Bank Competition and the Price of Credit:

Evidence Using Mexican Loan-Level Data

Carlos Cañón
Edgar Cortés
Rodolfo Guerrero

Bank Competition and the Price of Credit:

Evidence Using Mexican Loan-Level Data

Carlos Cañón
Edgar Cortés
Rodolfo Guerrero

Banco de México

April 2020

Abstract[1]

This paper studies the relationship between competition measures at the bank level and the price of credit for non-financial firms in Mexico during 2009-2016. Two indicators of competition are constructed: the Lerner indicator and the Boone indicator. Evidence is provided that similar loans provided by banks with higher market power (Lerner indicator) are significantly more expensive: 11 percent higher than the mean interest rate. In addition, that price difference is concentrated in loans given out to microenterprises and small firms, and firms located in the central and southern regions of the country.

JEL classifications: G1, G21, L13
Keywords: Competition, Banks, Non-financial firms, Loan interest rate

1. Introduction

There has been a longstanding interest in understanding what explains variation in access to credit, and the price of credit, across countries (see, e.g. Clerides et al., 2015 and Delis et al., 2016). In particular, countries in Latin America have historically displayed low levels of access and high credit costs (see, e.g., Álvarez and Jara (2016) and Presbítero and Rabellotti, 2016). One plausible important determinant of these conditions is the underlying level of competition in a given country. On one hand, it may be the case that intermediaries require some market power to recover the cost of information acquisition in an environment of asymmetric information, so that limited competition is necessary to serve individuals and firms.[2] On the other hand, market power may allow intermediaries to price loans above all costs, including informational ones. Establishing whether highly competitive environments are associated with increased access to finance and lower costs of finance or the opposite remains an empirical question.

In this paper, measures of competition covering the 2005-2016 period are constructed. The analysis focuses on all the banks that offer commercial credit; however, some banks were eliminated from the sample because of data-related problems. All of the banks in the database are large or midsized. We estimate measures for the Lerner indicator and the Boone indicator. The Lerner indicator measures the difference between the price of a good or service and its marginal cost, which means the capacity of a business to establish a price above the marginal cost. The Boone indicator is based on the notion that more efficient companies tend to increase their market share of profits, and that this effect is stronger when competition is stronger in the market. The characteristic that make this analysis innovative, for the case of Mexico, is the use of the marginal cost in the estimation of the Lerner indicator and the Boone indicator, instead of the average cost, as used in previous exercises.

Next, the Lerner indicator is related to the interest rate paid on newly issued non-revolving loans obtained by non-financial firms from banks we consider, through loan-level regression specifications in which we strive to isolate the relationship between our measure of bank market power and our measure of the price of credit, by controlling for loan, firm, and bank characteristics. To this end, we create a dataset linking our competition measures to loan-level data from regulatory

---

[2] This is known as the information hypothesis (Petersen and Rajan, 1995).

reports that banks provide to regulators.[3] This analysis is confined to the period 2009-2016, due to data availability and data quality considerations.

Our preferred results, which control for firm*bank fixed effects, suggest that banks with higher market power, as measured by the Lerner indicator, are able to charge significantly higher interest rates on loans to private firms—11 percent higher than the mean interest rate—and that these higher rates are concentrated in loans to firms classified as microenterprises and small firms, and that such premia are higher in the central and southern region of the country.[4] The latter finding provides an insight into the plausible relationship between competition and the price of credit. Information asymmetries are likely to be more prevalent in the credit market for microenterprises and small firms. Thus, banks with higher market power may be better at screening loan applicants, so that they can charge higher interest rates on observationally equivalent loans provided by banks without such market power. At the same time, the credit market for medium and large firms might be competitive. Similarly, banks might demand a higher premium to serve firms located in the central and especially in the southern region, which has lagged behind other regions in recent years.

This paper relates to two strands of literature. The first focuses on characterizing competition in the banking sector. Extensive cross-country studies find that competition varies substantially across regions[5] and bank segments[6] and is related to foreign bank ownership.[7] Regional level studies discuss the presence of monopolistic competition regimes.[8] Our paper contributes to this literature by implementing recently developed methods to measure competition

---

[3] We use data from Regulatory report R04-C, reported by banks to Mexico's Banking and Securities Commission, "Comisión Nacional Bancaria y de Valores" or CNBV for its acronym in Spanish.

[4] Results are similar if we consider financial firms and government entities. These are available from the authors upon request.

[5] Clerides et al. (2015) find that, while competition is low in Sub-Saharan and low-income countries, it is high in Europe, Central and South Asia, and in OECD countries. In addition, they document that overall levels of competition have fluctuated during the last twenty years, and that since 2008 these have deteriorated.

[6] See, e.g., van Leuvensteijn et al. (2010) who show that this is the case even in the five largest EUR countries, Japan, the United Kingdom and the United States.

[7] Using a large cross-country sample, Delis et al. (2016) suggest that foreign banks do not determine individual banks' market power, but they do have a positive and significant impact on country-level market power metrics. Individual country level analyses could exemplify counter arguments. For example, Mulyaningsih et at. (2015), using Indonesian data, argue that foreign banks behave more competitively than local banks.

[8] There is some evidence of the existence of the latter in selected countries from the Middle East and North Africa; see Polemis (2015) for a broader set of only African countries, as well as Banya and Biekpe (2017). For a larger set of emerging economies, see Apergis (2015). For countries in the European Monetary Union, competition is attenuated by interest-charging lending businesses; see Gischer and Muller (2015).

in a large emerging economy, Mexico. We provide updated estimates of the Lerner indicator[9] and the first estimates of the Boone indicator based on marginal costs.

The second strand of literature related to our paper seeks to study the effect of competition on firms' access to credit, on their credit conditions, and on the efficiency of the credit allocation process.[10] Conflicting results from this literature may stem from using different measures of competition and different approaches to measuring the cost of credit and access to credit. Most papers rely on country-level measures of competition, and relate such measures to country-level, bank-level,[11] and firm-level[12] measures of access to credit and measures of the cost of credit. While these exercises are instructive, cross-country variation is likely to mask substantial unobserved heterogeneity. A few papers relate bank-level measures of competition to firm-level indicators of the cost of credit.[13]

Our paper might most closely be related to Álvarez and Jara (2016), which relates bank-level measures of competition to firm-level measures of access. Using a sample of listed firms from six Latin American (Latam) countries, they find that higher levels of competition in the banking industry increase the financial constraints faced by firm[14] and deteriorate banks' incentives to lend, which could be a consequence of the presence of asymmetric information and agency costs.[15]

In contrast, using a broader sample of firms in Latam countries, Presbítero and Rabellotti (2016), relate country-level measures of competition to firm-level measures of access, and argue

---

[9] See Maudos and Solís (2011) for previous estimations of the Lerner index.

[10] Other related literature strands indirectly relate to our paper. For example, Diallo and Koch (2017) argue that given enough financial development, higher concentrations at the banking sector hurt growth. Nevertheless, they argue that for countries with credit constraints, this is no longer the case as growth only depends on financial intermediation.

[11] Tabak et al. (2015).

[12] Using a sample of 53 countries, Love and Martínez-Peria (2015), argue that competition has an increasing and significant effect on access to finance. Using a sample of firms from 69 developing countries, Leon (2015) argues that higher levels of competition reduce financial constraints.

[13] Using a sample SME firms from 20 European countries, Ryan et al. (2014) find that a reduction of banks' market power has a negative and significant effect on financing constraints. China has lately received special attention. Chong, Lu and Ongena (2013) show that lower concentration in the banking industry increases the availability of credit. Tan and Anchor (2017b) argue that higher competition in the banking industry decreases credit and insolvency risks but increases liquidity risk. In addition, Tan and Anchor (2017a) point to the necessity of considering bank ownership.

[14] In particular, the authors study whether the cash flow of a firm in a given year is affected by the level of competition of the banking industry.

[15] As the authors argue in the introduction, higher competition in the banking industry has two opposing effects. On the one hand, higher competition should alleviate financing constraints. On the other hand, higher competition creates weaker incentives to build lending relationships; it additionally reduces the quality of screening and investment in information-acquisition technologies.

that higher levels of penetration and competition among banks is related to firms displaying lower probabilities of financial constraint.

None of the cross-country or cross-bank analyses provide causal estimates of competition on access to finance and the cost of finance.

The main contribution of this paper consists of measuring whether, and to what extent, banks with higher measured market power are able to charge higher interest rates for different types of firms. According to the authors, this is the first study to obtain estimates that link bank-level competition measures to loan-level data, which is likely to allow us to circumvent some of the measurement problems of previous papers.

Furthermore, this paper relates to a short list of studies analyzing only the Mexican banking industry. The last major event for the Mexican financial industry was the *Tequila Crisis*. This event affected the credit penetration of banks, and GDP growth.[16] Moreover it took a decade to start the recovery phase; see Castellanos, Del Ángel and Garza-García (2016). The recovery was not entirely driven by commercial banks. Small-scale non-bank intermediaries played a role, until the arrival of the 2008 Financial Crisis; see see Berrospide and Herrerías (2015) and Cañón (2016).

Some papers study the effect of particular regulatory changes, but none focus on the effect of competition on credit conditions for non-financial firms. Ponce, Seira and Zamarripa (2014), Seira, Castellanos and Jiménez (2015), and Elizondo and Seira (2014) study specific regulatory changes and argue that these specific changes were ineffective due to the low elasticity of credit demand to interest rates. Finally, although banks faced more competition with the entry of niche banks during the last few years, important population segments kept using informal credit markets, see Campero and Kaiser (2013) and Castellanos et al. (2012).

2. Recent Evolution of the Mexican Banking Industry

In this section, we provide an overview of the recent evolution of the banking industry in Mexico.[17] The Mexican banking industry has undergone major changes during the last four decades. During

---

[16] See Heckman et al. (2000).
[17] This section relies on Chapters 3 and 6 of Castellanos, Del Ángel and Garza-García (2016).

this period different cycles of consolidation shaped not only the number of financial institutions, but also the nature and scope of their activities.

Four main phases are identified. The first phase, from the early 1970s until the early 1980s, is characterized by the creation of multipurpose banks through mergers and acquisitions of commercial banks and non-bank financial institutions. The second phase, which took place during the 1980s, is characterized by a reduction in the number of banks due to regulatory measures and economic conditions. The third phase, which took place during the early 1990s before the Tequila Crisis, is characterized by a re-privatization of the banking industry. The last phase has been ongoing since 1995. We will focus most of our attention on this phase, which is characterized by a consistent pace of consolidation and the arrival of global banks as major players in the industry. During the latter phase, we discuss the introduction of the 2014 Financial Reform.

The Mexican banking industry entered the twentieth century with two national banks and approximately 30 regional banks that could issue paper money. The Mexican Revolution in the 1910s seriously affected the financial system, and only after the mid-1920s did it start to recover; see Anaya (2002), and Haber, Maurer and Razo (2003). It was at this time that major regulatory changes took place, namely, the creation of Banco de México (1925) and the Enactment of Modern Banking Law (1932). The latter underwent modifications until 1941 when, in the spirit of the United States' Glass-Steagall Act, financial institutions were limited to commercial banks, non-bank financial institutions, mortgage firms, and trusts; see Del Ángel (2015).

Between the 1940s and the 1980s, the financial system was characterized by moderate levels of concentration, and it grew in size; see Villalpando-Benítez (2000). During this period, the average number of institutions fluctuated between 80 and 90, with the largest four banks holding more than half of the assets and activities; however, the concentration of the industry (measured with the Herfindahl-Hirschman Index) was moderate to low.

The multibank consolidation cycle started in December of 1970 with a banking law that recognized the existence of financial conglomerates, and later with the December 1974 banking law that allowed the merger of financial institutions from the same conglomerate.[18] The objective of the latter was to create institutions with larger economies of scale and scope, with the aim of lowering costs and creating greater efficiency. These regulatory changes benefited incumbent

---

[18] The law excluded financial institutions at different regions, and also excluded brokerage firms, and insurance companies; see Del Ángel (2015).

banks because they strengthened barriers to entry (see Villalpando-Benítez, 2003) and because institutions with greater market power tended to be more profitable. However, these changes limited the expansion of loans,vis-à-vis smaller banks; see Del Ángel (2003).

The 1982 Debt Crisis, which affected all Latin American countries, represents an inflection point. On September 1 of that year, the ownership, control, and administration of the banking system was transferred to the Mexican state.[19] According to Suárez (2005), two challenges stood out: namely, many banks were in poor financial condition and either had to close or merge, and there were too many banks in operation. Beginning with a total of 60 banks in 1982, after the consolidation phase there remained six banks with national coverage, seven multiregional banks, and another six regional banks.

Brokerage firms experienced important growth during this period. As nationalized banks were a major source of funding to the public sector, the securities market became an important source of funding to the private sector—with the help of brokerage firms. This cycle of consolidation ended by December 1988.

The re-privatization process began at the end of 1989 and was implemented during the presidencies of Miguel de la Madrid and Carlos Salinas de Gortari, when nationalized banks were offered through auction.[20] The banking industry became less concentrated, and Mexico benefited from a short-lived economic boom; see Del Ángel, Bazdresch and Suárez (2005).

The Tequila Crisis (1994) arrived as a consequence of several factors, namely, an appreciation of the real exchange rate, a deterioration of the balance of payments, an increase in short-term public debt, high leverage of private corporations, and growth of banks-issued loans without proper risk management programs. The crisis materialized in early 1995 and resulted in many banks being rescued or bailed out through the deposit insurance institution (Fobaproba).

Important regulatory modifications affected corporate governance in banking, and the participation of foreign investors in the industry. Regarding the latter, the process was gradual, and it was implemented in three stages; see Murillo and Garza (2005).[21] First, the 1994 NAFTA agreement gradually opened the banking industry to foreign firms from 1994 through 1999. Second,

---

[19] At that time the Mexican government saw this as a necessary measure to control the exchange rate, and consequently capital outflows. Del Ángel, Bazdresch and Suárez (2005) argue that the main reason was political, as these measures allowed the government to control banks' finances.

[20] 133 applications to bid were received from 44 groups.

[21] The Foreign Investment Law was previously enacted in 1989 but not signed into law until NAFTA took effect.

authorities raised the market share ceiling of affiliates of foreign banks and increased the investment limit of foreigners in local banks. Finally, in 1998, all restrictions on foreigners were lifted. The presence of global banks is a distinctive characteristic of Mexico, in relation to other emerging economies; see Haber and Musacchio (2014).

The Tequila Crisis affected banking credit penetration, and consequently, GDP growth; see Heckman et al. (2000). Castellanos, Del Ángel and Garza-García (2016) show that the crisis recovery phase only started after 2004, and as in the previous year, credit to the private sector reached only 16 percent of GDP. By 2011, this figure, though still low, reached 27 percent.

Mexican authorities implemented several regulatory modifications to reduce barriers to entry barriers. First, the Law of Credit Institutions (2001) established that, in order to control more than 5 percent of any bank or financial conglomerate, the only requirement was authorization from the Ministry of Finance. The new banks that emerged used an already established infrastructure. Such is the case of Elektra Group, a large retail store for household electronics and appliances, when it created the niche bank Banco Azteca.[22] Second, by 2008, the Law of Credit Institutions underwent a modification intended to promote the creation of niche banks even more. Third, between 2005 and 2008, various regulatory modifications incentivized the formation of small-scale, non-bank intermediaries capable of providing credit, such as Sofomes and Sofoles. Their main difference with commercial banks is that they do not fund themselves with deposits, instead using capital markets to issue short and long-term securities; see Berrospide and Herrerías (2015). These institutions grew significantly until the 2008 Financial Crisis. For example, mortgage lenders Sofomes and Sofoles thereafter lost momentum; see Cañón (2016).

Concurrent with the regulatory reforms described above, Mexican authorities implemented other regulatory modifications to promote credit growth through improving laws to protect consumers, enhance transparency, and standardize financial services. The Law for Transparent and Ordered Financial Services (2004) was intended to promote competition in financial services. The Law of Negotiable Instruments and Credit Growth (2000) was intended to enhance regulation of loan collateral and guarantees during periods of bankruptcy.[23]

---

[22] See Castañeda, Castellanos and Hernández (2011) for other examples.

[23] Two other laws were also important: the Bankruptcy and Suspension of Payment Law, and the Bankruptcy Law. See Del Ángel (2006) for details. Previously, another piece of legislation was introduced to enhance the transfer of ownership of commercial property, namely, the General Law of Credit Contracts and Operations (1996).

According to Caballero (2006), the "bottleneck (of the Mexican financial system) remains in the sentencing and execution that takes place in mercantile trials, since it's subject to a complex procedure full of loopholes." The 2014 Financial Reform, the next major reform, was intended to address significant loopholes in the law.

Despite all reforms prior to 2014—that is, those related to accounting and prudential regulation to enhance bank stability, or those which promoted the entry of niche banks and non-bank financial institutions—competition remained weak in general, though it could vary among different financial products; see Castañeda, Castellanos and Hernández (2011).

On the consumer protection front, the law[24] was modified before 2014, with the intention of providing more power to authorities; see Table 6.1 of Castellanos, Del Ángel and Garza-García (2016). Some of those measures did succeed in reducing the price of certain financial products or increasing demand for them. Other measures were less successful because of the low elasticity of credit demand with respect to the interest rate; see Ponce, Seira and Zamarripa (2014), Seira, Castellanos and Jiménez (2015), and Elizondo and Seira (2014).

On the front of financial deepening, the introduction of new financial institutions providing credit, such as Sofomes and Sofoles, among others, increased access to financial services; see Negrín et al. (2009). The latter did not change the fact that a large share of the population only use informal credit markets; see Campero and Kaiser (2013) and Castellanos et al. (2012).

Finally, in regard to development banks,[25] despite all reforms prior to 2014, their share in the assets of the entire banking industry declined from 23.5 percent to 16 percent between 2002 and 2013; see Castellano, Del Ángel and Garza-García (2016). The consequences of these regulatory changes on financial development and competition on the overall financial system remain an open research question.

The so-called 2014 Financial Reform is a compendium of reforms with the aim of improving the Mexican financial regulation system, with special attention given to competition. In July 2014, the Mexican Antitrust Commission (Cofece for its acronym in Spanish) delivered a comprehensive report providing policy recommendations on five topics: i) barriers to entry,

---

[24] In particular, the Law of the Protection and Defense of Financial Service Users (1999), the Law of Guaranteed Loan Transparency and Competition (2002), and the Law for Transparent and Ordered Financial Services (2004).

[25] Three reforms facilitated their creation, namely i) the creation of the Bank of National Savings and Financial Services (Bansefi), ii) the creation of the Federal Mortgage Company (SHF), and iii) the creation of the Rural Financing Fund (Finrural). In regard to the latter point, Trusts related to agriculture (Fira) are other institutions, different from development banks that contribute to the development of rural areas.

barriers, ii) displacement and access obstacles for competition, iii) lessening the risk of collusion or coordinated actions among competitors, iv) preventing or eliminating restrictions to market efficiency, and v) enhancing Cofece's effectiveness in enforcing sanctions against illegal conduct.

The Reform modified 34 laws and federal codes along four axes. First, in regard to the legal framework for compliance with commercial contracts, the reform attempts to reduce the legal risk hampering the growth of lending. Second, to ensure greater flexibility regarding the activities of development banks, the reform introduced new flexibilities in fiscal policy. Third, to improve competition for users of financial services, the reform modified the costs of bank switching. Finally, to strengthen banking stability, the reform included banking resolution measures and liquidation procedures.

3. Competition Measures: Lerner and Boone Indicators

Two non-structural[26] indicators of competition are considered, the Lerner indicator and the Boone indicator. Both indicators require obtaining estimates of banks' marginal cost of operation. To this end, we follow intermediation theory and assume that banks acquire funds to finance loans and to purchase bonds and securities; that is, we consider deposits as an input rather than a service in themselves

Banks' Cost Function. Banks acquire funds to finance loans and to purchase bonds and securities. A bank's cost function depends on its output level (real total earning assets held by the bank) and input prices.[27] We consider three inputs: deposits, capital, and labor, with corresponding input prices w_d, w_k, and w_l. The price of deposits is a weighted average of all rates paid on different types of deposits. We construct the price of physical capital by dividing the operating cost minus salary expenditures by the bank's total assets; the price of labor is the ratio of salary expenditures to total assets. The estimates incorporate two control variables related to risk: non-performing loans and regulatory capital, or equity. The former represents the quality of a bank's loan portfolio, while the latter indicates the losses that a bank can absorb without facing bankruptcy.[28] Given a parametric specification for the cost function, we estimate its parameters using Stochastic Frontier Analysis and construct an estimate for the marginal cost.[29] We use our

---

[26] The introduction contains a brief discussion of structural vs. non-structural measures of competition.
[27] In order to eliminate distortions due to the scale of the firms, we normalize the dependent variables by total assets.
[28] These variables may be exogenous. Macroeconomic shocks that affect banks may influence these.
[29] In the Appendix, we provide details behind the estimation of bank-specific marginal costs.

marginal cost estimate (MC_{it}) to construct our measures of competition, the Lerner and the Boone indicators.

Table 1. Variables Employed in the Cost Functions
(monthly average and standard deviations as a percentage of total assets)

Symbol	Mean	Standard deviation
Dependent variables		
C	0.066	0.029
Variable input prices		
w$_l$	0.014	0.007
w$_f$	0.035	0.017
w$_k$	0.030	0.121
Variable output quantities		
y	0.833	0.058
Control variables		
z	0.105	0.045

Notes: 1,450 observations. Summary statistics: mean and standard deviation for the variables used in the analysis.

3.1 Bank-Specific Measure of Competition: Lerner Indicator

Our bank-specific measure – the Lerner indicator (LI) – is a measure of banks' overall ability to obtain higher revenues net of marginal costs. Our main specification is as follows:

$$Lerner_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$$

where P_{it} indicates (Loans & Securities Interest Income)/ (Loans + Securities), and MC_{it} is our marginal cost measure.[30]

3.2 Economy-Wide Measure of Competition: Boone Indicator

Our economy-wide measure—the Boone indicator—specifies how much banks' market share or profit margins adjust because of relative reductions in the cost of providing financial services.

---

[30] We also consider an alternative specification, $ALI_{kt} = (\Pi_{kt} + C_{kt} - CM_{kt} * y_{kt})/(\Pi_{kt} + C_{kt})$, where Π_{kt} are the observed profits of bank k at time t, C_{kt} the observed total cost, CM_{kt} is the estimated marginal cost and y_{kt} is the observed total output.

Increases in the responsiveness of market shares and profit margins to cost reductions likely relate to how banks pass through cost reductions to interest rates and whether firms are aware of such reductions and are able to act upon these by switching to less costly finance providers.

In highly competitive environments, banks will increase short-term profits and gain market share by translating cost reductions into lower interest rates. In less competitive environments, they might be able to maintain relatively high interest rates without losing clients to their competitors.

Our goal here is to quantify the reductions in interest rates that accompany cost-reducing improvements in banks' market positions. Our main concern is that other determinants of equilibrium interest rates may co-vary with changes in the responsiveness of market positions to cost reductions. In particular, it is likely that the quality underlying the projects that are financed during periods of increased competitiveness differs from that of projects financed in other periods, so that the equilibrium interest rate observed in the market is likely to vary across periods of more and less competitive circumstances, irrespective of the effect of competition of interest rates.

Table 2. Boone Indicator

Year	ROA	Shares
2005	-0.0159	0.0284
2006	-0.0312	0.0331
2007	0.0161	-0.0152
2008	-0.0651	-0.0407
2009	-0.1956	0.0211
2010	0.0563	0.0302
2011	-0.0011	-0.0058
2012	-0.2922	0.0978
2013	0.0769	-0.0017
2014	-0.1785	0.0628
2015	0.236	0.0439
2016	-0.0154	-0.0006

The specific Boone indicator estimated in this paper has two characteristics that make it innovative for the case of Mexico. First, we use the marginal cost instead of approximating this variable with the average costs as in previous exercises. Second, market shares, as the dependent variable, and profits are used. The market shares are easily calculated as $m_i = q_i / \sum_{i=1}^{n} q_i$, where q_i is the market share of bank i. For the case of market shares, the Boone indicator is calculated as $Ln(m_i) = \alpha + \beta \cdot Ln(MC_i)$.[31]

3.3 Data Construction

To carry out the estimation, we constructed a monthly bank-level dataset covering the 2005-2016 period. We focus on a subset of all banks in the country, which offer commercial credit.[32] We dropped banks with less than two years of information and banks with a market share of less than 0.5 percent in terms of commercial loans. All of the remaining banks in the dataset are large and midsize. Despite the modest number of banks included, these account for about 95 percent of otal commercial credit provided in 2016.

3.4 Competition and the Price of Credit

We are interested in answering whether banks charge lower interest rates because of facing a more competitive environment, and the extent to which they do so. In order to obtain estimates of that effect, we isolate the extent to which equilibrium interest rates in the market for commercial loans vary exclusively because of variations in measures of the degree of competition faced by banks.

First discussed are the empirical challenges faced. We then describe relevant characteristics of the firm-level data we use, and outline the empirical specifications used in the underlying analysis. Finally, the results and a brief discussion are provided.

4. Empirical Analysis

4.1 Empirical Challenges

We seek to measure the extent to which bank market power translates into non-financial firms' increased price of credit. A higher price of credit faced by non-financial firms may result in firms actually paying more for bank credit, substituting bank credit for other types of credit, or not

---

[31] An analogous estimation can be performed with profits, see Appendix for detail.
[32] We normalized all data by assets so that comparing information from banks of different size presents no problem.

obtaining credit. In order to measure how bank market power is reflected in firms' overall price of credit, we would ideally use data on loan applications in order to measure the extent to which loan approval rates and interest rates change in response to changes in bank market power. However, we do not have data on loan applications, but only on loan outcomes, so that we focus solely on documenting the cost difference in loans provided to firms by banks with higher measured market power.[33]

In our empirical analysis, we consider loan-level, firm-level, and bank-level characteristics that may enable us to make relevant comparisons across loans. In particular, loan-level and firm-level characteristics are likely to allow us to isolate the contribution of bank market power from demand effects. However, we stress that there may be unobserved determinants of interest rates that co-vary with banks' measured market power, which prevent us from being able to estimate the causal effect of bank market power on firms' price of credit. A detailed discussion is provided in Section 4.4.[34]

4.2 Relevant Features of the Loan-Level Data

We use monthly data on the universe of commercial non-revolving loans provided by the 10 banks described in Section 3. Our main empirical analysis relies on loan-level data for the period 2009-2016. The data come from Regulatory report R04-C, collected by Mexico's Banking and Securities Commission (*Comisión Nacional Bancaria y de Valores*, CNBV).

We consider loans originating in Mexico between July 2009 and May 2016, provided in Mexican pesos, that display a positive interest rate and a positive due balance, taken by firms or firm representatives who are not directly related to the bank that issued the loan.[35]

We restrict our attention to newly issued loans,[36] and we have information on the type of firm for which the loan is intended. Thus, we are able to pick only private firms, micro

---

[33] As an example, suppose that during an economic boom new banks enter the market, increasing bank competition. During that boom, an increase in aggregate demand translates into an increase in firms' demand for loans. Suppose that banks increase the amount of loans provided less than proportionally, so that even though the overall probability of obtaining a loan has increased, the probability of obtaining a loan conditional on having applied for a loan has decreased. With only data on outcomes, we would only be able to observe that the overall probability of obtaining a loan has increased.

[34] Bank market power is an equilibrium outcome; unobserved determinants of loan approval rates and of interest rates—different from bank market power—might vary in tandem with bank market power, so that failing to properly account for these might result in biased estimates of the effect of bank market power.

[35] See the Appendix for details on a firm related to the issuing bank.

[36] We discard restructured loans, renovated loans, and others. Since we are sure that loans have just been originated, all the relevant loans are outstanding.

entrepreneurs, and individuals representing private firms. In addition, we consider the state of the country where the firm performs its main economic activity:[37] whether there is a real guarantee associated with the loan; the reported use of the loan (which we operationalize as an indicator variable for whether the loan is used as working capital); the firm's reported gross sales; and the number of employees working at the firm.

4.3 Descriptive Statistics

Table 3 provides summary statistics on the universe of loans considered in the empirical analysis of the next section. The data suggest that, on average, larger firms obtain more loans than smaller firms, but they do not obtain loans of larger size. Accordingly, on average, large firms have outstanding loans with about twice as many banks as micro and small firms. We denote these as bank relationships. Interest rates paid on loans provided to large firms are significantly lower than interest rates paid on loans provided to micro and small firms. Compared to the smallest firms, progressively larger firms report higher gross income.[38]

Table 3. Summary Statistics on Loan-Level Data

	All firms	Micro	Small	Medium	Large
Lerner	0.74	0.73	0.73	0.72	0.76
	[0.09]	[0.08]	[0.08]	[0.08]	[0.08]
Loan's Term	15.1	22.41	15.61	7.37	10.48
	[17.9]	[21.1]	[20.04]	[13.94]	[11.51]
Log Loan Size	10.19	10.95	10.96	10.76	9.13
	[2.52]	[2.14]	[2.46]	[2.71]	[2.41]
I(Working Capital)	0.81	0.81	0.74	0.69	0.87
	[0.39]	[0.39]	[0.44]	[0.46]	[0.33]
I(Real Guarantee)	0.12	0.12	0.12	0.18	0.10
	[0.32]	[0.32]	[0.33]	[0.39]	[0.30]
# of Bank Relationships	3.0	1.85	2.36	2.98	4.26
	[2.35]	[1.39]	[1.71]	[2.21]	[2.63]

---

[37] As reported by the firm to the bank when the loan is issued.

[38] We do not present statistics on the loans' term because some of these are revolving. These do not have an associated term.

Table 3., continued

	All firms	Micro	Small	Medium	Large
Length of Relationship with loan provider	40.7 [28.2]	34.7 [31.2]	40.75 [28.37]	42.91 [24.50]	45.67 [25.10]
Log Gross Income	15.9 [5.48]	11.38 [3.31]	13.76 [2.82]	15.76 [3.60]	20.28 [4.60]
Interest Rate	10.79 [5.54]	14.36 [7.46]	10.76 [5.40]	8.34 [3.41]	8.55 [1.48]
Number of loans	4,996,145	1,544,497	1,110,224	240,462	2,100,935

Notes: We report variable means used in this paper's main analyses samples. Standard deviations are shown in brackets. The main analysis sample consists of monthly loan-level information of commercial non-revolving loans to non-financial private firms (see the Appendix for details on the definition of firm), provided by the 10 banks detailed in Section 3. Data come from Regulatory Reports on commercial loans that banks report to Mexico's National Banking Commission for the period 2009-2016. See the Appendix for descriptions of all variables included.

4.4 The Effect of Competition on the Price of Credit Faced by Non-Financial Firms

We estimate the credit price difference faced by non-financial firms, resulting from differences in banks' market power.

4.4.1 Main Specification

The Lerner indicator varies across banks at a given point in time, and across time for each bank. Our specification is:

$$rate_{lfbt} = c + \alpha Lerner_{bt} + X_{l,t}\beta + Z_{f,t}\theta + PERIOD_t\gamma + STATE_s\delta + BANK_b\tau + FIRM_f\pi$$
$$+BANK_b * FIRM_f\rho + \varepsilon_{lfbt}$$

where $rate_{lfbt}$ denotes the gross interest rate associated to newly issued loan l [39] taken by firm f [40] from bank b [41] in period t. [42] $Lerner_{bt}$ is the Lerner indicator of bank b in period t. $X_{l,t}$ denotes a vector of control variables associated to loan l and recorded in period t, including the loan's term; [43] the logarithm of the loan size; an indicator variable for whether the loan is recorded by the bank as working capital; and an indicator variable for whether the loan has a real guarantee associated

---

[39] We restrict our attention to loans originating in the same period analyzed.
[40] We exclude non-private (government) firms and international organizations.
[41] We keep the 10 banks used for the construction of the Lerner Indicator and Boone Indicator.
[42] A period is a month. We use data for every month in our July 2009–May 2016 dataset.
[43] In our general specification, we consider both non-revolving and revolving loans, the latter of which have no term, so that in those specifications we do not include term as a regressor.

with it; $Z_{f,t}$ denotes a vector of controls associated to firm f and recorded in period t, including the number of banks the firm had a banking relationship with in the period in which the loan was issued; the length of the relationship the firm has had with the issuing bank (in months); the firm's (log) income, as recorded by the issuing bank and reported to the regulator; indicator variables for its (two-digit) economic activity classification;[44] and indicator variables for each possible firm score according to CNBV's official methodology. $PERIOD_t$ denotes a vector of period fixed effects. $STATE_s$ denotes a vector of state fixed effects corresponding to the state of the country where the firm performs its main economic activity. $BANK_b$ denotes a vector of bank fixed effects. $FIRM_f$ denotes a vector of firm fixed effects. ε_{lfbt} denotes unobserved determinants of loan l's interest rate. $BANK_b * FIRM_f$ denotes a vector of bank times firm fixed effects. We cluster standard errors at the (bank, period) level.

4.5 Results

Main results are presented in Table 4. In all columns, we include as controls loan and firm characteristics. Loan characteristics are the loan's term, the logarithm of its size—an indicator variable for whether the firm reports the loan as used as working capital—and an indicator variable for whether the loan has an associated physical guarantee. Firm characteristics are the number of the firm's bank relationships, the length of the relationship of the firm with the issuing bank (in months), and the firm's log gross income.[45] Other controls not shown in the table include indicator variables for each firm's official CNBV score, indicator variables for each type of economic activity, and indicator variables for each state and for each period.[46] Relative to the base results (Column 1), successive columns include bank fixed effects (Column 2), firm fixed effects (Column 3), separate firm and bank fixed effects (Column 4), and firm*bank fixed effects (Column 5).

Bank fixed effects allow us to control for bank-specific features different from market power that may remain fixed in time and predict interest rates, such as management quality. These fixed effects absorb the part of the variation in Lerner indicators that stem from fixed level differences in bank market power across banks. Thus, the Lerner coefficients in specifications that include these recover how variations in bank market power across time are reflected in different

---

[44] We do not include the four-digit economic classification because for some economic sectors we have too few observations.

[45] Specifications including income levels instead of logarithms yield similar results.

[46] The data are monthly.

interest rates paid by firms.[47] Firm fixed effects allow us to control for relevant firm-specific features, such as underlying productivity or creditworthiness. The addition of bank fixed effects reduces the Lerner point estimate slightly, while the inclusion of firm fixed effects results in a large reduction in the estimate.

Results from Column 5, our preferred specification, suggest that an increase in measured market power (Lerner indicator) from 0 to 1 is associated with a 1.19 increase in interest rates, an 11 percent increase relative to the mean interest rate (10.83).[48]

Focusing on Column 5, while a loan's term is not clearly associated with the interest rate paid, it is evident that larger loans do exhibit a lower interest rate, as do loans labeled as working capital, and those with an associated physical guarantee. Firms face lower interest rates during periods in which they have more bank relationships. The latter is consistent with firms increasing their bargaining power, as they have more lenders to choose from, or with firms getting better terms and loans from more lenders during periods in which they have more profitable projects. In turn, there is no clear association with how long a firm has been the issuing bank's client.[49]

Table 4. Main Results

	Base	Bank FE	Firm FE	Firm & Bank FE	Firm FE*Bank FE
Lerner	6.54	4.20	0.59	1.48	1.19
	[0.91]	[1.48]	[0.27]	[0.31]	[0.28]
Loan Term	0.13	0.10	0.02	0.01	0.002
	[0.01]	[0.01]	[0.002]	[0.002]	[0.002]
Log (Loan Size)	-0.22	-0.08	-0.89	-0.07	-0.04
	[0.01]	[0.01]	[0.02]	[0.004]	[0.004]
I(Working Capital)	0.71	-0.17	0.01	-0.15	0.13
	[0.20]	[0.19]	[0.05]	[0.05]	[0.04]
1(Guarantee)	-1.79	-1.09	-0.35	-0.14	-0.02
	[0.16]	[0.16]	[0.06]	[0.05]	[0.05]
Bank relationships	-0.12	-0.17	-0.05	-0.07	-0.05
	[0.02]	[0.02]	[0.01]	[0.02]	[0.01]

---

[47] For example, if banks displayed the same value for the Lerner indicator across *all* periods, the Lerner indicator and bank fixed effects would become collinear.

[48] Results are similar if we consider financial firms and government entities. These are available from the authors upon request.

[49] As proxied by the number of months since it obtained its first loan from that bank.

Table 4., continued

	Base	Bank FE	Firm FE	Firm & Bank FE	Firm FE*Bank FE
Length of Relationship	0.02	0.01	0.02	-0.0001	-0.03
	[0.001]	[0.001]	[0.001]	[0.0007]	[0.002]
Log(Gross Income)	-0.14	-0.32	0.04	0.01	0.04
	[0.02]	[0.04]	[0.007]	[0.01]	[0.008]
Mean Interest Rate			10.83		
Observations			4,996,145		
Number of Firms			323,995		
F-Statistic	258.44	401.82	123.83	215.10	361.33
Adjusted R-squared	0.67	0.72	0.95	0.95	0.97

Notes: The table displays the coefficients associated with estimating the specification shown in Section 4.4.1. Clustered standard errors at the (period, bank) level are shown in brackets. Standard deviations of the corresponding mean interest rate are shown in parentheses. Observations are newly issued loans. The sample includes commercial non-revolving loans to non-financial private firms. Regressions include the following control variables, whose coefficients are not shown: economic activity FE, score FE, State FE, and period FE.

4.5.1 Results by Firm Size

In Table 5, we estimate the specification considered in Column 5 of Table 4. This is carried out separately for firms of different size. The definition of firm size follows the official firm size definition developed by CNBV (see Appendix). Column 1 reproduces the estimation of Table 4, Column 5. Columns 2 through 5 show that the interest rate difference associated with bank market power in Column 1 is predominantly a result of interest rate differences for micro and small firms. This is not exclusive, however, as medium firms also show a statistically and economically significant interest rate premium associated with our market power measure. The Lerner coefficients in Columns 2 through 4 suggest that a 0-1 increase in the Lerner indicator results in 4.87, 2.43, and 0.54 interest rate increases, which represent increases of about 34, 23, and 6 percent, respectively. In contrast, there do not seem to be interest rate differences associated with bank market power on loans provided to large firms. The latter suggests that standard market segmentations, such as separating firms into Small and Medium Enterprises (SMEs) and large firms, may mask significant heterogeneity in the SME market.[50]

---

[50] This result echoes complementary analyses included in Banco de México (2015).

Table 5. Results by Firm Size

	All	Micro	Small	Medium	Large
Lerner	1.19	4.87	2.43	0.54	-0.25
	[0.28]	[1.06]	[0.54]	[0.16]	[0.35]
Mean Outcome Variable	10.83	14.36	10.76	8.34	8.55
(Interest Rate)	(5.58)	(7.46)	(5.40)	(2.18)	(1.49)
Observations	4,996,145	1,544,497	1,110,224	240,462	2,100,935
Number of Firms	323,995	258,440	112,170	7,749	7,935
F-Statistic	361.33	90.07	164.84	388.82	1727.29
Adjusted R-squared	0.97	0.97	0.97	0.92	0.87

Notes: The table displays Lerner coefficients associated with estimating the specification shown in Section 4.4.1, for each firm size. Clustered standard errors at the (period, bank) level are shown in brackets. Standard deviations of the corresponding mean interest rate are shown in parentheses. Observations are newly issued loans. The sample includes commercial non-revolving loans to non-financial private firms. Regressions include the following control variables, whose coefficients are not shown: Loan Term, Log (Loan Size), 1(Working Capital), 1(Guarantee), Bank relationships, Length of Relationship, Log(Gross Income), economic activity FE, score FE, State FE, period FE, and (bank*firm) FE.

4.5.2 Results by Region

In Table 6, we separately estimate the results included in Table 4, Column 4 for each of the four economic regions Banco de México considers in its regional analyses.[51] The Lerner coefficients in Columns 2 through 5 suggest that a 0-1 increase in the Lerner indicator results in interest rates increases across regions of 0.68 (Northern), 1.06 (North-Central), 1.85 (Central), and 1.94 (Southern), which represent increases of about 7, 10, 17, and 13 percent, respectively

The northern and north-central regions display similar levels of interest rate differences associated with bank market power. Interest rate differences related to bank market power are higher in the central and in the southern regions of the country. For instance, the Lerner coefficient in the southern region is about 2.85 times that of the northern region.[52]

---

[51] See Bank of Mexico (2018). States are grouped as follows. *Northern:* Baja California, Chihuahua, Coahuila, Nuevo León, Sonora, and Tamaulipas. *North-Central:* Aguascalientes, Baja California Sur, Colima, Durango, Jalisco, Michoacán, Nayarit, San Luis Potosí, Sinaloa, and Zacatecas. *Central*: Mexico City, Estado de México, Guanajuato, Hidalgo, Morelos, Puebla, Querétaro, and Tlaxcala. *Southern*: Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz, and Yucatán.

[52] In the southern region, economic activity has remained stagnant even during the recovery period after the 2007-2009 global economic crisis. See, for instance, Bank of Mexico (2018).

Table 6. Results by Region

	All	Northern	North-Central	Central	Southern
Lerner	1.76	0.68	1.06	1.85	1.94
	[0.43]	[0.16]	[0.32]	[0.45]	[0.37]
Mean Outcome Variable	10.83	10.45	10.81	10.54	14.43
(Interest Rate)	(5.58)	(5.32)	(5.20)	(5.58)	(7.15)
Observations	7,707,968	1,230,388	1,548,275	1,926,629	290,863
Number of Firms	460,855	69,288	73,671	57,982	49,329
F-Statistic	212.48	258.39	298.40	236.38	72.42
Adjusted R-squared	0.92	0.97	0.97	0.97	0.97

Notes: The table displays Lerner coefficients associated with estimating the specification shown in Section 4.4.1, for each region. Clustered standard errors at the (period, bank) level are shown in brackets. Standard deviations of the corresponding mean interest rate are shown in parentheses. Observations are newly issued loans. The sample includes commercial non-revolving loans to non-financial private firms. The Table displays Lerner coefficients associated to estimating the specification shown in Section 4.4.1. Clustered standard errors at the (period, bank) level are shown in brackets. Standard deviations of the corresponding mean interest rate are shown in parentheses. Observations are newly issued loans. The sample includes private, non-financial firms. Regressions include the following control variables, whose coefficients are not shown: Loan Term, Log (Loan Size), 1(Working Capital), 1(Guarantee), Bank relationships, Length of Relationship, Log(Gross Income), economic activity FE, score FE, State FE, period FE, and (bank*firm) FE. Regions are: Northern: Baja California, Chihuahua, Coahuila, Nuevo León, Sonora, and Tamaulipas; North-Central: Aguascalientes, Baja California Sur, Colima, Durango, Jalisco, Michoacán, Nayarit, San Luis Potosí, Sinaloa, and Zacatecas; Central: Mexico City, Mexico State, Guanajuato, Hidalgo, Morelos, Puebla, Querétaro, and Tlaxcala; Southern: Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz, and Yucatán.

4.5.3 Results by Firm Size and Region

In Table 7, we reproduce the Lerner-associated coefficients corresponding to estimating the specification considered in Column 4, Table 4. This is done separately by firm size and region. Lerner-associated interest rate differences are large for micro and small firms across all four regions, and especially larger for microenterprises in the central and southern region of the country.

Table 7. Results by Firm Size and Region

	All Regions	Northern	North-Central	Central	Southern
All Sizes	1.76	0.68	1.06	1.85	1.94
	[0.43]	[0.16]	[0.32]	[0.45]	[0.37]
	n=4,996,145	n=1,230,378	n=1,548,275	n=1,926,629	n=290,863
Micro	4.53	3.61	2.99	5.81	4.06
	[0.95]	[0.78]	[0.72]	[1.39]	[0.85]
	n=1,544,497	n=417,851	n=270,838	n=716,032	n=139,776
Small	2.42	2.31	2.39	2.44	1.96
	[0.62]	[0.56]	[0.61]	[0.58]	[0.59]
	n=1,110,224	n=275,176	n=245,832	n=509,699	n=79,517
Medium	0.21	0.95	0.35	0.67	-0.70
	[0.26]	[0.34]	[0.43]	[0.26]	[0.33]
	n=240,462	n=31,846	n=48,009	n=146,106	n=14,501
Large	0.06	0.20	0.45	-0.36	-0.43
	[0.21]	[0.19]	[0.41]	[0.40]	[0.25]
	n=2,100,935	n=505,498	n=983,595	n=554,773	n=57,069

Notes: The Table displays Lerner coefficients associated to estimating the specification shown in Section 4.4.1, for each combination of firm size and region. Clustered standard errors at the (period, bank) level are shown in brackets. Standard deviations of the corresponding mean interest rate are shown in parentheses. Observations are newly issued loans. The sample includes commercial non-revolving loans to non-financial private firms. The Table displays Lerner coefficients associated to estimating the specification shown in Section 4.4.1. Clustered standard errors at the (period, bank) level are shown in brackets. Standard deviations of the corresponding mean interest rate are shown in parentheses. Observations are newly issued loans. The sample includes private, non-financial firms. Regressions include the following control variables, whose coefficients are not shown: Loan Term, Log (Loan Size), 1(Working Capital), 1(Guarantee), Bank relationships, Length of Relationship, Log(Gross Income), economic activity FE, score FE, State FE, period FE, and (bank*firm) FE. Regions are: Northern: Baja California, Chihuahua, Coahuila, Nuevo León, Sonora, and Tamaulipas; North-Central: Aguascalientes, Baja California Sur, Colima, Durango, Jalisco, Michoacán, Nayarit, San Luis Potosí, Sinaloa, and Zacatecas; Central: Mexico City, Mexico State, Guanajuato, Hidalgo, Morelos, Puebla, Querétaro, and Tlaxcala; Southern: Campeche, Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Veracruz, and Yucatán.

5. Discussion

There has been a long-standing interest in understanding what explains the variation in access and the price of credit across countries. A plausibly important determinant is the underlying level of competition in a country's banking industry. We study whether highly competitive environments are associated with lower costs of finance for the case of a large emerging economy such as Mexico.

We construct measures of competition, covering the 2005-2016 period, for banks offering commercial credit. We implement the Lerner indicator and the Boone indicator. We then relate the Lerner Indicator to the interest rate paid on newly issued non-revolving loans obtained by non-financial firms from banks through loan-level regression specifications in which we strive to isolate the relationship between the Lerner indicator and interest rates, controlling for loan, firm, and bank characteristics.

We find that banks with higher market power, as measured by the Lerner indicator, are able to charge significantly higher interest rates on loans, and that these rate premia are concentrated in loans to firms classified as microenterprises and small firms, and that such premia are higher in the southern region of the country.

References

Alvarez, R., and M. Jara. 2016. "Banking Competition and Firm-Level Financial Constraints in Latin America." *Emerging Markets Review* 28: 89-104.

Anaya, L. 2002. *Colapso y Reforma: La Integración del Sistema Bancario en el México Revolucionario 1913-1932*. Mexico City, Mexico: Universidad de Zacatecas and Editorial Miguel Ángel Porrúa.

Apergis, N. 2015. "Competition in the Banking Sector: New Evidence from a Panel of Emerging Market Economies and the Financial Crisis." *Emerging Markets Review* 25: 154-62.

Bank of Mexico. 2015. *Reporte Sobre las Condiciones de Competencia en el Otorgamiento de Crédito a las Pequeñas y Medianas Empresas (PYME)*. Mexico City, Mexico: Bank of Mexico. Available at: http://www.banxico.org.mx/publicaciones-y-discursos/publicaciones/informes-periodicos/reporte-sobre-las-condiciones-de-competencia-en-lo/reporte-condiciones-competenc.html

Bank of Mexico. 2018. "Regional Economic Report Presentation." Mexico City, Mexico: Bank of Mexico. Available at:
http://www.banxico.org.mx/publicaciones-y-discursos/publicaciones/informes-periodicos/reportes-sobre-las-economias-regionales/%7BBE9CBB92-2EDA-30A7-511A-6F5637880A53%7D.pdf

Banya, R., and N. Biekpe. 2017. "Bank Competition and Economic Growth: Empirical Evidence from Selected Frontier African Countries." *Journal of Economic Studies* 44: 245-65.

Berger, A., and L.J. Mester. 2003. "Explaining the Dramatic Changes in Performance of US Banks: Technological Change, Deregulation and Dynamic Changes in Competition." *Journal of Financial Intermediation* 12: 57-95.

Berrospide, J., and R. Herrerías. 2015. "Finance Companies in Mexico: Unexpected Victims of the Global Liquidity Crunch." *Journal of Financial Stability* 18(C): 33-54.

Caballero, J. 2006. "El Perfil Jurisdiccional de los Jueces Federales." *Revista del Instituto de la Judicatura Federal* 22: 281-312.

Campero, A., and K. Kaiser. 2013. "Access to Credit: Awareness and Use of Formal and Informal Credit Institutions." Bank of Mexico Working Paper 2013-07. Mexico City, Mexico: Bank of Mexico.

Cañón, C. 2016. "Distributional Policy Effects with Many Treatment Outcomes: The Assessment of a Government Intervention in Mexico." Bank of Mexico Working Paper 2016-01. Mexico City, Mexico: Bank of Mexico.

Castañeda, G., S. Castellanos and F. Hernández. 2011. "Policies and Innovations for Improving Financial Access in Mexico." Washington, DC, United States: Center for Global Development.

Castellano, S., G. Del Ángel and J. Garza-García. 2016. London, United Kingdom: Palgrave MacMillan.

Castellanos, S., J. Morales and M. Torán. 2012. "Analysis of the Use of Financial Services by Companies in Mexico: What Does the 2009 Economic Census Tell Us?" *Well Being and Social Policy* 8(2): Second Semester.

Chong, T., L. Lu and S. Ongena. 2013. "Does Banking Competition Alleviate or Worsen Credit Constraints Faced by Small- and Medium-Sized Enterprises?" *Journal of Banking and Finance* 37(9): 3412-24.

Clerides, S., M. Delis and S. Kokas. 2015. "A New Data Set on Competition in National Banking Markets." *Financial Markets, Institutions and Instruments* 24(2-3): 267-311.

Delis, M., S. Kokas and S. Ongena. 2016. "Foreign Ownership and Market Power in Banking: Evidence from a World Sample." *Journal of Money, Credit, and Banking* 48(2-3): 449-83.

Diallo, B., and Q. Zhang. 2017. "Bank Concentration and Sectoral Growth: Evidence from Chinese Provinces." *Economic Letters* 154: 77-80.

Del Ángel, G. 2003. "Is Bigger Better? Concentration and Performance in Mexican Banks: 1945-1980." Documento de Trabajo 273. Mexico City, Mexico: Centro de Investigación y Docencia Económica.

Del Ángel, G. 2006. "The Corporate Governance of the Mexican Banking System: A Historical Perspective: 1940-2000." Documento de Trabajo 373. Mexico City, Mexico: Centro de Investigación y Docencia Económica.

Del Ángel, G. 2015. "The Nexus between Business Groups and Banks: Mexico, 1932-1982." *Business History* 57(6): 1-18.

Del Ángel, G., C. Bazdresch and F. Suárez, editors. 2005. *Cuando el Estado Se Hizo Banquero: Consecuencias de la Nacionalización Bancaria en México*. Colección Lecturas del Trimestre 96. Mexico City, Mexico: Fondo de Cultura Económica,

Elizondo, A., and E. Seira. 2014. "Are Information Disclosure Mandates Effective? Evidence from the Credit Card Market." Bank of Mexico Working Paper 2014-18. Mexico City, Mexico: Bank of Mexico.

Gischer, H., H. Muller and T. Richter. 2015. "How to Measure the Market Power of Banks in the Lending Business Accurately: A Segment-Based Adjustment of the Lerner Index." *Applied Economics* 47(40-42): 4475-83.

Haber, S., N. Maurer and A. Razo. 2003. *The Politics of Property Rights: Political Instability, Credible Commitments, and Economic Growth in Mexico 1876-1929*. Cambridge, United Kingdom: Cambridge University Press.

Haber, S., and A. Musacchio. 2014. *Los Buenos Tiempos Son Éstos: Los Efectos de la Incursión de la Banca Extranjera en México Despúes de un Siglo de Crisis Bancarias*. Mexico City, Mexico: Centro de Estudios Espinosa Yglesias.

Heckman, J. et al. 2010. "Policies to Promote Growth and Economic Efficiency in Mexico." Discussion Paper 4740. Bonn, Germany: Institute of the Study of Labor.

Khan, H., R. Ahmad and C. Gee. 2016. "Bank Competition and Monetary Policy Transmission through the Bank Lending Channel: Evidence from ASEAN." *International Review of Economics and Finance* 44: 19-39.

Leon, F. 2015. "Does Bank Competition Alleviate Credit Constraints in Developing Countries?" *Journal of Banking and Finance* 57: 130-42.

Love, I., and M. Martinez. 2015. "How Bank Competition Affects Firms' Access to Finance." *World Bank Economic Review* 29(3): 413 - 448.

Maudos, J., and L. Solís. 2011. "Deregulation, Liberalization and Consolidation of the Mexican Banking System: Effects on Competition." *Journal of International Money and Finance* 30(2): 337-353

Mulyaningsih, T., A. Daly and R. Miranti. 2015. "Foreign Participation and Banking Competition: Evidence from the Indonesian Banking Industry." *Journal of Financial Stability* 19: 70-82.

Murillo Garza, J. 2005. "La Banca después de la Privatización: Auge, Crisis y Reordenamiento." In: G.A. Del Ángel, C. Bazdresch and F. Suárez, editors. *Cuando el Estado Se Hizo Banquero. Consecuencias de la Nacionalización Bancaria*. Colección Lecturas del Trimestre 96. Mexico City, Mexico: Fondo de Cultura Económica.

Negrín, J. et al. 2009. "Introduction of Basic Accounts in Mexico to Address the issue of Access to the Banking System: Design and Expected Impact." *Well Being and Social Policy* 5(1): First Semester.

Polemis, M. 2015. "Does Monopolistic Competition Exist in the MENA Region? Evidence from the Banking Sector." *Bulletin of Economic Research* 67(S1): S74-S96 .

Ponce, A., E. Seira and G. Zamarripa. 2014. "Borrowing on the Wrong Credit Card: Evidence from Mexico." Bank of Mexico Working Paper, 2014-03. Mexico City, Mexico: Bank of Mexico.

Presbítero, A., and R. Rabellotti. 2016. "The Determinants of Firm Access to Credit in Latin America: Micro Characteristics and Market Structure." *Economic Notes* 45(3): 445-72.

Ryan, R., C. O'Toole and F. McCann. 2014. "Does Bank Market Power Affect SME Financing Constraints?" *Journal of Banking and Finance* 49: 495-505.

Seira, E., S. Castellanos and D. Jiménez. 2015. "Bancarizing with Credit Cards: Experimental Evidence on Interest Rates and Minimum Payments Elasticities for New Clients." Bank of Mexico Working Paper 2015-11. Mexico City, Mexico: Bank of Mexico.

Suárez, F. 2005. "La Administración de la banca nacionalizada." In: G.A. Del Ángel, C. Bazdresch and F. Suárez, editors. *Cuando el Estado Se Hizo Banquero. Consecuencias de la Nacionalización Bancaria*. Colección Lecturas del Trimestre 96. Mexico City, Mexico: Fondo de Cultura Económica.

Tan, Y., and J. Anchor. 2017a. "The Impacts of Risk-Taking Behavior and Competition on Technical Efficiency: Evidence from the Chinese Banking Industry." *Research in International Business and Finance* 41: 90-104.

Tan, Y., and J. Anchor. 2017b. "Does Competition Only Impact on Insolvency Risk? New Evidence from the Chinese Banking Industry." *International Journal of Managerial Finance* 13(3): 332-54.

Van Leuvensteijn, M. et al. 2011. "A New Approach to Measuring Competition in the Loan Markets of the Euro Area." *Applied Economics* 43(22-24): 3155-67.

Villalpando-Benitez, M. 2000. "The Political Economy of Banking Regulation: The Case of Mexico, 1940-1978." Columbus, United States: The Ohio State University. Doctoral dissertation.

Appendix: Estimation of Indicators of Bank Competition

Methods

In this section, we describe methods used to estimate indicators of bank competition and apply them to Mexican data for banks during the period 2005–2016. We estimate measures of the Lerner indicator and the Boone indicator. The analysis consists of an econometric approach to estimating the cost function. The estimated cost function is similar to the one proposed by Berger and Mester (2009), and it is estimated using the stochastic frontier analysis approach used by Schmidt and Sickles (1984). In this approach, the regression residual indicators of efficiency are composed of two parts: a random error (or white noise), and an efficiency component. Random error is assumed to be i.i.d, normally distributed. The stochastic cost frontier takes the following form:

$$C_{it} = C(w_{it}, y_{it}, z_{it}, u_i, \varepsilon_{it})$$

where C_{it} represents variable cost for bank i in period t; w_{it} is the variable input price vector; y_{it} is the output vector; z_{it} is the vector of control variables; u_i represents an inefficiency factor that affects cost; and ε_{it} is the random error, included to represent problems with data measurement or temporary shocks which affect bank costs.[53] The inefficiency variable u_{it} incorporates both allocative and technical inefficiency of the bank. Notice that the level of inefficiency given by u_i remains fixed through time. The inefficiency variable, the random error and the constant are multiplicative and separable from the rest of the function; this can be therefore represented in natural logarithms as:

$$Ln\ C_{it} = \alpha + f(w_{it}, y_{it}, z_{it}) + Ln\ (u_i) + Ln\ (\varepsilon_{it})$$

The selected parametric approach requires the specification of a functional form; we use a translog specification due to its great flexibility. The cost function functional form can be expressed as:

---

[53] See Berger and Mester (2003).

$$Ln(C_{it}) = \propto + \propto_1 Ln(y_{it}) + \propto_2 Ln(y_{it})^2 + \sum_{j=1}^{3} \beta_j Ln(w_{it}^j) + \sum_{j=1}^{3}\sum_{k=1}^{3} \beta_{jk} Ln(w_{it}^j)Ln(w_{it}^k)$$

$$+ \sum_{j=1}^{3} n_j Ln(w_{it}^j)Ln(y_{it}) + \delta_1 Ln(z_{it}) + \delta_2 Ln(z_{it})^2 + Ln\ (u_i) + Ln\ (\varepsilon_{it})$$

With the exception of the price input variables, we normalize all the used variables by total assets, to control for heteroskedasticity and to avoid scale problems that could be present in the estimation. Imposing the next restrictions guarantees satisfying the linear homogeneity condition in input prices.

$$\sum_{i=1}^{3} \beta_i = 1, \quad \sum_{j=1}^{3} \beta_{ij} = 0 \ for\ each\ i \quad and \quad \sum_{i=1}^{3} n_j = 0$$

By deriving this estimated cost function with respect to y, we obtain the marginal costs:

$$MC = \frac{\partial C(w, y, u)}{\partial y}$$

For this specific function, the Marginal Cost (MC) is:

$$\frac{\partial c}{\partial y} = \frac{C}{y}\left[\propto_1 + 2\propto_2 Ln(y) + \sum_{j=1}^{3} n_j Ln(w^j)\right]$$

We use the estimated MC to calculate the Lerner indicator for each bank in the system. The Lerner indicator measures the difference between the price of a good or service and its marginal cost, which means the capacity of a business to establish a price above the marginal cost. To obtain the index for the Mexican credit market, it is necessary to estimate MC and the implicit interest rate of the credit granted P_k. The Lerner indicator is:

$$L_{it} = \frac{P_{it} - MC_{it}}{CM_{it}}$$

where L_{it} represents the Lerner indicator of bank i in period t, P_{it} represents the implicit price of the product of bank i in period t and MC_{it} represents the marginal cost of bank i in period t. When the index takes the value of 0 we are in the presence of perfect competition. For high levels of market power, the index can take a maximum value of 1. Alternatively, the following index can be estimated where an implicit price is not required.

$$Alternative\ Lerner_{kt} = \frac{\Pi_{kt} + C_{kt} - MC_{kt} * y_{kt}}{\Pi_{kt} + C_{kt}}$$

where Π_{kt} are the observed profits of bank k at time t, C_{kt} is the observed total cost, MC_{kt} is the estimated marginal cost, and y_{kt} is the observed total output.

Additionally, we calculate the Boone indicator; this indicator is based on the notion that more efficient companies tend to increase their market share or profits, and that this effect is stronger as the competition is stronger in the market. The specific Boone indicator estimated in this paper has two characteristics that make it innovative for the case of Mexico. First, we use the marginal cost instead of approximating this with average costs, as in previous exercises. Second, we use market shares and profits, as dependent variables. The market shares are calculated as follows:

$$m_i = \frac{q_i}{\sum_{i=1}^{n} q_i}$$

where q_i is the market share of bank i. The equation used to obtain the Boone indicator for the case of market shares is the following:

$$Ln(m_i) = \alpha + \beta \cdot Ln(MC_i)$$

For profits, the equation is:

$$Ln(\pi_i) = \alpha + \beta \cdot Ln(MC_i)$$

The Boone indicator is estimated for the banking system each year.

Variable Definitions

Variables Employed in the Cost Function

Symbol	Definition
Dependent variables	
C	Variable operating cost plus interest costs, as a proportion of total assets.
Variable input prices	
w_1	Price of purchased funds. Interest rates paid on different types of deposits.
w_2	Price of labor. Salary expenditures to total assets.
w_3	Operating cost minus salary expenditure as a proportion of total assets.
Variable output quantities	
y_1	Total loans, bonds and securities as a percentage of total assets.
Control variables	
z	Stockholder equity as a percentage of total assets.

Loan-Level Data

Type of borrower. We consider non-financial, private sector firms. This category includes firms, unions, and non-profit organizations. It excludes all government agencies, all other financial intermediaries, and individuals. We exclude trusts.

Economic Sectors. We consider firms in retail, industry[54] and services.[55] We exclude primary activities and banking-related activities.

Revolving loans. We consider standard revolving credit lines, and firm-specific credit lines associated with a credit card, current account loans with undefined ending.

Non-revolving loans. We consider non-revolving credit lines, loans with a single disposition, syndicated loans, and exercised bills of credit, loans used for productive chains, and currency liquidation.

New Loans We restrict our sample to loans originated during the period of report. We consider loans registered as belonging to the bank's loan portfolio in its balance accounts during that period.

---

[54] Including construction; food industries; automobile industries; oil, gas, and energy; apparel industry; chemical and pharmaceutical industry; construction materials.

[55] Including communications and telecommunications; education; hotels and restaurants; health services; communal and social services; and professional services.

We exclude: all loans that enter the period having a positive balance; restructured loans; [56] renovated loans; loans in balance through portfolio acquisition; new loans, originated by another provider, that the bank is only managing; loans managed by the bank via portfolio securitization; new bills of credit. [57]

Firms with no relation to the bank. We restrict to loans given to firms whose representatives are not linked to the bank. They do not hold more than 2 percent of the bank's capital and do not hold more than 10 percent of the bank's titles or have control over those who do. They do not belong to the bank's board or to the board of firms belonging to the same financial group as the bank's, and neither do their family members. They do not hold a position in the three upper hierarchy levels at the bank.

Outstanding Loans. We exclude any loan classified as past due.

Balance. We only consider loans with a positive balance.

Working Capital. We construct an indicator variable for whether the loan was reported by the firm to be used as working capital.

Currency. We only consider loans denominated in Mexican pesos.

Gross Interest Rate. We use the interest rate with which the period interest payments were calculated.

Loan Size. We use the unpaid balance at the end of the period of report plus the amount of unpaid interests, capitalized interests, or refinanced interests, commissions, and other concepts.

Gross Income. The measure corresponds to the total gross income obtained during the year before the date in which the loan was authorized. It comprises the income obtained by the loan recipient through its entrepreneurial activity, including sales of inventory, provision of services, or any other concept derived from the main activities that constitute its main source of income.

Guarantee. We generate an indicator variable for whether a loan guarantee was used when the loan score was generated. [58]

Mexican Banking and Securities Commission Credit Score Classification. We include indicator variables for each of the different credit score official categories, in accordance with the

---

[56] These include those with guarantee modifications, or changes in the loan conditions at the moment of origination or in its payment scheme.

[57] Bank instruments through which banks guarantee a fixed payment to a beneficiary designated by the payer of the bill, against an invoice.

[58] Possible guarantees include deposits, firm shares, movable collateral, immovable collateral, notes receivable, inventories or finished products, debt securities and security trusts.

methodology published in the official document "*Disposiciones de carácter general aplicables a las instituciones de crédito.*"[59]

Firm Size. For the 2009-2016 period, we classify loans according to the Mexican Banking and Securities Commission's[60] official firm size definition. The following box summarizes how it is constructed.

Firm Size Definition				
Size	**Economic Sector**	**Range in Number of workers**	**Range in amount of annual sales** Millions of pesos	**Combined maximum value**
Micro	All	Up to 10	Up to 4	4.6
Small	Trade	From 11 to 30	From 4.01 to 100	93.0
	Industry and services	From 11 to 50		95.0
Medium	Trade	From 31 to 100	From 100.01 to 250	235.0
	Services	From 51 to 100		
	Industry	From 51 to 250		250.0
Large	When the combined maximum value exceeds 235 for commerce and services and 250 for industry.			
Combined Maximum Value = (Number of workers)*(0.10) + (Annual Sales)*(0.90)				

---

[59] http://www.cnbv.gob.mx/Normatividad/Disposiciones%20de%20car%C3%A1cter%20general%20aplicables%20a%20las%20instituciones%20de%20cr%C3%A9dito.pdf
[60] See DOF (2009): http://dof.gob.mx/nota_detalle_popup.php?codigo=5096849