Essays on Financial Intermediation

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Η παρούσα Διδακτορική Διατριβή εκπονήθηκε στο πλαίσιο των σπουδών για απόκτηση Διδακτορικού Διπλώματος στο Τμήμα …….……...…… και εγκρίθηκε στις …….. από τα μέλη της Εξεταστικής Επιτροπής

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Abstract

This thesis entitled "Essays on Financial Intermediation" is comprised of three interrelated chapters in the literature of empirical banking.

In the first chapter we estimate the degree of competition in the banking sectors for 12,206 banks operating in 148 countries over the period 1997-2010 using three methods: the Lerner index, the adjusted Lerner index, and the profit elasticity. Marginal cost estimates required for all methods are obtained using a flexible semiparametric methodology. All three indices show that competitive conditions in banking deteriorated during the period 1997-2006, improved until 2008, and deteriorated again thereafter. Levels of competition differ across regions and income groups, but there is gradual convergence over time. Banking system is less competitive in sub-Saharan Africa and low income countries and more competitive in Europe and Central and South Asia and OECD countries.

The nexus between ownership and competition in the banking sector is a major concern to policymakers around the world but one that is rarely comprehensively examined. In the second chapter, for 131 countries and 13 years we match bank ownership with over 50,000 bank-year estimates, of our aforementioned dataset, on individual bank market power. We find that ownership does not explain market power at the individual bank level. However, at the country level, foreign bank ownership has a positive and significant impact on market power mainly because foreign banks enter through mergers or acquisitions and not through greenfield investments. The increases in market power can be fully explained by increases in the gap between bank output prices and marginal costs but not by price increases or cost decreases separately.

In the last chapter we take the analysis to a different level, concerning the understanding of the economic behaviour of lending relationships. We exploit a unique data set on bank-firm relationships based on syndicated loan deals to examine the effect of banks' credit risk and capital on firms' risk and performance. Our data set is a multilevel cross-section, which essentially allows controlling for all bank and firm characteristics through respective fixed effects, thus avoiding concerns regarding omitted variables. We find that banks with higher credit risk are associated with more risky firms, with lower profitability and market value. Even though the total bank capital does not seem to play a role in lending to risky firms, we find that banks with higher risk-weighted capital ratios do lend to riskier firms with less market value. Our results are indicative of a strong adverse selection mechanism and highlight the need to monitor the risky banks more closely, especially as we consider large and influential syndicated loan deals.

Περίληψη

Η διατριβή με τίτλο «Δοκίμια για τη χρηματοπιστωτική διαμεσολάβηση» αποτελείται από τρία αλληλένδετα κεφάλαια που σχετίζονται με την βιβλιογραφία της εμπειρικής τραπεζικής.

Στο πρώτο κεφάλαιο εκτιμούμε το βαθμό του ανταγωνισμού στον τραπεζικό τομέα για 12.206 τράπεζες που λειτουργούν σε 148 χώρες κατά την περίοδο 1997-2010, χρησιμοποιώντας τρεις μεθόδους: τον δείκτη Lerner, τον διορθωμένο με βάση την αποτελεσματικότητα δείκτη Lerner , και την ελαστικότητα του κέρδους. Οι εκτιμήσεις του οριακού κόστους που απαιτούνται για όλες τις μεθόδους, λαμβάνονται με τη χρήση ήμι-παραμετρικής μεθοδολογίας. Και οι τρεις δείκτες δείχνουν ότι οι συνθήκες ανταγωνισμού στον τραπεζικό τομέα επιδεινώθηκαν κατά τη διάρκεια της περιόδου 1997-2006, βελτιώθηκαν μέχρι το 2008, και επιδεινώθηκαν και πάλι στη συνέχεια. Τα επίπεδα του ανταγωνισμού διαφέρουν μεταξύ των περιφερειών και εισοδηματικών ομάδων, αλλά υπάρχει σταδιακή σύγκλιση στην πάροδο του χρόνου. Το τραπεζικό σύστημα είναι λιγότερο ανταγωνιστικό στην υπο-σαχάρια Αφρική και τις χώρες χαμηλού εισοδήματος και πιο ανταγωνιστικό στην Ευρώπη και την Κεντρική και τη Νότια Ασία και τις χώρες του ΟΟΣΑ.

Η σχέση μεταξύ της ιδιοκτησίας και του ανταγωνισμού στον τραπεζικό τομέα είναι μια σημαντική ανησυχία στους υπευθύνους χάραξης πολιτικής σε ολόκληρο τον κόσμο, αλλά σπάνια εξετάζονται διεξοδικά σε ερευνητικό επίπεδο. Στο δεύτερο κεφάλαιο, για 131 χώρες και 13 χρόνια αντιπαραβάλουμε και ταιριάζουμε την ιδιοκτησία των τραπεζών με πάνω από 50.000 εκτιμήσεις για την τραπεζική δύναμη αγοράς. Θεωρούμε ότι η ιδιοκτησία δεν εξηγεί την τραπεζική δύναμη στην αγορά σε επίπεδο μεμονωμένων τραπεζών. Ωστόσο, σε επίπεδο χώρας, η ξένη ιδιοκτησία των τραπεζών έχει μια θετική και σημαντική επίδραση στην δύναμη αγοράς, κυρίως επειδή οι ξένες τράπεζες εισέρχονται μέσω συγχωνεύσεων ή εξαγορών και όχι μέσω επενδύσεων (πράσινες εισχωρήσεις). Οι αυξήσεις στην δύναμη αγοράς μπορούν να εξηγηθούν πλήρως από την αύξηση του χάσματος μεταξύ των τιμών της τράπεζας και του οριακού κόστους, αλλά όχι από τις αυξήσεις των τιμών ή μειώσεις του κόστους ξεχωριστά.

Στο τελευταίο κεφάλαιο παίρνουμε την ανάλυση σε ένα διαφορετικό επίπεδο, όσον αφορά την κατανόηση της οικονομικής συμπεριφοράς των δανειακών σχέσεων. Αξιοποιούμε ένα μοναδικό σύνολο δεδομένων για σχέσεις τράπεζας-εταιρείας με βάση τα κοινοπρακτικά δάνεια και εξετάζουμε την επίδραση του πιστωτικού κινδύνου και των κεφαλαίων της τράπεζας στην απόδοση και κίνδυνο των εταιρειών. Τα δεδομένων μας είναι μια πολύ-επίπεδη διατομή, η οποία ουσιαστικά επιτρέπει τον έλεγχο για όλα τα τραπεζικά και εταιρικά χαρακτηριστικά μέσω των αντίστοιχων σταθερών αποτελεσμάτων (fixed effects), αποφεύγοντας έτσι ανησυχίες σχετικά τις παραλειπόμενες μεταβλητές. Βρίσκουμε ότι οι τράπεζες με υψηλότερο πιστωτικό κίνδυνο συνδέονται με πιο ριψοκίνδυνες επιχειρήσεις. Επίσης, διαπιστώνουμε ότι οι τράπεζες με υψηλότερους σταθμισμένους δείκτες κεφαλαιακής επάρκειας δανείζουν σε πιο ριψοκίνδυνες επιχειρήσεις με μικρότερη εμπορεύσιμη αξία.

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To my family,

Christos, Valentina and Lambros

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Introduction

In the first chapter we present three new set of estimates for bank market power, namely the Lerner index, the efficiency-adjusted Lerner index, and the profit elasticity. In turn, we analyze their trends and patterns in the evolution of competition. We contribute to the literature on bank competition in four important ways. First, we use a novel technique to obtain accurate estimates of marginal cost and market power for each bank in the sample. More precisely, we use the smooth coefficient model, a semiparametric approach that allows for a flexible cost structure. Second, we have the broadest coverage compared to all existing studies, with 148 countries from 1997 to 2010. While most studies focus on a specific region or income group of countries, our dataset allows studying the degree of within-country banking competition in a large number of countries. With coverage up to 2010, we are also able to analyze the evolution of banking competition during the financial crisis. Third, we compute all three different indicators favored by the recent banking literature, namely the Lerner index, the adjusted-Lerner index and the profit elasticity. Fourth, we clean the raw bank-level data required to estimate these indices from double-counting stemming from mergers and acquisitions, ownership issues, inflexible features of the Bankscope database, and other problems.

Economic globalization is changing the entrepreneurial landscape in many developed and developing countries alike and the banking sector could be no exception. Claessens and Van Horen (2013) show that the percentage of foreign banks among total banks in a given country increased on average from 21% in 1995 to 35% in 2009, and in certain developing countries this increase was significantly higher. The effect of the increasing foreign bank presence on the market power of individual banks is still an under-researched relation in the foreign banking literature. To this end, in the second chapter, we try to shed more light in this relationship. We argue that there are two main effects through which a relationship between foreign bank presence and bank market power can be established. The first is simply that foreign banks have different levels of market power compared to domestic banks. We call this the *direct impact* of foreign ownership on bank market power. The direction of this effect is not a priori obvious, as there are both positive and negative forces. The second effect comes from the fact that foreign bank penetration changes the rules of the game in the domestic banking industry. This effect is carried out to the domestic banks, which follow the paradigm of foreign banks to avoid losing grounds in

their market share. We call this the *spillover effect* of foreign bank presence on bank market power. Again the direction of this effect is arguable.

To identify the aforementioned relationship we adopt a two-step procedure. First, we take the market power that we have estimate in the first chapter. We use the Lerner index and the adjusted-Lerner index. In turn, we examine the potency of the direct impact through the impact of a foreign ownership dummy variable that takes a value of one for each foreign-owned bank in the sample at each point in time and zero otherwise. We find that the ownership effect is statistical insignificant. This finding is quite novel as, to our knowledge, there exist no other studies with such detailed analysis at the bank-year level. Subsequently, we identify the spillover effect of foreign bank participation on banks' market power using the share of aggregate foreign bank presence in each country at each year, while controlling for the direct effect. In contrast to the direct effect, we find that a high foreign bank presence increases the market power of the average bank in the industry (whether domestic or foreign-owned).

We show that the positive effect of foreign bank presence on banks' market power is primarily transmitted due to their entry through a merger or acquisition rather than through a greenfield investment More so, we find that the positive spillover effect of foreign bank ownership on the Lerner index is not due to a separate effect on either bank output prices or marginal cost, but rather on the margin (gap) between the two. Thus, higher foreign bank presence in a country increases the market power of banks by directly affecting the gap between output prices and marginal cost and not solely because foreign banks spur monopolistic pricing banking products or enhances the cost efficiency across banks.

Our finding on the spillover effect is in disagreement with the only two empirical studies on this issue, which use country-level data. Indeed, Claessens and Laeven (2004), using a sample of 50 countries, and Jeon, Olivero, and Wu (2011), using a sample of Asian and Latin American countries, analyze the impact of foreign bank presence on bank competition at the country-year level and find a positive relationship between the two. We feel that the value added of our study is substantial for at least three interrelated reasons of equal importance. First, we have the broadest coverage compared to all existing studies, with bank-year observations from 131 countries over the period 1997 to 2009, while existing studies focus on the relationship between foreign bank entry and competition/ market power at the country-year level. Then, our data set allows (i) differentiating between the direct impact and the spillover effect of foreign bank participation, (ii)

increasing the accuracy of our estimates through the high number of observations and (iii) studying the potential heterogeneity of the spillover effect among different countries with different characteristics. Second, we review all banks one by one and clean the raw bank-level data required to estimate the Lerner indices from double-counting stemming from mergers and acquisitions, ownership issues, inflexible features of the Bankscope database, and other problems. Third, the semiparametric approach used for the estimation of marginal cost is less sensitive to the choice of a functional form for the technology of banks, as it allows for a very flexible cost structure.

In the last chapter, we analyze the characteristics of banks that lend to firms with relatively high risk and low performance. Our goal is to analyze the fundamental implications for the understanding of the bank-firm relationship lending, financial stability and real macroeconomic outcomes. In order to be able to estimate these relationships we need loan-level data. Toward this end, we generate a new unique and comprehensive database by merging three different data sources and finally examine data on syndicated loans with enriched details for borrowers and lenders. This syndicated loan market has experienced a rapidly growth over the last 30 years and has evolved as the main market through which banks lend to large corporations. Sufi (2007), states that this market in U.S. has increased from $ 137 million in 1987 to over $ 1 trillion in 2007. However, despite the importance of syndicated loans, the role of banks in the corporate performance and risk has not been investigated previously, to the best of our knowledge.

Syndicated loans are credits granted by a group of banks to a borrower. Loan syndication market allows banks to compete with capital market in large transaction that a sole lender wouldn't otherwise be able to underwrite due to internal and regulatory restrictions. These loans represent a hybrid instruments combining features of relationship lending and transaction lending. They allow the sharing of credit risk between various financial institutions without the disclosure and marketing burden that bond issuers face. This market is ideal for our empirical tests because it involves large, systemically important banks and firms and it is a relatively competitive market

Our results show that banks with high credit-risk ratios are strongly associated with firms with high profit volatility, lower market value, and lower profitability. These findings hold irrespective of the variables used to proxy the credit risk of banks and are economically significant. These results reveal a disconcerting affiliation of risky banks with risky firms, yielding a bad equilibrium in the market for credit. Given that this equilibrium is observed

in the syndicated loan market, which brings together relatively large banks and firms, this can be a recipe for a turmoil in both the banking (and by extension in financial) and the products markets.

Chapter 1: A new data set on competition in national banking markets

1.1. Introduction

The issue of banking sector competition has attracted much interest in recent years, not least because of the financial crisis. Alongside the standard objective of achieving effective market competition, the issue has additional significance in banking because of the sector's crucial role in the allocation of credit. Economic development relies upon financial intermediation services that link users with providers of capital and allow consumption decisions to be smoothed over time. There are at least three key questions of interest in the theoretical and empirical literature. First, does the degree of bank competition impact the efficiency of credit allocation (Cetorelli and Strahan, 2006; Bonnacorsi and Dell'Ariccia, 2004)? Second, how does the intensity of competition affect the financial system's stability (Keeley, 1990; Boyd and De Nicolo, 2005)? Third, what are the macroeconomic outcomes of banking-sector competition (Cetorelli, 2004)?

To address these important questions, one first needs to come up with meaningful measures of the intensity of bank competition. Some studies (e.g., Cetorelli and Strahan, 2006) followed the early industrial organization tradition and used concentration measures as a proxy for bank competition. There is however a growing consensus that concentration measures – useful as they may be in revealing important structural characteristics of the industry – are not good proxies for bank competition (Beck, Demirguc-Kunt and Levine, 2006; Claessens and Laeven, 2004). Instead, recent literature favors measures like the price-cost margin or Lerner index (Lerner, 1934), the adjusted-Lerner index (Koetter, Kolari and Spierdijk, 2012), the H statistic (Panzar and Rosse, 1987), and the profit elasticity (Griffith, Boone and Harrison, 2005). Computing any of these measures (with the exception of the H statistic) requires knowledge of marginal cost. Given that data on marginal cost are not usually available, an important first step in the construction of a competition index is the estimation of marginal cost using econometric methods.

The objective of this paper is to present a new set of estimates for bank competition in 148 countries for the period 1997-2010 and to analyze trends and patterns in the evolution of competition during that period. Competition is measured in terms of the Lerner index, the adjusted-Lerner index and the profit elasticity. The paper contributes to the literature on

bank competition in four important ways. First, we use a novel technique to obtain accurate estimates of marginal cost and market power for each observation in the sample. The smooth coefficient model we employ is a semiparametric approach that allows for a flexible cost structure. Second, we have the broadest coverage compared to existing studies, with 148 countries from 1997 to 2010. While most studies focus on a specific region or income group, our data set allows studying the degree of within-country bank competition in a large number of countries. With coverage up to 2010, we are able to analyze the evolution of bank competition during the financial crisis. Third, we compute three different indicators favored by the recent banking literature, namely the Lerner index, the adjusted-Lerner index and the profit elasticity. Fourth, we clean the raw data required to estimate these indices from double-counting stemming from mergers and acquisitions, ownership issues, inflexible features of the Bankscope database, and other problems.

All indices indicate substantive changes in bank competition over time and across income and regional classification. The Lerner index, the adjusted-Lerner index and the profit elasticity produce similar overall patterns of competition over time. We observe a gradual decline in the intensity of competition from 1997 to 2006. The trend reverses for a brief period (2007-2008) but then market power increases again in 2009 and 2010. This pattern raises interesting questions about the relationship between competitive conditions and financial stability. Notably, bank competition seems to weaken during the upward phase of the business cycle and to become more intense when economic conditions worsen. We do not formally explore this link in the current work but leave it open as an important question for future research.

The empirical results also highlight important differences across regions and income groups. On average, the banking systems of Sub-Saharan Africa are the least competitive, followed by East Asia and Pacific. Europe and Central and South Asia have the most competitive banking sectors. Non-OECD countries with either high or low income levels have less competitive banking sectors than middle-income countries. OECD countries have lower bank market power overall. Despite the differences, competition levels across income and regional groups seem to be converging over time.

The three competition measures largely coincide when it comes to the main overall trends but do differ when compared at a finer level. We do not take a stand on which index is best. Each measure has its own theoretical interpretation and its calculation presents different empirical challenges. Rather than propose a specific measure, we provide (section

1.2) an extensive discussion of the theoretical justification for each index that we hope will be a useful guide to potential users seeking to identify their preferred measure.

The structure of this chapter is as follows. Section 1.2 presents an overview of bank competition measures. Section 1.3 describes our data and the empirical methodology. Section 1.4 presents the empirical results on the various indices of bank competition. Section 1.5 concludes.

1.2. Empirical methods for the estimation of competition

Estimation of competition has a long history in industrial organization, dating back to Lerner (1934). Lerner defined his "index of the degree of monopoly power" (or "degree of monopoly" for short) as

$$Lerner_i = \frac{P_i - mc_i}{P_i} \quad , \tag{1.1}$$

where P_i and mc_i are firm i's price and marginal cost respectively. The index ranges between 0 and 1, with zero corresponding to perfect competition and larger values reflecting a greater degree of market power. The Lerner index remains to this day the most widely and popular measure of market power and the intensity of competition.[1] The main reasons for its popularity are simplicity, an intuitive interpretation, and relatively mild data requirements. The Lerner index measures the ability of an individual bank to charge a price above marginal cost. When data on prices and marginal cost are available, the Lerner index can be computed as a simple ratio. Because marginal cost is rarely available, researchers have to either estimate a cost function or impose equilibrium conditions derived from theoretical models in order to obtain marginal cost estimates. The former method is usually used in the banking literature, while the latter is preferred by industrial organization economists.[2] In this paper we will follow the banking literature approach of estimating a cost function.

[1] Throughout the paper we will use market power as a measure of competition intensity. This is usually an innocuous assumption, although research has shown that the Lerner index does not always point in the expected direction when competitive conditions change (Stiglitz, 1989; Boone, 2008a).

[2] The use of equilibrium conditions is the hallmark of the New Empirical Industrial Organization (NEIO) literature; see Bresnahan (1989) for an overview.

Koetter, Kolari and Spierdijk (2012) have argued that the conventional approach of computing the Lerner index assumes both profit efficiency (optimal choice of prices) and cost efficiency (optimal choice of inputs by firms). As a result, the estimated price-cost margins do not correctly measure the true extent of market power. The argument reflects a distinction pointed out by Lerner (1934) himself, who states that "for practical purposes we must read monopoly power not as *potential* monopoly, but as monopoly *in force*" (p. 170; italics as in the original). In other words, the Lerner index measures *actual* (exercised) market power, while Koetter, Kolari, and Spierdijk (2012) are interested in measuring *potential* market power. To that end, the authors propose an adjustment that results in the *efficiency-adjusted Lerner index*:

$$adjusted\ Lerner_i = \frac{\pi_i + tc_i - mc_i \cdot q_i}{\pi_i + tc_i}\ , \tag{1.2}$$

where π_i is the profit of bank i, tc_i is total cost, mc_i is marginal cost and q_i is total output. Like the standard Lerner index, the adjusted Lerner ranges from 0 to 1, with larger values indicating greater market power.

Boone (2008a) proposes a new competition measure called *relative profit differences* (RPD). He shows that in most theoretical models of oligopolistic competition, the difference in profit between more and less efficient firms is increasing in the intensity of competition. Consider an increase in competition – due perhaps to a decrease in entry costs or to goods becoming closer substitutes. It will cause the profits of all firms to decline but inefficient firms will suffer a greater decline than efficient firms. In other words, the profits of an efficient firm will *increase relative* to the profits of a less efficient firm as increased competition will penalize the least efficient firm more severely.

RPD is a theoretical construct that is difficult to compute in practice. Boone, Griffith and Harrison (2005) have proposed the *profit elasticity* (PE) as an empirical analogue of RPD. The PE is the percentage decrease in profits resulting from a one percent increase in the marginal cost:

$$profit\ elasticity_i = \frac{\partial \ln \pi_i}{\partial \ln mc_i}\ . \tag{1.3}$$

The PE (sometimes called the Boone indicator) should be negative because profits and marginal cost are inversely related. An efficient firm will have a lower PE (in absolute value) as its profits will be less affected by a change in marginal cost. For example, if *PE* =

-0.2, a 1 percent increase in the marginal cost (due to a decrease in the efficiency level) will decrease its profits by 0.2 percent. If *PE* = -0.5, a 1 percent increase in the marginal cost will decrease its profits by 0.5 percent. A large absolute value of the PE can be interpreted as a reduction in the ability of the bank to contain its losses due to an increase in competition. The profit elasticity therefore links bank performance to differences in efficiency (in terms of marginal cost).

Boone, Griffith and Harrison (2005) suggest that the PE can be estimated from the equation:

$$\ln \pi_i = \alpha + \beta_i \ln mc_i \quad . \tag{1.4}$$

The coefficient β_i is the desired profit elasticity index of market power. Intuitively, equation (1.4) examines the relationship between profits and marginal cost; or, differently phrased, the indirect relationship between profits and efficiency. The profit elasticity can take any value and is therefore a continuous indicator of market power. It has already been used in empirical applications in various industries (e.g., Delis, 2012; Van Leuvensteijn, Sorensen, Bikker and van Rixtel, 2013; Boone and Van Leuvensteijn, 2010). The index has also received some criticism; for example, Schiersch and Schmidt-Ehmcke (2010) show that the profit elasticity makes critical assumptions relative to firm size (the biggest firms are assumed to be the most efficient) and relative to the definition of the extent of the market.

It is worth pointing out that a measure of the profit elasticity can be derived from the adjusted-Lerner index by solving for π in equation (1.2) and differentiating with respect to marginal cost. The result is

$$profit\ elasticity_i = \frac{q_i \cdot mc_i}{q_i \cdot mc_i - tc_i \left(1 - adjusted\ Lerner_i\right)} . \tag{1.5}$$

Hence, the adjusted Lerner and profit elasticity are two closely related concepts.

Many older banking studies measured competition with the so-called H statistic. The statistic is based on the test for *"monopoly" equilibrium* proposed by Panzar and Rosse (1987; quotation marks included in the paper's title). Panzar and Rosse (henceforth PR) show that under very general conditions, the sum of the factor price elasticities of a monopolist's reduced form revenue equation must be non-positive. They further show that in commonly used oligopolistic models this sum is strictly positive; they note however that

this last result is based on relatively simple oligopoly models and is therefore less general than the monopoly result. They also point out that a monopoly facing a perfectly elastic demand curve can have a negative H statistic under some conditions, even though it has no market power. They conclude that "a rejection of the hypothesis that H < 0 must mean that the revenue functions of the observed firms are influenced by the actions of others" (p. 447).

PR presented the H statistic to be a test for monopoly behavior and avoided interpreting it as a measure of competition.[3] Nonetheless, their findings gave rise to a large literature – mostly in banking – that used that H statistic as a measure of competition. This literature has been recently criticized by Bikker, Shaffer, and Spierdijk (2012), who show that much of the analysis using scaled revenue equations leads to misleading results, while even "the unscaled P-R test is a one-tail test of conduct." They conclude that "the P-R revenue test results in a nonordinal statistic for firm conduct that is less informative than prior literature has suggested." Based on these findings and on our own reservations due to the lack of a clear theoretical justification, we decided not to compute the H statistic in this paper.

The Lerner, adjusted-Lerner and profit elasticity indices each have their own merits and drawbacks. Simplicity and direct applicability to empirical studies are strong arguments in favor of the Lerner and adjusted-Lerner indices, while the existence of a solid theoretical foundation justifies the use of the profit elasticity index. We do not take a stand on which measure better reflects competition. We use the three indices described above to measure banking-sector competition in a broad sample of 148 countries. We make all estimates available to the wider research community and let researchers decide which indicator is preferable, given the objectives of their research agenda. In fact, we will claim in the next section that probably the most important issue underlying all indices is the robust estimation of marginal cost at the bank-year level, which is required with all approaches.

1.3. Data and methodology

1.3.1. Data

Like many other banking studies, we rely on Bankscope as our primary source of bank-level data. Our sample covers the period 1997-2010. We exclude earlier years because of

[3] They did show that with constant elasticity demand and a CRS Cobb-Douglas technology, the H statistic is equivalent to the Lerner index: L = H/(H-1).

concerns associated with coverage and accounting issues. Our focus is on commercial banks, savings banks and cooperative banks. We exclude real-estate and mortgage banks, investment banks, other non-banking credit institutions (mainly operating in Germany), specialized governmental credit institutions, bank-holding and other holding companies.[4] Besides bank-holding companies, the excluded institutions are less dependent on the traditional intermediation function and have a different financing structure compared to our focus group. In short, our focus in this study is on banks carrying out traditional banking activities. Inclusion of bank-holding companies could lead to double counting, as these are corporations controlling one or more banks. We always check that we have the subsidiaries of these companies in the sample to avoid false exclusion of some banks. Further, we have included in our sample only countries that had at least three banks in each year of our panel.

We apply three further selection rules to avoid including duplicates in our sample. This is an essential part of the sample-selection process that is absent from most empirical studies using the Bankscope database (for a similar strategy with ours, see Claessens and van Horen, 2014). First, even though we do not include bank-holding companies, we still need to exclude double entries between parent banks and subsidiaries.[5] Bankscope's consolidation code system allows downloading either consolidated or unconsolidated statements, but in some cases information on either unconsolidated or consolidated statements of certain banks is not available.[6] We use either the consolidated or the unconsolidated statement depending on which one is available. This is a non-trivial process that requires the re-examination of all banks on an individual basis to avoid double-counting. Notably, there are cases of banks with subsidiaries in domestic or in foreign countries and one should be very careful to avoid double-counting of subsidiaries that are established, for example, in a foreign country.[7]

[4] The main activities of excluded financial institutions relate to the following: provide mortgages; assist corporations and governments in a range of services (e.g., M&As, raising capital, etc.); provide credit to public sectors; provide funding for public or municipal projects.

[5] For the determination of the subsidiary we follow the definition generally applied in the literature, i.e. 50% or more of the shares of the subsidiary owned by the parent bank.

[6] A consolidated statement is the statement of a bank integrating the statements of its subsidiaries or branches. An unconsolidated statement does not integrate subsidiaries.

[7] Let us provide some examples to clarify this point. Assume that bank A1 is the parent bank with a consolidated (C) statement and banks A11, A12 and A13 are subsidiaries and unconsolidated (U) statement. If we include all banks in our sample we will have 3 duplicates. Hence, we need to subtract either the percentage of the subsidiaries or to exclude the subsidiaries from the sample. The former solution is not feasible because we do not have enough information for the percentage and the time duration of the

Second, we account for mergers and acquisitions (M&As). We went through all the M&As one-by-one and made sure that both banks appear separately in the sample before the M&A and only the merged entity or the acquiring bank is included in the sample after the event. For example, if bank A and bank B merged in 2005, we create a new entity AB after 2005 and exclude the separate financial accounts of A and B that might still be reported for some time after the merger. We identify M&As and their timing using Bankscope and the websites of the merging parties.

Third, in the US there are many distinct banks that have the same name but are active in a different state. To solve this issue, we relate the value of total assets of, say, bank *i* in the last year this bank appears in our sample with Bankscope's identification number for bank *i*. This also allows avoiding problems with our procedure concerning M&As described above. This data cleaning process yields an unbalanced panel with 89,778 observations, corresponding to 12,206 banks operating in 148 countries between 1997 and 2010.

In order to compute the desired competition indices we first need to calculate the variables π, p, q and tc and then to estimate a cost function. The latter has the general form:

$$tc_{it} = f(q_{it}, w_{l,it}, w_{k,it}, w_{d,it}) \ , \tag{1.6}$$

where $w_{l,it}, w_{k,it}$ and $w_{d,it}$ are factor prices for labor, capital and deposits respectively. To identify bank inputs and outputs for the cost function we use the intermediation approach, which assumes that deposits are inputs used in the production process to produce bank outputs, and has been shown to be the preferred approach by a number of studies (e.g., Berger and Humphrey, 1997; Hughes and Mester, 1993). In particular, we measure bank total costs (*tc*) by real total expenses, and bank output (*q*) by real total earning assets. This measure for bank output relates to traditional banking activities, therefore our main indices reflect competition in these activities. We construct real variables were appropriate, using the GDP deflator (obtained from the World Bank).[8] Real total earning assets include loans, securities, and other earning assets (such as investments and insurance assets).

ownership of the subsidiaries. Thus, we resort to the later solution. Two other examples for the case of banks with foreign subsidiaries that we account for using the same strategy are (i) B1 is a parent bank with a C statement, B11 is a subsidiary bank operating in the domestic market with a C or a U statement and B111 is a sub-subsidiary bank operating in the domestic market and (ii) B1 is a parent bank with C statement, B12 is a subsidiary bank operating abroad with a C or a U statement and B121 is a sub-subsidiary bank operating in the domestic market with a U statement.

[8] As is standard in the macroeconomics literature, for Taiwan we use the GDP deflator of China and for Netherlands Antilles we use the GDP deflator of Aruba.

We also specify a cost function with the same three inputs but two outputs, namely real total earning asset (q_1) and off-balance sheet items (q_2). We employ this alternative specification because many banks have a significant volume of off-balance sheet items and naturally use their inputs to produce these outputs. Our competition index with this approach reflects competition in the traditional banking activities after controlling for the fact that many banks also use their inputs toward the production of off-balance sheet items.

The three input prices are proxied as follows: the price of labor w_l by the ratio of personnel expenses to total assets;[9] the price of physical capital w_k by the ratio of capital expenditures to fixed assets; and the price of deposits w_d as total interest expenses over total customer deposits. We measure bank profits π using total profits before taxes. For the Lerner index and the adjusted-Lerner index we need the aggregate output price p. This is calculated as the ratio of total income over total earning assets (Beck, Jonghe and Schepens, 2013).

As a final step, we clean our sample from outliers in the sense of unreasonably negative values for total assets and total expenses. Additionally, for the three input prices we drop 1% of our sample from each end of their distribution. This excludes unreasonably high or low input prices (Delis, 2012; Claessens and Laeven, 2004). Notably, the initial dataset before all the steps of the cleaning process described above includes 300,180 observations for 21,445 banks operating in 149 countries between 1997 and 2010. Our final dataset consists of 89,778 observations for 12,206 banks operating in 148 countries between 1997 and 2010. Most of the observations are dropped due to some form of double-counting stemming from Bankscope's consolidation system and M&As. This shows that the data-cleaning process is extremely important in generating sensible indices of bank competition. Table 1.1 reports the number of banks for all years, Table 1.2 provides detailed information on the construction of the variables, and Table 1.3 reports summary statistics.

[Insert Tables 1.1, 1.2 and 1.3 about here]

[9] We divide by total assets instead of the number of employees because Bankscope has limited information on the number of employees. The related literature follows a similar approach (e.g., Delis, 2012; Claessens and Laeven, 2004).

1.3.2. Econometric methodology for the estimation of market power

An important concern for the empirical estimation of market power is the choice of a proper functional form to obtain observation-specific estimates of marginal cost. The selection of a functional form is crucial because an inappropriate choice will invalidate any inference. At a minimum, the production technology should be allowed to vary (i) across banks operating in the same industry and (ii) over time. We rely on a semiparametric approach, which has some appealing features that we analyze below.

We start from the cost function implied by a standard log-linear production function and impose the usual linear homogeneity restriction in inputs prices (that is, we normalize total cost and the input prices by the price of deposits before taking logs). We end up with the following cost function:

$$\ln tc_{itc} = b_1 + b_2 \ln w_{l,itc} + b_3 \ln w_{k,itc} + a_1 \ln q_{itc} \ . \tag{1.7}$$

We estimate this equation with a semi-parametric partial linear smooth coefficient (PLSC) model, which uses the local polynomial fitting regression and the Gaussian kernel function to obtain estimates of α_1 for each bank *i* at time *t* in country *c.* A thorough discussion of the PLSC model can be found in Fan and Zhang (1999) and Mamuneas, Savvides and Stengos (2006). Delis (2012) and Delis, Iosifidi and Tsionas (2012) use this model to estimate marginal cost; the summary that follows is based on their discussion.

We can write the econometric form of the total cost equation as

$$Y_i = E(Y_i \mid W_i) + e_i = X_i \beta_1 + V_i \beta_2 (Z_i) + e_i \ . \tag{1.8}$$

In this equation, β_2 is a function of one or more variables of dimension *k* added to the vector *Z*, which is an important element of the analysis and will be discussed below. The presence of a linear part in Eq. (1.8) is in line with the idea of a semiparametric model as opposed to a fully nonparametric one. The coefficients of this part are estimated in a first step as averages of the polynomial fitting by using an initial bandwidth chosen by cross-validation. In the second step we use these average estimates to re-define the dependent variable as

$$Y_i^* \equiv Y_i - X_i \hat{\beta}_i = V_i \beta_2 \left(z \right) + e_i^* \ . \tag{1.9}$$

The coefficient $\beta_2(z)$ is a smooth but unknown function of z. We estimate $\beta_2(z)$ using a local least squares approach.[10] Using the PLSC technique, we allow the model to be linear in the regressors but their coefficients are allowed to change "smoothly" with the value of other variables z.

We can now re-write Eq. (1.7) in econometric form as

$$\ln tc_{itc} = b_1 + a_1(z_{itc}) \ln q_{itc} + b_{2,itc} \ln w_{l,itc} + b_{3,itc} \ln w_{k,itc} + e_{itc} \ , \qquad (1.10)$$

where e is a stochastic disturbance and z is the smoothing variable required by the PLSC approach. The model is semiparametric in the sense that it treats only the coefficient a_1 as a function of z. From Eq. (1.10) we can obtain the marginal cost for each bank i at time t in country c as $\partial tc_{itc} / \partial q_{itc} = a_1\left(z_{itc}\right)\left(tc_{itc} / q_{itc}\right)$.[11]

A critical issue in the estimation process is the choice of the variable(s) that comprise Z. The best candidates are variables that shift a_1 and exhibit variation across banks, countries and time. We need variables that shift marginal cost and the natural candidates to use are the input prices; they are observation-specific by construction and they clearly affect marginal cost. Any cost function derived from a cost minimization problem will be a function of, among other thing, input prices. Numerous studies that have estimated cost functions using a translog specification find that input prices are indeed important determinants of marginal cost. Delis, Iosifidi and Tsionas (2012) propose using the linear combination of input prices as the z variable and show that it works well in this context. We follow their suggestion and define the smoothing variable as $z_{itc} = \ln w_{l,itc} + \ln w_{k,itc}$. As a robustness check we experimented with various other combinations (such as the product of the input prices or linear combinations with different weights) and found that our results are not sensitive to the choice of z function.

Once we have our estimates of marginal cost we use them to calculate the Lerner index from Eq. (1.1) and the adjusted-Lerner index from Eq. (1.2), as well as to estimate the profit elasticity from Eq. (1.4). A problem that arises with the latter is the fact that we have

[10] Mamuneas, Savvides and Stengos (2006) discuss in detail how this function can take specific parametric formulations (such as linear) that can be tested against the general unknown specification. They also provide formulae for the local least squares criterion.

[11] We use $\ln tc_{itc} = b_1 + a_1(z_{itc}) \ln q_{1,itc} + a_2 \ln q_{2,itc} + b_{2,itc} \ln w_{l,itc} + b_{3,itc} \ln w_{k,itc} + e_{itc}$ for the model with the off-balance sheet items. Given that we focus on the market power stemming from traditional banking activities, marginal cost is still derived from $\partial tc / \partial q_{1,itc} = a_1\left(z_{itc}\right)\left(tc_{itc} / q_{1,itc}\right)$.

to take the logarithm of profits, and profits can be negative. Bos and Koetter (2011) propose a solution using the following transformation for bank profits (π):[12]

$$\pi^{+} = \begin{cases} \pi & \text{if } \pi \in \Re_{+} \\ 1 & \text{if } \pi \in \Re_{-} \end{cases} \text{ and } NPI = \begin{cases} 1 & \text{if } \pi \in \Re_{+} \\ |\pi| & \text{if } \pi \in \Re_{-} \end{cases} . \tag{1.11}$$

This is an indicator that captures both profits and losses since π^{+} can be used as a left-hand side variable in the regression equation and the negative profit indicator (NPI) as a right-hand side variable. Hence, the actual estimated equation equivalent to that of Eq. (1.4) is

$$\ln \pi_{itc}^{+} = a + \beta(z_{itc}) \ln mc_{itc} + \gamma \ln NPI_{itc} + u_{itc} \ . \tag{1.12}$$

Estimation of equation (1.10) and subsequently of equation (1.12) via the PLSC technique presents some considerable interrelated advantages. Most importantly, the semiparametric nature of the method implies that no assumption regarding the functional form of the underlying cost function is made globally. This is important as it usually quite difficult for the researcher to be certain about the validity of the chosen functional form. The PLSC method allows for considerable flexibility in the estimation of the cost function because of variation in the structural variables employed. In their survey paper, Reiss and Wolak (2007) are very skeptical about using a specific functional to estimate cost functions without a prior analysis of the data, since an "incorrect" cost function can bias the estimation and inference of marginal cost in an unknown direction and magnitude. The flexibility of the semiparametric technique takes into account the heterogeneity in the production technology across banks and countries and hence allows the use of large international samples of banks employing different production technologies. Finally, Mammen, Rothe and Schienle (2012) establish theoretically that the two-step estimation procedure reduces measurement errors stemming from unobserved country factors. Delis, Iosifidi and Tsionas (2012) and Wheelock and Wilson (2012) provide empirical support to these arguments by showing that estimation of marginal cost using semiparametric and nonparametric methods produces significantly better results than parametric techniques and commonly used functional forms like the translog.

[12] There are two alternative approaches. The first is to truncate profits and exclude banks that incur losses and the second is to rescale profits by adding the maximum loss observed in the sample plus a small number to each observation on bank profits. The obvious drawback of the first approach is that it introduces selection bias. The rescaling approach is a good approximation when the shift is small relative to the magnitude of the shifted variable but will bias the estimated coefficient if the shift is large, which may be the case here. We experimented with both of these alternative approaches but they produced coefficients which were either insignificant or unreasonable.

1.4. Estimates of bank competition

In Table 1.4 we report the pairwise correlation coefficients between the Lerner, the adjusted-Lerner and the profit-elasticity measures (the calculation weighs observations by bank size, measured as total earning assets). The Lerner and the adjusted-Lerner indices are highly correlated, while the correlation coefficients involving the profit elasticity are substantially smaller but still statistically significant at the 1% level.

Further, in Tables 1.5, 1.6, 1.7 and 1.8 we report the average values of these indices by country and year. As is common in the literature, we obtain these market-level measures by taking the weighted mean of the individual measures, with market shares as the weights. The reported values are effectively four new indices of banking-sector competition that (i) rely on efficient estimates of marginal cost, (ii) have the largest coverage compared to previous studies, and (iii) are constructed on the basis of a clean database as discussed in Section 1.3.1. The weighted mean values are 0.27, 0.21, -0.46, and 0.23 for the Lerner index, the adjusted-Lerner index, the profit elasticity, and the Lerner index with two outputs, respectively. The Lerner index ranges between -0.12 in Ecuador in 1998 and 0.82 (close to monopoly) in Cuba in 1997. The adjusted-Lerner index ranges between -0.18 in Paraguay in 2002 and 0.82 in Cuba in 1997. The profit elasticity ranges between -0.7 in China in 1997 and -0.33 in Afghanistan and Serbia in 2006 and 2002, respectively. We will omit the analysis for the Lerner index for the two-output case, as the results on this index are very similar to the other two Lerner-type indices.

[Insert Tables 1.4, 1.5, 1.6, 1.7 and 1.8 about here]

The Lerner and adjusted-Lerner indices suggest that Austria, Belgium, Germany, Israel and Paraguay have the most competitive banking systems, while Cuba, Ethiopia, Libya and Seychelles have the least competitive ones. The results for the European countries are consistent with the findings of Carbo et al. (2009). The values for the profit elasticity suggest that South Korea, Kuwait, Mexico, Paraguay, Portugal and Turkey have the most competitive banking systems, while Japan, Afghanistan and Finland have the least competitive ones.

The results in Tables 1.5, 1.6 and 1.7 indicate that the degree of competition varies considerably across countries and geographical areas. In Figure 1.1 we show the time trend in average bank competition for each of the three indices. To facilitate comparison, we use two different vertical axes: the left one for the Lerner indices and the right one for the PE.

In broad terms, all indices identify similar trends in competition over time. Average bank market power peaks in 2006 for the Lerner index (*Lerner = 0.30*), in 2005 for the adjusted-Lerner index (*adjusted Lerner = 0.26*) and in 2004 for the profit elasticity (β = -0.42), declines somewhat from 2006-2008 and increases again in 2009 and 2010.

This pattern may reflect the sharp increase in financial globalization before the financial crisis of 2007 and related reforms that are likely to have led to higher market power through cross-border M&As and increased efficiency without an accompanying reduction in the lending rate. The increase of market power before the financial crisis of 2007 may also be partially attributed to financial globalization and the gradual penetration of foreign banks in local markets through the acquisition of domestic banks. The onset of the global financial crisis coincides with a decrease in market power. This may be related to capital losses and non-performing loans suffered by many banks, which reduced efficiency; or to the rising informational asymmetry costs faced by banks during crises (adverse selection and moral hazard) that increase the cost of lending.

[Insert Figure 1.1 about here]

To examine the evolution of bank competition among different groups of countries, we use the World Bank's classification of countries according to income group and geographical region. There are five income groups. The first includes all the OECD countries with an annual income per capital of $12,476 or more (31 countries). The second includes the high income (HI) countries that are non-OECD members with an annual income per capita of $12,476 or more (19 countries). The third, fourth and fifth groups are the upper-middle-income (UMI, 43 countries with income of $4,036 – $12,475), the lower-middle income (LMI, 33 countries with income $1,026 – $4,035) and the low income (LI, 22 countries with income $ 1,025 or less). For the regional classification the World Bank includes only the low and middle-income economies. In particular, there are six groups: East Asia and Pacific (EAP), Europe and Central Asia (ECA), Latin America and the Caribbean (LAC), Middle East and North Africa (MENA), South Asia (SA) and Sub-Saharan Africa (SSA).

In Figure 1.2 we plot the average of each of the three indices across (i) OECD economies, (ii) high-income economies (non OECD), (iii) upper-middle income economies, (iv) lower-middle income economies and (v) low-income economies. With all three indices the market power of banks in the OECD countries is on average low (*Lerner* ≈ 0.2) and stable until 2001 but starts increasing until 2004. This finding is in line with Bikker and Spierdijk (2008), who suggest that the increase in bank market power was the result of the creation

and the widespread employment of more innovative financial products and the greater use of new technologies. These may have increased scale economies and network externalities and thus led to larger banks with greater market power.

In the other (non-OECD) high-income economies bank market power follows the same path as in the OECD countries, but is on average higher (*Lerner* ≈ 0.30). For middle-income economies, the market power of banks peaks in 2005 (*Lerner* ≈ 0.27) and declines slowly only after 2008. The overall trend in low-income economies is slightly different, as market power is following an increasing path until 2006 and remains stable thereafter. The higher systemic risk in the low-income economies, might lead to increased probability of default, higher probability of bank runs and to the survival of a smaller number of banks that might find it easier to collude. The above results are consistent with the picture shown in Table 1.1.

An interesting pattern in Figure 1.2 is the fact that the medium-income countries have a more competitive and stable banking sector than the high-income countries (non OECD), perhaps because they operate in a less risky business environment. The relatively high market power of banks operating in the middle-income countries may be explained by the stronger local loan demand from local firms in these countries (Caminal and Matutes, 2002). Notably, the middle-income economies are characterized by a large number of small- or medium-sized local firms, a structural element that has been shown to increase loan demand and raise market power of banks.

[Insert Figure 1.2 about here]

Figure 1.3 shows the weighted averages of our three indices by regional groups of countries. The Sub-Saharan African and East-Asian and Pacific banking systems seem to be the least competitive ones according to all indices. Further, the banking systems of East Asia and Pacific, South Asia, and Latin America and the Caribbean have large fluctuations in the degree of competition, while the banking systems of Sub-Saharan Africa and Europe and Central Asia have relative stable market power. Also, the market power in the Middle East and North Africa region is increasing and stable.

[Insert Figure 1.3 about here].

1.5. Conclusions

This paper constructs a new set of indices of bank market power – the Lerner index, the efficiency-adjusted Lerner index, and the profit elasticity – for a large number of countries over the 1997-2010 period. We contribute to the literature on bank competition in four important ways. First, we use a semiparametric technique to obtain estimates of marginal cost for each bank-year observation in the sample. This technique has some important advantages compared to parametric techniques, especially related to the increased flexibility of the functional form. Second, we have the broadest coverage compared to all existing studies, with 148 countries from 1997 to 2010. Third, we compute all three different indicators favored by the recent banking literature, namely the Lerner index, the adjusted-Lerner index and the profit elasticity. Fourth, we clean the raw bank-level data required to estimate these indices from all double counting stemming from mergers and acquisitions, ownership issues, inflexible features of the Bankscope database, and other possible problems.

Our results show that the Lerner index, the adjusted-Lerner index and the profit elasticity produce similar patterns of competition over time. All three measures show that market power increased on average during the period 1997-2006, declined until 2008, and increased again in 2009 and 2010. This trend broadly coincides with the global business cycle. A possible interpretation is that bank efficiency increased during the upward phase of the business cycle – possibly owing to lower informational asymmetries and adjustment costs – but the savings were not fully passed through to prices of banking products, leading to an increase in market power. The empirical results also emphasize important differences among regional and income groups of countries.

The new indices can be used by researchers wishing to analyze the factors affecting competition in the banking sector. Among these factors, the political and regulatory elements that influence the extent of market power, as well as the reasons behind the different patterns produced by the three indices are particularly promising direction for future work. Further, an examination of the effects of bank competition on the real economy would provide important insights on the role of bank competition in promoting growth, equality and prosperity.

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Table 1.1: Number of banks in the sample

LI refers to the low-income economies, LMI refers to the lower-middle-income economies, OECD refers to the OECD member countries, HI refers to high-income economies other than OECD countries, and UMI refers to upper-middle-income economies. EAP refers to East Asian and Pacific countries, ECA to the European and Central Asian countries, LAC refers to Latin American and Caribbean countries, MENA refers to Middle Eastern and North African countries, SA refers to Southern Asian countries and SSA refers to Sub-Saharan African countries.

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
							All countries							
	3,895	4,051	6,349	6,262	6,184	6,047	5,937	6,062	7,362	7,486	7,829	7,838	7,531	6,945
							Income groups							
LI	54	66	74	87	90	98	111	120	138	140	161	191	207	180
LMI	223	250	282	278	273	283	299	337	391	397	427	440	446	391
OECD	3,154	3,241	5,443	5,281	5,194	5,013	4,815	4,848	5,765	5,693	5,777	5,652	5,524	5,219
HI	110	112	107	116	116	116	114	128	141	142	140	133	113	94
UMI	354	382	443	500	511	537	598	629	927	1,114	1,324	1,422	1,241	1,061
							Regional groups							
EAP	119	118	119	100	98	103	112	137	172	183	199	220	222	208
ECA	83	83	145	164	183	236	290	324	625	791	955	1,004	811	649
LAC	222	271	291	333	318	282	284	291	280	293	322	345	357	326
MENA	49	44	48	48	42	46	49	51	49	57	74	89	97	89
SA	76	83	86	89	93	100	111	114	121	117	125	127	135	123
SSA	82	99	110	130	138	145	151	154	181	181	210	237	242	205

Table 1.2: Data description

Variable	Measure	Notation
For aggregate output (1 output)		
Earning assets	Natural log of deflated total earning assets (measure of a bank's output)	q
Price of output	Total income/ total earning assets	P
For disaggregate outputs (2 outputs)		
Earning assets	Natural log of deflated total earning assets (measure of bank's output)	q_1
Off-balance sheet items	Natural log of deflated off-balance sheet items (measure of bank's output)	q_2
Price of earning asset	Total income/ total earning assets	P_1
Price of off-balance sheet	Total income/ off-balance sheet	P_2
Expenses	Natural log of deflated total interest expenses and total noninterest expenses (measure of a bank's total cost)	tc
Price of deposits	Total interest expenses/ total customer deposits	w_d
Price of labor	Personnel expenses/ total assets	w_l
Price of physical capital	(Overheads-personnel expenses)/ fixed assets	w_k
Profits	A bank's deflated total profits before tax	π
NPI	Natural log of $\begin{cases} 1 & \text{if } \pi \in \Re_+ \\ \lvert\pi\rvert & \text{if } \pi \in \Re_- \end{cases}$	NPI
Positive profits	Natural log of $\begin{cases} \pi & \text{if } \pi \in \Re_+ \\ 1 & \text{if } \pi \in \Re_- \end{cases}$	π^+

Table 1.3: Summary statistics
The table reports summary statistics (number of observations, mean, standard deviation, minimum and maximum) for the variables used in the empirical analysis. The bank level variables are defined in Table 1.2. The measures of competition are defined in Eqs. (1.1), (1.2) and (1.4) for the Lerner index, the adjusted-Lerner index and the Profit elasticity, respectively, and are estimated using the methodology in Section 1.3.2.

Variable	Observations	Mean	Std. dev.	Min.	Max.
For aggregate output (1 output)					
Earning assets	89,778	11.71	2.02	6.83	21.38
Price of output	89,778	0.09	0.07	0.02	0.71
For disaggregate output (2 output)					
Earning assets	89,778	11.71	2.02	6.83	21.38
Off-balance sheet items	79,875	9.16	2.47	-1.58	21.26
Price of earning asset	89,778	0.09	0.07	0.02	0.71
Price of off-balance sheet	79875	39.30	811	0.00	110,787
Expenses	89,778	12.25	2.10	5.29	22.42
Price of deposits	89,778	0.06	0.09	0.00	1.03
Price of labor	89,778	0.02	0.01	0.00	0.09
Price of physical capital	89,778	1.70	3.71	0.13	56.96
Profits	81,939	7.00	2.13	-2.24	16.76
NPI	89,778	0.58	2.09	-2.27	16.69
Positive profits	89,778	6.39	2.83	-2.24	16.76
Lerner index	88,202	0.22	0.12	-0.20	0.95
Adjusted-Lerner index	85,832	0.17	0.12	-0.20	0.95
Profit elasticity	89,778	-0.42	0.08	-0.96	-0.32

Table 1.4: Correlation between indices of weighted market power by market share
The * mark denotes statistical significance at the 1% level.

	Lerner index	Adjusted -Lerner index	Profit elasticity
Lerner index	1.00		
Adjusted-Lerner index	0.86*	1.00	
Profit elasticity	0.33*	0.31*	1.00

Table 1.5: Average estimates of market power (weighted by market shares) using the Lerner index

The table reports average estimates of market power (weighted by market shares) by country and year. Averages are obtained from the bank-level estimates of market power using the Lerner index, as this is defined in Eq. (1.1). Higher values reflect higher market power (lower competition).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean
Afghanistan									0.381	0.237	0.084	0.362	0.299	0.147	0.252
Albania			0.120	0.321	0.210	0.201	0.184	0.215	0.293	0.274	0.317	0.303	0.318	0.359	0.223
Algeria	0.153	0.165	0.065	0.153	0.229	0.387	0.244	0.459	0.590	0.648	0.533	0.624	0.528	0.513	0.378
Andorra	0.255	0.296	0.354	0.359	0.305	0.373	0.459	0.505	0.505	0.507	0.439	0.281			0.386
Angola	0.275	0.313	0.281	0.397	0.498	0.427			0.412	0.267	0.459	0.492	0.427	0.467	0.393
Antigua and Barbuda				0.051	0.090	0.123	0.133				0.266	0.334	0.344		0.192
Argentina	0.217	0.170	0.189	0.218	0.136	0.121	0.019	0.167	0.257	0.285	0.245	0.209	0.325	0.318	0.205
Armenia	0.182	0.235	0.215	0.188	0.280	0.348	0.375	0.389	0.374	0.364	0.354	0.329	0.226	0.284	0.296
Australia	0.253	0.248	0.211	0.285	-0.085	0.225			0.250	0.233	0.218	0.165	0.250	0.251	0.209
Austria	0.147	0.122	0.132	0.146	0.145	0.154	0.189	0.185	0.182	0.174	0.166	0.151	0.206	0.260	0.168
Azerbaijan	0.533	0.370	0.377	0.535	0.436	0.382	0.375	0.435	0.441	0.388	0.388	0.411	0.380	0.275	0.409
Bahamas, The	0.159	0.173	0.210	0.272	0.294	0.214	0.321	0.356	0.393	0.388	0.421	0.333	0.391	0.390	0.308
Bahrain	0.205	0.177	0.175	0.161	0.177	0.239	0.223	0.284	0.265	0.201	0.189	0.232			0.211
Bangladesh	0.030	-0.033	0.070	0.114	0.134	0.142	0.138	0.164	0.214	0.189	0.211	0.256	0.275	0.339	0.160
Belarus	0.092	0.209	0.112	0.178	0.120	0.183	0.168	0.150	0.182	0.211	0.186	0.174	0.241	0.246	0.175
Belgium	0.103	0.138	0.145	0.162	0.166	0.150	0.161	0.158	0.122	0.143	0.071	-0.016	0.079	0.155	0.124
Bermuda	0.097	0.114	0.118	0.156	0.120	0.194	0.210	0.131	0.269	0.266	0.274	0.128	0.211	0.229	0.180
Bolivia	0.138	0.186	0.206	0.179	0.194	0.239	0.203	0.145	0.177	0.221	0.238	0.300	0.261	0.274	0.211
Bosnia and Herzegovina								0.215	0.237	0.233	0.256	0.183	0.230	0.251	0.229
Botswana	0.246	0.307	0.248	0.324	0.326	0.338	0.353	0.337	0.357	0.328	0.269	0.294	0.309	0.336	0.312
Brazil	0.137	0.160	0.155	0.132	0.144	0.161	0.228	0.219	0.244	0.274	0.278	0.195	0.294	0.259	0.206
Bulgaria					0.309	0.283	0.339	0.360	0.372	0.378	0.385	0.338	0.323	0.343	0.343
Burkina Faso	0.277	0.386	0.337	0.270	0.236	0.350	0.348	0.317	0.342	0.306	0.308	0.246	0.266	0.346	0.310
Cambodia				0.478	0.469	0.337	0.386	0.436	0.436	0.450	0.484	0.517	0.379	0.363	0.430
Cameroon			0.580	0.499	0.451	0.420	0.385	0.479	0.432	0.426	0.435	0.390	0.314	0.345	0.430
Canada	0.135	0.108	0.179	0.168	0.166	0.194	0.202	0.229	0.187	0.215	0.190	0.152	0.258	0.304	0.192
Cayman Islands	0.176														0.176
Chile	0.161	0.160	0.204	0.206	0.238	0.283	0.194	0.150	0.160	0.228	0.308	0.217	0.411	0.383	0.236
China	0.405	0.383	0.254	0.275	0.259	0.346	0.379	0.399	0.385	0.390	0.429	0.407	0.417	0.449	0.370
Colombia	0.146	0.081	0.030	0.085	0.146	0.152	0.244	0.283	0.322	0.279	0.312	0.318	0.341	0.379	0.223
Costa Rica	0.073	0.084	0.076	0.182	0.185	0.183	0.235	0.220	0.214	0.226	0.213	0.175	0.145	0.222	0.174
Cote d'Ivoire	0.379	0.386	0.322	0.300	0.263	0.241	0.230	0.273	0.266	0.276	0.303	0.286	0.277	0.263	0.290
Croatia	0.209	0.167	0.169	0.226	0.202	0.215	0.251	0.271	0.282	0.257	0.268	0.253	0.274	0.301	0.239
Cuba	0.824	0.761	0.731	0.689	0.569	0.703	0.785	0.787	0.701	0.611	0.470	0.557	0.536	0.651	0.670
Cyprus	0.155	0.151	0.284	0.107	0.111	0.143	0.176	0.208	0.188	0.253	0.284	0.202	0.233	0.249	0.196
Czech Republic	0.180	0.158	0.167	0.166	0.162	0.239	0.267	0.298	0.343	0.328	0.328	0.277	0.440	0.444	0.271
Denmark	0.165	0.175	0.141	0.147	0.251	0.265	0.390	0.180	0.184	0.161	0.135	0.104	0.218	0.213	0.195
Dominican Republic	0.189	0.180	0.166	0.190	0.190	0.198	0.175	0.115	0.184	0.202	0.220	0.226	0.220	0.266	0.194
Ecuador	0.050	-0.124	0.297	0.127	0.113	0.185	0.197	0.227	0.268	0.276	0.268	0.241	0.234	0.265	0.187
Egypt, Arab Rep.											0.065	0.065	0.314	0.238	0.171

El Salvador	0.119	0.169	0.166	0.178	0.244	0.288	0.282	0.304	0.326	0.365	0.359	0.365	0.380	0.447	0.285
Estonia	0.262	0.029	0.014	0.052	0.204	0.271	0.328	0.347	0.341	0.364	0.323	0.313	0.286	0.373	0.251
Ethiopia	0.270	0.257	0.344	0.285	0.406	0.331	0.574	0.573	0.574	0.612	0.538	0.616	0.650	0.595	0.473
Finland	0.055	0.000	0.338	0.354			0.266	0.207	0.174	0.188	0.194	0.118	0.267	0.280	0.203
France	0.100	0.107	0.128	0.112	0.132	0.152	0.168	0.205	0.220	0.221	0.197	0.172	0.229	0.248	0.171
Gambia, The	0.495		0.569	0.551	0.552	0.529	0.530	0.437	0.401	0.417	0.272	0.330	0.253	0.317	0.435
Georgia		0.335	0.362	0.318	0.339	0.341	0.341	0.316	0.351	0.333	0.282	0.262	0.230	0.235	0.311
Germany	0.171	0.151	0.164	0.139	0.132	0.157	0.175	0.189	0.185	0.204	0.166	0.153	0.193	0.234	0.172
Ghana	0.160	0.442	0.419	0.137		0.412	0.414	0.435	0.483	0.442	0.293	0.274	0.241	0.324	0.344
Greece	0.169	0.201	0.404	0.215	0.000	0.044	0.112	0.136	0.183	0.216	0.173	0.104	0.184	0.151	0.164
Guatemala				0.088	0.124	0.126	0.186	0.228	0.246	0.251	0.242	0.253	0.248	0.257	0.204
Haiti	0.123	0.119	0.116	0.172	0.156	0.108	0.224	0.099	0.145	0.171	0.178	0.197	0.183	0.183	0.155
Honduras	0.338	0.262	0.186	0.129	0.165	0.197	0.256	0.180	0.205	0.240	0.250	0.272	0.233	0.208	0.223
Hong Kong SAR, China	0.238	0.187	0.243	0.273	0.165	0.351	0.389	0.429	0.300	0.276	0.260	0.176	0.299	0.343	0.281
Hungary	0.153	0.144	0.087	0.122	0.163	0.181	0.226	0.219	0.245	0.243	0.250	0.192	0.223	0.313	0.197
Iceland	0.167	0.175	0.200	0.068	0.145	0.210	0.231	0.269	0.336	0.363	0.331	0.426	0.337	0.489	0.268
India	0.121	0.146	0.120	0.158	0.158	0.209	0.244	0.303	0.282	0.266	0.241	0.186	0.194	0.211	0.203
Indonesia	0.134	0.043	0.030	0.107	0.129	0.160	0.228	0.325	0.248	0.256	0.295	0.311	0.315	0.356	0.210
Iraq											0.463	0.316			0.389
Ireland	0.177	0.175	0.253	0.215	0.148	0.135	0.228	0.217	0.144	0.132	0.146	0.146	0.196	0.205	0.180
Israel	0.153	0.064	0.092	0.124	0.084	0.102	0.116	0.177	0.150	0.198	0.206	0.141	0.197	0.108	0.136
Italy	0.157	0.200	0.143	0.203	0.183	0.218	0.218	0.179	0.241	0.258	0.240	0.198	0.238	0.236	0.208
Jamaica	0.128	0.158	0.201		0.289	0.216	0.271	0.233	0.267	0.278	0.271	0.301	0.293	0.334	0.249
Japan	0.246	0.246	0.259	0.259	0.250	0.230	0.266	0.261	0.282	0.285	0.286	0.242	0.191	0.233	0.253
Jordan	0.152	0.182	0.173	0.147	0.239	0.237	0.325	0.362	0.490	0.400	0.363	0.349	0.370	0.419	0.301
Kazakhstan	0.245	0.310	0.306	0.246	0.347	0.366	0.359	0.393	0.356	0.329	0.340	0.243	0.230	0.077	0.296
Kenya	0.153	0.262	0.270	0.311	0.321	0.318	0.380	0.371	0.361	0.391	0.369	0.344	0.326	0.384	0.326
Korea, Rep.	0.071	0.115	0.219	0.179	0.266	0.311	0.316	0.331	0.310	0.291	0.271	0.191	0.221	0.258	0.239
Kuwait	0.092	0.239	0.287	0.299	0.367	0.444	0.517	0.555	0.565	0.470	0.393				0.384
Kyrgyz Republic	0.176			0.323	0.116	0.371	0.375	0.460	0.365	0.397	0.454	0.319	0.359	0.327	0.337
Lao PDR		0.232				0.019	0.000	0.252	0.478	0.555	0.669	0.292	0.285	0.353	0.314
Latvia	0.280	0.214	0.257	0.280	0.271	0.303	0.337	0.356	0.362	0.327	0.305	0.241	0.247	0.227	0.286
Lebanon	0.168	0.149	0.141	0.144	0.127	0.141	0.163	0.142	0.151	0.149	0.144	0.179	0.190	0.226	0.158
Libya				0.535		0.576	0.535	0.050	0.401	0.523	0.597	0.691	0.248		0.462
Lithuania	0.269	0.154	0.242	0.151	0.183	0.217	0.184	0.252	0.289	0.306	0.311	0.245	0.178	0.205	0.228
Luxembourg	0.103	0.095	0.115	0.134	0.118	0.134	0.151	0.189	0.207	0.198	0.184	0.137	0.242	0.285	0.164
Macao SAR, China	0.127	0.132	0.166	0.184	0.190	0.290	0.354	0.396	0.366	0.296	0.280	0.325	0.395	0.423	0.280
Macedonia, FYR	0.498	0.353	0.346	0.297	0.303	0.265	0.317	0.317	0.359	0.359	0.365	0.314	0.261	0.242	0.328
Madagascar	0.555	0.565	0.507	0.377	0.321	0.356	0.451	0.458	0.471	0.492	0.441	0.337	0.271	0.260	0.419
Malawi	0.420	0.460	0.443	0.390	0.263	0.357	0.360	0.371	0.390	0.491	0.525	0.438	0.422	0.360	0.406
Malaysia	0.277	0.246	0.271	0.362	0.344	0.355	0.351	0.352	0.355	0.353	0.360	0.366	0.362	0.409	0.340
Mali	0.252	0.266	0.298	0.253	0.324	0.307	0.335	0.304	0.311	0.367	0.325	0.304	0.321	0.286	0.304
Malta	0.214	0.217	0.249	0.226	0.225	0.239	0.273	0.307	0.345	0.339	0.336	0.292	0.310	0.362	0.281
Mauritania	0.574	0.505				0.313	0.340	0.186	0.463	0.466	0.275	0.277	0.431	0.333	0.378

Mauritius	0.174	0.198	0.180	0.183	0.204	0.326	0.279	0.324	0.330	0.279	0.262	0.284	0.304	0.399	0.266
Mexico	0.011	0.002	0.063	0.017		0.280			-0.025	-0.023					0.046
Moldova	0.353	0.388	0.401	0.413	0.380	0.384	0.408	0.351	0.289	0.341	0.340	0.284	0.222	0.309	0.347
Mongolia			0.316	0.220	0.272	0.255	0.226	0.263	0.214	0.167	0.200	0.219	0.207	0.190	0.229
Montenegro						0.000	0.275	0.238	0.161	0.204	0.256	0.205	0.197	0.231	0.196
Morocco	0.217	0.237	0.217	0.294	0.310	0.329	0.329	0.375	0.305	0.337	0.336	0.359	0.354	0.364	0.312
Mozambique	0.263	0.236	0.319	0.259	0.279	0.272	0.194	0.238	0.259	0.340	0.368	0.375	0.385	0.356	0.296
Namibia				0.183		0.023	0.490	0.425	0.270	0.255	0.256	0.249	0.241	0.270	0.266
Nepal	0.355	0.247	0.319	0.362	0.357	0.348	0.231	0.258	0.273	0.311	0.292	0.333	0.326	0.283	0.307
Netherlands Antilles		0.114	0.142	0.210		0.130	0.129								0.145
Netherlands	0.126	0.127	0.143	0.204	0.213	0.109	0.094	0.160	0.154	0.135	0.177	0.183	0.149	0.256	0.159
New Zealand	0.121	0.085	0.230	0.207	0.226	0.272	0.249		0.200	0.211	0.196	0.173	0.204		0.198
Nicaragua						0.201	0.220	0.237	0.295	0.327	0.342	0.370	0.379	0.367	0.304
Niger	0.261	0.399	0.066	0.206	0.145	0.206	0.143	0.233	0.304	0.322	0.265	0.352	0.336	0.328	0.255
Nigeria	0.228	0.290	0.304	0.276	0.296	0.268	0.275	0.264	0.313	0.317	0.309	0.325	0.195	0.224	0.277
Norway	0.169	0.061	0.146	0.157	0.155	0.128	0.159	0.219	0.265	0.230	0.176	0.146	0.266	0.263	0.181
Oman	0.309	0.274	0.283	0.258	0.301	0.392	0.398	0.428	0.423	0.420	0.378	0.429	0.464		0.366
Pakistan	0.040	0.023	-0.014	0.045	0.119	0.185	0.259	0.270	0.395	0.368	0.321	0.277	0.288	0.276	0.204
Panama	0.196	0.134	0.317	0.259	0.255	0.300	0.363	0.322	0.306	0.275	0.320	0.311	0.305	0.313	0.284
Papua New Guinea		0.250	0.259	0.088			0.401	0.641	0.520	0.504	0.611	0.614	0.530	0.490	0.446
Paraguay	0.278	0.181	0.104	0.041	0.092	0.015	-0.114	0.052	0.140	0.131	0.133	0.208	0.168	0.216	0.118
Peru	0.219	0.203	0.184	0.160	0.174	0.259	0.295	0.315	0.357	0.364	0.351	0.387	0.438	0.390	0.293
Philippines	0.264	0.272	0.177	0.001	0.065	0.214	0.298	0.237	0.239	0.248	0.239	0.193	0.278	0.325	0.218
Poland	0.170	0.175	0.162	0.165	0.166	0.169	0.137	0.174	0.190	0.239	0.246	0.215	0.232	0.241	0.192
Portugal	0.119	0.131	0.104	0.168	0.305	0.202	0.230	0.294	0.198	0.162	0.138	0.082	0.087	0.065	0.163
Qatar				0.242	0.318	0.471	0.522	0.514	0.551	0.435	0.398	0.370	0.375		0.420
Romania	0.233	0.215	0.214	0.199	0.247	0.190	0.202	0.262	0.236	0.221	0.209	0.224	0.234	0.278	0.226
Russian Federation	0.207	0.061	0.410	0.377	0.454	0.344	0.310	0.339	0.307	0.297	0.282	0.272	0.239	0.202	0.293
Rwanda					0.187	0.205	0.257	0.109	0.004	0.320	0.352	0.343	0.249	0.343	0.237
San Marino	0.185	0.262	0.400	0.397	0.328	0.335	0.435	0.506	0.504	0.460	0.382	0.195			0.366
Saudi Arabia	0.263	0.261	0.254	0.247	0.311	0.405	0.490	0.501	0.490	0.488	0.340	0.225	0.362	0.288	0.352
Senegal	0.356	0.428	0.351	0.344	0.364	0.352	0.345	0.342	0.330	0.340	0.307	0.327	0.297	0.281	0.340
Serbia						0.374	0.472	0.362	0.336	0.217	0.249	0.228	0.234	0.176	0.294
Seychelles		0.198						0.508	0.559	0.567	0.595	0.594	0.377	0.528	0.491
Sierra Leone	0.190	0.400		0.646	0.535	0.481	0.474	0.519	0.472	0.386	0.287	0.188	0.247	0.328	0.396
Singapore	0.248	0.232	0.362	0.353	0.297	0.230		0.414	0.361	0.309	0.331	0.376	0.489	0.438	0.342
Slovak Republic	0.092	0.032	0.029	0.142	0.158	0.183	0.216	0.246	0.267	0.291	0.284	0.304	0.322	0.390	0.211
Slovenia	0.214	0.213	0.224	0.238	0.188	0.210	0.214	0.252	0.266	0.252	0.249	0.184	0.237	0.269	0.229
South Africa	0.105	0.163	0.167	0.179	0.204	0.300	0.211	0.177	0.155	0.233	0.222	0.199	0.217	0.229	0.197
Spain	0.130	0.161	0.228	0.181	0.179	0.196	0.238	0.275	0.242	0.246	0.229	0.207	0.292	0.305	0.222
Sri Lanka	0.149	0.177	0.114	0.102	0.094	0.150	0.224	0.210	0.210	0.196	0.171	0.146	0.171	0.232	0.168
Sudan	0.395	0.266	0.246	0.258	0.145	0.317	0.180	0.291	0.257	0.277	0.171	0.223	0.193	0.214	0.245
Sweden	0.186	0.168	0.156	0.182	0.183	0.169	0.206	0.277	0.234	0.224	0.178	0.160	0.223	0.244	0.199
Switzerland	0.168	0.132	0.126	0.156	0.124	0.165	0.179	0.180	0.122	0.125	0.039	0.036	0.129	0.179	0.133

Syrian Arab Republic									0.000	0.064	0.309	0.568	0.569	0.567	0.346
Taiwan				0.159	0.165	0.227	0.349	0.283	0.307	0.278	0.248	0.218	0.294	0.342	0.261
Tanzania							0.471	0.439	0.390	0.423	0.395	0.392	0.357	0.343	0.401
Thailand	0.171	0.011	0.045	0.106	0.148	0.233	0.290	0.375	0.375	0.288	0.289	0.334	0.369	0.389	0.245
Togo	0.111	0.191	0.216	0.446	0.225	0.129	0.276	0.315	0.259	0.307	0.259	0.282	0.244	0.344	0.258
Trinidad and Tobago	0.195	0.193	0.231	0.266	0.284	0.302	0.360	0.347	0.309	0.321	0.338	0.345	0.313	0.442	0.303
Tunisia	0.562	0.557	0.458	0.302	0.292	0.267	0.189	0.208	0.221	0.285	0.295	0.323	0.331	0.346	0.331
Turkey	0.022	0.034	0.143	0.046	-0.017	0.112	0.190	0.240	0.286	0.226	0.227	0.209	0.335	0.320	0.169
Uganda											0.401	0.360	0.368	0.341	0.367
Ukraine	0.229	0.269	0.316	0.211	0.229	0.182	0.245	0.233	0.221	0.243	0.220	0.314	0.250	0.214	0.241
United Arab Emirates	0.307	0.298	0.314	0.295	0.340	0.462	0.507	0.516	0.516	0.359	0.346	0.372	0.453	0.468	0.397
United Kingdom	0.182	0.184	0.177	0.243	0.110	0.169	0.282	0.292	0.254	0.241	0.236	0.103	0.294	0.308	0.220
United States	0.239	0.229	0.252	0.224	0.266	0.332	0.355	0.321	0.304	0.268	0.227	0.239	0.344	0.352	0.282
Uruguay	0.072	0.076	0.073	0.097	0.037	0.248	0.013	0.241	0.090	0.190	0.269	0.363	0.181	0.250	0.157
Uzbekistan	0.378	0.307	0.301	0.371	0.364	0.321	0.223	0.181	0.239	0.275	0.283	0.229	0.212	0.248	0.281
Venezuela, RB	0.291	0.283	0.217	0.182	0.226	0.301	0.327	0.343	0.276	0.293	0.281	0.263	0.265	0.306	0.275
Vietnam	0.379	0.346	0.314	0.345	0.264	0.292	0.273	0.349	0.336	0.282	0.277	0.208	0.198	0.205	0.291
Yemen, Rep.									0.055	0.226	0.231	0.200	0.272	0.242	0.204
Zambia	0.047	0.172	0.117	0.194	0.234	0.224	0.101	0.233	0.296	0.340	0.340	0.299	0.337	0.288	0.230
Zimbabwe													0.297	0.299	0.298
Mean	0.212	0.207	0.226	0.230	0.228	0.255	0.280	0.298	0.299	0.301	0.294	0.277	0.290	0.305	0.266

Table 1.6: Average estimates of market power (weighted by market shares) using the adjusted-Lerner index

The table reports average estimates of market power (weighted by market shares) by country and year. Averages are obtained from the bank-level estimates of market power using the adjusted-Lerner index, as this is defined in Eq. (1.2). Higher values reflect higher market power (lower competition).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean
Afghanistan									0.412	0.129	0.017	0.400	0.259	0.027	0.207
Albania			0.515	0.258	0.133	0.125	0.187	0.152	0.295	0.247	0.293	0.248	0.227	0.273	0.211
Algeria	0.009	0.028	0.042	0.041	0.058	0.230	0.145	0.098	0.207	0.460	0.420	0.512	0.496	0.468	0.230
Andorra	0.220	0.254	0.315	0.324	0.299	0.366	0.443	0.479	0.438	0.449	0.374	0.236			0.350
Angola	0.248	0.296	0.065	0.046	0.270	0.133			0.364	0.194	0.375	0.435	0.361	0.405	0.266
Antigua and Barbuda				0.051	0.090	0.123	0.138				0.249	0.276	0.301		0.175
Argentina	0.183	0.098	0.097	0.115	0.042	0.038	-0.013	0.104	0.194	0.197	0.177	0.155	0.256	0.288	0.138
Armenia	0.082	0.180	0.135	0.105	0.144	0.341	0.320	0.391	0.373	0.345	0.322	0.301	0.140	0.253	0.245
Australia	0.281	0.230	0.137	0.160	-0.125	0.238			0.241	0.221	0.208	0.139	0.167	0.204	0.175
Austria	0.097	0.055	0.092	0.089	0.077	0.081	0.116	0.135	0.134	0.184	0.145	0.074	0.099	0.148	0.109
Azerbaijan	0.487	0.311	0.187	0.424	0.325	0.258	0.259	0.303	0.300	0.303	0.325	0.273	0.174	0.062	0.285
Bahamas, The	0.152	0.172	0.189	0.249	0.273	0.175	0.284	0.328	0.383	0.372	0.399	0.289	0.357	0.331	0.282
Bahrain	0.167	0.088	0.112	0.120	0.129	0.126	0.214	0.372	0.278	0.202	0.148	0.118			0.173
Bangladesh	0.040	-0.023	0.035	0.062	0.092	0.092	0.090	0.115	0.097	0.163	0.174	0.216	0.240	0.293	0.120
Belarus	-0.124	0.015	-0.034	0.077	-0.054	0.131	0.115	0.116	0.158	0.152	0.164	0.124	0.177	0.178	0.085
Belgium	0.083	0.058	0.114	0.118	0.124	0.111	0.149	0.142	0.140	0.161	0.072	-0.068	0.028	0.127	0.097
Bermuda	0.095	0.105	0.120	0.153	0.111	0.170	0.204	0.307	0.321	0.281	0.273	0.237	0.210	0.240	0.202
Bolivia	0.110	0.076	0.085	-0.041	0.027	0.046	0.097	0.079	0.124	0.196	0.220	0.221	0.232	0.215	0.121
Bosnia and Herzegovina								0.091	0.128	0.140	0.144	0.074	0.071	0.096	0.106
Botswana	0.211	0.289	0.284	0.269	0.318	0.326	0.329	0.314	0.339	0.308	0.239	0.274	0.266	0.310	0.291
Brazil	0.087	0.063	0.065	0.107	0.103	0.104	0.166	0.161	0.187	0.168	0.231	0.089	0.208	0.200	0.139
Bulgaria					0.295	0.239	0.346	0.336	0.309	0.332	0.347	0.303	0.189	0.182	0.288
Burkina Faso	0.303	0.386	0.298	0.191	0.196	0.329	0.272	0.232	0.160	0.208	0.165	0.127	0.223	0.302	0.242
Cambodia				0.445	0.000	0.246	0.274	0.285	0.273	0.372	0.462	0.503	0.309	0.302	0.316
Cameroon			0.286	0.308	0.279	0.309	0.381	0.341	0.299	0.320	0.323	0.289	0.264	0.304	0.309
Canada	0.120	0.072	0.151	0.125	0.122	0.090	0.169	0.216	0.176	0.206	0.184	0.127	0.193	0.272	0.159
Cayman Islands	0.138														0.138
Chile	0.124	0.105	0.068	0.148	0.183	0.249	0.171	0.155	0.187	0.238	0.277	0.133	0.280	0.289	0.186
China	0.392	0.352	0.185	0.201	0.214	0.269	0.294	0.329	0.327	0.328	0.378	0.331	0.375	0.416	0.314
Colombia	0.077	0.023	0.000	-0.016	0.063	0.092	0.180	0.241	0.255	0.217	0.227	0.208	0.224	0.284	0.148
Costa Rica	0.066	0.079	0.071	0.164	0.167	0.142	0.210	0.203	0.194	0.190	0.188	0.148	0.095	0.161	0.148
Cote d'Ivoire	0.235	0.193	0.198	0.184	0.137	0.088	0.091	0.154	0.191	0.248	0.273	0.255	0.272	0.231	0.196
Croatia	0.135	0.093	0.105	0.198	0.189	0.215	0.232	0.236	0.256	0.231	0.234	0.220	0.187	0.204	0.195
Cuba	0.822	0.761	0.726	0.684	0.554	0.681	0.778	0.770	0.683	0.607	0.454	0.559	0.516	0.611	0.658
Cyprus	0.126	0.117	0.273	0.165	0.068	-0.022	0.035	0.062	0.122	0.196	0.258	0.172	0.138	0.130	0.131
Czech Republic	0.055	-0.002	0.016	0.103	0.146	0.249	0.295	0.316	0.330	0.321	0.307	0.217	0.355	0.360	0.219
Denmark	0.147	0.146	0.120	0.118	0.186	0.206	0.339	0.194	0.205	0.191	0.147	0.023	0.048	0.108	0.156
Dominican Republic	0.162	0.138	0.139	0.142	0.146	0.169	0.122	0.093	0.155	0.189	0.213	0.207	0.184	0.233	0.164
Ecuador	0.019	-0.052	0.039	0.081	0.125	0.143	0.138	0.160	0.199	0.216	0.201	0.211	0.172	0.188	0.131
Egypt, Arab Rep.											0.237	0.046	0.285	0.222	0.197
El Salvador	0.129	0.137	0.086	0.091	0.138	0.181	0.185	0.205	0.205	0.288	0.271	0.251	0.176	0.334	0.191

Estonia	0.257	0.000	0.034	-0.052	0.116	0.218	0.295	0.332	0.349	0.364	0.345	0.222	0.001	0.086	0.183
Ethiopia	0.157	0.205	0.232	0.213	0.345	0.247	0.529	0.491	0.559	0.597	0.527	0.610	0.637	0.591	0.424
Finland	0.000	0.378	0.335	0.393			0.261	0.207	0.168	0.190	0.191	0.113	0.197	0.251	0.224
France	0.072	0.090	0.105	0.097	0.105	0.119	0.134	0.178	0.186	0.195	0.169	0.131	0.159	0.193	0.138
Gambia, The	0.491		0.557	0.544	0.542	0.528	0.492	0.442	0.361	0.363	0.265	0.322	0.215	0.297	0.417
Georgia		0.329	0.283	0.230	0.236	0.257	0.269	0.197	0.297	0.246	0.219	0.034	0.046	0.178	0.217
Germany	0.117	0.106	0.100	0.087	0.067	0.064	0.097	0.099	0.110	0.100	0.085	0.061	0.108	0.130	0.095
Ghana	0.037	0.435	0.410	0.055		0.406	0.426	0.431	0.466	0.427	0.269	0.203	0.119	0.244	0.302
Greece	0.126	0.123	0.388	0.127	0.000	0.072	0.075	0.081	0.116	0.154	0.098	0.050	0.075	0.003	0.106
Guatemala				0.083	0.120	0.108	0.164	0.198	0.231	0.239	0.227	0.234	0.219	0.243	0.188
Haiti	0.208	0.139	0.108	0.142	0.146	0.093	0.209	0.074	0.126	0.199	0.184	0.206	0.209	0.235	0.163
Honduras	0.327	0.162	0.121	0.063	0.112	0.114	0.162	0.146	0.183	0.217	0.228	0.210	0.155	0.164	0.169
Hong Kong SAR, China	0.223	0.103	0.118	0.231	0.066	0.304	0.329	0.423	0.315	0.277	0.233	0.150	0.247	0.319	0.239
Hungary	0.146	0.107	0.054	0.118	0.151	0.152	0.176	0.165	0.200	0.194	0.185	0.129	0.052	-0.011	0.130
Iceland	0.104	0.129	0.158	0.029	0.081	0.139	0.094	0.154	0.318	0.397	0.253	0.188	0.222	0.331	0.185
India	0.062	0.098	0.064	0.101	0.079	0.125	0.158	0.219	0.165	0.182	0.178	0.142	0.137	0.162	0.134
Indonesia	0.061	0.015	0.014	0.080	0.123	0.143	0.192	0.316	0.197	0.198	0.246	0.242	0.247	0.297	0.169
Iraq											0.440	0.309			0.374
Ireland	0.161	0.146	0.193	0.179	0.059	0.093	0.221	0.210	0.069	0.137	0.129	0.029	0.008	0.000	0.117
Israel	0.126	0.042	0.065	0.092	0.020	0.020	-0.005	0.084	0.089	0.181	0.168	0.097	0.157	0.113	0.089
Italy	0.098	0.148	0.143	0.191	0.160	0.179	0.166	0.151	0.199	0.224	0.208	0.138	0.145	0.144	0.164
Jamaica	0.128	0.158	0.201		0.289	0.217	0.266	0.227	0.264	0.272	0.264	0.283	0.269	0.316	0.243
Japan	0.066	0.114	0.114	0.122	0.125	0.102	0.108	0.147	0.180	0.203	0.196	0.142	0.085	0.143	0.132
Jordan	0.123	0.136	0.112	0.094	0.134	0.141	0.222	0.319	0.461	0.392	0.334	0.330	0.295	0.352	0.246
Kazakhstan	0.229	0.222	0.204	0.159	0.164	0.237	0.232	0.247	0.241	0.238	0.260	0.037	0.063	0.304	0.203
Kenya	0.112	0.216	0.219	0.256	0.252	0.239	0.292	0.287	0.296	0.338	0.339	0.307	0.299	0.360	0.272
Korea, Rep.	-0.010	-0.070	0.045	0.087	0.137	0.134	0.047	0.156	0.253	0.250	0.242	0.105	0.092	0.080	0.111
Kuwait	0.171	0.216	0.271	0.285	0.357	0.421	0.484	0.533	0.532	0.435	0.380				0.371
Kyrgyz Republic	0.129			0.304	0.014	0.368	0.257	0.350	0.353	0.380	0.445	0.254	0.299	0.272	0.285
Lao PDR		0.038				0.019	0.517	0.394	0.350	0.550	0.683	0.315	0.286	0.349	0.350
Latvia	0.254	0.004	0.172	0.261	0.238	0.262	0.285	0.330	0.351	0.331	0.296	0.124	0.027	0.027	0.212
Lebanon	0.145	0.138	0.118	0.111	0.104	0.106	0.113	0.113	0.132	0.122	0.131	0.166	0.184	0.215	0.135
Libya				0.535		0.576	0.512	0.035	0.536	0.508	0.560	0.604	0.248		0.457
Lithuania	0.191	0.127	0.210	0.116	0.159	0.197	0.220	0.239	0.248	0.292	0.308	0.162	-0.003	-0.004	0.176
Luxembourg	0.094	0.084	0.109	0.119	0.107	0.129	0.148	0.183	0.187	0.197	0.177	0.116	0.210	0.274	0.152
Macao SAR, China	0.094	0.039	0.094	0.109	0.104	0.181	0.237	0.371	0.369	0.313	0.286	0.280	0.393	0.419	0.235
Macedonia, FYR	0.240	0.269	0.195	0.067	0.097	0.110	0.209	0.322	0.205	0.296	0.280	0.224	0.145	0.153	0.201
Madagascar	0.557	0.544	0.487	0.407	0.332	0.207	0.391	0.473	0.485	0.459	0.425	0.316	0.097	0.120	0.378
Malawi	0.401	0.453	0.357	0.334	0.248	0.286	0.338	0.318	0.328	0.441	0.496	0.442	0.419	0.371	0.374
Malaysia	0.194	0.061	0.158	0.265	0.229	0.275	0.276	0.305	0.280	0.283	0.287	0.318	0.297	0.372	0.257
Mali	0.215	0.174	0.152	0.065	0.255	0.209	0.176	0.122	0.115	0.250	0.206	0.225	0.223	0.230	0.187
Malta	0.187	0.200	0.152	0.172	0.166	0.215	0.290	0.336	0.356	0.351	0.336	0.287	0.294	0.345	0.263
Mauritania	0.344	0.383				0.226	0.262	0.185	0.379	0.411	0.192	0.098	0.220	0.128	0.257

Mauritius	0.104	0.161	0.157	0.152	0.185	0.297	0.198	0.295	0.312	0.274	0.251	0.262	0.267	0.371	0.235
Mexico	-0.018	-0.015	0.054	0.030		0.340			0.003	0.009					0.057
Moldova	0.300	0.248	0.305	0.381	0.391	0.355	0.346	0.298	0.272	0.324	0.322	0.230	0.105	0.196	0.291
Mongolia			0.097	0.161	0.157	0.174	0.143	0.117	0.106	0.081	0.147	0.169	0.181	0.184	0.143
Montenegro						0.018	0.197	0.179	0.129	0.139	0.148	0.106	0.042	0.048	0.112
Morocco	0.152	0.086	0.204	0.216	0.214	0.170	0.176	0.259	0.277	0.225	0.265	0.251	0.228	0.272	0.214
Mozambique	0.307	0.195	0.217	0.173	0.212	0.204	0.178	0.230	0.205	0.315	0.346	0.353	0.345	0.312	0.257
Namibia				0.042		0.000	0.445	0.000	0.247	0.211	0.232	0.233	0.224	0.264	0.190
Nepal	0.329	0.180	0.284	0.318	0.301	0.261	0.181	0.281	0.366	0.356	0.322	0.350	0.342	0.294	0.297
Netherlands Antilles		0.114	0.000	0.242		0.144	0.146								0.129
Netherlands	0.115	0.099	0.135	0.197	0.205	0.086	0.078	0.155	0.194	0.106	0.163	0.152	0.126	0.238	0.146
New Zealand	0.110	0.076	0.218	0.217	0.223	0.249	0.155		0.188	0.204	0.189	0.165	0.128		0.177
Nicaragua						0.192	0.248	0.273	0.308	0.229	0.199	0.260	0.227	0.244	0.242
Niger	0.234	0.331	0.066	0.150	0.099	0.130	0.061	0.193	0.192	0.200	0.150	0.284	0.275	0.298	0.190
Nigeria	0.207	0.220	0.227	0.211	0.207	0.207	0.221	0.249	0.272	0.258	0.283	0.282	0.089	0.215	0.225
Norway	0.170	0.056	0.131	0.135	0.115	0.111	0.153	0.213	0.293	0.251	0.195	0.125	0.187	0.253	0.171
Oman	0.282	0.257	0.217	0.191	0.065	0.233	0.272	0.343	0.416	0.420	0.388	0.368	0.331		0.291
Pakistan	0.037	0.055	-0.131	0.045	0.082	0.184	0.307	0.311	0.388	0.364	0.285	0.180	0.196	0.216	0.180
Panama	0.197	0.167	0.315	0.220	0.202	0.259	0.315	0.248	0.264	0.182	0.251	0.232	0.229	0.266	0.239
Papua New Guinea		0.203	0.119	0.126			0.387	0.633	0.521	0.502	0.605	0.586	0.522	0.478	0.426
Paraguay	0.251	0.204	0.081	0.067	0.064	-0.179	-0.085	0.055	0.108	0.101	0.120	0.193	0.152	0.208	0.096
Peru	0.117	0.060	0.051	0.031	0.064	0.136	0.217	0.239	0.300	0.300	0.325	0.331	0.351	0.311	0.202
Philippines	0.201	0.156	0.079	0.000	0.056	0.167	0.249	0.175	0.194	0.200	0.204	0.173	0.227	0.284	0.169
Poland	0.151	0.165	0.149	0.134	0.139	0.129	0.114	0.145	0.200	0.238	0.229	0.149	0.100	0.133	0.155
Portugal	0.044	0.053	0.061	0.138	0.128	0.131	0.182	0.201	0.169	0.141	0.114	0.047	0.074	0.071	0.111
Qatar				0.205	0.257	0.400	0.476	0.519	0.555	0.430	0.395	0.335	0.297		0.387
Romania	0.229	0.157	0.162	0.181	0.201	0.166	0.157	0.228	0.200	0.191	0.151	0.176	0.078	0.097	0.170
Russian Federation	0.173	0.029	0.369	0.348	0.389	0.320	0.272	0.298	0.274	0.241	0.221	0.192	0.107	0.157	0.242
Rwanda					0.194	0.134	0.159	0.070	0.108	0.291	0.373	0.267	0.147	0.311	0.205
San Marino	0.166	0.246	0.397	0.371	0.313	0.295	0.197	0.233	0.306	0.224	0.168	0.047			0.247
Saudi Arabia	0.236	0.225	0.215	0.227	0.285	0.376	0.456	0.445	0.467	0.450	0.261	0.162	0.197	0.049	0.289
Senegal	0.194	0.232	0.249	0.292	0.298	0.268	0.298	0.304	0.288	0.297	0.265	0.245	0.221	0.226	0.263
Serbia						0.023	0.298	0.231	0.162	0.155	0.175	0.232	0.151	0.122	0.172
Seychelles		0.158						0.457	0.550	0.564	0.592	0.584	0.340	0.524	0.471
Sierra Leone	-0.111	0.438		0.647	0.545	0.478	0.473	0.482	0.429	0.340	0.136	0.098	0.148	0.283	0.337
Singapore	0.130	0.103	0.286	0.304	0.277	0.166		0.414	0.307	0.335	0.313	0.311	0.406	0.404	0.289
Slovak Republic	0.003	0.000	0.095	0.176	0.152	0.161	0.204	0.225	0.251	0.269	0.255	0.248	0.165	0.299	0.179
Slovenia	0.154	0.163	0.166	0.164	0.173	0.186	0.171	0.197	0.210	0.214	0.207	0.095	0.045	0.071	0.158
South Africa	0.075	0.124	0.148	0.156	0.110	0.210	0.071	0.134	0.194	0.203	0.184	0.138	0.111	0.145	0.143
Spain	0.093	0.112	0.211	0.186	0.154	0.163	0.170	0.229	0.238	0.248	0.219	0.143	0.154	0.175	0.178
Sri Lanka	0.088	0.096	0.103	0.029	0.041	0.077	0.146	0.144	0.166	0.167	0.145	0.120	0.149	0.219	0.121
Sudan	0.376	0.245	0.241	0.238	0.104	0.245	0.121	0.215	0.201	0.036	0.164	0.211	0.183	0.208	0.199
Sweden	0.191	0.192	0.181	0.183	0.306	0.099	0.177	0.247	0.243	0.221	0.183	0.136	0.052	0.214	0.187
Switzerland	0.005	0.124	0.148	0.139	0.096	0.098	0.151	0.180	0.145	0.143	0.055	0.029	0.073	0.173	0.111

Syrian Arab Republic									0.461	0.064	0.294	0.606	0.538	0.552	0.419
Taiwan				0.131	0.112	0.072	0.187	0.164	0.153	0.121	0.160	0.104	0.186	0.284	0.152
Tanzania							0.462	0.441	0.349	0.346	0.376	0.358	0.285	0.271	0.361
Thailand	0.055	0.016	0.027	0.151	0.108	0.137	0.238	0.304	0.334	0.207	0.188	0.249	0.297	0.339	0.189
Togo	0.242	0.137	0.133	0.367	0.209	0.078	0.140	0.584	0.263	0.327	0.285	0.317	0.230	0.314	0.259
Trinidad and Tobago	0.180	0.175	0.223	0.251	0.264	0.276	0.333	0.335	0.338	0.311	0.331	0.346	0.281	0.270	0.280
Tunisia	0.370	0.311	0.321	0.176	0.267	0.140	0.120	0.100	0.138	0.153	0.185	0.214	0.232	0.227	0.211
Turkey	-0.007	0.006	0.121	0.043	0.037	0.113	0.133	0.212	0.254	0.206	0.217	0.171	0.272	0.304	0.149
Uganda											0.310	0.358	0.338	0.310	0.329
Ukraine	0.152	0.051	0.229	0.100	0.117	0.098	0.156	0.145	0.157	0.150	0.140	0.114	0.044	0.085	0.124
United Arab Emirates	0.303	0.272	0.272	0.260	0.306	0.423	0.466	0.494	0.502	0.355	0.325	0.303	0.274	0.312	0.348
United Kingdom	0.166	0.158	0.168	0.249	0.120	0.265	0.246	0.256	0.214	0.207	0.192	0.093	0.103	0.113	0.182
United States	0.213	0.206	0.230	0.194	0.216	0.283	0.323	0.303	0.287	0.250	0.168	0.088	0.128	0.213	0.222
Uruguay	0.028	0.044	0.041	0.043	0.020	0.235	-0.029	0.124	0.042	0.176	0.211	0.319	0.171	0.204	0.116
Uzbekistan	0.326	0.321	0.268	0.200	0.203	0.157	0.154	0.145	0.109	0.170	0.194	0.174	0.147	0.169	0.195
Venezuela, RB	0.261	0.211	0.146	0.158	0.184	0.223	0.284	0.324	0.246	0.253	0.239	0.202	0.193	0.231	0.225
Vietnam	0.379	0.346	0.314	0.273	0.221	0.283	0.263	0.299	0.218	0.194	0.242	0.148	0.167	0.177	0.252
Yemen, Rep.									0.020	0.168	0.185	0.119	0.188	0.140	0.137
Zambia	0.000	0.020	0.135	0.137	0.187	0.192	0.097	0.132	0.249	0.269	0.307	0.237	0.211	0.219	0.171
Zimbabwe													0.260	0.286	0.273
Mean	0.167	0.156	0.172	0.179	0.170	0.194	0.228	0.250	0.261	0.261	0.256	0.222	0.208	0.236	0.213

Table 1.7: Average estimates of market power (weighted by market shares) using profit elasticity

The table reports average estimates of market power (weighted by market shares) by country and year. Averages are obtained from the bank-level estimates of market power using profit elasticity, as this is defined in Eq. (1.4). Higher values reflect higher market power (lower competition).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean
Afghanistan									-0.339	-0.331	-0.375	-0.355	-0.382	-0.399	-0.363
Albania	-0.341	-0.392	-0.550	-0.506	-0.426	-0.415	-0.430	-0.398	-0.389	-0.392	-0.393	-0.417	-0.396	-0.391	-0.417
Algeria	-0.647	-0.692	-0.679	-0.659	-0.600	-0.590	-0.396	-0.392	-0.401	-0.400	-0.401	-0.394	-0.396	-0.362	-0.501
Andorra	-0.633	-0.635	-0.538	-0.632	-0.616	-0.453	-0.395	-0.389	-0.387	-0.400	-0.479	-0.625			-0.515
Angola	-0.368	-0.401	-0.372	-0.344	-0.415	-0.404			-0.395	-0.400	-0.398	-0.407	-0.469	-0.493	-0.405
Antigua and Barbuda				-0.472	-0.465	-0.433	-0.397				-0.389	-0.406	-0.422		-0.426
Argentina	-0.408	-0.419	-0.424	-0.429	-0.444	-0.635	-0.545	-0.451	-0.436	-0.451	-0.446	-0.466	-0.432	-0.441	-0.459
Armenia	-0.591	-0.552	-0.606	-0.616	-0.562	-0.400	-0.389	-0.382	-0.380	-0.395	-0.394	-0.450	-0.468	-0.465	-0.475
Australia	-0.449	-0.582	-0.537	-0.420	-0.410	-0.456			-0.438	-0.467	-0.513	-0.559	-0.440	-0.424	-0.474
Austria	-0.572	-0.485	-0.478	-0.608	-0.503	-0.456	-0.428	-0.445	-0.484	-0.514	-0.517	-0.532	-0.465	-0.430	-0.494
Azerbaijan	-0.625	-0.544	-0.448	-0.403	-0.417	-0.420	-0.397	-0.436	-0.435	-0.444	-0.498	-0.547	-0.549	-0.590	-0.482
Bahamas, The	-0.399	-0.402	-0.419	-0.420	-0.401	-0.395	-0.400	-0.400	-0.403	-0.393	-0.401	-0.395	-0.399	-0.422	-0.403
Bahrain	-0.666	-0.676	-0.661	-0.685	-0.602	-0.458	-0.483	-0.449	-0.517	-0.635	-0.670	-0.605			-0.592
Bangladesh	-0.418	-0.417	-0.426	-0.428	-0.433	-0.432	-0.427	-0.423	-0.444	-0.445	-0.455	-0.480	-0.465	-0.447	-0.439
Belarus	-0.398	-0.397	-0.460	-0.516	-0.487	-0.521	-0.465	-0.423	-0.415	-0.446	-0.488	-0.557	-0.633	-0.642	-0.489
Belgium	-0.605	-0.602	-0.430	-0.470	-0.433	-0.422	-0.404	-0.401	-0.541	-0.561	-0.633	-0.629	-0.547	-0.454	-0.509
Bermuda	-0.393	-0.397	-0.392	-0.413	-0.412	-0.407	-0.367	-0.369	-0.396	-0.395	-0.394	-0.400	-0.360	-0.349	-0.389
Bolivia	-0.460	-0.446	-0.454	-0.439	-0.418	-0.402	-0.396	-0.385	-0.395	-0.396	-0.396	-0.398	-0.395	-0.368	-0.411
Bosnia and Herzegovina								-0.431	-0.422	-0.414	-0.448	-0.466	-0.472	-0.424	-0.440
Botswana	-0.455	-0.414	-0.393	-0.438	-0.402	-0.392	-0.391	-0.390	-0.395	-0.401	-0.421	-0.400	-0.408	-0.397	-0.407
Brazil	-0.546	-0.579	-0.576	-0.494	-0.536	-0.605	-0.461	-0.435	-0.457	-0.441	-0.429	-0.526	-0.456	-0.459	-0.500
Bulgaria					-0.399	-0.396	-0.396	-0.403	-0.422	-0.410	-0.404	-0.423	-0.442	-0.418	-0.411
Burkina Faso	-0.399	-0.401	-0.399	-0.397	-0.396	-0.397	-0.397	-0.393	-0.395	-0.395	-0.394	-0.396	-0.399	-0.420	-0.398
Cambodia				-0.397	-0.400	-0.504	-0.398	-0.431	-0.393	-0.400	-0.407	-0.540	-0.564	-0.441	-0.443
Cameroon			-0.388	-0.418	-0.403	-0.402	-0.394	-0.417	-0.428	-0.422	-0.444	-0.413	-0.389	-0.369	-0.407
Canada	-0.466	-0.433	-0.404	-0.402	-0.406	-0.397	-0.397	-0.395	-0.395	-0.395	-0.394	-0.395	-0.394	-0.389	-0.404
Cayman Islands	-0.512														-0.512
Chile	-0.646	-0.669	-0.592	-0.619	-0.518	-0.400	-0.398	-0.396	-0.399	-0.401	-0.401	-0.506	-0.396	-0.394	-0.481
China	-0.703	-0.667	-0.535	-0.443	-0.400	-0.394	-0.393	-0.394	-0.391	-0.395	-0.395	-0.394	-0.391	-0.394	-0.449
Colombia	-0.499	-0.546	-0.539	-0.443	-0.426	-0.404	-0.396	-0.393	-0.411	-0.401	-0.395	-0.404	-0.399	-0.395	-0.432
Costa Rica	-0.619	-0.574	-0.574	-0.552	-0.502	-0.498	-0.433	-0.446	-0.433	-0.421	-0.421	-0.538	-0.534	-0.428	-0.498
Cote d'Ivoire	-0.399	-0.401	-0.407	-0.401	-0.401	-0.400	-0.397	-0.397	-0.393	-0.381	-0.383	-0.401	-0.397	-0.396	-0.397
Croatia	-0.469	-0.473	-0.510	-0.417	-0.395	-0.402	-0.401	-0.402	-0.400	-0.400	-0.409	-0.422	-0.453	-0.420	-0.427
Cuba	-0.389	-0.387	-0.640	-0.703	-0.591	-0.446	-0.339	-0.410	-0.433	-0.521	-0.667	-0.551	-0.551	-0.697	-0.523
Cyprus	-0.523	-0.507	-0.461	-0.479	-0.453	-0.439	-0.455	-0.450	-0.440	-0.412	-0.424	-0.462	-0.435	-0.436	-0.455
Czech Republic	-0.642	-0.635	-0.532	-0.435	-0.418	-0.407	-0.400	-0.407	-0.404	-0.404	-0.401	-0.395	-0.402	-0.401	-0.449
Denmark	-0.396	-0.398	-0.393	-0.397	-0.406	-0.401	-0.396	-0.614	-0.580	-0.595	-0.598	-0.615	-0.514	-0.457	-0.483
Dominican Republic	-0.462	-0.516	-0.523	-0.553	-0.555	-0.528	-0.497	-0.464	-0.430	-0.413	-0.408	-0.402	-0.400	-0.400	-0.468
Ecuador	-0.684	-0.642	-0.651	-0.442	-0.416	-0.402	-0.398	-0.392	-0.388	-0.395	-0.396	-0.395	-0.390	-0.390	-0.456

Egypt, Arab Rep.											-0.414	-0.445	-0.428	-0.440	-0.432
El Salvador	-0.575	-0.583	-0.592	-0.554	-0.432	-0.389	-0.389	-0.391	-0.391	-0.393	-0.392	-0.388	-0.388	-0.398	-0.447
Estonia	-0.425	-0.641	-0.522	-0.507	-0.444	-0.392	-0.389	-0.390	-0.391	-0.393	-0.399	-0.544	-0.467	-0.389	-0.449
Ethiopia	-0.572	-0.540	-0.514	-0.497	-0.400	-0.452	-0.400	-0.390	-0.394	-0.400	-0.392	-0.400	-0.399	-0.400	-0.439
Finland	-0.388	-0.401	-0.393	-0.387			-0.391	-0.383	-0.378	-0.388	-0.395	-0.432	-0.397	-0.382	-0.393
France	-0.467	-0.465	-0.453	-0.462	-0.441	-0.431	-0.412	-0.425	-0.447	-0.455	-0.485	-0.521	-0.500	-0.459	-0.459
Gambia, The	-0.422		-0.392	-0.392	-0.393	-0.393	-0.397	-0.429	-0.423	-0.389	-0.378	-0.381	-0.375	-0.370	-0.395
Georgia		-0.479	-0.496	-0.465	-0.451	-0.405	-0.393	-0.389	-0.405	-0.485	-0.579	-0.615	-0.578	-0.534	-0.483
Germany	-0.444	-0.442	-0.434	-0.444	-0.445	-0.428	-0.418	-0.412	-0.407	-0.406	-0.412	-0.417	-0.401	-0.399	-0.422
Ghana	-0.487	-0.462	-0.518	-0.404		-0.394	-0.394	-0.401	-0.399	-0.399	-0.397	-0.396	-0.413	-0.398	-0.420
Greece	-0.427	-0.465	-0.428	-0.534	-0.341	-0.389	-0.396	-0.399	-0.400	-0.395	-0.392	-0.411	-0.391	-0.392	-0.411
Guatemala				-0.671	-0.673	-0.653	-0.502	-0.463	-0.454	-0.446	-0.436	-0.407	-0.409	-0.406	-0.502
Haiti	-0.391	-0.397	-0.413	-0.401	-0.397	-0.399	-0.401	-0.398	-0.378	-0.396	-0.398	-0.364	-0.333	-0.340	-0.386
Honduras	-0.467	-0.602	-0.506	-0.447	-0.403	-0.391	-0.389	-0.407	-0.398	-0.399	-0.402	-0.426	-0.440	-0.448	-0.437
Hong Kong SAR, China	-0.660	-0.672	-0.674	-0.667	-0.442	-0.392	-0.392	-0.395	-0.449	-0.507	-0.490	-0.393	-0.381	-0.391	-0.493
Hungary	-0.586	-0.565	-0.502	-0.457	-0.448	-0.453	-0.428	-0.466	-0.427	-0.433	-0.451	-0.474	-0.496	-0.414	-0.471
Iceland	-0.480	-0.510	-0.650	-0.694	-0.698	-0.592	-0.456	-0.454	-0.532	-0.651	-0.684	-0.494	-0.444	-0.404	-0.553
India	-0.499	-0.501	-0.518	-0.514	-0.496	-0.487	-0.453	-0.415	-0.403	-0.413	-0.416	-0.464	-0.492	-0.465	-0.467
Indonesia	-0.615	-0.650	-0.567	-0.558	-0.618	-0.586	-0.527	-0.417	-0.414	-0.445	-0.408	-0.410	-0.407	-0.400	-0.502
Iraq											-0.500	-0.538			-0.519
Ireland	-0.579	-0.574	-0.485	-0.486	-0.394	-0.392	-0.515	-0.535	-0.560	-0.532	-0.608	-0.596	-0.550	-0.373	-0.513
Israel	-0.440	-0.558	-0.506	-0.507	-0.528	-0.474	-0.405	-0.387	-0.398	-0.400	-0.397	-0.397	-0.396	-0.400	-0.442
Italy	-0.517	-0.481	-0.451	-0.436	-0.437	-0.401	-0.384	-0.390	-0.408	-0.416	-0.443	-0.483	-0.419	-0.398	-0.433
Jamaica	-0.640	-0.387	-0.390		-0.397	-0.461	-0.479	-0.495	-0.440	-0.432	-0.425	-0.408	-0.442	-0.405	-0.446
Japan	-0.396	-0.394	-0.372	-0.354	-0.348	-0.342	-0.336	-0.335	-0.335	-0.336	-0.340	-0.350	-0.356	-0.346	-0.353
Jordan	-0.479	-0.461	-0.465	-0.480	-0.444	-0.409	-0.399	-0.395	-0.397	-0.409	-0.410	-0.409	-0.397	-0.403	-0.425
Kazakhstan	-0.392	-0.520	-0.503	-0.409	-0.417	-0.435	-0.539	-0.568	-0.585	-0.593	-0.596	-0.631	-0.614	-0.616	-0.530
Kenya	-0.646	-0.494	-0.450	-0.414	-0.403	-0.385	-0.372	-0.362	-0.371	-0.374	-0.380	-0.394	-0.394	-0.386	-0.416
Korea, Rep.	-0.658	-0.685	-0.666	-0.670	-0.618	-0.498	-0.460	-0.419	-0.411	-0.457	-0.520	-0.591	-0.501	-0.427	-0.541
Kuwait	-0.543	-0.680	-0.644	-0.648	-0.531	-0.476	-0.404	-0.392	-0.413	-0.522	-0.607				-0.533
Kyrgyz Republic	-0.399			-0.398	-0.408	-0.453	-0.378	-0.380	-0.390	-0.389	-0.383	-0.478	-0.453	-0.370	-0.407
Lao PDR		-0.611				-0.401	-0.397	-0.401	-0.434	-0.485	-0.401	-0.450	-0.410	-0.396	-0.439
Latvia	-0.394	-0.422	-0.418	-0.396	-0.401	-0.392	-0.392	-0.390	-0.409	-0.438	-0.484	-0.543	-0.502	-0.428	-0.429
Lebanon	-0.635	-0.642	-0.643	-0.645	-0.650	-0.610	-0.578	-0.536	-0.524	-0.553	-0.545	-0.491	-0.465	-0.452	-0.569
Libya				-0.388		-0.387	-0.389	-0.410	-0.387	-0.359	-0.353	-0.352	-0.333		-0.373
Lithuania	-0.395	-0.397	-0.413	-0.406	-0.396	-0.399	-0.399	-0.399	-0.394	-0.402	-0.417	-0.508	-0.470	-0.398	-0.414
Luxembourg	-0.612	-0.643	-0.581	-0.557	-0.517	-0.517	-0.509	-0.522	-0.488	-0.490	-0.474	-0.486	-0.482	-0.432	-0.522
Macao SAR, China	-0.576	-0.580	-0.545	-0.556	-0.523	-0.394	-0.394	-0.398	-0.398	-0.491	-0.493	-0.392	-0.383	-0.384	-0.465
Macedonia, FYR	-0.433	-0.435	-0.446	-0.437	-0.399	-0.402	-0.402	-0.400	-0.400	-0.401	-0.397	-0.394	-0.390	-0.392	-0.409
Madagascar	-0.399	-0.401	-0.400	-0.415	-0.410	-0.410	-0.398	-0.371	-0.395	-0.425	-0.526	-0.392	-0.392	-0.391	-0.409
Malawi	-0.400	-0.393	-0.628	-0.531	-0.536	-0.463	-0.428	-0.397	-0.394	-0.389	-0.399	-0.394	-0.392	-0.398	-0.439
Malaysia	-0.562	-0.629	-0.488	-0.417	-0.412	-0.401	-0.424	-0.411	-0.405	-0.406	-0.402	-0.396	-0.388	-0.384	-0.437
Mali	-0.383	-0.383	-0.396	-0.395	-0.396	-0.393	-0.394	-0.392	-0.395	-0.398	-0.399	-0.399	-0.398	-0.399	-0.394

Malta	-0.457	-0.440	-0.525	-0.437	-0.426	-0.431	-0.411	-0.423	-0.425	-0.426	-0.443	-0.439	-0.423	-0.420	-0.438
Mauritania	-0.390	-0.485				-0.416	-0.384	-0.393	-0.396	-0.385	-0.417	-0.393	-0.376	-0.384	-0.402
Mauritius	-0.685	-0.687	-0.688	-0.666	-0.629	-0.646	-0.481	-0.484	-0.513	-0.510	-0.534	-0.511	-0.443	-0.422	-0.564
Mexico	-0.534	-0.669	-0.660	-0.633		-0.701			-0.572	-0.540					-0.616
Moldova	-0.635	-0.680	-0.517	-0.451	-0.488	-0.431	-0.420	-0.430	-0.416	-0.417	-0.469	-0.560	-0.574	-0.411	-0.493
Mongolia			-0.594	-0.531	-0.467	-0.525	-0.543	-0.525	-0.566	-0.582	-0.575	-0.535	-0.443	-0.634	-0.543
Montenegro						-0.392	-0.396	-0.402	-0.389	-0.385	-0.458	-0.426	-0.398	-0.391	-0.404
Morocco	-0.547	-0.550	-0.485	-0.426	-0.426	-0.418	-0.414	-0.408	-0.401	-0.405	-0.417	-0.412	-0.408	-0.402	-0.437
Mozambique	-0.408	-0.399	-0.398	-0.400	-0.402	-0.401	-0.399	-0.396	-0.395	-0.400	-0.401	-0.397	-0.395	-0.394	-0.399
Namibia				-0.387		-0.397	-0.630	-0.690	-0.403	-0.406	-0.391	-0.403	-0.408	-0.393	-0.451
Nepal	-0.495	-0.437	-0.482	-0.447	-0.443	-0.449	-0.409	-0.411	-0.396	-0.395	-0.424	-0.433	-0.454	-0.493	-0.441
Netherlands Antilles		-0.399	-0.400	-0.401		-0.693	-0.600								-0.499
Netherlands	-0.633	-0.601	-0.586	-0.553	-0.527	-0.508	-0.471	-0.571	-0.561	-0.510	-0.445	-0.425	-0.408	-0.390	-0.513
New Zealand	-0.623	-0.627	-0.490	-0.572	-0.533	-0.484	-0.438		-0.567	-0.468	-0.485	-0.530	-0.474		-0.524
Nicaragua						-0.540	-0.405	-0.390	-0.398	-0.428	-0.413	-0.398	-0.395	-0.392	-0.418
Niger	-0.345	-0.376	-0.369	-0.461	-0.376	-0.396	-0.399	-0.395	-0.397	-0.396	-0.397	-0.393	-0.397	-0.393	-0.392
Nigeria	-0.418	-0.424	-0.429	-0.463	-0.439	-0.449	-0.419	-0.406	-0.403	-0.397	-0.395	-0.395	-0.404	-0.398	-0.417
Norway	-0.471	-0.564	-0.474	-0.475	-0.465	-0.465	-0.418	-0.405	-0.402	-0.428	-0.453	-0.565	-0.442	-0.421	-0.461
Oman	-0.409	-0.441	-0.447	-0.451	-0.408	-0.394	-0.398	-0.398	-0.400	-0.400	-0.398	-0.401	-0.393		-0.411
Pakistan	-0.435	-0.495	-0.444	-0.442	-0.409	-0.417	-0.404	-0.396	-0.417	-0.458	-0.494	-0.484	-0.521	-0.488	-0.450
Panama	-0.473	-0.556	-0.480	-0.539	-0.501	-0.443	-0.425	-0.426	-0.422	-0.428	-0.409	-0.403	-0.404	-0.403	-0.451
Papua New Guinea		-0.411	-0.407	-0.404			-0.387	-0.396	-0.349	-0.374	-0.391	-0.394	-0.401	-0.394	-0.392
Paraguay	-0.468	-0.510	-0.635	-0.624	-0.651	-0.587	-0.390	-0.618	-0.508	-0.639	-0.588	-0.570	-0.538	-0.534	-0.561
Peru	-0.469	-0.536	-0.472	-0.480	-0.434	-0.398	-0.400	-0.400	-0.398	-0.399	-0.396	-0.391	-0.395	-0.390	-0.426
Philippines	-0.479	-0.486	-0.446	-0.387	-0.652	-0.492	-0.429	-0.395	-0.397	-0.396	-0.394	-0.395	-0.398	-0.399	-0.439
Poland	-0.594	-0.603	-0.499	-0.539	-0.491	-0.456	-0.495	-0.408	-0.410	-0.417	-0.417	-0.424	-0.408	-0.418	-0.470
Portugal	-0.534	-0.567	-0.507	-0.508	-0.539	-0.614	-0.624	-0.580	-0.441	-0.480	-0.508	-0.571	-0.514	-0.414	-0.529
Qatar				-0.545	-0.430	-0.392	-0.395	-0.393	-0.394	-0.493	-0.557	-0.485	-0.460		-0.454
Romania	-0.676	-0.663	-0.649	-0.640	-0.633	-0.581	-0.442	-0.442	-0.407	-0.405	-0.472	-0.508	-0.532	-0.435	-0.535
Russian Federation	-0.470	-0.478	-0.503	-0.449	-0.469	-0.437	-0.471	-0.438	-0.454	-0.475	-0.512	-0.548	-0.551	-0.478	-0.481
Rwanda					-0.393	-0.391	-0.392	-0.388	-0.417	-0.397	-0.399	-0.374	-0.380	-0.391	-0.392
San Marino	-0.676	-0.522	-0.387	-0.510	-0.609	-0.614	-0.415	-0.391	-0.391	-0.432	-0.492	-0.501			-0.495
Saudi Arabia	-0.518	-0.522	-0.469	-0.497	-0.435	-0.398	-0.399	-0.399	-0.399	-0.450	-0.447	-0.401	-0.395	-0.343	-0.434
Senegal	-0.397	-0.398	-0.399	-0.397	-0.395	-0.396	-0.397	-0.397	-0.395	-0.397	-0.392	-0.394	-0.396	-0.396	-0.396
Serbia						-0.331	-0.417	-0.394	-0.427	-0.451	-0.443	-0.448	-0.408	-0.405	-0.414
Seychelles		-0.546						-0.397	-0.394	-0.396	-0.396	-0.383	-0.396	-0.350	-0.407
Sierra Leone	-0.399	-0.380		-0.393	-0.388	-0.399	-0.394	-0.395	-0.398	-0.400	-0.399	-0.399	-0.398	-0.397	-0.395
Singapore	-0.669	-0.685	-0.565	-0.527	-0.630	-0.631		-0.389	-0.423	-0.456	-0.431	-0.391	-0.397	-0.380	-0.506
Slovak Republic	-0.667	-0.672	-0.643	-0.659	-0.454	-0.414	-0.397	-0.396	-0.393	-0.394	-0.400	-0.408	-0.398	-0.393	-0.478
Slovenia	-0.568	-0.484	-0.459	-0.505	-0.480	-0.438	-0.418	-0.396	-0.397	-0.402	-0.442	-0.537	-0.439	-0.422	-0.456
South Africa	-0.654	-0.547	-0.584	-0.460	-0.473	-0.388	-0.401	-0.392	-0.391	-0.389	-0.407	-0.490	-0.462	-0.393	-0.459
Spain	-0.629	-0.620	-0.431	-0.430	-0.428	-0.422	-0.416	-0.458	-0.518	-0.555	-0.629	-0.645	-0.497	-0.415	-0.507
Sri Lanka	-0.588	-0.499	-0.526	-0.539	-0.632	-0.531	-0.469	-0.445	-0.448	-0.469	-0.557	-0.569	-0.525	-0.437	-0.517
Sudan	-0.392	-0.390	-0.390	-0.419	-0.398	-0.423	-0.554	-0.412	-0.411	-0.594	-0.570	-0.555	-0.561	-0.606	-0.477

Sweden	-0.597	-0.591	-0.587	-0.612	-0.521	-0.413	-0.390	-0.366	-0.456	-0.444	-0.519	-0.537	-0.410	-0.401	-0.489
Switzerland	-0.452	-0.421	-0.468	-0.496	-0.447	-0.395	-0.396	-0.392	-0.455	-0.476	-0.546	-0.535	-0.387	-0.390	-0.447
Syrian Arab Republic									-0.334	-0.397	-0.571	-0.437	-0.406	-0.407	-0.425
Taiwan				-0.471	-0.468	-0.426	-0.443	-0.408	-0.405	-0.419	-0.426	-0.419	-0.396	-0.394	-0.425
Tanzania							-0.372	-0.359	-0.360	-0.375	-0.377	-0.377	-0.371	-0.375	-0.371
Thailand	-0.675	-0.681	-0.543	-0.455	-0.423	-0.405	-0.399	-0.399	-0.405	-0.414	-0.412	-0.404	-0.402	-0.399	-0.458
Togo	-0.415	-0.430	-0.401	-0.400	-0.399	-0.398	-0.394	-0.397	-0.386	-0.394	-0.396	-0.396	-0.393	-0.393	-0.400
Trinidad and Tobago	-0.516	-0.541	-0.571	-0.544	-0.562	-0.485	-0.401	-0.408	-0.437	-0.434	-0.430	-0.402	-0.392	-0.390	-0.465
Tunisia	-0.401	-0.569	-0.644	-0.681	-0.543	-0.451	-0.439	-0.411	-0.407	-0.417	-0.420	-0.427	-0.423	-0.423	-0.475
Turkey	-0.671	-0.643	-0.643	-0.638	-0.650	-0.613	-0.605	-0.551	-0.548	-0.575	-0.580	-0.560	-0.466	-0.406	-0.582
Uganda											-0.413	-0.391	-0.392	-0.371	-0.392
Ukraine	-0.492	-0.573	-0.518	-0.469	-0.474	-0.440	-0.438	-0.478	-0.498	-0.549	-0.601	-0.610	-0.622	-0.573	-0.524
United Arab Emirates	-0.444	-0.526	-0.488	-0.542	-0.488	-0.404	-0.395	-0.396	-0.422	-0.484	-0.525	-0.438	-0.410	-0.398	-0.454
United Kingdom	-0.450	-0.503	-0.484	-0.406	-0.458	-0.489	-0.397	-0.395	-0.439	-0.458	-0.465	-0.460	-0.418	-0.402	-0.445
United States	-0.441	-0.428	-0.418	-0.429	-0.410	-0.400	-0.393	-0.390	-0.402	-0.402	-0.400	-0.398	-0.376	-0.356	-0.403
Uruguay	-0.564	-0.573	-0.607	-0.602	-0.598	-0.631	-0.659	-0.567	-0.580	-0.355	-0.363	-0.370	-0.349	-0.340	-0.511
Uzbekistan	-0.586	-0.691	-0.577	-0.507	-0.536	-0.467	-0.484	-0.504	-0.466	-0.425	-0.392	-0.446	-0.525	-0.471	-0.505
Venezuela, RB	-0.400	-0.429	-0.415	-0.401	-0.407	-0.432	-0.414	-0.396	-0.394	-0.393	-0.408	-0.417	-0.409	-0.395	-0.408
Vietnam	-0.439	-0.441	-0.465	-0.411	-0.466	-0.435	-0.514	-0.465	-0.458	-0.516	-0.494	-0.549	-0.503	-0.549	-0.479
Yemen, Rep.									-0.397	-0.430	-0.431	-0.508	-0.473	-0.504	-0.457
Zambia	-0.401	-0.424	-0.393	-0.404	-0.394	-0.401	-0.398	-0.356	-0.358	-0.369	-0.374	-0.369	-0.372	-0.365	-0.384
Zimbabwe													-0.379	-0.377	-0.378
Mean	-0.508	-0.518	-0.500	-0.488	-0.470	-0.451	-0.427	-0.423	-0.424	-0.436	-0.449	-0.456	-0.435	-0.420	-0.456

Table 1.8: Average estimates of market power (weighted by market shares) using the Lerner index, considering a two-output cost function

The table reports average estimates of market power (weighted by market shares) by country and year. Averages are obtained from the bank-level estimates of market power using the Lerner index, considering a two-output cost function. Higher values reflect higher market power (lower competition).

	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Mean
Afghanistan									0.388	0.251	0.096	0.356	0.306	-0.013	0.232
Albania			0.212	0.220	0.216	0.212	0.195	0.225	0.303	0.284	0.324	0.311	0.328	0.368	0.284
Algeria	0.151	0.174	0.084	0.163	0.236	0.394	0.207	0.391	0.582	0.619	0.456	0.613	0.507	0.233	0.407
Andorra	0.264	0.119	0.137	0.367	0.314	0.382	0.467	0.512	0.512	0.514	0.447	0.290			0.362
Angola	0.284	0.322	0.291	0.405	0.216	0.199			0.295		0.467	0.499	0.311	0.200	0.328
Antigua and Barbuda				0.064	0.102		0.144				0.276	0.343	0.353		0.214
Argentina				0.013	0.114	0.112	0.023	0.172	0.264	0.065	0.032	0.052	0.043	0.074	0.102
Armenia	0.150	0.164	0.207	0.196	0.289	0.357	0.384	0.397	0.382	0.372	0.285	0.335	0.224	0.264	0.299
Australia	0.264	0.257	0.219	0.295	-0.069	0.236			0.235	0.243	0.227	0.176	0.260	0.261	0.228
Austria	0.158	0.134	0.144	0.123	0.147	0.155	0.187	0.164	0.161	0.083	0.065	0.079	0.125	0.138	0.130
Azerbaijan	0.539	0.378	0.386	0.541	0.443	0.390	0.378	0.442	0.446	0.396	0.396	0.404	0.364	0.249	0.396
Bahamas, The	0.164	0.163	0.221	0.283	0.299	0.222	0.298	0.364	0.401	0.396	0.429	0.313	0.268	0.280	0.310
Bahrain	0.214	0.185	0.185	0.171	0.188	0.249	0.234	0.291	0.274	0.210	0.196	0.240			0.218
Bangladesh	-0.039	-0.018	0.083	0.125	0.146	0.154	0.150	0.173	0.224	0.195	0.215	0.266	0.285	0.348	0.192
Belarus	0.105	0.197	0.108	0.117	0.109	0.194	0.167	0.162	0.193	0.222	0.197	0.184	0.238	0.116	0.182
Belgium	0.114	0.142	0.156	0.172	0.177	0.160	0.170	0.166	0.052	0.068	0.013	0.005	0.030	0.053	0.120
Bermuda	0.110	0.127	0.130	0.161	0.125	0.198	0.100	0.143	0.280	0.277	0.284	0.140	0.216	0.233	0.191
Bolivia	0.150	0.197	0.217	0.190	0.205	0.250	0.215	0.157	0.188	0.231	0.249	0.296	0.255	0.284	0.216
Bosnia and Herzegovina								0.218	0.248	0.243	0.262	0.186	0.229	0.246	0.232
Botswana	0.237	0.302	0.259	0.301	0.307	0.347	0.362	0.346	0.366	0.337	0.279	0.304	0.319	0.277	0.316
Brazil	0.120	0.145	0.159	0.139	0.153	0.168	0.230	0.223	0.227	0.274	0.282	0.199	0.279	0.252	0.207
Bulgaria					0.318	0.293	0.341	0.369	0.361	0.360	0.394	0.340	0.330	0.303	0.346
Burkina Faso	0.286	0.395	0.347	0.281	0.218	0.317	0.358	0.327	0.347	0.315	0.318	0.257	0.277	0.198	0.305
Cambodia				0.485	0.477	0.346	0.394	0.444	0.444	0.455	0.461	0.523	0.389	0.371	0.432
Cameroon			0.503	0.404	0.181	0.429	0.394	0.452	0.440	0.434	0.341	0.400	0.324	0.353	0.389
Canada	0.107	0.113	0.072	0.176	0.175	0.204	0.213	0.218	0.175	0.206	0.199	0.156	0.257	0.308	0.188
Cayman Islands	0.186														0.186
Chile	0.171	0.170	0.214	0.216	0.248	0.267	0.164	0.162	0.171	0.238	0.313	0.222	0.408	0.380	0.278
China	0.411	0.390	0.054	0.058	0.210	0.343	0.388	0.408	0.393	0.397	0.435	0.414	0.425	0.457	0.415
Colombia	0.031	0.022	0.048	0.098	0.158	0.164	0.254	0.293	0.165	0.135	0.079	0.113	0.136	0.108	0.157
Costa Rica	0.085	0.095	0.088	0.082	0.144	0.163	0.148	0.160	0.156	0.084	0.052	0.063	0.054	0.094	0.104
Cote d'Ivoire	0.369	0.196	0.299	0.309	0.273	0.251	0.240	0.283	0.276	0.286	0.312	0.242	0.226	0.273	0.274
Croatia	0.151	0.105	0.164	0.146	0.136	0.117	0.141	0.050	0.124	0.104	0.082	0.204	0.282	0.311	0.160
Cuba	0.827	0.351	0.617	0.692	0.574	0.413		0.480	0.706	0.615	0.474	0.561	0.329	0.654	0.552
Cyprus	0.166	0.163	0.294	0.118	0.124	0.155	0.085	0.100	0.071	0.110	0.246	0.189	0.213	0.258	0.162
Czech Republic	0.187	0.120	0.134	0.130	0.172	0.247	0.192	0.047	0.350	0.335	0.334	0.279	0.404	0.410	0.245
Denmark	0.175	0.185	0.153	0.156	0.257	0.271	0.394	0.190	0.193	0.170	0.144	0.115	0.228	0.224	0.200
Dominican Republic									0.157	0.204	0.225	0.232	0.133	0.154	0.190
Ecuador	0.059	-0.117	0.302	0.100	0.084	0.119	0.035	0.089	0.151				0.013	0.042	0.091

Egypt, Arab Rep.											0.078	0.070	0.324	0.249	0.255
El Salvador		0.075	0.151	0.189	0.190	0.298	0.280	0.296	0.336	0.216	0.217	0.215	0.217	0.012	0.233
Estonia	0.246	0.038	0.024	-0.022	0.048	0.012	0.010	0.069	0.350	0.366	0.324	0.323	0.266	0.006	0.201
Ethiopia	0.163	0.151	0.275	0.245	0.414	0.307	0.572	0.579	0.580	0.617	0.511	0.604	0.606	0.596	0.504
Finland	0.068		0.348	0.363			0.274	0.214	0.018	0.021	0.083	0.131	0.277	0.289	0.182
France	0.111	0.118	0.139	0.122	0.124	0.148	0.165	0.191	0.195	0.194	0.161	0.171	0.230	0.248	0.157
Gambia, The	0.502		0.575	0.558	0.559	0.536	0.536	0.445	0.409	0.425	0.282	0.339	0.263	0.326	0.418
Georgia		0.322	0.370	0.327	0.348	0.337	0.335	0.317	0.350	0.340	0.161	0.173	0.071	0.037	0.267
Germany	0.179	0.162	0.174	0.150	0.142	0.167	0.185	0.198	0.195	0.214	0.177	0.163	0.204	0.242	0.181
Ghana	0.172	0.449	0.427	0.149		0.420	0.422	0.443	0.487	0.448	0.300	0.276	0.247	0.323	0.311
Greece	0.180	0.212	0.413	0.221		0.050	0.117	0.072	0.098	0.087	0.130	0.094	0.159	0.099	0.140
Guatemala					0.133	0.137	0.197	0.239	0.167	0.036	0.020	0.116	0.110	0.016	0.134
Haiti												0.124	0.050	0.012	0.083
Honduras	0.347	0.258	0.197	0.141	0.176	0.208	0.267	0.191	0.214	0.251	0.260	0.282	0.234	0.210	0.231
Hong Kong SAR, China	0.147	0.115	0.113	0.092	0.165	0.190	0.001	0.375	0.251	0.286	0.270	0.187	0.308	0.352	0.255
Hungary	0.100	0.111	0.099	0.130	0.161	0.123	0.179	0.123	0.092	0.090	0.251	0.186	0.220	0.322	0.155
Iceland									0.196	0.312	0.316	0.431	0.346	0.496	0.341
India	0.129	0.156	0.132	0.158	0.142	0.187	0.220	0.272	0.251	0.198	0.218	0.167	0.182	0.179	0.187
Indonesia	0.129	0.040	0.030	0.114	0.137	0.162	0.235	0.328	0.256	0.257	0.298	0.318	0.249	0.154	0.199
Iraq											0.192	0.161			0.176
Ireland								0.068	0.126	0.097	0.153	0.153	0.207	0.216	0.161
Israel	0.164	0.074	0.102	0.135	0.094	0.112	0.128	0.188	0.162	0.209	0.217	0.153	0.208	0.120	0.134
Italy	0.142	0.173	0.153	0.208	0.185	0.228	0.224	0.182	0.228	0.234	0.222	0.196	0.238	0.224	0.215
Jamaica	0.139	0.170	0.212		0.299	0.222	0.281	0.234	0.161	0.257	0.253	0.299	0.280	0.326	0.250
Japan	0.257	0.253	0.266	0.266	0.256	0.237	0.272	0.264	0.282	0.286	0.290	0.246	0.197	0.240	0.258
Jordan	0.164	0.194	0.185	0.159	0.250	0.248	0.334	0.371	0.425	0.409	0.197	0.358	0.313	0.359	0.285
Kazakhstan	0.248	0.311	0.315	0.254	0.355	0.375	0.368	0.401	0.364	0.336	0.347	0.251	0.238	0.057	0.308
Kenya	0.162	0.272	0.279	0.321	0.330	0.328	0.384	0.360	0.340	0.302	0.324	0.353	0.335	0.341	0.326
Korea, Rep.	0.078	0.120	0.157			0.007	0.012	0.214	0.176	0.198	0.207	0.151	0.144	0.262	0.161
Kuwait		0.229	0.295	0.307	0.376	0.451	0.524	0.561	0.571	0.477	0.327				0.416
Kyrgyz Republic	0.080			0.333	0.124	0.403	0.383	0.467	0.374	0.406	0.461	0.328	0.368	0.336	0.366
Lao PDR		0.242							0.084	0.083		0.043	0.039	0.362	0.128
Latvia	0.255	0.224	0.265	0.286	0.274	0.213	0.309	0.365	0.371	0.336	0.293	0.251	0.257	0.185	0.290
Lebanon	0.177	0.119	0.133	0.137	0.136	0.150	0.173	0.116	0.122	0.159	0.153	0.189	0.196	0.211	0.157
Libya						0.582	0.542	0.063	0.409	0.372	0.429		0.257		0.340
Lithuania	0.192	0.166	0.253	0.156	0.181	0.221	0.191	0.263	0.299	0.313	0.321	0.247	0.190	0.139	0.231
Luxembourg	0.112	0.104	0.124	0.144	0.128	0.125	0.157	0.191	0.208	0.196	0.178	0.134	0.234	0.293	0.155
Macao SAR, China	0.138	0.133	0.081	0.195	0.188	0.288	0.161	0.111	0.298	0.306	0.290	0.335	0.323	0.355	0.250
Macedonia, FYR	0.505	0.362	0.355	0.307	0.313	0.275	0.326	0.326	0.227	0.364	0.374	0.324	0.272	0.156	0.317
Madagascar		0.088	0.120	0.094	0.126	0.187	0.255	0.257	0.479	0.499	0.449	0.347	0.281	0.270	0.265
Malawi	0.428	0.467	0.450	0.399	0.273	0.366	0.369	0.379	0.398	0.498	0.532	0.445	0.311	0.297	0.394
Malaysia	0.286	0.254	0.280	0.318	0.335	0.342	0.360	0.335	0.332	0.317	0.229	0.309	0.370	0.417	0.312
Mali	0.262	0.276	0.136	0.207	0.333	0.317	0.234	0.213	0.222	0.302	0.334	0.313	0.242	0.185	0.268

Malta	0.225	0.228	0.259	0.236	0.236	0.249	0.283	0.304	0.344	0.348	0.340	0.302	0.319	0.359	0.286
Mauritania						0.126	0.115	0.153	0.130	0.067	0.154	0.285	0.384	0.045	0.177
Mauritius	0.183	0.207	0.187	0.192	0.212	0.334	0.289	0.333	0.339	0.288	0.272	0.292	0.264	0.329	0.290
Mexico	0.021	0.012	0.071	0.023		0.286									0.044
Moldova	0.250	0.395	0.409	0.421	0.389	0.363	0.296	0.287	0.290	0.350	0.326	0.293	0.201	0.255	0.303
Mongolia			0.325	0.231	0.231	0.197	0.140	0.249	0.179	0.175	0.198	0.210	0.217		0.202
Montenegro							0.286	0.238	0.173	0.214	0.197	0.212	0.128	0.150	0.203
Morocco	0.227	0.246	0.227	0.303	0.319	0.338	0.339	0.384	0.315	0.347	0.346	0.368	0.150	0.151	0.296
Mozambique	0.273	0.247	0.329	0.224	0.252	0.254	0.205	0.249	0.270	0.349	0.376	0.314	0.322	0.284	0.291
Namibia									0.260	0.250	0.266	0.176	0.155	0.281	0.233
Nepal	0.364	0.257	0.328	0.371	0.366	0.357	0.237	0.267	0.283	0.327	0.297	0.336	0.287	0.209	0.298
Netherlands Antilles			0.154	0.221		0.137	0.139								0.155
Netherlands	0.122	0.115	0.151	0.211	0.222	0.120	0.105	0.136	0.123	0.101	0.145	0.171	0.133	0.266	0.151
New Zealand	0.019	0.011	0.012	0.013							0.166	0.144	0.166		0.126
Nicaragua						0.212	0.231	0.248	0.305			0.292	0.316	0.298	0.285
Niger		0.407	0.072	0.109	0.100	0.122	0.155	0.160	0.314	0.207	0.258	0.361	0.346	0.337	0.252
Nigeria	0.216	0.284	0.301	0.268	0.299	0.274	0.284	0.239	0.201	0.220	0.279	0.331	0.205	0.228	0.267
Norway	0.180	0.073	0.158	0.162	0.166	0.138	0.166	0.135	0.211	0.199	0.169	0.153	0.260	0.241	0.197
Oman	0.296	0.255	0.293	0.269	0.311	0.401	0.406	0.436	0.431	0.387	0.387	0.437	0.472		0.363
Pakistan	0.002	0.002	0.003	-0.004		0.007	0.009	0.006	0.003	0.000	0.013	0.285	0.297	0.285	0.237
Panama	0.190	0.145	0.327	0.263	0.247	0.310	0.371	0.239	0.122	0.091	0.100	0.223	0.262	0.259	0.241
Papua New Guinea		0.261	0.269	0.101			0.409	0.646	0.526	0.511	0.616	0.620	0.536	0.498	0.438
Paraguay	0.254	0.190	0.099	0.051	0.100	0.028	-0.099	0.062	0.138	0.141	0.133	0.090	0.177	0.209	0.132
Peru	0.226	0.152	0.092	0.082	0.188	0.246	0.070	0.196	0.322	0.212	0.066	0.108	0.142	0.399	0.183
Philippines	0.130	0.100	0.112	0.015		0.225	0.298	0.217	0.241	0.251	0.234	0.201	0.286	0.334	0.242
Poland	0.175	0.116	0.082	0.157	0.113	0.091	0.093	0.065	0.093	0.189	0.177	0.161	0.222	0.227	0.148
Portugal	0.123	0.139	0.120	0.113	0.138	0.209	0.232	0.301	0.120	0.075	0.070	0.057	0.113	0.082	0.118
Qatar				0.252	0.327	0.478	0.529	0.521	0.307	0.443	0.406	0.379	0.383		0.414
Romania	0.241	0.011	0.208	0.192	0.248	0.198	0.210	0.172	0.247	0.232	0.220	0.234	0.240	0.287	0.223
Russian Federation	0.222	0.049	0.413	0.385	0.458	0.349	0.314	0.348	0.260	0.232	0.176	0.151	0.167	0.158	0.282
Rwanda					0.042	0.090	0.271	0.167	-0.059	0.330	0.359	0.280	0.211	0.352	0.255
San Marino	0.195	0.273	0.408	0.405	0.336	0.344	0.443	0.513	0.511	0.120	0.061	0.057			0.311
Saudi Arabia	0.273	0.271	0.145	0.257	0.321		0.497	0.508	0.497	0.495	0.349	0.236	0.371	0.297	0.339
Senegal	0.204	0.265	0.221	0.189	0.205	0.206	0.231	0.238	0.323	0.332	0.296	0.312	0.294	0.291	0.267
Serbia						0.381	0.402	0.351	0.345	0.211	0.233	0.210	0.185	0.144	0.246
Seychelles		0.208						0.515	0.565	0.573	0.601	0.600	0.234	0.282	0.441
Sierra Leone	0.202	0.409		0.651	0.542	0.488	0.482	0.525	0.479	0.395	0.189	0.199	0.257	0.338	0.414
Singapore	0.257	0.240	0.369	0.362	0.302	0.235		0.422	0.370	0.319	0.341	0.385	0.496	0.446	0.360
Slovak Republic	0.097	0.034	0.028	0.144	0.160	0.174	0.209	0.248	0.257	0.276	0.269	0.219	0.246	0.381	0.208
Slovenia	0.224	0.223	0.234	0.228	0.160	0.198	0.058	0.246	0.262	0.246	0.149	0.121	0.175	0.198	0.200
South Africa	0.104	0.173	0.165	0.163	0.164	0.310	0.222	0.188	0.167	0.244	0.233	0.210	0.228	0.239	0.207
Spain	0.140	0.172	0.239	0.189	0.186	0.163	0.248	0.204	0.215	0.250	0.233	0.215	0.204	0.189	0.210
Sri Lanka	0.160	0.188	0.126	0.115	0.105	0.158	0.235	0.221	0.221	0.207	0.159	0.137	0.182	0.243	0.182
Sudan	0.403	0.180	0.192	0.168	0.007	0.009	0.132		0.004	0.045	0.060	0.105	0.061	0.204	0.115

Sweden	0.196	0.177	0.167	0.192	0.191	0.177	0.217	0.282	0.244	0.234	0.188	0.170	0.234	0.255	0.219
Switzerland	0.179	0.143	0.137	0.166	0.136	0.170	0.153	0.187	0.129	0.133	0.040	0.024	0.132	0.092	0.126
Syrian Arab Republic										0.077	0.317	0.115	0.090	0.089	0.135
Taiwan				0.171	0.177	0.238	0.358	0.294	0.310	0.288	0.201	0.189	0.269	0.278	0.264
Tanzania							0.478	0.208	0.392	0.414	0.402	0.399	0.365	0.352	0.384
Thailand	0.156	-0.009	0.039	0.085	0.125	0.204	0.260	0.345	0.339	0.259	0.263	0.303	0.308	0.393	0.243
Togo	0.142	0.203	0.227	0.454	0.236	0.141	0.282	0.325	0.269	0.317	0.269	0.292	0.255	0.353	0.256
Trinidad and Tobago	0.206	0.204	0.241	0.244	0.257	0.312	0.369	0.356	0.319	0.330	0.347	0.354	0.323	0.450	0.316
Tunisia	0.568	0.562	0.464	0.308	0.301	0.276	0.200	0.174	0.188	0.245	0.294	0.333	0.340	0.355	0.289
Turkey	0.031	0.045	0.151	0.056	-0.010	0.122	0.199	0.143	0.295	0.236	0.237	0.218	0.344	0.329	0.203
Uganda											0.409	0.350	0.364	0.336	0.363
Ukraine	0.167	0.221	0.247	0.199	0.233	0.172	0.229	0.231	0.226	0.244	0.192	0.293	0.252	0.218	0.230
United Arab Emirates	0.317	0.307	0.323	0.304	0.349	0.470	0.514	0.522	0.523	0.368	0.355	0.381	0.461	0.476	0.413
United Kingdom	0.192	0.194	0.175	0.253	0.120	0.172	0.270	0.268	0.245	0.246	0.245	0.116	0.261	0.317	0.227
United States	0.235	0.229	0.254	0.228	0.267	0.329	0.350	0.329	0.311	0.277	0.237	0.249	0.351	0.359	0.292
Uruguay	0.086	0.070	0.082	0.105	0.042	0.253	0.024	0.230	0.041	0.003	0.142	0.029	0.062	0.235	0.099
Uzbekistan	0.197	0.148	0.304	0.379	0.372	0.330	0.226	0.161	0.209	0.233	0.253	0.240	0.222	0.242	0.255
Venezuela, RB	0.251	0.236	0.228	0.192	0.237	0.311	0.334	0.342	0.283	0.272	0.252	0.167	0.095	0.302	0.258
Vietnam	0.387	0.350	0.307	0.354	0.262	0.302	0.283	0.358	0.345	0.292	0.287	0.218	0.198	0.191	0.260
Yemen, Rep.									0.068	0.237	0.241	0.211	0.282	0.252	0.239
Zambia	0.060	0.047	0.061	0.205	0.240	0.231	0.110	0.243	0.305	0.349	0.348	0.308	0.346	0.297	0.264
Zimbabwe													0.014	0.025	0.018
Mean	0.178	0.166	0.210	0.196	0.211	0.247	0.267	0.263	0.248	0.238	0.211	0.204	0.255	0.269	0.229

Figure 1.1

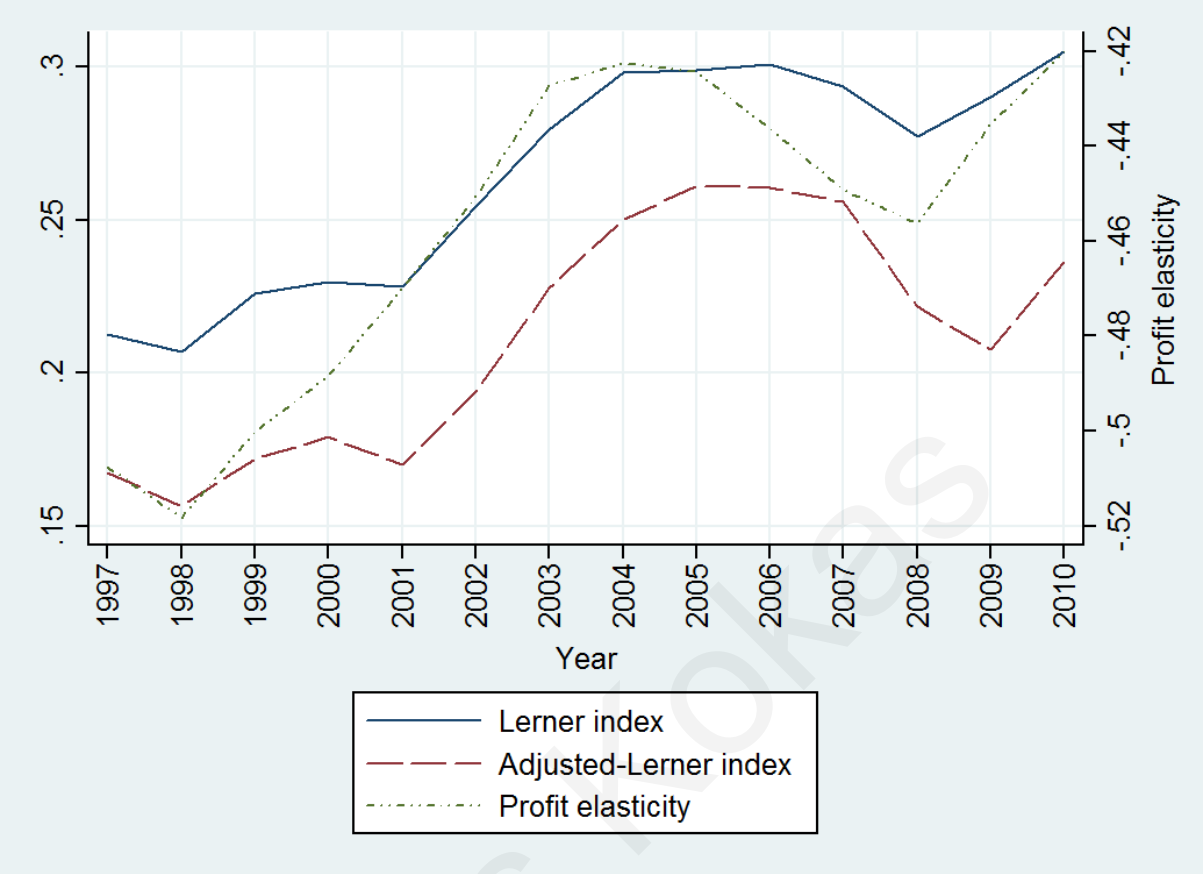
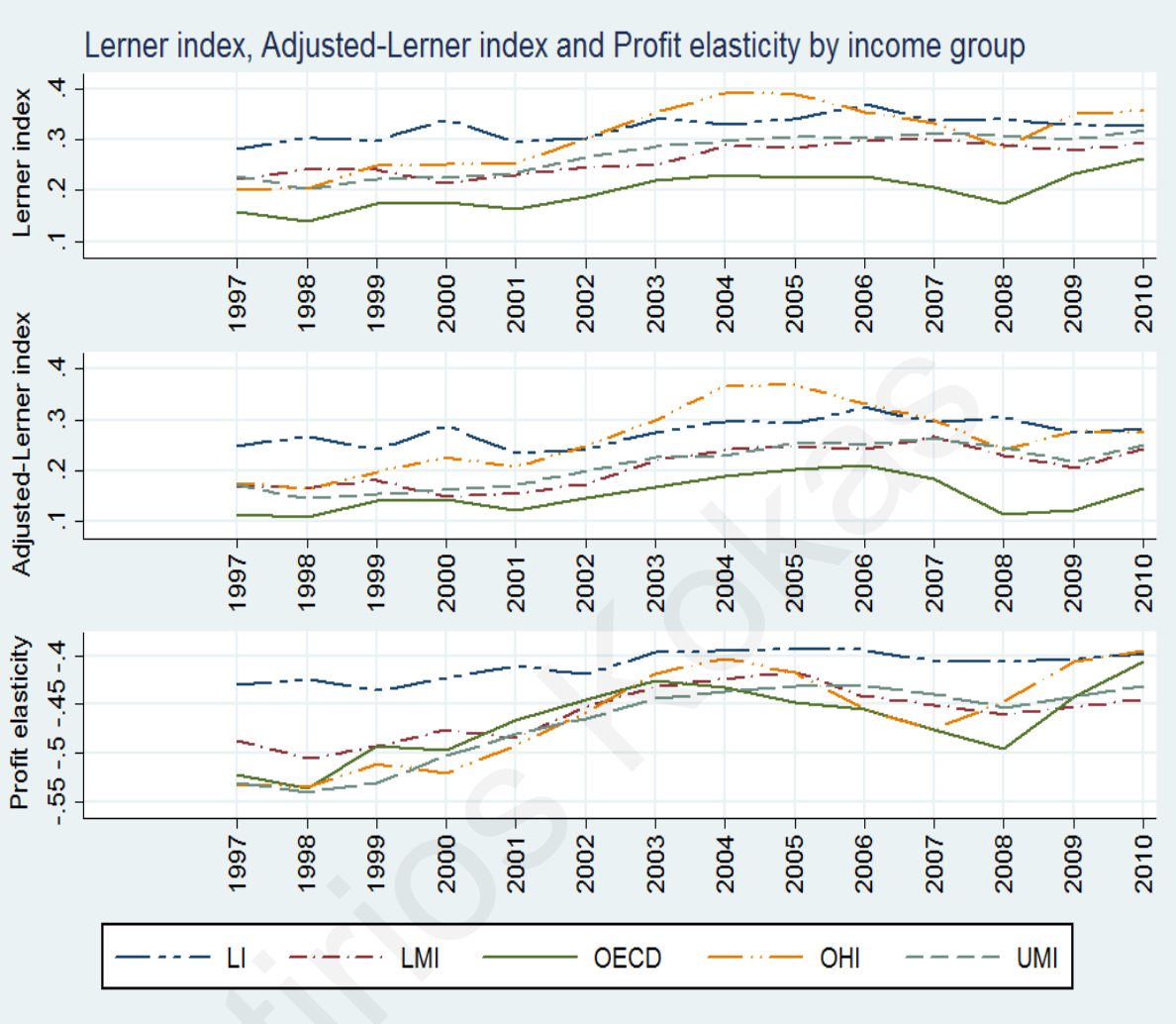
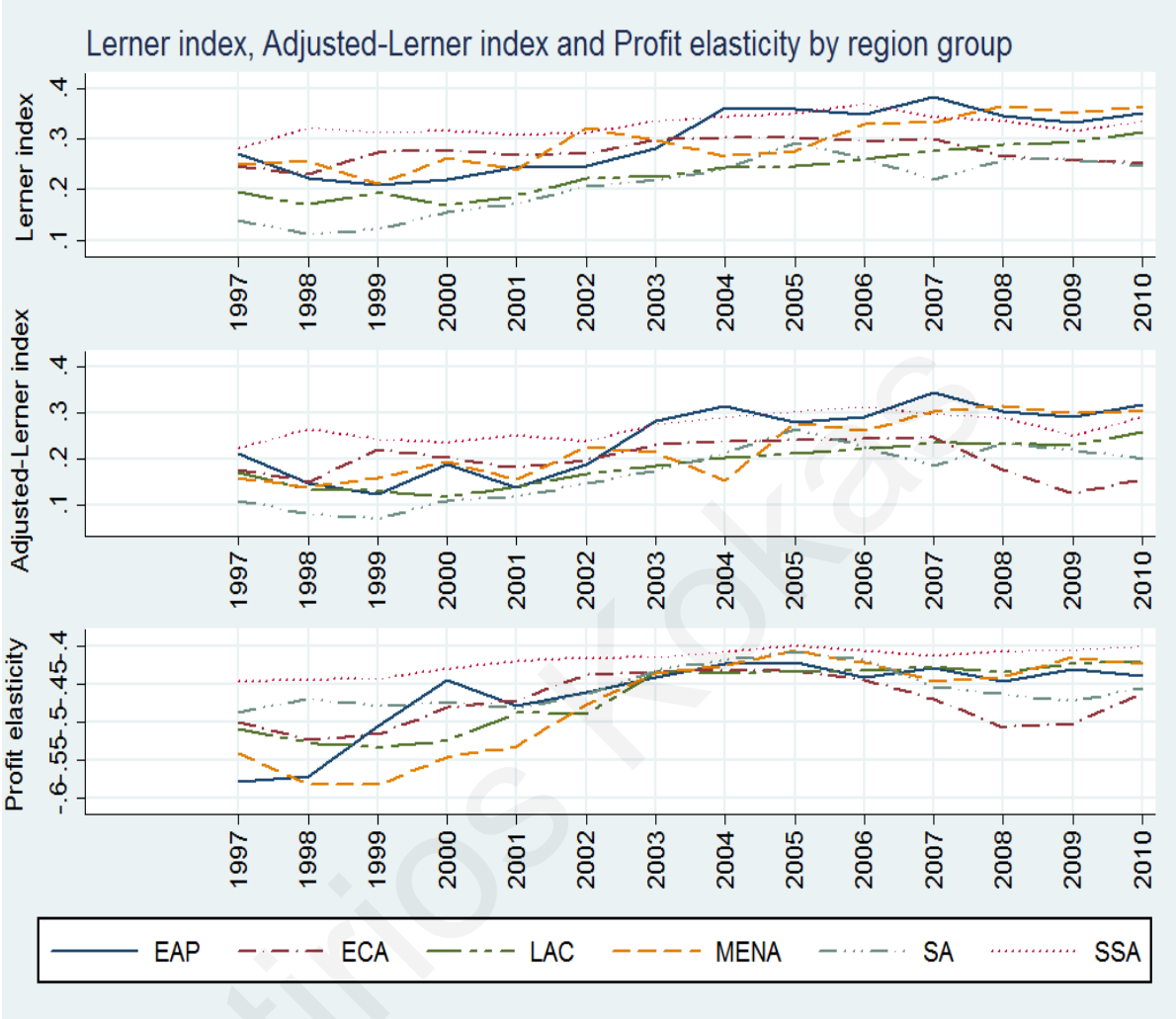


Figure 1.2



Note: LI refers to the low-income economies, LMI refers to the lower-middle-income economies, OECD refers to the OECD member countries, OHI refers to high-income economies other than OECD countries, and UMI refers to upper-middle-income economies.

Figure 1.3



Note: EAP refers to East Asian and Pacific countries, ECA to the European and Central Asian countries, LAC refers to Latin American and Caribbean countries, MENA refers to Middle Eastern and North African countries, SA refers to Southern Asian countries and SSA refers to Sub-Saharan African countries

Chapter 2: Foreign ownership and market power in banking: Evidence from a world sample

2.1. Introduction

Globalization is changing the nationality of ownership of firms around the world in many sectors, and the banking sector is no exception. Claessens and Van Horen (2014) for example report that the percentage of foreign banks present in a country increased from on average 21% in 1995 to 35% in 2009, and that in certain developing countries this increase was even substantially higher. A first-order question that once arises is how these changes in ownership affect market power in the banking sector. To address this question we therefore construct a new data set that includes comprehensive bank-year estimates of market power of individual banks in most countries around the world and we study the effects of foreign bank ownership on our newly-constructed estimates of individual bank market power.

Our paper addresses two crucial questions at once. First, we investigate if the ownership status, i.e., foreign or domestic, of individual banks affects their *own* market power. We call this the *direct impact* of (foreign) bank ownership. Theoretically, foreign banks could specialize in new and more specific products that are associated with higher prices and intermediation margins, or foreign banks could be the bearers of more cost-effective production technologies, increasing the price-cost margins (a traditional measure of market power). These (and other similar) forces would yield higher price-cost margins for foreign-owned banks. However, foreign banks entering a new banking market might also face an informational disadvantage that would force them to price their products more competitively compared to the existing local banks, or be less cost effective for an initial period following their entry. So these forces would yield lower price-cost margins for foreign-owned banks. Therefore, the overall direct impact of foreign bank ownership on their market power is *a priori* ambiguous.

Second, we analyze the extent to which changes in foreign bank presence at the country (and year) level has an impact on the market power of all banks in the industry (both foreign and domestic). That is we consider whether a banking system with a higher foreign bank presence in general induces changes in individual bank market power. We call this the *spillover effect*. More intense foreign bank presence can trigger increased competition through the entry of new banks (greenfield entry), which leads to more competitive pricing

of the banking products even for local banks (e.g., through a price war). However, the overall spillover effect of increased foreign bank presence on price-cost margins could also be positive if foreign bank presence increases rapidly and higher cost efficiency does not materialize into more competitive pricing, especially given that foreign banks could carry monopoly pricing in their new products.

To empirically identify the direct impact and the spillover effect we adopt a two-step procedure. First, we estimate the individual market power of virtually all banks in the world for which financial statements are available and comparable. For our analysis, we rely on both the Lerner index, which measures deviations of prices from marginal cost, and on the adjusted-Lerner index, which is similarly calculated but relaxes the assumption that banks function in a fully efficient manner. For the calculation of both indices we first estimate the marginal cost with a semiparametric technique that allows for greater flexibility in the production technology of banks compared to the extant parametric techniques. Thus, changes in the structure of the production technology across banks, countries and time are better accounted for. In this way we improve on the estimation of marginal cost and provide a new index of market power for the maximum amount of time and number of banking systems possible. We also examine the sensitivity of our results to the use of other commonly-used measures of market power (e.g., Lerner indices from other sources, the Boone indicator, etc.).

In the second step, we examine the potency of the aforementioned direct impact and spillover effect. Using the database constructed by Claessens and van Horen (2014) we classify all banks in our sample at each point in time as either domestic or foreign-owned. Yet, despite the relevant and dynamic character of our ownership classification we fail to find in any of the empirical exercises we do a statistically significant (and/or economically relevant) direct effect of foreign ownership. It seems indeed there is no difference in market power between domestic and foreign-owned banks.

Next, we aggregate foreign bank presence in each country and for each year. In this case, and even when controlling for the (seemingly irrelevant) direct impact, we find that higher foreign bank presence (at the country-year level) increases the market power of the average bank in the industry (whether it is domestic or foreign-owned) in a statistically significant and robust manner. This effect is also economically relevant. For example, an increase in foreign bank presence from 17% in 1997 to 25% in 2009 (which is the increase observed for the average country in our baseline specification) results in an increase in the Lerner index of 0.07 points (for the average Lerner index in our sample of 0.22 this is equivalent

to a 32% increase). These findings are further robust to the specifications used to estimate the Lerner index, and to the measurement of market power using the country-level Lerner and Boone indicators from the World Bank's database for example.

We also analyze some theoretically plausible heterogeneous effects in the identified positive relation between foreign bank presence and market power. We show that the positive effect of foreign bank presence on banks' market power is primarily due to their entry through a merger or acquisition rather than through a greenfield investment. Indeed, in our sample, two out of three foreign banks are established in the host country through a merger or acquisition and this is seemingly the main channel leading to the positive spillover effect of foreign bank presence on banks` market power.

More so, we find that the positive spillover effect of foreign bank ownership on the Lerner index is not due to a separate effect on either bank output prices or marginal cost, but rather on the margin (gap) between the two. Thus, higher foreign bank presence in a country increases the market power of banks by directly affecting the gap between output prices and marginal cost and not solely because foreign banks spur monopolistic pricing banking products or enhance the cost efficiency across banks. Importantly, this result is mainly driven by the mode of foreign bank entry.

Our study is the first to investigate if and if so by how much foreign bank ownership affects individual bank market power, across certain bank and industry characteristics that may affect the potency of this effect. Our finding on the positive spillover effect is in contrast with the only two existing empirical studies on this issue. Claessens and Laeven (2004) study a cross-sectional sample of 50 countries (with market power estimates average over the period 1994-2001) and Jeon, Olivero, and Wu (2011) study a country-year panel for the period 1997-2008 of only Asian and Latin American countries. Both analyze the impact of foreign bank presence on bank competition at the country (and year) level. Both studies find a negative (positive) relation between foreign ownership and market power (competition).

There are a number of differentiating characteristics of our study *vis-à-vis* theirs that explain our unique findings. Most importantly based on our own estimates of individual bank market power and the foreign ownership data collected by Claessens and van Horen (2014) we can analyze the impact of a bank-level market power variable for a sample covering 131 countries over the period 1997 to 2009 (which compared to all existing studies guarantees us the broadest coverage). In contrast, existing studies focus on the

relation between foreign bank entry and market power (competition) at the country or country-year level for a more limited number of countries. We take a number of steps (including the replication of the results of both previous studies) to show that level of the analysis and the sample coverage are the main reasons behind our finding of a positive correspondence between foreign bank presence at the country level and market power at the bank level.

The remainder of the chapter is structured as follows. Section 2.2 provides the theoretical arguments linking foreign bank ownership with bank market power and the explicit paths that can influence this relation. Section 2.3 discusses the data set on the banks' market power along with the way this is estimated, and also provides definitions and information on the foreign bank ownership and the control variables. Section 2.4 discusses the empirical identification procedure and the estimation results. Section 2.5 summarizes the results and provides policy implications.

2.2. Theoretical considerations and related literature

There are two main channels through which foreign bank ownership may affect bank market power. First foreign banks may have different levels of market power compared to domestic banks. We call this the direct impact of foreign ownership on market power. The second effect is related to the fact that foreign bank presence in the banking industry as a whole can cause changes to banks' market power, both domestic and foreign. We call this the spillover effect of foreign bank presence on bank market power. We analyze the two effects by emphasizing their sources, as these are related to the pricing of banking products or to the marginal cost. Both prices and costs may change due to the direct impact and the spillover effect, hence the price-cost margin (Lerner index), which is a common measure of market power, may be change accordingly.

It is not *a priori* obvious whether the direct impact will be positive or negative. On the one hand, foreign banks have access to alternative sources of funds through their affiliates in their country of origin and could bring in more specialized and sophisticated banking products that are monopolistically priced. Furthermore, these banks are usually more cost-efficient (Bonin, Hasan, and Wachtel, 2005; Degryse, Havrylchyk, Jurzyk, and Kozak, 2012), as they have access to better technology, especially if their country of origin has a more developed banking sector compared to the one they penetrate (Micco, Panizza, and Yan, 2007; Claessens, Demirgüç-Kunt, and Huizinga, 2001). On the other hand, foreign

banks entering a new market may face an informational handicap (Gormley, 2010), at least in the initial period following their entry, that could force them to price their products more competitively so that they offer better loan terms to attract customers from existing banks (Sengupta, 2007). Such behavior would result in a lower price-cost margin.

The direction of the spillover effect is again *a priori* ambiguous. Foreign bank entry can stimulate competition in domestic markets in general and put downward pressure on prices (Levine, 1996; Beck, Ioannidou, and Schafer, 2012). This effect is likely to be particularly strong in the case of greenfield entry, which adds competitors, and less so in the case of acquisitions, where a foreign bank takes over an existing domestic bank. However, there are also forces leading to a positive relation between foreign bank presence and bank market power. First, if the efficiency advantage of foreign banks forces domestic banks to become more efficient themselves, this could lead to higher margins for all banks if the cost savings are not passed on through lower prices. The same effect could arise if foreign banks are able to exploit their superior know-how and come to dominate domestic markets in new innovative financial products. If this is accompanied by a large scale and rapid penetration of foreign banking, this mechanism will naturally result to a monopolistic behavior of many banks in the industry and the loss of competitive pricing of the monopolistic products, at least for some period of time.

Clearly, the nexus between foreign bank ownership and market power could be affected by a number of bank- and market-specific characteristics. At the bank level, a comparative advantage of the foreign banks usually comes from their access to capital from their parent companies in the origin country. Given that capital requirements are now in place in virtually all countries, this advantage of foreign banks can translate into lower cost of capital and improved efficiency. However, if the capital market in the domestic banking system is deep and domestic banks are well-capitalized, this will weaken the implied positive relation between foreign ownership and market power. The opposite effect could prevail if there is a big difference between foreign and domestic banks in the way they finance their own lending. Usually, domestic banks have established long-term relationships with their depositors and they tend to have higher deposits to assets ratios. In contrast, foreign banks have access to potentially less expensive liquid funds from their parent companies or the international interbank market.

As discussed above, a natural differentiating factor in the impact of foreign ownership on competition is the mode of foreign bank entry. Greenfield entry increases the number of banks in the domestic banking industry, which by itself promotes competition, while

penetration through an acquisition leaves the number of banks unchanged (Martinez Peria and Mody, 2004). Claeys and Hainz (2014) and Van Tassel and Vishwasrao (2007) further highlight that a foreign bank enters through a greenfield investment only if its advantage in screening new applicant firms, due to e.g. better screening technology, compensates its disadvantage of having no information about incumbent firms. If a foreign bank enters *via* an acquisition, it acquires a credit portfolio that contains information about the quality of incumbent firms. In addition, the acquired bank can generate information by screening applicants and this generates an informational advantage for foreign banks entering *via* acquisitions. The mode of entry, thus, determines the distribution of information between foreign and domestic banks, which affects the degree of competition in the banking industry.

The empirical evidence on the influence of the mode of entry on various aspects of banking is substantial. For example, in Mexico during the so-called tequila crisis, foreign banks entered almost entirely through the acquisition of existing domestic banks, thus preserving the oligopolistic structure of the industry (Moguillansky, Stuart, and Vergara, 2004). Also, Havrylchyk (2006) shows that Polish banks acquired by foreign banks do not show improvements in efficiency, whereas greenfield entrants tend to be more efficient than their domestic counterparts.[13] Finally, Lehner (2009) suggests that greenfield entry occurs mainly in developed countries, whereas entry by acquisition in less developed countries.

The relation between market power and foreign ownership can also be affected by a number of characteristics of the banking industry. Claessens, Demirgüç-Kunt, and Huizinga (2001) show that foreign banks have lower interest margins, overhead expenses, and profitability than domestic banks in developed countries, whereas the opposite is true in developing countries. Similarly, Lensink and Hermes (2004) find that foreign bank entry into less developed countries leads to higher costs and margins for the local banks, and Micco, Panizza, and Yan (2007) that foreign-owned banks in developing countries are more cost-efficient than private local banks. This studies suggest that the reasons for foreign entry, as well as the competitive and regulatory conditions found abroad, might differ significantly between developed and developing countries.

[13] Similarly, Peek, Rosengren, and Kasirye (1999) find that foreign banks entering the US market tend to acquire poor-performing institutions and that the performance of these institutions does not substantially improve post-acquisition.

Besides the two papers that are directly relevant to our work (Claessens and Laeven, 2004; Jeon, Olivero, and Wu, 2011), our study is also related to two large, but rather separate, literatures one on foreign bank participation and one on banking competition and market power. Claessens (2006) reviews and refines the full set of arguments linking the two literatures and identifies the limitations of the existing empirical evidence. Among other studies, Clarke, Cull, Martinez Peria, and Sanchez (2003), Bruno and Hauswald (2013), and Beck, Ioannidou, and Schafer (2012) find that foreign bank entry improves credit conditions for enterprises of all sizes, and Berger, Hasan, and Klapper (2004) suggest that a larger foreign bank presence leads to a greater availability of credit to SMEs (see also Giannetti and Ongena, 2009, 2012).

Detragiache, Tressel, and Gupta (2008), Gormley (2010), Beck and Martinez Peria (2010), and Balmaceda, Fischer, and Ramirez (2014) offer a less positive view of foreign bank participation by highlighting that foreign banks tend to select borrowers with greater creditworthiness ("cherry pick"), while domestic banks are left with lower quality borrowers. This, in turn can hurt the profitability of the domestic banks and their willingness to lend. Empirical research on the relative performance of domestic and foreign banks has produced contradictory results, with some studies finding that foreign banks do better and other studies reporting stronger performance of domestic banks; see Degryse and Ongena (2008) and Chen and Liao (2011) for reviews of this evidence.

2.3. Variables and data

The empirical model used to study the relation between foreign bank ownership and bank market power is of the following form:

$$L_{itc} = \delta_0 + \delta_1 L_{i,t-1,c} + \varphi\, FO_{i,t-1,c} + \theta\, FP_{t-1,c} + \delta_2 B_{itc} + \delta_3 X_{t-1,c} + \varepsilon_{itc}\,. \qquad (2.1)$$

In equation (2.1) the market power L of bank i at year t and country c is regressed on its annual lag, a dummy variable *foreign-owned* (*FO*) that is observed at the bank-country-year level and takes the value one when a bank is foreign-owned and zero otherwise, an indicator *foreign presence* (*FP*) that is observed at the country-year level and measures the extent of foreign bank presence,[14] a vector of bank characteristics B observed at the bank-

[14] The correlation coefficient between the two variables is not very high in our sample (it is equal to 0.50). Also, the variance inflation factor and other tests for collinearity imply that this is not an issue and an analysis including both variables is meaningful.

year level, and a vector of variables X observed at the country-year level. ε_{itc} is the stochastic disturbance.

Foreign-owned and *foreign presence* enter equation (2.1) with a one-year lag in our baseline specifications, and the same holds for all the variables observed at the country-year level. This timing is derived from the fact that country-level changes, like structural, regulatory, and macroeconomic developments, take time to reach the market and have a bearing on the market power of individual banks. In addition, modelling our two foreign ownership variables in this way mitigates the endogeneity problem stemming from reverse causality. In contrast, all the bank-level control variables B enter equation (2.1) contemporaneously. These variables have a direct and contemporaneous bearing on the cost structure and the pricing decisions of banks, as they describe individual bank strategies that can change in the short-term.

We choose the specification of equation (2.1) due to the identification strategy that we employ. More precisely, two important identification problems are the dynamic nature of bank market power and the potential endogeneity of the foreign ownership variables. Concerning the former, Berger, Bonime, Covitz, and Hancock (2000) and Goddard, Molyneux, and Wilson (2004) suggest that even developed banking markets might be characterized by information opacity, networking, and relationship-lending, all of which impede competition. These elements cause persistence in the cost structure, profitability, and market power of banks.

To account for these dynamics we include the first and/ or the second lag of the dependent variable among the regressors and use the GMM estimators for dynamic panels of Arellano and Bond (1991) and Blundell and Bond (1998). In our analysis we use the two-step "difference" GMM estimator with robust standard errors corrected using the method of Windmeijer (2005).[15] The consistency of the GMM estimator depends both on the assumption of the validity of the instruments and on the assumption that the error term does not exhibit serial correlation. To this end, we use two tests proposed by Arellano and Bond (1991) to evaluate these assumptions. The first is the Hansen test of over-identifying restrictions, which tests the overall strength of the instruments. The second test examines the assumption of no serial correlation in the error terms.

[15] We prefer the "difference" over the "system" GMM estimator because the results on the specification tests are better under the former method. Specifically, we find that the lagged differences used as instruments under the system GMM procedure are rather poor instrumental variables. For a similar application of GMM in the banking industry, see Bruno and Hauswald (2013).

Note that the error term obtained from the estimation of equation (2.1) is likely to be serially correlated due to the fact that the dependent variable is observed at the bank-country-year level and some of the explanatory variables are observed at the country-year level. This problem is comprehensively analyzed by Moulton (1990). Thus, estimation is carried out using standard errors clustered by country. We also experiment with country-specific year effects, but this increases the number of instruments in the GMM procedure asymptotically and causes the Hansen test to be equal to unity.

In estimating equation (2.1), endogeneity of the two foreign ownership variables can arise both from reverse causality and omitted variable bias. Reverse causality could emerge from the preference of foreign-owned banks to enter with monopolistic products with high markups, so as to generate higher profits. To alleviate these concerns of reverse causality, all the right-hand side variables except the bank characteristics are lagged once. This is intuitive both statistically and theoretically. From a statistical viewpoint, the literature (e.g., Beck, Jonghe, and Schepens, 2013) suggests that explanatory variables in lags can potentially diminish endogeneity issues that emerge due to reverse causality. On the theoretical side, the banks are aware of their main balance-sheet characteristics when deciding on their cost structure and pricing policy (i.e., the components of the Lerner index).

In turn, we reduce the omitted variable problem by using an IV-style instrumental variable. Specifically, we use the entry restrictions for foreign banks (*ERFB*) lagged once as an IV-style instrument. We construct this index with information from the studies of Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou (2012), Barth, Caprio, and Levine (2008) and previous versions of the latter study (details are provided in Table 2.1). This index ranges between zero and four inclusive, with higher values reflecting higher entry restrictions for foreign banks. We identify the two endogenous variables by using both $ERFB_{t-1}$ and $ERFB_{t-2}$ as IV-style instruments.

Naturally, the entry restrictions for foreign banks affect foreign bank ownership and presence in each country: we hypothesize that foreign bank presence must be lower in countries with significant protection of the domestic banking sector. Further, it seems unlikely that these restrictions affect banks' market power directly. The only way that *ERFB* could be correlated with the Lerner indices is through common regulatory, institutional, and macroeconomic developments that tend to move together. However, as discussed in Section 2.3.3, in our empirical analysis we control for a number of such variables, and most importantly for the general entry restrictions common to all banks,

foreign-owned or not. Thus, we distinguish between entry restrictions for foreign banks and general entry restrictions. We also control for year fixed effects, and other regulatory, macroeconomic, institutional, and political variables.[16]

Some of the control variables can also be considered as endogenous in equation (1) due to an omitted variable bias. Not recognizing these variables as such can bias the coefficient on the foreign ownership variable. GMM allows treating these variables as endogenous using lags of the instrumented variables as instruments (Bond, 2002; Beck, Demirgüç-Kunt, and Levine, 2006; Roodman, 2009). We adopt this strategy despite its imperfections because finding solely economically motivated instruments for all potential endogenous control variables would be challenging. We choose the lag-length of these instruments on the basis of the Hansen test of overidentifying restrictions.

In light of the above, the full set of the instrumental variables in the baseline specification includes the contemporaneous and the first lag of the entry restrictions for foreign banks as IV-style instruments, and, as GMM-style instruments, the third lag of the dependent variable, the first lags of the bank-specific control variables and the second to fourth lags of *entry restrictions*. In the specifications with additional controls we also add the second lags of these control variables as GMM-style instruments. Use of these instruments yields Hansen tests that do not reject the null of overidentifying restrictions. We also examine the sensitivity of our results with even fewer instruments to avoid the too-many instruments problem highlighted by Roodman (2009). Our results are essentially unchanged. We also confirm, using the second-order autocorrelation test (reported as AR2), that our estimated equations do not suffer from serial correlation.

Our final data set includes bank-level data from 131 countries and spans the period 1997-2009 (due to the availability of data for foreign bank ownership). The rest of this section discusses our measures of bank market power, the foreign ownership variables and the control variables used in our study. The correlation coefficients between the explanatory variables that were used as determinants of bank market power do not give rise to any multicollinearity concerns (further left unreported). In Table 2.1 we provide detailed definitions for the variables used to estimate equation (2.1) and in Table 2.2 we report summary statistics for these variables.

[16] We run additional tests for the validity of the *ERFB* variable as an instrument as follows. First, we regress, using the fixed effects model, the two foreign ownership variables on the *ERFB* variable plus controls and we find that *ERFB* is negative and strongly statistically significant. Also, we regress, again with the fixed effects model, the market power variables on the *ERFB* plus the same controls and we find that *ERFB* is statistically insignificant.

[Insert Tables 2.1 and 2.2 about here]

2.3.1. Measures of market power

The measurement of market power has received much attention in the economics literature since the importance of imperfectly competitive markets was first recognized in the 1930s. The Lerner index (1934) remains to this day a popular measure of market power (and of competition) thanks to its simplicity and transparency. It is defined as:

$$L_{itc} = \frac{P_{itc} - MC_{itc}}{P_{itc}}, \tag{2.2}$$

where P and MC are the price of bank output and the marginal cost of the production of this output. The Lerner index ranges between zero and one, with zero corresponding to perfect competition and larger values reflecting more market power (and less competition). The index can also be negative if $P < MC$, which is of course not sustainable in the long run.

The Lerner index measures departures from the competitive benchmark of marginal cost pricing. This makes it a simple and intuitively appealing index of market power. The index has also often been used as a measure of competition. Although the link between market power and competition might seem obvious, it has been shown that the Lerner index does not always point in the expected direction when competitive conditions change (Stiglitz, 1989; Boone, 2008). For this reason we interpret the Lerner index as primarily a measure of market power, with a further connection to competition a natural but not entirely uncontroversial possibility.

Alternative measures of market power and competition include the H-statistic (Panzar and Rosse 1987) and the profit elasticity (Griffith, Boone, and Harrison, 2005). The H-statistic has been widely used in banking studies, but has a shortcoming when it is used as a continuous measure of market power. As Bikker, Shaffer, and Spierdijk (2012) point out, the H-statistic maps the various degrees of market power only weakly and thus cannot be viewed as a continuous variable. The profit elasticity (or Boone indicator) is a relatively new concept that has been used in several recent studies but has also received some

criticism. For example, Schiersch and Schmidt-Ehmcke (2010) show that it makes critical assumptions relative to firm size and to market definition.

Given that the alternative indices of market power and competition are still open to some critique, we favor the Lerner index and its variants as our proxy for market power. However, we also employ as robustness checks the H-statistic and the Boone indicator. The main reason for our choice is that the Lerner index allows for variation at the bank level. This advantage increases the richness of our empirical analysis as it allows us to study both the direct impact and the spillover effect of foreign bank ownership and presence. Also, as Beck, De Jonghe, and Schepens (2013) readily argue, the Lerner index is a good proxy for current and future profits stemming from pricing power, while it is not constrained by the extent of the market. In contrast, other bank-level measures, such as the market share or Tobin's q, can lead to larger measurement error because they also capture to a greater extent the rents extracted from being too-big-to-fail.[17] Moreover, the Lerner index captures both the impact of pricing power on the asset side of the banks' balance sheet and the elements associated with the cost efficiency on their liability side.

Computation of the Lerner index requires knowledge of the marginal cost. When such information is unavailable (as in most empirical data sets), the marginal cost can be estimated using econometric methods. A popular approach has been to estimate a translog cost function and take its derivative to obtain the marginal cost. Some recent work has shown that it is possible to improve on this methodology with semiparametric or nonparametric methods that allow for more flexibility in the functional form (McAllister and McManus, 1993; Delis, Iosifidi, and Tsionas, 2014). We follow this new literature and estimate the cost function using a partial linear smooth coefficient (PLSC) model. All the details for the econometric estimation of marginal cost and the data cleaning process are in section 1.3 and here we just outline the advantages of this approach.[18]

Most importantly, the semiparametric nature of the method implies that no assumption regarding the functional form of the cost equation is made globally. An assumption is just made "in local neighborhoods of observations." This is important as it is usually quite difficult for the researcher to be certain about the validity of the chosen functional form. In their survey paper, Reiss and Wolak (2007) are very skeptical about using a specific

[17] Even though to a lesser extent, this can also be the case for the Lerner index, in light of governments' policies towards too-big-to-fail banks, especially during times of financial turmoil.

[18] We check the robustness of our results by using the translog model. We find some deviations in our results that are in line with the study of Delis, Iosifidi, and Tsionas (2014). However, our end results on the effect of foreign bank presence on bank market power are qualitatively similar.

functional form to estimate a cost equation without a prior analysis of the data, since an "incorrect" cost equation can bias the estimation and inference of marginal cost in an unknown direction and with an unknown magnitude. The flexibility of the semiparametric technique also allows using large international samples of banks from different countries, without being concerned that certain banking markets in different countries or banks within the same country face or adopt different production technologies. Hence, this approach takes into account the heterogeneity in the production technology across banks, countries, and time. Delis (2012), Delis, Iosifidi and Tsionas (2014), and Wheelock and Wilson (2012) show that estimation of marginal cost using semiparametric and nonparametric methods produces significantly better results (in terms of lower bias) than parametric techniques and commonly used functional forms like the translog.

The data used for the estimation of the Lerner index are from Bankscope and require an advanced cleaning process to avoid including duplicates in our sample. This literally involves examining each bank one by one and in many instances collecting information from the banks' websites, for example to examine the history of bank operation and ownership, the existence of subsidiaries with the same names with the parent bank, and the occurrence of M&As during our sample period. We provide all the details of this intensive data collection and processing in section 1.3.1.

We also use two variants of the traditional Lerner index. The first is the efficiency-adjusted Lerner index, which takes the form:

$$adj.-Lerner_{itc} = \frac{\Pi_{itc} + TC_{itc} - MC_{itc} \cdot Q_{itc}}{\Pi_{itc} + TC_{itc}} , \tag{2.3}$$

where Π is the banks' profit and Q is the banks' output, measured by the banks' total earning assets. This index allows for the possibility that firms do not choose the prices and input levels in a profit-maximizing way. For the estimation of this index we use the exact same procedure as Koetter, Kolari, and Spierdijk (2012).

The second variant of the Lerner index adopts a dual-output cost function. Specifically, many banks have a significant volume of off-balance sheet items that can be considered as a distinct output besides the total earning assets that are used as our main output. The off-balance sheet items are produced using essentially the same inputs with the single-output model of the bank and, thus, the single-output model may be missing some important information. For the estimated dual-output cost function and its derivative, see section 1.3.2.

2.3.2. Foreign bank ownership

Information for foreign bank ownership is from the database of Claessens and van Horen (2014). As we follow their approach in our own data processing to estimate bank market power, we have an almost identical sample of banks that we identify as foreign or domestic owned. Foreign-owned banks are identified as those with 50% or more of their shares owned by foreigners and we use this information to construct the *foreign-owned* dummy variable. This variable identifies the direct effect of foreign ownership on the market power of individual banks.

For the country-level *foreign presence*, Claessens and van Horen (2014) construct two indices. The first index is defined as the percentage of foreign banks among total banks in a country (*foreign presence*) and covers the period 1995 to 2009. The second is defined as the percentage of foreign bank assets among total bank assets (*foreign presence in terms of assets)*. Even though the second index can be argued to describe foreign bank presence somewhat better, it is only available for the 2004-2009 period because of missing information on bank assets for a large number of banks before 2004. The correlation coefficient between the two indices for the period 2004-2009 is as high as 81.1%. Thus, the large time span of the data set makes the use of the first index optimal for our study, whereas the index based on the market share of foreign banks is used in a sensitivity analysis.

By using *foreign presence* in the same equation with *foreign-owned* we are able to identify the separate impact of the two on banks' market power. Figure 2.1 presents a scatter plot of the Lerner index against *foreign presence* and the associated regression line. The regression line has a positive slope that is statistically significant at the 1% level. It remains to be examined whether this relation continues to hold when controlling for *foreign-owned* and whether it can be interpreted as causal.

[Insert Figure 2.1 about here]

2.3.3. Control variables

Consistent with previous studies, we include several control variables that are drawn from the literature on the determinants of bank competition to rule out other possible explanations for our results (e.g., Claessens and Laeven, 2004; Beck, Demirgüç-Kunt, and Levine, 2006; Delis, 2012). The bank-specific variables (indicated as B_{itc} in equation 2.1) include: the ratio of customer deposits to total assets (termed *deposits*) to control for the level of bank deposits supporting total assets; the ratio of equity capital to total assets (*capitalization*) to control for bank capitalization; the ratio of loans to total assets (*loans*) to control for bank specialization (also used as a crude measure of liquidity); and the natural logarithm of real total assets (*bank size*) to measure bank size. Delis (2012) shows that well-capitalized and larger banks are able to set higher margins or to have access to cheaper sources of funds due to scale economies and lower informational asymmetries. In contrast, a higher deposits ratio implies higher cost of intermediated funds and, thus, lower market power (especially in normal economic periods). In turn, *loans* is a measure of bank specialization, with a higher ratio relating to banks that focus on the traditional activity of credit provision.

We additionally assess the robustness of our results to the use of other measures of bank liquidity (liquid assets divided by total assets) and credit risk (non-performing loans divided by total loans or loan loss provisions divided by total loans), but we did not find significant changes in our results. It should be noted that the sample is smaller when including the last two variables, due to missing data, and that the definition of liquid assets in Bankscope sometimes differs across countries.

For the country-level characteristics we use a wide set of structural, regulatory, institutional, and macroeconomic variables. First, we use the entry restrictions index, which measures the degree to which all banks in a country face entry barriers. We construct this index using information from the studies of Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou (2012), Barth, Caprio, and Levine (2008), and previous versions of the latter study (details are provided in Table 2.1). This index takes a value from zero to 12, with larger values denoting more stringent entry restrictions.

We also use the relative share of privately owned banks *vs*. that of the publicly owned banks (constructed in terms of deposits). This allows avoiding to falsely attribute the impact of foreign bank ownership (which usually corresponds to private ownership), to the associated impact of private ownership on banks' market power. We note that poorer countries are associated with higher levels of public ownership of banks, which is consistent with the findings of La Porta, Lopez de Silanes, and Shleifer (2002). Further, we

use the Herfindahl-Hirschman index, which is defined as the ratio of the sum of squared market shares of each bank in the industry. Market concentration measures, such as the Herfindahl-Hirschman index, have been considered in the past as measures of competition (Cetorelli and Strahan, 2006). There is now consensus that these indices are not accurate proxies of competition but they are nonetheless useful control variables as they reflect important industry characteristics (Beck, Demirgüç-Kunt, and Levine, 2006; Claessens and Laeven, 2004).

Another important set of characteristics that can potentially influence the relation between market power and foreign bank ownership relates to the regulatory framework in which banks operate (Beck, Demirgüç-Kunt, and Levine, 2006; Claessens and Laeven, 2004). We use three indices obtained from Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou (2012), Barth, Caprio, and Levine (2008), and previous versions of the latter study. These indices represent activity restrictions, capital requirements, and supervisory power. Explicit definitions of these indices are provided in Table 2.1. For a literature review of the relation between bank competition and regulation, see for example Degryse and Ongena (2008).

Moreover, we control for the impact of the macroeconomic environment common to all banks that can potentially affect competitive conditions. We use the share of the manufacturing sector relative to GDP (*manufacturing*) and the net inflow of foreign direct investment (*FDI*). Cetorelli and Strahan (2006) suggest that the manufacturing sector is highly bank-dependent and the conditions in this industry can affect the market power of banks through both demand and supply forces. Clarke, Cull, Martinez Peria, and Sanchez (2003) provide evidence suggesting that foreign banks follow their clients abroad. Thus, the effect of foreign bank ownership on the banks' market power might be overestimated when the net inflow of *FDI* and *manufacturing* are excluded from the analysis.

In addition, we use information from the Heritage foundation on the size of the public sector, as measured by the ratio of government spending to GDP (*government spending*). Following the reasoning of La Porta, Lopez de Silanes, and Shleifer (2002), countries with a larger public sector are relatively inefficient, governments are interventionist, and protection of property rights is poor. Thus, we could observe a positive link between this measure of government size and banks' market power.

Along the same lines, we use the *financial freedom index* and the *trade freedom index* from the Heritage foundation. The financial freedom index measures independence from

government control and interference in the financial sector. Higher values for this index reflect greater financial liberalization.[19] The trade freedom index is a composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services, with higher values indicating more freedom to trade internationally.

We also control for the prevailing political ideology and freedom using the *ideology of chief executives* variable (left, center, or right) from Beck, Clarke, Groff, Keefer, and Walsh (2001) (updated until 2012) and the *polity* variable from the Polity IV project, respectively. These two variables are potentially important in explaining the competitive conditions in the banking sector, because banks operating in more democratic and more rightwing countries will have fewer restrictions that might not be captured by our regulatory variables. Finally, we control for the level of economic development by including the natural logarithm of *GDP per capita*, taken from the World Bank Indicators.[20]

2.4. Foreign bank ownership and market power: Identification and results

2.4.1. Baseline results

In Table 2.3 we report the baseline results from the estimation of equation (2.1). The Hansen test shows that the estimated equations are not overidentified and the AR2 test that there is no second-order autocorrelation. As expected, the values of the coefficient on the lagged dependent variable indicate that market power is quite persistent.

[Insert Table 2.3 about here]

The specifications in Table 2.3 include different measures of market power. In column I we use the most basic Lerner index and we find that the coefficient of *foreign-owned* is statistically insignificant. This result shows that the average foreign bank in our sample does not have a significantly higher Lerner index compared to the average domestically

[19] An alternative index has been constructed by Abiad, Detragiache, and Tressel (2010) but its coverage ends in 2005.

[20] We exhaustively control with more than two hundred other variables taken from various databases. But we do not find any significant changes in the main results we report here. We therefore think our estimates are conservatively robust.

owned bank. In contrast, *foreign presence* has a positive and statistically significant (at the 5% level) effect on the Lerner index. This effect is also economically significant. For example, an increase in foreign bank presence by 8%p (percentage points) from 17% in 1997 to 25% in 2009 (which is the increase observed for the average country in our baseline specification) resulted in an increase in the Lerner index of 0.07 points (for the average Lerner index in our sample of 0.22 this is equivalent to a 32% increase). Considering that the standard deviation of *foreign presence* is 17%p and the trend on this variable is indeed increasing, it seems that the share of foreign banks is a very important explanatory factor of the bank-level markups.

In column II we assess the inclusion of *foreign presence in terms of assets* to examine the spillover effect (instead of *foreign presence*). The coefficient on this variable is positive and statistically significant at the 1% level. The economic significance however is lower compared to *foreign presence*. This is expected because the assets-based variable incorporates the element that foreign banks can also be partially owned by domestic owners, whereas *foreign presence* characterizes foreign banks entirely as foreign-owned or not. Still a 10%p increase in foreign bank ownership in terms of assets will increase the Lerner index by 0.03. For the bank in our sample with an average Lerner index this implies an 13.6% increase in the Lerner index.

In columns III and IV we carry out the same analysis by using Lerner indices obtained when *capitalization* is included in the cost function and when, in addition to the inclusion of *capitalization*, the cost function also includes country fixed effects. Compared to column I, the results from both specifications remain practically unaffected. In columns V and VI we further experiment with the adjusted-Lerner and the dual-output Lerner indices and we still find that the only statistically significant ownership variable is *foreign presence*. These results also hold when we use the country-year average of the Lerner index (column VII) , the translog-based country-year average Lerner index from the World Bank (column VIII), and the country-year Boone indicator from the World Bank (column IX). In contrast, the results are inferior when we use the H-statistic, either at the bank-level as in column X or at the country-year level as in column XI.[21]

The implications of these results are then straightforward. The ownership status, foreign or domestic, of individual banks seems to play no role in explaining banks' market power.

[21] The inferior findings on the regressions including the H-statistic compared to the rest of the specifications on the Lerner and Boone indices reflect the idea that from the three measures of market power, the H-statistic is the only one that does not robustly map the various degrees of market power (e.g., Bikker, Shaffer, and Spierdijk, 2012).

Thus, we can rule out a significant direct effect of *foreign-owned* on bank market power, but we do find a positive and significant spillover effect of *foreign presence* on bank markups.

The effect of the control variables is in line with expectations and with previous studies. For example, Barth, Caprio, and Levine (2004) find that higher entry restrictions in banking markets are associated with a greater ability for the banks to charge a price above its marginal cost. In our sample we identify the same effect through the entry restrictions variable. We also find that well-capitalized banks are those possessing higher market power, which can be attributed to their ability to raise capital more easily and perhaps more inexpensively. In contrast, banks with higher *deposits* have lower market power in some of our baseline specifications. This is consistent with the fact that the higher cost of deposits relative to other sources of bank funds, implies lower market power, probably because the marginal cost is higher.

We also consider in our baseline specifications the effect of the economic development (as measured by the *GDP per capita*) and we find that it is associated with lower Lerner indices in our preferred models (columns I-III). Thus, it seems that banks in countries with lower economic development benefit from higher price-cost margins, a result in line with Delis (2012). In Appendix A1 we report the results from the addition of many other structural, institutional, and macroeconomic variables. Our main results on the effect of the foreign ownership variables remain unaffected.

The economic transition mechanism that influences our results is threefold. First, Herrero and Martinez Peria (2007) found that foreign banks penetrate those banking sectors with profit opportunities. Usually the old regime of these sectors consists of banks with low-quality technology that are relatively cost-inefficient or miss-price risk. In these situations, foreign banks are better able to price risk through their technological advantage, and this leads to higher intermediation margins *via* higher intermediation prices (Havrylchyk and Jurzyk, 2011). Claessens (2006), suggest that this effect is then carried over to the domestic banks, which will follow the new pricing schemes because they will, in time, gain access to the new technology (i.e., resulting in a technology spillover effect of know-how). Second, foreign banks tend to lend to more creditworthy clients. From the demand side, these borrowers might be willing to pay higher margins, if they perceive foreign banks as less risky. Third, foreign banks have the ability to offer new banking products compared to domestic banks. Thus, they become the monopolists in these products, at least for some time.

2.4.2. Differences with existing studies

The findings reported in Table 2.3 and Appendix A1 are in contrast with the two existing studies on this issue (Claessens and Laeven; 2004; Jeon, Olivero, and Wu, 2011) that document a negative effect of foreign bank presence on market power measured at the country level. In Appendix A2 we identify the main reason behind this different finding. In column I we report the results from a cross-sectional sample (year-averages for each country over the period 1997-2004 including the same countries with Claessens and Laeven (2004).[22] We use the same explanatory variables with this study and the same estimation method (OLS with robust standard errors). We are indeed able to (almost) exactly replicate their results on the foreign bank presence variable both in terms of sign and magnitude. Subsequently, we aggregate our Lerner index across the same set of countries and years and we find that the results also predict a negative relation between foreign bank presence and market power. Thus, the findings of Claessens and Laeven (2004) are not due to the measure of market power.

Subsequently, in column III we allow the Lerner index to vary at the bank level and we use again the countries included by Claessens and Laeven over the period 1997-2004. Thus, in this regression the Lerner index is identified at the bank-country-year level as in our baseline specification in Table 2.3. We use the GMM estimator, but the results are robust to the use of OLS with bank fixed effects. The results change completely and are in line with those of Table 2.3. Thus, we confirm that the difference in our findings compared to the study of Claessens and Laven (2004) is mainly due to the higher dimension of our data.[23]

Traditional theories of financial intermediation assert that information asymmetries are central to bank lending. Prospective borrowers typically know more about their ability to repay loans than lenders do. Accordingly, banks screen borrowers to select high-quality entrepreneurs and reduce risk of default among low-quality ones. A more recent literature on relationship lending takes the view that repeated interactions can reduce such

[22] Claessens and Laeven (2004) use data for the period 1994-2001. Given that we do not have data on market power prior to 1997, we replicate their findings using the period 1997-2004.

[23] We also tried to replicate the results by Jeon, Olivero, and Wu (2011). Their H-statistics are unavailable to us and, thus, we used our bank-level estimates on the H-statistic (the ones also used in column X of Table 3) to produce country-year aggregates for the countries and years used by Jeon, Olivero, and Wu. However, the foreign bank presence variable is not a statistically significant determinant of the constructed H-statistic. We also tried to re-estimate the country-year H-statistic parametrically using the methodology described in Jeon, Olivero, and Wu. We found that their non-linear estimator does not converge in our country-specific samples. Finally, we used the random coefficient estimation approach of Swamy (1970) to produce the country-year H-statistics, but again the resulting measure was not significantly explained by foreign bank presence. These results are available on request.

information asymmetries between bank and borrower. According to this view, banks gain knowledge about payoff-relevant borrower attributes during the course of a lending relationship. Consequently, relationships emerge as a prime source of an incumbent bank's comparative advantage over potential outside lenders. This undermines competition in credit markets; the incumbent's superior information about its own clients weakens a competitor's ability to offer credit at lower interest rates

2.4.3. Heterogeneity in the results

In this section we examine the driving forces of the positive effect on foreign presence on banks' market power, by following the changes in the effects over time, and by differentiating between the components of the Lerner index (price vs. marginal cost), the mode of foreign bank entry (greenfield vs. M&A), and the period in question (pre- vs. post-crisis). In most of the analysis, we focus on the effect of *foreign presence*, which is the only foreign-ownership variable that carries a significant coefficient in Table 2.3.

First, we follow the changes in the market power of foreign banks over time in a more systematic way. We begin by considering the potential heterogeneity in the coefficient on *foreign presence* based on the time (years) since the foreign bank presence reached a specific threshold. The rationale for including this variable is that the longer it takes foreign banks to dominate in a new market, the more acquainted they become with domestic practices and clientele, thereby facing lower informational and agency costs. To this end, we introduce interaction terms between the years in which *foreign presence* reached values equal to 40% and 50%, respectively, and we present the estimation results in columns I and II of Table 2.4. We find a positive and marginally statistically significant (at the 10% level) interaction term in both regressions. Therefore, our findings suggest that the longer a country has high levels of foreign bank presence, the higher the positive impact of foreign bank presence on banks' market power.

[Insert Table 2.4 about here]

In column III of Table 2.4 we additionally include the third lag of *foreign presence* to examine how the estimation results evolve over time. This is a test of whether the positive

effect of foreign presence will fade over time. The results show that this is not the case. The first lag used all along in our empirical analysis is the only one that retains a positive and statistically significant coefficient. We do not include the second lag of *foreign presence* because the results are clearly driven by collinearity (the pairwise correlation coefficient between the first and the second lags of foreign presence is equal to 0.99). We also experiment with the inclusion of the fourth and the fifth lags, but these estimates are again statistically insignificant. In column IV we report the results from the equivalent exercise with the *foreign-owned* variable. The coefficient estimates on all the lags of this variable are statistically insignificant.

We also take one additional step and carry out an event-type analysis to examine the timeliness of the effect of the foreign ownership variables. Specifically, in a similar fashion to Perstiani (1997), we regress the change in foreign bank ownership in the year following the event of foreign bank entry on a dummy variable that takes the value one in the year the foreign bank enters the market. We use a treatment effects model, where the dummy variable is endogenous and again the *entry restrictions for foreign banks* is our instrument. The results, reported in column V, are equivalent to those of the previous analysis, showing that foreign presence is the only significant foreign ownership variable. When we use a two-year time window after the event, both the foreign ownership variables become insignificant (column VI). The same holds for longer time windows for market power.

In Table 2.5 we look at the effect of foreign bank ownership on the separate components of the Lerner index. In column I we replicate column I of Table 2.3, this time using the price of bank output as our dependent variable, while in column II we use the marginal cost as our dependent variable. We find that the only significant effect (at the 10% level) is than of *foreign presence* on marginal cost. Equivalently, in column III the results show that the effect of *foreign presence* on the Lerner index is due to the increase in the gap between the price and marginal cost (i.e., the numerator of the Lerner index). Thus, the main mechanism driving the increase in the market power of banks relates to the cost-efficiency advantage of the foreign banks, which forces domestic banks to also become more efficient. However, this increase in efficiency is not accompanied by a significant reduction in the lending rates for the average bank.

[Insert Table 2.5 about here]

In Table 2.6 we look into the role of the mode of entry of foreign banks, greenfield or through M&As, on the positive nexus between foreign presence and market power. Column I reports the results from a specification that includes an interaction term between *foreign presence* and the variable named *country M&As*. This variable equals the number of foreign owned banks that enter in the host country through an M&A over those that enter through the establishment of a new institution (greenfield entry), scaled from zero to one for expositional brevity. In our sample, two out of three foreign banks enter our sample through an M&A. To provide inference at the mean of the main effects, we mean-center the variables used to construct interaction terms. Due to space considerations we only report the coefficients of main interest. The main effect of the *foreign presence* comes out positive and statistically significant as before. The interaction effect is also positive and statistically significant at the 5% level, indicating that entry through M&As is one of the main causal factors of the positive relation between *foreign presence* and *Lerner*. Thus, greenfield entry of foreign banks, along with an equally capitalized domestic banking sector, seems to be the *sine qua non* to avoid the buildup of market power.

[Insert Table 2.6 about here]

In column II of Table 2.6 we examine how the incumbent domestic banks react to foreign bank entry via greenfield or M&As.[24] We find that the results are almost identical with those of column I, with the exception that the main effect of *foreign presence* is statistically insignificant at conventional levels. Thus, this regression equation shows that the positive effect of foreign presence on incumbent domestic banks only comes from the entry of foreign banks through M&As. In column III we further experiment with the country-year average Lerner index by carrying out the same analysis. The result on *foreign presence* is identical to column I while the interaction effect is positive but statistically significant at the 10% level, indicating that the foreign bank entry through M&As is the main transition mechanism for the positive effect even in country-level regression.

The main question arising from the exercises of Tables 2.5 and 2.6 is whether the higher market power of the foreign banks entering through an M&A is price- or efficiency-based. In columns IV to VI of Table 2.6 we replicate the results of Table 2.5, using as dependent

[24] Evanoff and Ors (2008) show that small US banks improve their efficiency when confronted with increased competition from the entry of other banks in the local market.

variable the price of bank output, marginal cost and the price-cost margin in columns IV, V and VI, respectively when including the interaction term of column I. Again the results, especially those of column VI, show that it is the enlargement of the gap between output price and marginal cost of the banks entering through acquisitions that drives the positive relation between foreign bank presence and market power.

These findings are quite important and have two specific implications in relation with the existing literature. First, a foreign bank usually brings in its own, many times superior, technology in pricing risk and this can lead to a change in the pricing decisions compared to the acquired domestic-owned bank. To avoid losses associated with very risky borrowers of the old regime, the foreign bank could charge higher rates instead of potentially dropping these strategic relationships. Indeed, foreign banks frequently enter a country *via* M&As, instead of greenfield entry, to benefit from the comparative advantage in relationship lending of the existing domestic bank.

Second, there is an efficiency effect (Bonin, Hasan, and Wachtel, 2005; Degryse, Havrylchyk, Jurzyk, and Kozak, 2012). Foreign banks mainly acquire domestic banks with high cost inefficiency and the new bank, after the M&A, tends to reduce marginal costs, which increases the gap between the output price and the marginal cost. In the same vein, a recent strand of literature (Martinez Peria and Mody, 2004) suggests that cross-border M&As in banking are value destructing because of high inefficiency of the old domestic bank. The new bank entering through an M&A will lower costs, giving rise to higher Lerner indices. All in all, we have to keep in mind that there is a reason for the acquisition. Even in developed countries, the acquired bank usually is a low-performance institution or a government-owned one with no clear profit-maximizing objective (Berger, Clarke, Cull, Klapper, and Udell, 2005).

Notably, these two implications are interrelated, in the sense that the effects on the price and the marginal cost happen contemporaneously. Indeed we mostly identify an effect on the gap between the output price and the marginal cost and not so much individually on each of the two components of the Lerner index. Thus, the mechanisms highlighted above work in parallel to produce an overall significant effect on the Lerner index.

An interesting extension of the empirical analysis is to consider the potential structural break in the relation between foreign bank presence and market power caused by the financial crisis of 2007. A recent strand of the literature suggests that foreign banks do not necessarily enjoy the financial support of their parent institutions during the financial crisis

(De Haas and Van Lelyveld, 2014) or that foreign banks become even more selective in directing their lending to financially sounder local firms (Pennathur and Vishwasrao, 2014). In columns I and III of Table 2.7 we report our baseline results for the pre- and post-crises periods, respectively (before and after 2007). We find that the coefficients on *foreign presence* are positive and statistically significant in both periods and that the economic significance is somewhat higher in the post-crisis period. Thus, the nexus between foreign bank presence and market power becomes somewhat stronger after 2007. Again, the main source of this finding is foreign bank entry through M&As. This is reflected in the larger coefficient of the relevant interaction term in column V (post-crisis period) relative to the respective one in column II (pre-crisis period).

[Insert Table 2.7 about here]

We consider various other analyses to examine the heterogeneity in our baseline results based on the theoretical considerations discussed in Section 2.2. First, we examine whether our results on the foreign ownership variables change with the level of economic development, by either introducing relevant interaction terms of the foreign ownership variables or examining each income group separately. Our differences in the findings are negligible Second, we introduce an interaction term between foreign-owned and foreign presence. This would allow to see whether the spillover effect is similar across the domestic and foreign banks. We find that this interaction term is statistically insignificant, showing that domestic and foreign banks are perfect substitutes in this process. Third, we hypothesize that the impact of foreign bank ownership on the market power of banks depends on differences in banking-system institutions between the host and the origin country (Mian, 2006). We consider difference in (i) restrictions on banks to own non-financial firms, (ii) entry barriers on banks, (iii) regulations in terms of the summation of the three previous regulatory characteristics, (iv) geographical distance between the capitals of the two countries, (v) institutions (information sharing, credit rights and property rights), (vi) culture, (vii) banking-industry concentration, and (viii) financial-statement transparency. However, we do not find robust evidence in favor of these hypotheses.

2.5. Conclusions

This paper analyzes the impact of foreign bank ownership on the market power of individual banks. We collect bank-year data for all countries in the world to estimate the market power of banks through the use of the Lerner index. We use a cost function with a semiparametric technique that allows for a very flexible specification and does not impose a specific functional form on the data. Our method yields observation-specific estimates of the Lerner index.

Subsequently, we match our data set with that of Claessens and van Horen (2014) who have information on foreign bank ownership. Thus, our final sample includes information for banks from 131 countries over the period 1997-2009. Using this data set we examine the impact of the ownership status (foreign or domestic) of individual banks on their market power (direct effect), as well as the impact of the share of the number of foreign-owned banks to the total number banks in the industry (spillover effect).

We find that the only significant impact comes from the spillover effect and that this effect is positive in the sense of a higher bank market power due to an increased foreign bank presence. This effect is mainly transmitted through the considerably higher incidence of foreign bank entry through M&As, instead of greenfield entry. We also find that the positive impact of the country-level trends in foreign bank presence on banks' market power is not driven solely by an increase in the price of bank output or by a decrease in the marginal cost, but both of these elements contribute to a potent overall effect (even though the reduction in the marginal cost is somewhat more important).

These results have important policy implications for regulators and policy makers alike. If increased competition is the requirement, then it seems imperative that foreign bank entry is made through greenfield entry. Further, a concomitant abolition of entry barriers is warranted. If, in contrast, competition is already rather strong and there are concerns about the stability of the banking system, the foreign bank entry through M&As and the protectionist policies are preferable to increase the market power of banks and their rents. Thus, a natural extension to our work would be to examine the real effects behind the positive nexus of foreign bank presence with banks' market power. In particular, bank market power is usually linked to increased lending rates and, thus, to reduced welfare. Yet, a higher market power of banks increases bank profitability and can lead to increased financial stability. Given our findings, the special role of foreign bank presence in the bank

market power-stability relation needs further examination. We leave this and other issues for future research.

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Table 2.1: Variable definitions and sources

Name	Description	Data source
Panel A: Variables used in the analysis of market power		
Earning assets	Natural logarithm of deflated total earning assets (measure of a bank's output).	Bankscope
Price of output	Total income divided by total earning assets.	Bankscope
Expenses	Natural logarithm of deflated total interest expenses and total noninterest expenses (measure of a bank's total cost).	Bankscope
Price of borrowed funds	Natural logarithm of total interest expenses divided by total customer deposits and short-term funding.	Bankscope
Price of labor	Natural logarithm of personnel expenses divided by total assets.	Bankscope
Price of physical capital	Natural logarithm of overheads minus personnel expenses divided by fixed assets.	Bankscope
Price of financial capital	Natural logarithm of equity divided by total assets	Bankscope
Panel B: Variables used in the analysis of market power		
A. Dependent variable		
Lerner index	The ability of an individual bank to charge a price above marginal cost.	Own calculations
Average Lerner index	The Lerner index averaged by country and year	Own calculations
Adj.-Lerner index	Variant of the Lerner index which allows for the possibility that firms do not choose the prices and input levels in a profit-maximizing way.	Own calculations
Dual-output Lerner	Variant of the Lerner index that adopts a dual-output cost function.	Own calculations
H-statistic	This is the Panzar and Rosse (1987) H-statistic measured by the elasticity of bank interest revenues to input prices. The H-statistic is estimated at the bank-year level using the same technique with the Lerner indices. Higher values reflect less market power.	Own calculations
Average H-statistic	The H-statistic averaged by country and year	Own calculations
Lerner World Bank	The Lerner index by country and year, where marginal cost is estimated with the usual parametric techniques and a translog cost function.	World Bank
Boone World Bank	The elasticity of profits to marginal costs by country and year, where marginal cost is estimated with the usual parametric techniques and a translog cost function.	World Bank
Price-cost margin	The price of output minus the marginal cost	Own calculation
B. Bank characteristics		
Deposits	Total customer deposits divided by total assets.	Bankscope
Capitalization	Equity capital divided by total assets.	Bankscope
Loans	Total loans divided by total assets.	Bankscope
Bank size	Natural logarithm of total assets.	Bankscope
C. Main explanatory variables		
Foreign-owned	Dummy variable equal to one if bank is foreign owned (50% or more of their assets)	Claessens and Van Horen (2014)
Foreign presence	The ratio of the number of foreign banks over the number of all banks.	Claessens and Van Horen (2014)
Foreign presence in terms of assets	The ratio of the assets of foreign banks over the total assets of all banks.	Claessens and Van Horen (2014)
Country M&As	The ratio of the number of foreign-owned banks that enter via M&As over the number of all banks (scaled from zero to one).	Claessens and Van Horen (2014)
Entry restrictions	The index measures the degree to which banks face entry restrictions in the banking market and is constructed by adding 1 if the answer is yes and 0 otherwise, for each one of the following twelve questions: (1) Is more than one license required (e.g. one for each banking activity)? (2) Which of the following are legally required to be submitted before issuance of the banking license: (a) draft bylaws (b) intended organizational chart (c) financial projections for first three years (d) financial information on main potential shareholders (e) background/experience of future board directors (f) background/experience of future senior managers (g) source of funds to be used as capital. (3) What were the primary reasons for denial of the applications: (a) capital amount or quality (b) banking skills (c) reputation (d) other? This index takes a value from 0 to 12, with larger values denoting more stringent entry restrictions.	Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou (2012), Barth, Caprio, and Levine (2008,2004,2001)
Loan-loss provisions	Loan-loss provisions divided by total loans	Bankscope
Private ownership	The percentage of bank deposits held in privately owned banks were used to construct rating intervals. Countries with larger shares of privately held deposits received higher ratings.	Economic freedom of the world: 2012 Annual report
Herfindahl-Hirschman index	Hirschman-Herfindahl index of each bank's total earning assets (takes value from 0 to 1).	Own calculations
Activity restrictions	The score for this variable is determined on the basis of the level of regulatory restrictions on bank participation in: (1) securities activities, (2) insurance activities, (3) real estate activities, and (4) bank ownership of non-financial firms. These activities can be unrestricted, permitted, restricted or prohibited and on this basis the variable is assigned the values of 1, 2, 3 or 4, respectively. The index takes a value	Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou,(2012), Barth, Caprio, and Levine (2008,2004,2001)

	from 0 to 16, with larger values denoting more stringent activity restrictions.	
Capital requirements	This variable is determined: (a) by adding 2, 1, or 0 if the answer is Basel II, Basel I, or other; in the question: Which is the regulatory capital adequacy regime?, (b) by adding 1 if the answer is yes and 0 otherwise in the questions: Does the ratio vary with market risk? Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities?, (c) by adding 1 if the answer is no and 0 otherwise in the questions: Can the initial or subsequent injections of capital be done with assets other than cash or government securities? Can initial disbursement of capital be done with borrowed funds? This index takes a value from 0 to 6, with larger values denoting more stringent capital requirements.	Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou,(2012), Barth, Caprio, and Levine (2008,2004,2001)
Supervisory power	Index of the powers of the supervisor of the banking sector, reflecting whether the supervisory agency has the authority to take specific actions to prevent and correct problems in the banking sector. Takes values from 0 to 14, with higher values reflecting more supervisory powers (see Barth, Caprio, and Levine, 2008).	Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou,(2012), Barth, Caprio, and Levine (2008,2004,2001)
Manufacturing	The sum of gross output minus the value of intermediate inputs used in the production of manufacturing goods.	World Development Indicators
Foreign direct investment	The net inflow of foreign direct investment.	World Development Indicators
Government spending	The level of government expenditures as a percentage of GDP.	Heritage Foundation
Financial freedom	Index of banking security and independence from government control. Larger values indicate more freedom.	Heritage Foundation
Trade freedom	A composite measure of the absence of tariff and non-tariff barriers that affect imports and exports of goods and services. Larger values indicate more freedom.	Heritage Foundation
Ideology	The classification rule for the chief executive of each country is as follows: Right (1); Center (2); Left (3); No information (NA); No executive (NA).	Beck, Clarke, Groff, Keefer, and Walsh (2001)
Polity	The polity scale ranges from +10 (strongly democratic) to -10 (strongly autocratic).	Polity IV
GDP per capita	Natural logarithm of GDP per capita.	World Development Indicators
Years of foreign ownership>40%	The number of consecutive years since when the foreign ownership variable reached a value of 40% or higher in a specific country (zero otherwise).	Own calculations
Years of foreign ownership>50%	The number of consecutive years since when the foreign ownership variable reached a value of 50% or higher in a specific country (zero otherwise).	Own calculations
D. Instrumental variable		
Entry restriction for foreign banks	This variable is determined by adding 1 if the answer is yes and 0 otherwise, for each one of the following four questions: Are foreign entities prohibited from entering through: (1) Acquisition, (2) Subsidiary, (3) Branch and (4) Joint venture. The index takes a value from 0 to 4, with larger values denoting more stringent entry restrictions for foreign banks.	Cihak, Demirgüç-Kunt, Martinez Peria, and Mohseni-Cheraghlou,(2012), Barth, Caprio, and Levine (2008,2004,2001)

Table 2.2: Summary statistics

The table reports summary statistics for the variables used in the empirical analysis. The variables are defined in Table 2.1.

Variable	Level	Obs.	Mean	Std. Dev.	Min.	Max.
Panel A: Variables used in the derivation of market power from 1997-2010						
Earning assets	Bank	89,514	11.71	2.02	6.83	21.38
Price of output	Bank	89,514	0.09	0.07	0.02	0.71
Expenses	Bank	89,514	8.85	1.93	4.55	18.41
Price of borrowed funds	Bank	89,514	-3.62	0.85	-8.79	0.03
Price of labor	Bank	89,514	-4.30	0.56	-7.18	-2.41
Price of physical capital	Bank	89,514	-0.10	0.92	-2.04	4.04
Price of financial capital	Bank	89,514	-2.50	0.59	-8.40	0.00
Marginal cost	Bank	89,514	0.07	0.06	0.01	1.75
Panel B: Variables used in the analysis of market power from 1997-2009						
Lerner index	Bank	80,506	0.22	0.11	-0.20	0.95
Lerner index with financial capital	Bank	80,557	0.22	0.12	-0.20	0.95
Adjusted-Lerner index	Bank	78,634	0.17	0.12	-0.20	0.95
Dual-output Lerner index	Bank	74,148	0.21	0.20	-11.54	0.95
H-statistic	Bank	81,906	0.23	0.22	-0.56	0.46
Lerner World Bank	Country	81,698	0.21	0.08	-1.61	0.82
Boone World Bank	Country	73,920	-0.05	0.10	-2.08	5.69
Average price	Bank	81,906	0.09	0.06	0.02	0.71
Marginal cost	Bank	81,906	0.07	0.06	0.01	1.75
Price-cost margin	Bank	81,906	0.02	0.02	-1.08	0.41
Deposits	Bank	81,906	0.69	0.20	0.00	1.00
Capitalization	Bank	81,906	0.10	0.08	0.00	1.00
Loans	Bank	81,839	0.61	0.19	0.00	9.36
Bank size	Bank	81,906	12.85	1.66	7.70	21.51
Loan-loss provisions	Bank	79,461	0.01	0.70	-5.70	180.54
Foreign-owned	Bank	81,906	0.08	0.27	0	1
Country M&As	Country	81,906	0.72	0.32	0	1
Foreign presence	Country	81,906	20.60	16.96	0	100
Foreign presence in terms of assets	Country	42,424	18.40	18.54	0	100
Entry restrictions	Country	81,181	7.56	1.96	0	12
GDP per capita	Country	81,864	10.10	0.82	6.10	11.21
Years of foreign ownership>40%	Country	81,906	0.59	2.13	0	13
Years of foreign ownership>50%	Country	81,906	0.39	1.70	0	13
Private ownership	Country	72,596	7.65	2.46	0	10
Herfindahl-Hirschman index	Country	81,906	0.09	0.14	0	1
Activity restrictions	Country	81,215	9.01	2.50	1	16
Capital requirements	Country	81,351	3.53	0.86	0	6
Supervisory power	Country	81,301	11.05	2.27	1	14
Manufacturing	Country	80,350	17.93	4.54	1.82	35.63
Foreign direct investment	Country	81,735	5.63	34.26	-15.03	564.92
Government spending	Country	81,649	50.82	21.00	0	99.30
Financial freedom	Country	81,649	64.18	18.57	10	90
Trade freedom	Country	81,649	77.75	9.93	0	95
Ideology	Country	77,899	1.64	1.07	0	3
Polity	Country	80,325	8.89	3.17	-10	10
Entry restrictions for foreign banks	Country	81,744	0.09	0.33	0	4

Table 2.3: The impact of foreign bank ownership and foreign bank presence on market power: Baseline regressions

The table reports coefficients and t-statistics (in parentheses). The total sample consists of 131 countries and spans the time period 1997-2009. Column I shows our baseline results, where we use the simple Lerner index. The following columns confirm the results of our baseline regression when using alternative measures of foreign ownership (Column II) or competition proxies (III-XI). The dependent variable in column III is the Lerner index with financial capital, in IV the Lerner index with financial capital when we include country fixed effects in the estimation of marginal cost, in V the adjusted-Lerner index, in VI the Lerner index obtained from the dual-output cost function, in VII the average Lerner index by country and year, in VIII the Lerner index of the World Bank by country and year, in IX the Boone indicator from the World Bank by country and year, in X the H-statistic and in XI is the average H-statistic by country and year. The variables are defined in Table 2.1. All regressions are estimated with the two-step "difference" GMM estimator for dynamic panels and robust standard errors are clustered by country. Also, all regressions include year-fixed effects. Wald is the p-value of the Wald test, which shows the joint statistical significance of the coefficient estimates. Hansen is the p-value of the Hansen test of overidentifying restrictions, which requires a value higher than 0.05 to accept the null (valid instruments) at the 5% level. AR1 and AR2 are the p-values of the tests for the first- and- second-order autocorrelation, respectively. All equations include GMM-style instruments (lags) and the entry restriction for foreign banks ($ERFB_{t-1}$) as an IV-style instrument. The *, **, *** marks denote statistical significance at the 10, 5, and 1% level, respectively.

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Dependent variable:	Lerner	Lerner	Lerner with financial capital	Lerner with financial capital	Adj.-Lerner	Dual-output Lerner	Average Lerner	Lerner World Bank	Boone World Bank	H-statistic	Average H-statistic
Lagged dependent	0.467***	0.376**	0.508***	0.490***	0.607***	0.275***	0.367***	-0.361	0.314***	0.362***	0.717***
	(3.042)	(1.989)	(3.713)	(3.503)	(6.075)	(4.038)	(3.688)	(-1.425)	(4.758)	(6.262)	(7.464)
Deposits	-0.225	-0.332	-0.266	-0.291	-0.341*	-0.182	-0.408*	-0.349**	-0.030	0.259**	0.028
	(-1.160)	(-1.264)	(-1.334)	(-1.370)	(-1.796)	(-0.682)	(-1.862)	(-2.122)	(-0.285)	(2.086)	(0.269)
Capitalization	0.977***	1.073**			0.907***	1.209***	0.340**	0.565	0.048	0.120	0.129
	(3.900)	(2.438)			(4.020)	(4.405)	(2.232)	(0.916)	(0.387)	(0.506)	(0.819)
Loans	0.031	0.144	0.030	0.003	-0.032	0.061	-0.155	0.068	-0.210*	-0.184	-0.107
	(0.176)	(0.779)	(0.147)	(0.017)	(-0.149)	(0.371)	(-1.283)	(0.151)	(-1.683)	(-1.367)	(-1.088)
Bank size	0.043	0.067	0.018	0.015	0.017	0.067**	0.031	0.008	-0.050**	-0.058	-0.022
	(1.488)	(0.811)	(0.461)	(0.412)	(0.641)	(2.420)	(1.183)	(0.113)	(-2.106)	(-1.069)	(-0.552)
Foreign presence	0.009**		0.010**	0.010**	0.007**	0.005**	0.010***	0.016***	0.004*	0.001	0.001
	(2.506)		(2.431)	(2.482)	(2.138)	(2.267)	(3.088)	(3.629)	(1.954)	(0.210)	(0.526)
Foreign presence in terms of assets		0.003***									
		(2.617)									
Foreign-owned	-0.230	0.049	-0.251	-0.249	-0.208	0.099	0.074	-0.107	-0.131	0.755*	0.267
	(-1.005)	(0.193)	(-1.031)	(-0.977)	(-1.019)	(0.640)	(0.498)	(-0.288)	(-0.474)	(1.771)	(1.244)
Entry restrictions	0.014***	0.045	0.015***	0.015***	0.012***	0.007**	0.009***	0.026**	-0.001	-0.003	-0.002
	(5.956)	(1.513)	(6.182)	(5.856)	(4.018)	(2.286)	(3.031)	(2.569)	(-0.193)	(-0.718)	(-0.948)
GDP per capita	-0.297**	-0.255	-0.322*	-0.282	-0.146	-0.045	-0.097	-0.044	0.256	-0.011	0.138
	(-2.149)	(-0.546)	(-1.747)	(-1.575)	(-0.997)	(-0.272)	(-0.680)	(-0.164)	(1.196)	(-0.037)	(0.613)
Observations	49,776	25,837	49,830	49,769	47,125	55,855	51,216	61,653	55,613	51,173	51,217
Wald	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hansen	0.329	0.143	0.297	0.289	0.284	0.516	0.423	0.447	0.637	0.809	0.749
AR1	0.003	0.035	0.001	0.001	0.000	0.000	0.006	0.357	0.000	0.000	0.000
AR2	0.988	0.599	0.912	0.994	0.538	0.324	0.107	0.924	0.247	0.202	0.815

Table 2.4: Foreign bank presence and market power: Evolution of the effect over time

This table reports coefficients and t-statistics (in parentheses). The dependent variable is the Lerner index. The variables are defined in Table 2.1. Columns I-IV are estimated with the two-step "difference" GMM for dynamic panels and robust standard errors clustered by country. Columns V-VI are estimated with treatment effects model. Also, all regressions include year-fixed effects. Wald is the p-value of the Wald test, which shows the joint statistical significance of the coefficient estimates. Hansen is the p-value of the Hansen test of overidentifying restrictions, which requires a value higher than 0.05 to accept the null (valid instruments) at the 5% level. AR1 and AR2 are the p-values of the tests for the first- and- second-order autocorrelation, respectively. All equations include the entry restriction for foreign banks ($ERFB_{t-1}$) as an IV-style instrument. Columns I-IV include GMM-style instruments (lags). The *, **, *** marks denote statistical significance at the 10, 5, and 1% level, respectively.

	I	II	III	IV	V	VI
Heterogeneous effect due to:	Years of foreign ownership> 40%	Years of foreign ownership> 50%	Evolution of the effect of foreign presence	Evolution of the effect of foreign-owned	Treatment effect(1 year)	Treatment effect(2 year)
Lagged dependent	0.470***	0.456***	0.452***	0.468***		
	(3.760)	(3.070)	(4.153)	(3.686)		
Deposits	-0.231	-0.256*	-0.109	-0.119	0.034***	0.065***
	(-1.450)	(-1.766)	(-0.647)	(-0.586)	(6.377)	(8.800)
Capitalization	0.803***	0.800***	1.019***	1.098***	-0.078***	-0.112***
	(3.368)	(3.523)	(4.355)	(4.626)	(-6.250)	(-6.485)
Loans	0.078	0.041	0.220*	0.188	0.028***	0.034***
	(0.588)	(0.290)	(1.660)	(1.310)	(6.665)	(6.129)
Bank size	0.057***	0.046**	0.049	0.044	0.008***	0.006***
	(2.598)	(2.116)	(1.244)	(0.922)	(4.778)	(2.672)
Foreign presence	0.005**	0.007***	0.010***	0.011**	0.001***	0.000
	(2.255)	(2.726)	(2.599)	(2.316)	(4.434)	(0.854)
Foreign presence (t-3)			-0.003			
			(-1.105)			
Foreign-owned	-0.270	-0.234	-0.435*	-0.389	0.070	0.180
	(-1.372)	(-1.143)	(-1.877)	(-1.452)	(0.50)	(1.20)
Foreign-owned (t-3)				-0.060		
				(-0.247)		
Entry restrictions	0.013***	0.014***	0.015***	0.016***	0.003***	0.010***
	(6.957)	(7.513)	(5.042)	(5.222)	(7.805)	(18.918)
GDP per capita	-0.290*	-0.261	-0.418***	-0.440***	-0.083***	-0.238***
	(-1.754)	(-1.549)	(-3.020)	(-2.865)	(-6.145)	(-12.464)
Years of foreign ownership	-0.036*	-0.040				
	(-1.669)	(-1.521)				
Foreign presence * Years of foreign ownership	0.001*	0.001*				
	(1.855)	(1.736)				
Observations	49,733	49,733	41,037	41,037	60,728	51,107
Wald	0.000	0.000	0.000	0.000	0.000	0.000
Hansen	0.859	0.977	0.260	0.158		
AR1	0.001	0.003	0.000	0.001		
AR2	0.948	0.913	0.272	0.659		

Table 2.5: Foreign bank presence and subcomponents of the Lerner index

The table reports coefficients and t-statistics (in parentheses). The dependent variable in column I is the average price of bank activities (P), in II the marginal cost (MC), and in III the price-cost margin (the difference between price and marginal cost). The variables are defined in Table 2.1. All regressions are estimated with the two-step "difference" GMM for dynamic panels and robust standard errors clustered by country. Also, all regressions include year-fixed effects. Wald is the p-value of the Wald test, which shows the joint statistical significance of the coefficient estimates. Hansen is the p-value of the Hansen test of overidentifying restrictions, which requires a value higher than 0.05 to accept the null (valid instruments) at the 5% level. AR1 and AR2 are the p-values of the tests for the first- and- second-order autocorrelation, respectively. All equations include GMM-style instruments (lags) and the entry restriction for foreign banks (ERFBt-1) as an IV-style instrument. The *, **, *** marks denote statistical significance at the 10, 5, and 1% level, respectively.

	I	II	III
Dependent variable:	Price	Marginal Cost	Price-cost margin
Lagged dependent	0.692***	0.705***	0.464***
	(5.863)	(5.238)	(7.791)
Deposits	0.229	0.051	-0.082**
	(0.981)	(0.629)	(-2.137)
Capitalization	0.354***	-0.091	0.241***
	(3.025)	(-0.654)	(5.603)
Loans	-0.051	-0.143*	-0.038
	(-1.009)	(-1.693)	(-1.268)
Bank size	-0.043	-0.024	0.002
	(-1.563)	(-0.900)	(0.434)
Foreign presence	0.001	-0.004*	0.002**
	(0.268)	(-1.853)	(2.476)
Foreign-owned	0.101	0.171	0.024
	(0.787)	(1.084)	(0.794)
Entry restrictions	-0.005*	0.007*	-0.014***
	(-1.797)	(1.776)	(-3.273)
GDP per capita	0.244	0.427**	-0.011
	(1.000)	(2.036)	(-0.444)
Observations	51,173	61,740	51,173
Wald	0.000	0.000	0.000
Hansen	0.316	0.339	0.665
AR1	0.000	0.000	0.000
AR2	0.076	0.358	0.157

Table 2.6: Foreign bank presence and market power: The mode of foreign bank entry

The table reports coefficients and t-statistics (in parentheses). The dependent variable in columns I-II is the Lerner index, in III the average Lerner index, in III the average price of bank activities (P), in IV the marginal cost (MC), and in V the price-cost margin (the difference between price and marginal cost). The variables are defined in Table 2.1. All regressions are estimated with the two-step "difference" GMM for dynamic panels and robust standard errors clustered by country. Also, all regressions include year-fixed effects and the control variables included in Table 3. Wald is the p-value of the Wald test, which shows the joint statistical significance of the coefficient estimates. Hansen is the p-value of the Hansen test of overidentifying restrictions, which requires a value higher than 0.05 to accept the null (valid instruments) at the 5% level. AR1 and AR2 are the p-values of the tests for the first- and- second-order autocorrelation, respectively. All equations include GMM-style instruments (lags) and the entry restriction for foreign banks (ERFBt-1) as an IV-style instrument. The *, **, *** marks denote statistical significance at the 10, 5, and 1% level, respectively.

	I	II	III	IV	V	VI
Dependent variable:	Lerner	Lerner	Average Lerner	Price	Marginal cost	Price-cost Margin
Lagged dependent	0.450***	0.447***	0.399***	0.687***	0.715***	0.474***
	(3.489)	(3.283)	(3.271)	(5.767)	(5.488)	(8.469)
Foreign presence	0.008**	0.005	0.008**	0.000	-0.002	0.001
	(2.196)	(1.267)	(2.305)	(0.195)	(-1.411)	(1.217)
Foreign-owned	-0.326	-0.046	0.016	0.094	0.158	0.010
	(-1.166)	(-1.201)	(0.087)	(0.615)	(1.097)	(0.313)
Country M&As	0.057	0.061	0.049	0.041	0.015	0.008
	(0.891)	(0.912)	(0.865)	(0.972)	(0.745)	(1.111)
Foreign presence * Country M&As	0.010**	0.011**	0.010*	0.002	-0.001	0.001**
	(2.101)	(2.145)	(1.909)	(0.726)	(-0.866)	(2.555)
Observations	49,776	46,842	51,216	51,173	61,740	51,173
Wald	0.000	0.000	0.000	0.000	0.000	0.000
Hansen	0.134	0.276	0.497	0.604	0.259	0.471
AR1	0.001	0.002	0.000	0.000	0.000	0.000
AR2	0.607	0.528	0.726	0.193	0.404	0.212

Table 2.7: Foreign bank presence and market power: The effect of the crisis

The table reports coefficients and t-statistics (in parentheses). The dependent variable is the Lerner index. In columns I-II we limit our sample to the pre-2007 period and in columns III-IV to the post-2007 period. The variables are defined in Table 2.1. All regressions are estimated with the two-step "difference" GMM for dynamic panels and robust standard errors clustered by country. Also, all regressions include year-fixed effects and the control variables included in Table 3. Wald is the p-value of the Wald test, which shows the joint statistical significance of the coefficient estimates. Hansen is the p-value of the Hansen test of overidentifying restrictions, which requires a value higher than 0.05 to accept the null (valid instruments) at the 5% level. AR1 and AR2 are the p-values of the tests for the first- and- second-order autocorrelation, respectively. All equations include GMM-style instruments (lags) and the entry restriction for foreign banks ($ERFB_{t-1}$) as an IV-style instrument. The *, **, *** marks denote statistical significance at the 10, 5, and 1% level, respectively.

	I	II	III	IV
Threshold:	Pre-crisis	Pre-crisis type of entry	Post-crisis	Post-crisis type of entry
Lagged dependent	0.451***	0.391**	0.413	0.388***
	(4.927)	(2.523)	-1.322	(5.265)
Foreign presence	0.010**	0.011**	0.011**	0.009**
	(2.190)	(1.967)	-1.998	(2.103)
Foreign-owned	0.283	0.087	-0.26	-0.115
	(0.881)	(0.290)	(-0.880)	(-0.407)
Country M&As		0.024		0.140*
		(0.568)		(1.924)
Foreign presence * Country M&As		0.009**		0.014**
		(2.074)		(2.250)
Observations	27,916	27,916	21,860	24,641
Wald	0.000	0.000	0.000	0.000
Hansen	0.779	0.706	0.544	0.878
AR1	0.000	0.012	0.143	0.000
AR2	0.331	0.222	0.919	0.061

Appendix A1: Foreign bank ownership and market power

The table reports coefficients and t-statistics (in parentheses). The dependent variable is the Lerner index. The variables are defined in Table 2.1. All regressions are estimated with the two-step "difference" GMM estimator for dynamic panels and robust standard errors are clustered by country. Also, all regressions include year-fixed effects. Wald is the p-value of the Wald test, which shows the joint statistical significance of the coefficient estimates. Hansen is the p-value of the Hansen test of overidentifying restrictions, which requires a value higher than 0.05 to accept the null (valid instruments) at the 5% level. AR1 and AR2 are the p-values of the tests for the first- and- second-order autocorrelation, respectively. All equations include GMM-style instruments (lags) and the entry restriction for foreign banks ($ERFB_{t-1}$) as an IV-style instrument. The *, **, *** marks denote statistical significance at the 10, 5, and 1% level, respectively.

	I	II	III	IV	V	VI
	Structural variable	Regulation variables	Macroeconomic variables	Freedom variables	Political variables	Bank risk
Lagged dependent	0.338**	0.471***	0.435**	0.435**	0.387***	0.063
	(2.257)	(3.545)	(2.330)	(2.330)	(2.782)	(0.836)
Deposits	-0.327	-0.322**	-0.144	-0.144	-0.267*	-0.177
	(-1.263)	(-2.017)	(-1.086)	(-1.086)	(-1.738)	(-1.124)
Capitalization	0.967***	0.789***	0.927***	0.927***	0.794***	0.919***
	(3.653)	(3.320)	(3.856)	(3.856)	(2.809)	(4.218)
Loans	-0.025	-0.015	0.060	0.060	0.011	0.043
	(-0.140)	(-0.110)	(0.445)	(0.445)	(0.097)	(0.215)
Bank size	0.037	0.034	0.035	0.035	0.019	0.053**
	(0.891)	(1.162)	(1.177)	(1.177)	(0.771)	(2.127)
Foreign presence	0.008***	0.010***	0.006**	0.006**	0.005**	0.006***
	(2.860)	(2.864)	(2.419)	(2.419)	(2.477)	(3.008)
Foreign-owned	-0.168	-0.184	-0.314	-0.314	-0.080	0.055
	(-0.626)	(-0.883)	(-1.560)	(-1.560)	(-0.459)	(0.175)
Entry restrictions	0.014***	0.016***	0.013***	0.013***	0.014***	0.015***
	(4.092)	(4.892)	(7.198)	(7.198)	(6.875)	(4.788)
GDP per capita	-0.178	-0.218*	-0.299**	-0.299**	-0.114	-0.287
	(-0.776)	(-1.784)	(-2.147)	(-2.147)	(-0.948)	(-1.148)
Private ownership	-0.001					
	(-0.203)					
HHI	-0.067					
	(-1.200)					
Activity restrictions		0.003				
		(0.681)				
Capital requirements		0.020***				
		(2.647)				
Supervisory power		0.003				
		(0.674)				

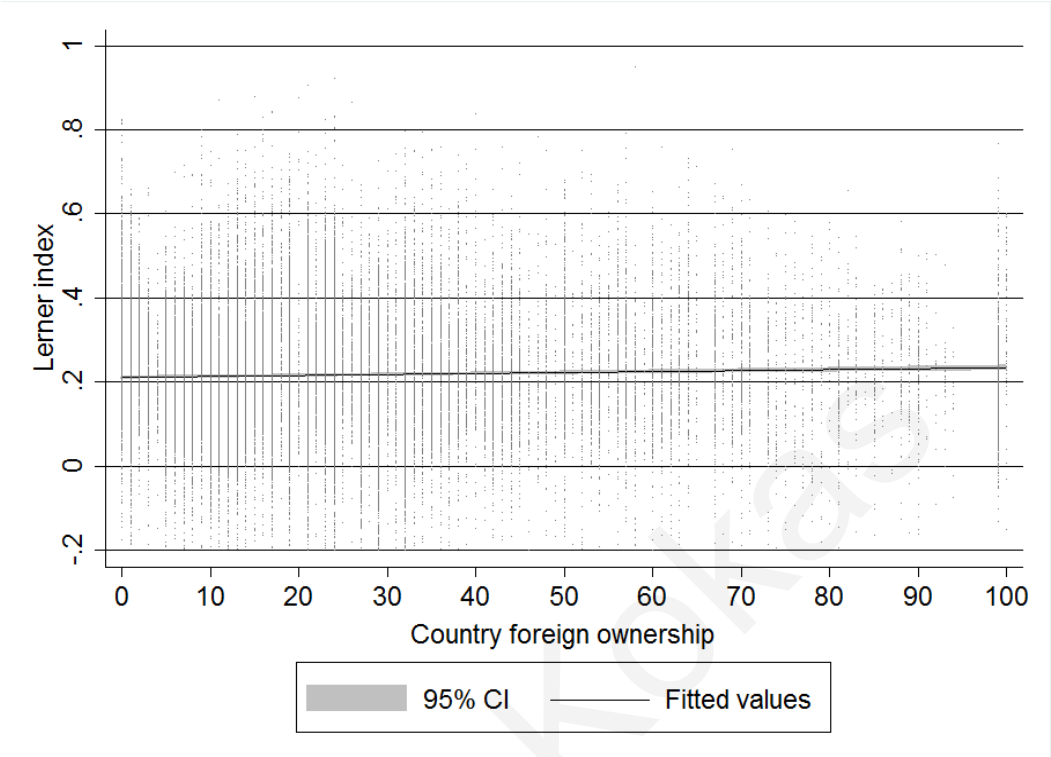
Manufacturing			-0.010***			
			(-4.038)			
FDI			-0.000***			
			(-3.859)			
Government spending			0.001**			
			(2.388)			
Financial freedom				0.000		
				(1.341)		
Trade freedom				0.004***		
				(3.550)		
Ideology					-0.005**	
					(-2.406)	
Polity					0.023**	
					(2.254)	
Loan-loss provisions						0.005***
						(3.665)
Observations	46,627	49,715	48,947	49,699	46,596	48,254
Wald	0.000	0.000	0.000	0.000	0.000	0.000
Hansen	0.745	0.779	0.695	0.443	0.802	0.751
AR1	0.008	0.001	0.001	0.020	0.002	0.008
AR2	0.558	0.925	0.868	0.703	0.684	0.105

Appendix A2: Replication of Claessens and Laeven (2004)

The table reports coefficients and t-statistics (in parentheses). In columns I-II we replicate the analysis of Claessens and Laeven (2004) for the period 1997-2004 and in column III we use bank-level data for the countries used by Claessens and Laeven (2004) over the period 1997-2004. The variables are defined in Table 2.1. Columns I-II are estimated using OLS with robust standard errors. Column III is estimated with the two-step "difference" GMM estimator for dynamic panels and robust standard errors are clustered by country. Also, column III includes year-fixed effects. Wald is the p-value of the Wald test, which shows the joint statistical significance of the coefficient estimates. Hansen is the p-value of the Hansen test of overidentifying restrictions, which requires a value higher than 0.05 to accept the null (valid instruments) at the 5% level. AR1 and AR2 are the p-values of the tests for the first- and-second-order autocorrelation, respectively. Column III include GMM-style instruments (lags) and the entry restriction for foreign banks ($ERFB_{t-1}$) as an IV-style instrument. The *, **, *** marks denote statistical significance at the 10, 5, and 1% level, respectively.

	I	II		III
Dependent variable	H-statistic	Lerner	Dependent variable	Lerner
Foreign presence	0.002***	-0.001**	Lagged dependent	0.232
	(3.744)	(-2.530)		(1.453)
GDP per capita	-0.004	-0.002	Deposits	0.190
	(-0.307)	(-0.283)		(0.615)
Inflation	-0.002*	-0.001	Capitalization	1.156
	(-1.810)	(-1.626)		(0.803)
CR5	0.123**	-0.017	Loans	0.041
	(2.139)	(-0.481)		(0.102)
			Bank size	0.016
				(0.362)
			Foreign presence	0.023***
				(3.516)
			Foreign-owned	-1.177
				(-0.792)
			Entry restrictions	0.004
				(0.287)
			GDP per capita	0.034
				(0.063)
Observations	50	50	Observations	13,652
F (p-value)	0.000	0.092	Wald	0.000
R-squared	0.309	0.113	Hansen	0.471
			AR1	0.040
			AR2	0.198

Figure 2.1
Foreign bank presence and banks' market power



Chapter 3: Who lends to riskier and lower-profitability firms? Evidence from the syndicated loan market

3.1. Introduction

What are the characteristics of banks that lend to firms with relatively high risk and low performance? The answer to this question has fundamental implications for the understanding of the bank-firm relationship lending, financial stability and real macroeconomic outcomes. Surprisingly, despite the presence of a prominent literature on relationship lending, this issue has been under-researched. In this paper, we aim to fill this gap in the literature by empirically analyzing the relation between firm risk and performance on the one hand, and bank capital and credit risk on the other.

The main proposition of our analysis is that banks with differential levels of credit risk and capital will be associated with firms with differential risk and performance. Specifically, risky and less profitable firms can have a difficult time obtaining credit from banks with relatively low levels of credit risk in their portfolios (risk-averse banks). In turn, banks with higher levels of credit risk are usually inclined to lend to more risky and less profitable firms (Peek and Rosengren, 2005). Thus, causality in this type of bank-firm relationship runs in both directions. The end result is one of a special type of cherry-pick, where the financially healthy banks are associated with financially healthy firms and the less healthy banks are associated with the less profitable firms (Jones et al., 2005).

The possible role of bank capital in the nexus between banks and firms is less straightforward. On the positive side, banks with higher capital ratios are those with more prudent behavior in all their activities, including lending to less risky and profitable firms (Diamond and Rajan, 2000; 2001; Gorton and Winton, 2000). On the negative side, a high capital ratio is a strong safety net for bank managers, who therefore face increased incentives to lend to risky borrowers that the bank would not be associated with if the level of capital was lower (Dahl and Shrieves, 1992; Bhattacharya and Thakor, 1993; Repullo, 2004; Murfin, 2012).

We test the presence of these bank-firm relationships using data from the syndicated loan market. This market is ideal for our empirical tests because it usually involves large,

systemically important banks and firms and it is a relatively competitive market. Thus, we expect that the results in other more traditional bank-firm relationships would be even more pronounced if present in the syndicated loan market. Moreover, the data from the syndicated loan market have a unique characteristic. They represent the only source of information at the loan-level, with additional information on who is the lender (the lead bank-arranger of the loan) and who is the borrower (firm). This allows the matching of these data with information on the bank and firm characteristics, which are invaluable in the empirical examination of the question "who lends to risky and non-performing firms."

To this end, we build a unique data set on loan, bank, and firm characteristics, and analyze the nexus between firm risk and performance, and bank credit risk and capitalization. Theoretically, the direction of the causality in our analysis is not an issue. We aim to identify the nature of the bank-firm relationships and not which of the two parties initiates this relationship. However, a potential bias in our estimates may come from omitted variables bias, as there are many unobserved reasons behind the choice to lend to a specific firm or borrow from a specific bank. On this front, the structure of our sample has the additional merit that is a multilevel cross-sectional data set, with the different levels stemming from the fact that the same bank has given many loans in each time period and the same firm has obtained more than one loans within the same period. This allows including both bank and firm fixed effects, which effectively eliminate the omitted variables bias in our empirical models.

Our results show that banks with high credit-risk ratios are strongly associated with firms with high profit volatility, lower market value, and lower profitability. With small modifications, these findings hold irrespective of the variables used to proxy the credit risk of banks and are economically significant. Specifically, a 1% point increase in our preferred measure of bank credit risk is associated with an increase in the volatility of the return on assets for the mean firm from 0.022 to 0.026 and a decrease in the risk-adjusted returns of the mean firm from 20.3 to 14.5. These results reveal a disconcerting affiliation of risky banks with risky firms, yielding a bad equilibrium in the market for credit. Given that this equilibrium is observed in the syndicated loan market, which brings together relatively large banks and firms, this can be a recipe for a turmoil in both the banking (and by extension in financial) and the products markets.

The role of bank capital in defining the bank-firm relationships is also quite important for the bank-firms relationships. We find that banks with high risk-weighted capital ratios are

associated with firms with high volatility of returns and low market value. These findings are in line with the idea that overcapitalized banks will tend to take on higher risk in search for yield, which is in line with the adverse selection and moral hazard mechanisms of the capital-regulation theory (Hellmann et al., 2000). We contend that our results have important implications for prudential regulation in light of the recent revisions under the impulse of Basel III.

The rest of our paper is structured as follows. Section 3.2 analyzes the theoretical links between firm risk and performance, and bank credit risk and capital. Section 3.3 discusses the data and the variables used in the empirical analysis. Section 3.4 discusses the empirical identification method and presents the empirical results. Section 3.5 concludes with the policy implications of our findings.

3.2. Theoretical considerations and testable hypotheses

The literature on relationship lending highlights a number of beneficial effects of close bank-firm relationships. The most notable of these effects are the alleviation of liquidity constraints of firms due to the reduction in adverse selection and moral hazard problems and the longer-term horizon of investment decisions (e.g., Rajan, 1992; Hoshi et al., 1991). However, a more recent strand of this literature also highlights some wrinkles in the beneficial effects of relationship lending. For example, Giannetti (2003) shows that banks can renew lending to insolvent projects and accumulate losses, which leads to increased probability of bank insolvency and financial instability.

The seminal paper on the theory of the selection of borrowers by banks is the one by Stiglitz and Weiss (1981). In this model, banks are unable to observe the exact riskiness of borrowers, thus they offer the same type of loan contracts to all firms. One problem with this modelling framework is that, in the real world, bank managers tend to cherry-pick borrowers based on specific screening devices such as collateral (e.g. Bester, 1985). This immediately suggests that banks have a clear view about the different risk levels of potential borrowers, especially as informational asymmetry problems decrease.

The opposite argument concerning the decisions of banks with different level of capital and credit risk to lend to healthy or less healthy firms is quite under-researched. The theoretical debate on this front can be traced in the work of Peek and Rosengren (2005) for the misallocation of credit to relatively weak firms. In a world with relatively lax

regulatory supervision, banks follow a policy of forbearance with the troubled borrowers to avoid increasing their own loan-loss reserves, which will impair their capital ratios. Subsequently, the risky banks will be incentivized to extend their line of credit to troubled borrowers, so as to enable these borrowers to make interest payments on outstanding credit.

This line of reasoning also works in the opposite direction as well, from troubled firms to the worse-performing banks. The less profitable and risky firms will have a tough time borrowing from a healthy bank, which is likely to have superior managerial and monitoring capacity as a means to reduce adverse selection and moral hazard in the lending process. Thus, these firms are likely to turn to less risk-averse banks, which have a history of lending to riskier firms. These banks will likely be characterized by higher levels of non-performing loans and loan-loss provisions, information which is ex post disclosed to the public on a quarterly basis. Thus, we expect that risky (worse performing) firms are likely to be affiliated with risky banks and vice versa, especially when we call risky banks those with a relatively high amount of credit risk in their portfolios.

The proposition on the relationship between risky banks and risky firms is a special type of a more hazard problem, which however has some element of adverse selection in that the problem precedes the loan deal. Thus, we are referring here to a variant of the Akerlof (1970)-type lemon's problem, whereby the low-quality firms will be left to choose the low-quality banks and vice-versa, even if information is complete. This state of affairs creates a vicious cycle with an association of low quality firms and banks, which for markets as important as the syndicated loan market can be a recipe for banking instability.

In contrast, the role of capital in the banks' decision to lend to relatively riskier and lower-profitability firms is usually studied within the theoretical bank capital regulation literature. This literature makes contradicting predictions about the role of bank capital. Diamond and Rajan (2000; 2001) and Gorton and Winton (2000) propose a number of mechanisms (quoted as financial fragility mechanisms) through which higher bank capitalization reduces lending and, thus, credit risk. The highlight of this influential literature is that bank capital diminishes the financial fragility that facilitates the lending process and will "crowd out" deposits. The resulting effect is a safer banking system through the reduction of the credit risk of banks. However, this literature is, in general, silent on the type of firms that the well-capitalized banks tend to be associated with.

The opposite result is established by giving bank capital the role of risk buffer, which expands banks' risk-bearing capacity (e.g., Bhattacharya and Thakor, 1993; Repullo, 2004). In this framework, the well-capitalized banks have increased incentives to extend their credit to relatively risky borrowers, because holding too much capital bears an important opportunity cost. In fact, most empirical studies (e.g., Jokipii and Milne, 2011; Dahl and Shrieves, 1992) document a positive relationship between capital buffers (i.e., the distance of the actual level of capital from its regulatory minimum) and bank risk. Further, the recent paper of Murfin (2012) shows that well-capitalized banks tend to write looser contracts with their borrowers, while reductions in equity capital will lead to stricter contracts. This effect is consistent with the idea that undercapitalized banks are more cautious in their risk-taking strategies to shield their already low levels of capital from further deterioration.

It becomes quite apparent, that the role of capital in the bank-firm relationships is ambiguous. If banks operate under the financial-fragility mechanism, then they will curtail lending especially to the more risky firms. If banks operate under the capacity mechanism, which seems to be the dominant mechanism in the existing empirical literature, they will possibly expand their risky activities to firms with less healthy balance sheets.

In sum, these influential theoretical papers allow us to formulate the following two testable hypotheses:

H1: Banks with higher credit risk will be associated with more risky and worse-performing firms.

H2: The better capitalized banks will most probably be associated with more risky and worse-performing firms.

3.3. Data

Based on our testable hypotheses, in the empirical analysis we aim to identify the characteristics of banks, in terms of capital and credit risk, that lend to risky and relatively poor-performing firms. This translates to an empirical model of the form:

$$R_{f,t} = \theta_1 F_{f,t} + \theta_2 L_{lt} + \theta_3 B_{b,t} + u_{fbt}, \quad (1)$$

where R is a measure of risk or performance of firm f at the time of the loan origination t. In turn, R is a linear function of a vector of firm characteristics F that affect R, a vector of loan characteristics L, and a vector of the lead arranger's (lead bank's) characteristics B that include the capital and credit-risk profile of the bank. Finally, u is the stochastic disturbance, which for identification purposes includes both bank and firm fixed effects as we will further discuss below.

3.3.1. Data and the syndicated loan market

We construct a unique database including information on syndicated loans, the involved banks, and the borrowing firms. We focus on US syndicated loan deals for the period 2000-2010. We draw data from three different data sources and match them to construct our final sample. Our data sources are the Thomson Reuters' Thomson One Banker database, the Call reports from the Federal Reserve Board of Governors (FRB) and Compustat.

We begin with only a brief description of the syndicated loan market, as this market has been extensively analyzed before by a number of studies (e.g., Sufi, 2007). The syndicated loans are credits granted by a group of banks to a single borrower. Loan syndication allows banks to compete with the capital markets in the generation of relatively large transactions that a sole lender would not otherwise be able (or willing) to undertake due to internal and regulatory restrictions. These loans represent a hybrid instrument, combining features of relationship and transactional lending. They allow the sharing of credit risk between various financial institutions without the disclosure and marketing burden that bond issuers face.

In general, the syndication process works as follows. The borrowing firm signs a loan agreement with the lead arranger, who specifies the loan characteristics (collateral, loan amount, covenant, a range for the interest rate, etc.). The members of the syndicate fall into three groups, namely the lead arranger or co-leads, the co-agents, and the participant lenders. The first group consists of senior syndicate members and is led by one or more lenders, typically acting as mandated arrangers, arrangers, lead managers or agents. If two or more lead arrangers are identified, they are then co-leads. Lead arrangers coordinate the documentation process, choose whom to invite to participate in the loan syndicate and may delegate certain tasks to the co-agents. In addition, the lead arranger receives a fee (paid by the borrower) for arranging and managing the syndicated loan.

The co-agents are not in a lead position but they collaborate with the lead arranger in administrative responsibilities, as well as in the screening and monitoring efforts. The lenders with neither lead nor co-agent roles are classified as participant lenders. These lenders can provide comments and suggestions when the syndication occurs prior to closing. However, they are not generally involved in the negotiations or the information sharing between the borrower and the lead arrangers (or the co-agents if applicable). The price and the structure of the loans are determined in a bargaining process that takes place between the lead bank and the potential participants after the non-price characteristics of the loan are set.

A key aspect differentiating a syndicated loan from multiple sole-lender loans is that the members of the syndication reduce their costs by avoiding staff, monitoring, and origination costs. However, this benefit comes at a cost. The loan syndication market could display some unique types of agency problems, stemming both from adverse selection and moral hazard. The adverse selection problem arises when the participant lenders do not have private information about the borrower's quality. The moral hazard problem emerges when lenders decide to sell in the secondary market parts of the loan to a "passive" lender whose incentives to monitor are reduced.

The information for the syndicated loan deals is from Thomson Reuters' Thomson One Banker database. [25] This database provides detailed information on the loan deal's characteristics (amount, maturity, collateral, borrowing spread, performance pricing, etc.), as well as more limited information for the members of the syndicate, the lead bank, the share of each bank in the syndicated (which is important in the construction of our measure of market power discussed below) and the firm that receives the loan.

To obtain information for the financial statements of the banks we match these data with the Call Reports. Because these reports are available on a quarterly basis, we match the information on the origination date of the loan deal with the relevant quarter. For example, we match all syndicated loans that were originated from April 1st to June 30th with the second quarter of that year of the Call Reports. In a similar fashion, we obtain information for the financial statements of firms from Compustat, the information being available annually.

[25] Most empirical studies on syndicated loans use the DealScan database. However, the Thomson One Banker database has also been used by a large number of studies as the source for syndicated loan deals and its coverage is very similar with that of DealScan for our sample period.

Our analysis is conducted at the "loan-facility" level, as opposed to the "loan-deal" level. The difference between the two is that the loan facility refers to each individual portion of a deal, whereas the deal itself comprises potentially multiple loan facilities and covers the full amount of credit granted to the firm on that occasion. A loan-facility analysis is appropriate for two reasons. First, loan facilities may have different starting dates, maturity, amount, and loan type. Hence, multiple loan facilities and even when in the same loan deal cannot be treated as fully dependent observations (e.g., simply adding facilities, and ignoring their differences, may therefore introduce a bias in the estimates). Second, the loan facility can be used as a diversification device, in which riskier firms are more likely to take loans with multiple facilities (tranching). However, all results presented below are robust to a loan-deal analysis. In our sample, 80 percent of the loan deals contain only one facility, and the remainder two or more facilities.

The matching process of data from the three databases yields a maximum of 7,362 observations, originated by 118 banks and involving 3,597 non-financial firms. However, the number of observations used for the regressions depends on the availability of data for the variables used in our empirical analysis. These observations comprise a so-called multilevel data set, which has observations on banks and firms (lower level) and loan deals (higher level). This is a unique feature that proves particularly helpful for econometric identification purposes.

[Insert Tables 1 & 2 about here]

3.3.2. Measures of firm risk and performance

We use four measures of firm risk and performance that capture a variety of relevant aspects of firms. The first is the standard deviation of the return on assets (σROA), which is a standard measure of firms' risk (e.g., Laeven and Levine, 2009). We calculate this measure using a rolling 12-quarter horizon of the returns on assets (ROA). The higher is the volatility of earnings, the higher the riskiness of the firm. The second dependent variable of our study is the natural logarithm of the firms' market value of common stock.

This is a market-oriented measure of firm performance and, thus, it complements the accounting-based ratio by being more forward-looking.[26]

Our third measure is the accounting-data equivalent of the Sharpe ratio (e.g., Robb and Watson, 2012; Delis et al., 2014). We calculate this ratio using the book value of ROA over σ(ROA), the latter again calculated using a 12-quarter horizon. This ratio measures the risk-adjusted returns of each firm at each point in time. By discounting the returns on assets, we provide a cleaner measure of returns, which is directly comparable across industries with inherently different levels of risk. The last measure of firm performance is the simple ROA, which is the most standard measure of firm performance in the corporate performance literature (e.g., Adams and Ferreira, 2009; Hitt et al., 1997).

3.3.3. Measures of bank credit risk and capital

We use three variables to measure each of ex post bank credit risk and capital. For credit risk, we use the ratios of non-performing loans to total loans, loan-loss provisions to total loans, and loan charge-offs to total loans (see e.g., Grier, 2007). Consistent with our theoretical considerations, all these measures are ex post measures of bank credit risk, while they complement each other in a number of ways.

Specifically, non-performing loans differ from loan charge-offs in that the former are assets that are past due 90 days or more as to principal or interest, or where reasonable doubt exists as to timely collection. In contrast, loan charge-offs occur when a loan is de facto an irrecoverable bad loan. The pairwise correlation coefficient between the two ratios in our sample is equal to 0.77. In turn, provisions for loan losses are somewhat more forward looking, as it represent the expense set aside by the bank for loan defaults (charge-offs). Thus, loan-loss provisions are very highly correlated with loan charge-offs, as the bank assigns a value for provisions approximately equal to the loans written off. Indeed, we find that the pairwise correlation coefficient in our sample is equal to 0.95.

With respect to bank capital, we use the ratio of risk-based capital to risk-weighted assets and we complement it with the basic ratio of total bank capital to total assets and the ratio

[26] An alternative measure to the log of the market value would be Tobin's q; however, a recent literature suggests that Tobin's q is an endogenous measure of performance. Specifically, Dybvig and Warachka (2013) criticize Tobin's q on the basis that scale inefficiency due to underinvestment lowers firm performance but increases Tobin's q.

of Tier 1 capital to risk-weighted assets. The first ratio is the one primarily used by bank regulators, as it includes all types of capital and the element of risk weights. Accordingly, it is the one favored in our empirical analysis (for details, see Grier, 2007).[27]

3.3.4. Control variables

In unreported regressions we experiment with more than 200 firm-level control variables that may affect firm risk and returns (available from Compustat), loan-level variables aggregated at the firm-level (available from Thomson One Banker), and bank-level variables (available from the FDIC Call Reports). We resort to the use of variables that are theoretically motivated, are not multicollinear and show at least some statistical significance in some of the estimated models. Further, we also use a crisis dummy variable for the years 2007-2008 to capture the potential adverse effects of the subprime crisis on firm risk and performance.

At the firm level, we control for firm size, efficiency, liquidity, and age. In the literature, the effect of firm size on firms' risk and performance is ambiguous (Richard et al., 2004; Delis et al., 2014), with positive forces on performance stemming from economies of scale, while negative forces stemming from lack of specialization, value-destroying M&A deals, etc. Firm efficiency (measured here by the ratio of firm sales to total assets), should be positively related with returns. However, the effect of this variable on risk is also likely to be positive, because firms with high sales to assets ratios are likely to have higher profit volatility. As a proxy for liquidity we use the so-called current ratio (ratio of current assets to current liabilities). We expect that the higher the current ratio, the lower firms' risk and the higher the performance. Also, firm age is related to shareholder and managerial experience and we expect that, if anything, this measure is positively related to firm performance. In addition to these variables we control for firm fixed effects in all our estimated equations to capture any remainder unobserved characteristics of firms.

Concerning the loan-level variables, we use the average all-in-one spread of all the loans that are obtained by each firm in our sample within a specific year. We expect that higher spreads are linked to more risky and worse-performing firms because of the pricing of the

[27] Note that using this variable is, in our analysis, essentially the same with using the respective capital-buffers variable, because there have been no alternations in the minimum capital requirement during our sample period. Thus, subtracting the 8% minimum from the risk-weighted capital ratio for all available observations will not yield any changes in the empirical results or in inference.

higher risk premium. Further, we use a dummy variable to capture the extent to which the firm uses covenants to safeguard loan deals. We expect that these firms are in general less risky.

The last group of control variables is related to the characteristics of the lead bank of the loan syndicate.[28] We experiment with many variables related to bank size, efficiency, liquidity, types of bank risk other than credit risk, but we find that most of these variables are statistically insignificant determinants of firm risk or performance. We find that bank size plays a significant role, in line with our theoretical discussion above, and thus we include the logarithm of total assets along with the bank capital and credit risk variables in the regression equations. We also use variables characterizing bank risk in general, as opposed to credit risk in particular. The most obvious measure of bank risk is the Z-score (a formal definition is provided in Table 1), which serves as a proxy for the risk of bank default or total bank risk (see e.g., Fu et al., 2014). Higher values on the Z-score reflect lower risk of default. Also, similar to the case of firm-level variables, we control for bank fixed effects in all the estimated equations.

3.4. Empirical methodology and findings

3.4.1. Econometric identification

Theoretically, our study is *not* intended to identify a causal relation of bank capital and credit risk on firm risk and performance. Instead we are interested in identifying the lending channels from risky banks to risky and non-performing firms. This implies that the direction of causality (i.e. whether it runs from banks to firms or vice versa) is not important in our study. On this front, we simply aim to identify associations and thus we can begin our analysis with simple OLS models that include firm fixed effects. However, the presence of omitted variables is very much possible and this can create a bias in our estimates of bank capital and risk.

The fact that our data set is a multilevel cross section, with specific firms making multiple loan deals with a specific lead bank, allows using bank and firm fixed effects to control for virtually all the omitted variables.[29] This is a unique feature of our data set that makes

[28] We do not find any effect stemming from the characteristics of the rest of the banks in the syndicate.

[29] The time dimension is not an issue, because the loan deals are unique (not repeated in time). Thus, the bank and firm fixed effects already incorporate the information concerning any structural, regulatory and macroeconomic developments common to all banks. Indeed, if we include year fixed effects in our models

econometric identification robust, as it thoroughly accounts for any omitted variables bias. Subsequently, estimation with OLS on this high-dimensional fixed effects model yields best linear unbiased estimates and allows avoiding instrumental variables estimators that could lead to bias due to imperfect instrumentation. The particular methodology used is thoroughly described in Gormley and Matsa (2014). Jimenez et al. (2012; 2014) use a similar identification method with multilevel data to avoid the same identification problems.

3.4.2. Empirical results

The first four columns of Table 3 report the empirical results from the OLS regressions including firm fixed effects. Non-performing loans are negative and statistically significant determinants of market value and the Sharpe ratio. Economically, a 1% point increase in non-performing loans leads to a 0.088 point reduction in the market value of firms and a 1.84 point reduction in the Sharpe ratio. These are equivalent to approximately a 1.3% reduction in the market value and a 9.07% reduction in the Sharpe ratio.

The next four columns report the empirical results from the regressions including bank non-performing loans as the measure of credit risk. In the first and the last two regressions, non-performing loans are now statistically significant at the 1% level, with a 1% point increase in non-performing loans increasing σ(ROA) by 0.004 points. In other words, for the firm with a mean σ(ROA) this implies an economically significant increase from 0.022 to 0.026. The equivalent decreases in the Sharpe ratio and the ROA are also economically significant. Specifically, a 1% point increase in non-performing loans yields a 5.8 point reduction in the Sharpe ratio (mean equals 20.3), and a 0.016 reduction in ROA (mean equals 0.12), all of which are sizeable effects.

[Insert Table 3 about here]

The bank risk-weighted capital significantly determines σ(ROA) and market value. In particular, the banks with a high risk-weighted capital ratio seem to be associated with

we find that these fixed effects are jointly statistically insignificant. To avoid over-identification of our models, we exclude the year fixed effects. Below we do carry out additional analysis to inquire about the effect of the time dimension in our findings.

firms with high variability of profits and low market value.[30] A 1% point increase in the risk-weighted capital increases σ(ROA) by approximately 0.26% points. For a firm with an average σ(ROA) this increase is equivalent to an increase from 0.022 to 0.0276. These results are in line with the theoretical literature on the moral hazard behavior of banks that hold higher levels of capital. In other words, the role of bank capital as a risk buffer expands the risk-bearing capacity of banks and increases incentives to lend to riskier firms (e.g., Repullo, 2004).

In Tables 4 and 5 we replicate the results of the last four columns of Table 3, this time using loan-loss provisions and loan charge-offs as our measure of credit risk, respectively. The regressions of both tables show a qualitatively very similar picture with that of Table 3, even though the number of available observations differs substantially. Specifically, loan-loss provisions increase the σ(ROA) of firms and reduce their market value and ROA. Also, the effect of a 1% point increase in loan-loss-provisions is economically smaller compared to the respective effect of non-performing loans. In turn, the loan charge-offs also increase the σ(ROA) and decrease the Sharpe ratio. The economic significance of the loan charge-offs is the largest among the three bank credit-risk variables in the Sharpe-ratio equations, which is intuitive given the de facto increase in the credit risk reflected by this variable.

[Insert Tables 4&5 about here]

In Table 6 we report the results from the equations that include the bank Z-score instead of the bank risk-weighted capital.[31] We do not include both these variables in the same equation because the Z-score includes information on bank capital. We only report the results based on the non-performing loans ratio as the measure of credit risk, which is also included given that credit and total bank risk are two relatively different notions. Even though these regressions have a somewhat lower number of observations, the non-performing loans ratio is the one favored by the majority of the banking literature (e.g., Fernández and González, 2005; Bushman and Williams, 2012).

[Insert Table 6 about here]

[30] We document similar results when we use the total bank capital or the Tier 1 capital ratio, except from the fact that the latter ratio has a statistically significant effect on the Sharpe ratio instead of the market value. These results are available upon request.
[31] We also use the probability of default (Fu et al., 2014) and the results are very similar.

We find that the bank Z-score is positively related with firms' market value, the Sharpe ratio and the ROA and this effect is strongly statistically and economically significant. Moreover, the effect of the Z-score is independent of the respective effect of non-performing loans, implying that several types of bank risk other than credit risk have a direct bearing on the bank-firm relationships. Evidently, banks with a lower probability of defaults (higher Z-score) are likely to be associated with better-performing firms.

We examine the sensitivity of our results using a number of additional robustness tests (results are available on request) on the potential in-sample heterogeneity of our estimates due to other bank characteristics and macroeconomic developments. First, we examine whether the results change in the periods before and after 2007 (the year of the subprime crisis origination), by including the interaction term of our bank credit-risk and capital variables with a dummy that takes the value one in the period 2000-2006 and zero otherwise. However, these interaction terms are statistically insignificant.

Second, we examine whether there is interplay between bank credit risk and bank capital in determining firms' risk and performance. Given the finding that both bank credit risk and risk-based capital have a positive effect on the variability of returns, this is a test of the hypothesis that for banks with high capital ratios, the positive relation between bank credit risk and firms risk will be more significant for those banks with higher capital. However, this interaction term is also statistically insignificant.

Finally, we experiment with interaction terms of bank credit-risk with bank size and market power, as well as of bank capital with bank size and market power. For market power we introduce a Lerner index of market power, estimated as in Delis et al. (2014). However, even these interaction terms are found to be statistically insignificant.

3.5. Conclusions and policy implications

This article examines the profile of banks that lend to firms with higher risk and lower profitability. We use a unique data set of syndicated loans, which has two important advantages. First, it allows building a sample on bank-firm relationships where all the important observable characteristics of firms and banks are available through a merging process with other databases. Second, it represents a multilevel cross-sectional data set, with the important feature of repeated observations across firms and banks. This allows

controlling for essentially all the bank and firm characteristics through the use of bank and firm fixed effects.

We examine the profile of banks in terms of their levels of credit risk and capital, which are the variables characterizing the theoretical nexus in the decision to lend in the majority of the theoretical literature. We find that banks with high credit risk de facto lend to firms with higher profit volatility, lower market value and lower profitability ratios (simple or risk-adjusted). These effects are so economically significant and document an important adverse selection mechanism in financial intermediation, whereby the risky banks are affiliated with risky and worse-performing firms. We also find that banks with relatively high levels of risk-weighted capital are associated with firms with higher volatility of returns and lower market value.

Taken together with the fact that we examine the syndicated loan market, which involves relative large banks and firms and is deemed to be quite competitive and transparent, our results have important policy implications. With respect to bank credit risk, our results show that there is a special type of a moral hazard mechanism potentially working in both directions, from firms to banks and vice versa. If this mechanism is considered as a bad equilibrium in a multiple equilibrium framework (the good one being the relationship lending between healthy banks and firms), then this is a recipe for market failure.

With respect to bank capital, our findings are in line with an important theoretical literature on the way higher levels of capital inflict adverse selection and moral hazard in the lending behavior of banks. Subsequently, this creates room for prudential supervision, whereby the bank regulators should monitor the projects undertaken by overly risky and well-capitalized banks more closely. This proposal is quite timely in light of the discussion surrounding the newly introduced leverage ratio (in terms of Tier 1 capital) under Basel III.

Evidently, the emphasis on the types of bank-firm relationships, especially in large loan deals, based on credit risk is quite important in light of the higher capital requirements imposed on banks. Our results suggest that targeting credit risk more directly could enhance the soundness of the bank lending activity and could break this multiplicity of equilibria, yielding a more stable syndicated loan market. The emphasis on bank capital alone, despite promoting a safer banking environment, has the limitation that it also exacerbates the adverse selection and moral hazard problems in the market for loans.

Certainly, further analysis is needed to identify which loans (and borrowers) are very risky and which ones are required as a means to improve the growth potential of the relatively worse-performing firms. To this end, potential extensions of research include separating the firms into risky and less risky ones or analyzing the effect of bank capital and risk on the probability of firm growth or default. Identifying causal mechanisms around these relationships are clear challenges for future research.

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Table 3.1: Variable definitions and sources

Variable	Definition	Source
Dependent variables		
σ(ROA)	The variance of firm ROA, where ROA is the ratio of profits before taxes to total assets and σ(ROA) is calculated over a rolling window of 12 quarters.	Compustat
Market value	Natural logarithm of the market value of common stock of firms.	Compustat
Sharpe	ROA/ σ(ROA), where ROA is the ratio of profits before taxes to total assets and σ(ROA) is calculated over a rolling window of 12 quarters.	Compustat
ROA	Ratio of profits before taxes to total assets.	Compustat
Firm-level explanatory variables		
Firm size	Natural logarithm of the dollar value of firms' sales.	Compustat
Firm efficiency	Ratio of firm sales to total assets.	Compustat
Firm liquidity	Ratio of current assets to current liabilities.	Compustat
Firm age	Firm age in years.	Compustat
Borrowing spread	All-in-one spread of the average firms' loan deals.	Thomson Reuters
General covenants	Dummy variable equal to one if the firm uses general covenants in its loan deals and zero otherwise.	Thomson Reuters
Bank-level explanatory variables		
Bank capital	Ratio of total bank capital to total assets.	FDIC Call Reports
Bank risk-weighted capital	Ratio of risk-based bank capital to risk-weighted assets.	FDIC Call Reports
Bank Tier 1 capital	Ratio of Tier 1 bank capital to risk-weighted assets.	FDIC Call Reports
Bank non-performing loans	Ratio of bank non-performing loans to total loans.	FDIC Call Reports
Bank loan-loss provisions	Ratio of bank loan-loss provisions to total loans.	FDIC Call Reports
Bank loan charge-offs	Ratio of bank net loan charge-offs to total loans.	FDIC Call Reports
Bank size	Natural logarithm of total bank assets.	FDIC Call Reports
Bank Z-score	(Bank ROA + Bank capital)/Bank σ(ROA), where Bank ROA is the ratio of profits before taxes to total assets and Bank capital is as above.	FDIC Call Reports
Other variables		
Crisis dummy	Dummy variable equal to one for the years 2007 and 2008 and zero otherwise.	Own calculations

Table 3.2: Summary statistics

Notes: The table reports the number of observations, mean, standard deviation, minimum, and maximum of the variables used in the empirical analysis.

Variable	Obs.	Mean	Std. dev.	Min.	Max.
σ(ROA)	3,806	0.022	0.110	0.001	6.224
Market value	3,408	6.897	2.132	-0.864	12.468
Sharpe	3,526	20.284	26.209	-21.993	339.703
ROA	3,704	0.121	0.111	-2.004	0.766
Firm size	3,824	6.890	1.915	0.003	12.410
Firm efficiency	3,827	0.961	0.800	0.001	7.567
Firm liquidity	3,185	1.800	1.608	0.059	36.508
Firm age	3,982	20.933	16.799	1	59
Borrowing spread	7,362	210.41	136.27	7.00	1,200.0
General covenants	7,362	1.286	1.604	0	1
Bank capital	7,359	0.089	0.039	0.047	0.493
Bank risk-weighted capital	5,259	0.114	0.035	0.001	0.376
Bank Tier 1 capital	5,259	0.081	0.027	0.001	0.368
Bank non-performing loans	6,019	0.016	0.017	0.000	0.091
Bank loan-loss provisions	7,359	0.009	0.010	0.000	0.063
Bank loan charge-offs	7,359	0.008	0.008	0.000	0.072
Bank size	7,362	18.635	1.595	11.817	20.980
Bank Z-score	3,032	1.578	1.795	-40.893	7.702

Table 3.3: The effect of risk-weighted bank capital and non-performing loans on firms' performance

Notes: The first four columns report coefficient estimates and t-statistics (in parentheses) from the OLS regressions with firm fixed effects. The rest of the table reports respective results from the multiple high-dimensional fixed effects model, where firm and bank fixed effects are included in the regression equations. The t-statistics are calculated from cluster-robust standard errors. The dependent variables of each regression are reported in the first line of the table. All variables are defined in Table 1. The F-test that bank and firm fixed effects are equal to zero has a p-value = 0 in all regressions. The ***, **, and * marks denote statistical significance at the 1, 5, and 10 level, respectively.

Dependent variable:	σ(ROA)	Market value	Sharpe	Profitability	σ(ROA)	Market value	Sharpe	Profitability
Firm size	-0.007*	0.882***	1.991***	0.006	-0.006***	0.495***	1.071	-0.024*
	(-1.68)	(29.48)	(3.90)	(1.28)	(-2.57)	(4.57)	(0.65)	(-1.93)
Firm efficiency	0.002	-0.751***	1.734*	0.027***	0.016***	-0.560**	0.383	0.109***
	(0.84)	(-12.09)	(1.71)	(4.98)	(2.93)	(-1.88)	(0.1)	(4.89)
Firm liquidity	-0.000	0.075***	-0.590**	0.001	-0.002**	0.026**	0.048	-0.002
	(-0.35)	(3.06)	(-2.00)	(0.33)	(-1.89)	(2.48)	(0.2)	(-0.84)
Firm age	0.000	-0.009***	0.068	-0.000**	0.001**	0.115***	-0.390	0.001
	(0.34)	(-4.35)	(1.25)	(-2.33)	(2.44)	(3.89)	(-1.42)	(0.84)
Borrowing spread	0.000***	-0.004***	-0.030***	-0.000***	0.000	-0.001***	-0.010	-0.000
	(2.67)	(-9.64)	(-5.78)	(-4.55)	(0.53)	(-2.62)	(-1.39)	(-0.28)
General covenants	-0.003**	-0.057**	0.544	0.008**	-0.000	0.016	0.156	0.002
	(-2.53)	(-2.32)	(1.24)	(2.47)	(-0.88)	(0.58)	(0.39)	(0.92)
Bank risk-weighted capital	0.075	-1.038	3.762	-0.535***	0.256**	-13.061***	-77.311	0.126
	(0.63)	(-0.74)	(0.12)	(-2.93)	(2.34)	(-3.1)	(-0.79)	(0.3)

Bank non-performing loans	0.140	-8.805**	-183.531**	0.010	0.401***	2.387	-576.188***	-1.579***
	(0.88)	(-2.45)	(-2.13)	(0.03)	(2.88)	(0.2)	(-3.05)	(-2.58)
Bank size	0.001	0.021	0.340	0.004**	-0.001	0.031	2.232	0.008
	(0.26)	(0.90)	(0.65)	(2.04)	(-0.72)	(0.39)	(1.51)	(1.43)
Crisis dummy	-0.000	0.313***	2.186	0.015**	0.003	-0.517*	5.038	0.003
	(-0.02)	(3.91)	(1.23)	(1.99)	(0.82)	(-1.64)	(0.86)	(0.21)
Observations	1,913	1,644	1,876	1,916	1,913	1,644	1,876	1,916

Table 3.4: The effect of risk-weighted bank and loan-loss provisions on firms' performance

Notes: The table reports coefficient estimates and t-statistics (in parentheses) from the multiple high-dimensional fixed effects model, where firm and bank fixed effects are included in the regression equations. The t-statistics are calculated from cluster-robust standard errors. The dependent variables of each regression are reported in the first line of the table. All variables are defined in Table 1. The F-test that bank and firm fixed effects are equal to zero has a p-value = 0 in all regressions. The ***, **, and * marks denote statistical significance at the 1, 5, and 10 level, respectively.

Dependent variable:	σ(ROA)	Market value	Sharpe	ROA
Firm size	-0.006***	0.505***	0.848	-0.026**
	(-2.78)	(5.15)	(0.45)	(-2.09)
Firm efficiency	0.016***	-0.550**	0.092	0.109***
	(2.63)	(-1.88)	(0.03)	(5.07)
Firm liquidity	-0.002*	0.026***	0.127	-0.001
	(-1.85)	(2.75)	(0.58)	(-0.45)
Firm age	0.001**	0.075**	-0.279	-0.000
	(2.12)	(1.97)	(-1.00)	(0.32)
Borrowing spread	0.000	-0.001***	-0.012*	-0.000
	(0.93)	(-3.15)	(-1.64)	(-0.29)
General covenants	-0.001	0.010	0.233	0.024
	(-1.02)	(0.33)	(0.59)	(1.16)
Bank risk-weighted capital	0.256**	-10.567**	-85.755	0.197
	(2.47)	(-2.58)	(-1.00)	(0.47)
Bank loan-loss provisions	0.329**	-11.566*	-198.587	-1.041**
	(2.32)	(-1.79)	(-1.63)	(-2.06)
Bank size	-0.000	0.046	1.277	0.004
	(-0.25)	(0.57)	(1.09)	(0.72)
Crisis dummy	-0.001	-0.099	6.022**	0.018*
	(-0.35)	(-1.23)	(2.39)	(1.76)
Observations	1,949	1,672	1,912	1,952

Table 3.5: The effect of risk-weighted bank capital and loan charge-offs on firms' performance

Notes: The table reports coefficient estimates and t-statistics (in parentheses) from the multiple high-dimensional fixed effects model, where firm and bank fixed effects are included in the regression equations. The t-statistics are calculated from cluster-robust standard errors. The dependent variables of each regression are reported in the first line of the table. All variables are defined in Table 1. The F-test that bank and firm fixed effects are equal to zero has a p-value = 0 in all regressions. The ***, **, and * marks denote statistical significance at the 1, 5, and 10 level, respectively.

Dependent variable:	σ(ROA)	Market value	Sharpe	ROA
Firm size	-0.006**	0.509***	0.519	-0.026**
	(-2.57)	(5.04)	(0.28)	(-2.02)
Firm efficiency	0.016***	-0.561*	0.242	0.109***
	(2.92)	(1.90)	(0.07)	(4.98)
Firm liquidity	-0.002*	0.027***	0.099	-0.001
	(-1.83)	(2.93)	(0.44)	(-0.43)
Firm age	0.001**	0.076*	-0.543	0.001
	(2.20)	(1.80)	(-1.59)	(0.60)
Borrowing spread	0.000	-0.001***	-0.010	0.000
	(1.06)	(-3.30)	(-1.50)	(-0.82)
General covenants	-0.001	0.010	0.395	0.002
	(-1.08)	(0.32)	(1.00)	(0.97)
Bank risk-weighted capital	0.254**	-11.045**	-35.798	0.102
	(2.28)	(-2.58)	(-0.41)	(0.24)
Bank loan charge-offs	0.512**	-13.301	-712.479***	-0.672
	(2.75)	(-1.23)	(-2.76)	(-0.85)
Bank size	0.000	0.037	1.016	0.004
	(0.02)	(0.47)	(0.86)	(0.58)
Crisis dummy	0.000	-0.115	5.184**	0.003*
	(-0.08)	(-1.41)	(2.23)	(1.73)
Observations	1,949	1672	1,912	1,952

Table 3.6: The effect of non-performing loans and total bank risk on firms' performance

Notes: The table reports coefficient estimates and t-statistics (in parentheses) from the multiple high-dimensional fixed effects model, where firm and bank fixed effects are included in the regression equations. The t-statistics are calculated from cluster-robust standard errors. The dependent variables of each regression are reported in the first line of the table. All variables are defined in Table 1. The F-test that bank and firm fixed effects are equal to zero has a p-value = 0 in all regressions. The ***, **, and * marks denote statistical significance at the 1, 5, and 10 level, respectively.

Dependent variable:	σ(ROA)	Market value	Sharpe	ROA
Firm size	-0.008***	0.559***	-2.569	-0.012
	(-2.77)	(5.01)	(-0.62)	(-1.42)
Firm efficiency	0.023***	-1.461***	-11.840	-0.005
	(3.42)	(-5.89)	(-1.55)	(-0.29)
Firm liquidity	-0.002	-0.029	-1.042**	-0.008***
	(-1.41)	(1.15)	(-2.33)	(-4.90)
Firm age	0.001**	0.034*	-0.374*	-0.001
	(2.09)	(1.64)	(-1.72)	(-0.84)
Borrowing spread	0.000	-0.001***	-0.008	0.000
	(1.16)	(-3.00)	(-0.97)	(0.23)
General covenants	-0.001*	0.008	0.514	0.001
	(-1.87)	(0.37)	(1.22)	(0.56)
Bank non-performing loans	0.434***	-14.361***	-477.616***	-1.157***
	(2.71)	(-2.67)	(-3.26)	(-3.25)
Bank Z-score	-0.005	0.757***	8.236***	0.098***
	(-1.37)	(6.35)	(3.88)	(11.27)
Bank size	0.001	0.029	0.691	0.002
	(0.74)	(0.87)	(0.65)	(0.59)
Crisis Dummy	-0.000	-0.045	5.709*	0.009
	(-0.13)	(-0.57)	(1.91)	(1.62)
Observations	2,346	2,078	2,313	2,352