomic 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 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. Our results are robust under a variety of tests 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 discusses the data and presents the econometric methodology. We provide the main results in Section 3 and present robustness tests in Section 4. Section 5 concludes.

2 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 to 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 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,

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

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. In additional estimations, we also seek evidence of a non-linear relationship between CONCENTRATION and INCLUSION by including the square of CONCENTRATION.

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. 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. Similarly, 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, Caprio, and Levine (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 1,000 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 1,000 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 1,000.

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.[4] (See Table 1)

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 1,000 adults is 173, but the standard deviation is almost equally as large. Similarly, the banking industry is fairly concentrated with 82 percent 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. In the next section, we explore how the variation in banking industry characteristics are related to the variation in financial inclusion.

3 Results

Tables 3 and 4 report the results of estimation of Equation 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).

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[4] Beck et al. (2007) use similar data.

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.[5] 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 percent, 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.

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[5] 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 R^2).

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 measure 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. [6]

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 banking 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

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

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 sample 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 percent 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 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 and its interaction with industry concentration.[7] 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 percent, or about the median for the estimation sample.

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[7] 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.

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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 percent, but a range of 37 to 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 to 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 1,000 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.

4 Robustness Checks

We next conduct a number of robustness checks. In this section we describe estimations that allow us to determine that our 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, and 4) examining differences in financial inclusion and competition rather than levels.

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.[8] 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. Fortunately, our original estimation sample did not contain many observations from countries considered to be OFCs and removing them from the sample does not materially

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[8] 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 Offshore 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). Authors impose further that the OFC hosts at least $10 million in total assets.

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 1 and 2 (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.[9] This too confirms our initial results that concentration and competition in the banking system matter for improved access to all forms of financial services. (See Appendix Table 3.)

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

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[9] 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?

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 4. 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.[10]

5 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.

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[10] 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), Beck, Levine, and Levkov (2007)) Additionally, a large presence of state-owned banks may also be indicative of a non-competitive banking sector. (Barth et al (2004), Berger, Hasan and Klapper (2004). Unfortunately, these efforts results in very few observations (between 20 and 80) and we were unable to obtain statistically significant coefficients for many of the variables. .

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.

An important caveat is that our findings do not give insight on all the channels through which increased concentration and competition may affect the role of the financial sector in fostering access to finance for individuals. In particular, we did not investigate across countries the relationship between direct measures of the cost of financial intermediation, such as net interest margins, and our measure of competition (although that does capture the degree to which banks pass input costs on to output costs). Although the fixed effects estimation controls for fixed country characteristics that affect financial inclusion in a very general way, we do not explore specifically all possible measures of countries' characteristics, including institutional aspects that may explain these findings. That is an avenue for future research. Nevertheless, our results shed some important insights on how concentration and competition in the banking sector can affect access to external financing.

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.

Table 2: Summary Statistics

	Mean	SD	Min	Max	#observations
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: Commerical 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***	101.3***	119.5***	94.18***	224.8***	237.7***	225.6***	236.5***	250.3***	270.2***	460.6***	430.3***
	(35.58)	(33.25)	(36.87)	(36.00)	(59.02)	(53.55)	(63.67)	(60.37)	(94.20)	(90.44)	(117.4)	(113.6)
LN(GDP/capita)	271.8***	266.0***	273.6***	264.0***	325.2***	351.8***	338.9***	402.3***	978.1***	987.2***	1171***	1105***
	(62.74)	(58.63)	(65.57)	(63.40)	(95.28)	(86.49)	(100.7)	(96.54)	(217.5)	(208.6)	(250.0)	(241.8)
% assets top three banks	3.613***	27.51***			3.152***	32.23***			2.208	33.45***		
	(0.593)	(3.059)			(0.893)	(4.437)			(1.389)	(6.640)		
(%assets top three)^2		-0.164***				-0.203***				-0.225***		
		(0.0206)				(0.0305)				(0.0469)		
%assets top five banks			6.645***	29.65***			7.470***	39.61***			7.747***	52.57***
			(0.803)	(4.712)			(1.166)	(7.451)			(1.600)	(11.11)
(%assets top five)^2				-0.154***				-0.221***				-0.300***
				(0.0312)				(0.0507)				(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 1,000 adults

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***	50.55***	78.24***	79.00***	126.1***	128.3***	146.3***	145.5***
	(10.25)	(10.26)	(11.59)	(11.63)	(14.45)	(14.48)	(17.10)	(17.08)
LN(GDP/capita)	139.6***	139.0***	164.1***	163.4***	88.85***	92.42***	96.39***	101.1***
	(29.02)	(29.03)	(30.49)	(30.51)	(33.58)	(33.57)	(36.57)	(36.67)
% assets top three banks	0.397	1.869			-0.355	2.557		
	(0.241)	(1.583)			(0.313)	(1.951)		
(%assets top three)^2		-0.00986				-0.0196		
		(0.0105)				(0.0130)		
%assets top five banks			1.103***	-0.743			1.202**	4.730*
			(0.326)	(2.358)			(0.473)	(2.699)
(%assets top five)^2				0.0117				-0.0230
				(0.0148)				(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

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 1,000 adults

Table 4 (cont.): Commercial Bank Concentration and Access to Loans

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Loan Accounts				Household Loan Accounts			
LN(Private Credit/GDP)	198.5***	201.8***	236.3***	236.0***	238.9***	240.4***	267.7***	266.9***
	(35.77)	(35.74)	(42.56)	(42.59)	(41.28)	(41.25)	(48.06)	(48.05)
LN(GDP/capita)	289.3***	294.3***	304.0***	306.3***	263.5***	260.7***	246.8***	248.4***
	(73.17)	(73.06)	(86.47)	(86.60)	(79.34)	(79.28)	(88.33)	(88.30)
% assets top three banks	-0.0516	6.945*			-0.549	5.690		
	(0.704)	(4.083)			(0.784)	(4.906)		
(%assets top three)^2		-0.0482*				-0.0427		
		(0.0277)				(0.0331)		
%assets top five banks			2.249**	7.085			1.534	10.14
			(0.983)	(7.236)			(1.038)	(7.847)
(%assets top five)^2				-0.0312				-0.0552
				(0.0462)				(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 1,000 adults

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***	47.49*	58.72***	80.71***	49.31*	146.6***	113.4***	87.27**	187.2***	102.3***	120.8**	261.2***
	(25.85)	(26.71)	(11.31)	(23.15)	(25.68)	(16.06)	(30.75)	(42.22)	(31.67)	(33.11)	(59.85)	(40.12)
LN(GDP/capita)	69.46***	85.49***	88.11***	43.63***	69.64***	32.39**	93.88***	128.4***	84.06***	81.85***	83.01***	41.06
	(16.30)	(16.74)	(12.23)	(15.06)	(18.41)	(14.89)	(21.74)	(23.34)	(22.66)	(23.11)	(31.78)	(28.89)
Restrictions on Banking Activities	2.335			-1.500			-15.62*			-23.95**		
	(4.491)			(5.611)			(8.393)			(9.725)		
Fraction Entry Applications Denied		25.71			20.61			-119.9*			-222.9**	
		(30.60)			(34.21)			(71.52)			(106.0)	
Lerner Index			8.200			-18.50			-65.37			-185.1*
			(24.32)			(32.61)			(85.29)			(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

Table 6: Concentration, Competition and Deposits

	(1)	(2)	(3)	(4)	(5)	(6)
			Household			
	Depositors		Depositors		Household Deposit Accounts	
LN(M3/GDP)	88.27**	90.15**	217.9**	223.7**	431.0***	443.5***
	(40.03)	(43.02)	(83.81)	(98.43)	(129.1)	(133.0)
LN(GDP/capita)	351.3***	374.5***	469.7***	484.7***	1076***	1220***
	(77.93)	(87.72)	(140.7)	(165.9)	(241.8)	(261.5)
% assets top three banks	6.703***		10.36***		12.75***	
	(0.996)		(1.649)		(2.394)	
% assets top three banks*lerner	-9.947***		-22.85***		-31.28***	
	(2.969)		(5.208)		(7.249)	
lerner	695.7***	779.5**	1956***	1236**	2233***	1599**
	(223.2)	(346.6)	(430.1)	(574.2)	(570.2)	(729.4)
%assets top five banks		9.488***		10.95***		13.85***
		(1.187)		(1.764)		(2.603)
%assets top five banks*lerner		-9.990**		-14.08**		-22.75**
		(4.073)		(6.858)		(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.

Appendix Table 1: Using Rank Order of Concentration Ratio, Deposits

	(1)	(2)	(3)	(4)
		Depositors		
LN(M3/GDP)	100.3***	109.8***	137.9***	112.2***
	(36.33)	(35.17)	(38.68)	(39.03)
LN(GDP/capita)	262.2***	259.5***	253.3***	243.5***
	(64.01)	(61.90)	(68.50)	(67.66)
Rank of % assets top three banks	0.0703***	0.380***		
	(0.0164)	(0.0581)		
(Rank of %assets top three)^2		-0.000113***		
		(2.03e-05)		
Rank of %assets top five banks			0.132***	0.372***
			(0.0225)	(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

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.

Appendix Table 1 (cont.): Using Rank Order of Concentration Ratio, Deposits

	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Household Depositors				Household Deposit Accounts			
LN(M3/GDP)	225.5***	221.6***	246.1***	202.6***	241.3**	251.5***	473.4***	395.0***
	(60.21)	(57.76)	(67.36)	(68.40)	(97.48)	(94.70)	(125.6)	(128.1)
LN(GDP/capita)	328.7***	319.3***	306.6***	327.4***	945.5***	1024***	1106***	1127***
	(97.26)	(93.32)	(106.5)	(105.0)	(226.4)	(220.7)	(267.7)	(264.5)
Rank of % assets top three banks	0.0515**	0.420***			0.0192	0.512***		
	(0.0253)	(0.0891)			(0.0416)	(0.132)		
(Rank of %assets top three)^2		-0.000136***				-0.000189***		
		(3.17e-05)				(4.80e-05)		
Rank of %assets top five banks			0.159***	0.493***			0.166***	0.618***
			(0.0358)	(0.136)			(0.0487)	(0.190)
(Rank of %assets top five)^2				-0.000162**				-0.000224**
				(6.37e-05)				(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.

Appendix Table 2: Using Rank Order of Concentration Ratio, loans

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			Borrowers			Household Borrowers		
LN(Private Credit/GDP)	49.80***	52.14***	79.83***	79.09***	126.7***	128.7***	144.0***	138.2***
	(10.24)	(10.24)	(11.63)	(11.70)	(14.44)	(14.45)	(17.39)	(17.14)
LN(GDP/capita)	139.5***	138.7***	161.8***	163.0***	90.00***	91.24***	88.11**	107.8***
	(29.04)	(28.91)	(30.40)	(30.47)	(33.55)	(33.46)	(36.65)	(36.48)
Rank of % assets top three banks	0.00964	0.0649***			-0.0119	0.0426		
	(0.00640)	(0.0248)			(0.00830)	(0.0363)		
(Rank of %assets top three)^2		-2.03e-05**				-1.97e-05		
		(8.82e-06)				(1.28e-05)		
Rank of %assets top five banks			0.0272***	0.0481			0.0196	0.175***
			(0.00783)	(0.0324)			(0.0119)	(0.0523)
(Rank of %assets top five)^2				-9.26e-06				-7.14e-05***
				(1.39e-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

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.

Appendix Table 2 (cont.): Using Rank Order of Concentration Ratio, loans

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Loan Accounts				Household Loan Accounts			
LN(Private Credit/GDP)	198.7***	199.4***	237.4***	229.8***	239.1***	237.9***	268.9***	262.3***
	(36.20)	(36.04)	(43.31)	(43.09)	(41.26)	(41.22)	(48.18)	(48.35)
LN(GDP/capita)	285.4***	294.6***	290.4***	312.7***	264.7***	261.2***	244.5***	238.7***
	(74.37)	(74.15)	(87.99)	(87.79)	(79.34)	(79.28)	(88.48)	(88.44)
Rank of % assets top three banks	-0.00283	0.135**			-0.0181	0.0846		
	(0.0196)	(0.0655)			(0.0214)	(0.0797)		
(Rank of %assets top three)^2		-5.15e-05**				-3.85e-05		
		(2.33e-05)				(2.88e-05)		
Rank of %assets top five banks			0.0481*	0.293***			0.0290	0.169
			(0.0257)	(0.102)			(0.0263)	(0.107)
(Rank of %assets top five)^2				-0.000116**				-6.56e-05
				(4.64e-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.

Appendix Table 3: 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*	39.90	56.99**	40.53	83.43***	68.43**	92.01***	71.23**
	(27.01)	(27.39)	(27.04)	(29.09)	(31.30)	(31.97)	(31.01)	(34.95)
LN(GDP/capita)	82.12***	85.95***	78.04***	84.26***	51.30***	52.96***	46.19***	51.38***
	(17.43)	(17.52)	(17.40)	(17.85)	(18.08)	(17.82)	(17.79)	(18.12)
%assets top five banks	0.898*	3.474*			1.101*	3.903*		
	(0.512)	(1.935)			(0.610)	(2.199)		
(%assets top five)^2		-0.0228				-0.0288		
		(0.0166)				(0.0213)		
%deposits top five banks			0.932*	2.951*			0.849*	2.747
			(0.480)	(1.566)			(0.493)	(1.672)
(%deposits top five)^2				-0.0192				-0.0190
				(0.0142)				(0.0160)
Observations	92	92	93	93	47	47	48	48
Number of countries	61	61	61	61	34	34	34	34

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).

Appendix Table 3 (cont.): Bank Concentration and Bank Loans, alternative data source

	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	Loan Accounts				Household Loan Accounts			
LN(Private Credit/GDP)	110.3**	71.41	112.0**	68.59	111.8**	71.58	111.5**	71.68
	(46.78)	(45.24)	(45.64)	(44.86)	(55.04)	(53.39)	(54.82)	(54.67)
LN(GDP/capita)	112.0***	124.1***	112.6***	126.9***	102.0***	115.0***	103.8***	116.4***
	(27.12)	(26.13)	(26.67)	(25.79)	(29.93)	(28.84)	(29.86)	(29.13)
%assets top five banks	1.560	17.70***			2.870**	16.23***		
	(1.085)	(4.169)			(1.163)	(4.377)		
(%assets top five)^2		-0.126***				-0.112***		
		(0.0325)				(0.0361)		
%deposits top five banks			2.213**	14.07***			2.972***	11.83***
			(0.989)	(3.349)			(1.084)	(3.607)
(%deposits top five)^2				-0.0972***				-0.0774**
				(0.0269)				(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).

Appendix Table 4: Difference in Deposit Accounts and Difference in Concentration

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