Bank Competition, Capital Misallocation, and Industry Concentration: Evidence from Peru

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December 8, 2021

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Abstract

We estimate the effects of bank competition on economic development relying on a merger episode that involved the two largest banks competing over small firms in Peru. By exploiting differences in the banks' geographical footprint, we measure how the merger changed the degree of competition in local banking markets, and how it affected credit, economic activity, and the allocation of resources across firms. We find an aggregate decline in credit, labor, capital, and sales of small firms after the merger. Moreover, we find that low bank competition discourages entry decisions, favoring incumbent firms over potential entrants, and reducing business dynamism. The decline in bank competition has substantial distributional effects. The contraction of capital is concentrated among small firms with high marginal returns, which increases capital misallocation. In equilibrium, large firms expand by taking over the market share previously attended by small firms, leading to higher levels of concentration in the real economy.

*Corresponding author: cburga@princeton.edu. I am extremely grateful to my advisors Adrien Matray and Eduardo Morales, as well as Atif Mian and Richard Rogerson, for invaluable guidance and support throughout this project. I also thank Elena Aguilar, Francisco Cabezón, Jiwon Choi, Pablo Fajgelbaum, Gregor Jarosch, Nobuhiro Kiyotaki, Moritz Lenel, Ernest Liu, Ezra Oberfield, Rafael Parente, Steve Redding, Mica Sviatschi, Gianluca Violante, Arlene Wong, Motohiro Yogo, and Yinuo Zhang as well as numerous seminar participants at Princeton for helpful discussions and comments. I gratefully acknowledge financial support from the International Economics Section at Princeton University. Required disclosure: The views expressed herein are those of the authors and do not necessarily reflect those of the Central Bank of Peru.

1 Introduction

Financial institutions are crucial for economic development as they determine the level of aggregate investment and the allocation of capital across firms. In most countries and in particular developing ones, banks are the main actors in financial markets, as stock and bond markets are less developed.[1] A common characteristic of banking sectors, in particular in emerging markets, is the presence of high levels of concentration. For example, the average share of assets held by the top five banks in Latin American countries is 77%. Thus, understanding and quantifying the effects of bank competition is of great interest to researchers and policy makers studying the relationship between finance and economic development.

A priori, the effect of bank competition on economic development is unclear. From a standard industrial organization perspective, perfectly competitive banking sectors lead to the highest volume of credit at the lowest interest rate (e.g., Freixas and Rochet (1997)). However, developing countries are characterized by high levels of informality and limited systems to produce codifiable, "hard information".[2] In such contexts where "soft information" is prevalent, low competition can actually encourage banks to build lending relationships, improving access to credit particularly for small and young firms with limited collateral (e.g., Petersen and Rajan (1995)). In addition to providing banks with incentives to invest in lending relationships, creating rent opportunities can also promote access to financial services by incentivizing banks to open branches in under-served areas (Hellmann et al. (1998)). Thus, whether more or less competition in the banking sector is desirable in developing countries remains an open question.

To understand whether bank competition hinder or foster economic development, we study a merger episode that involved the two largest banks competing among small firms in Peru, *Bank M1* and *Bank M2*. In December 2013, during a slowdown of the Peruvian economy, *Bank M2*'s shareholders decided to sell the bank and prioritize their operations abroad. In March 2014, the Peruvian Bank Supervisor approved the merger between *Bank M1* and *Bank M2*. By exploiting differences in the banks' geographical footprint, we can estimate how the merger changed the degree of competition in the local banking markets where these two banks operated, and how it affected both the average supply of credit and the allocation of resources

[1] For example, the World Bank Enterprise Survey documents that bank loans represent 61% of firms external financing used for investment in the average Latin American country.

[2] Hard information is quantitative and easy to transmit in impersonal ways, while soft information is subjective and acquired through personal interactions with borrowers. The predominance of either type of information determines the value of lending relationships (Rajan (1992); Stein (2002)).

across heterogeneous firms. We estimate the effects of bank competition comparing firms that are established in municipalities where *Bank M1* and *Bank M2* operated before the merger with firms established in other locations.

We combine two main datasets covering the universe of firms operating in the formal economy between 2010 and 2018. First, we use loan-level credit registry data from the *Reporte Crediticio Consolidado* provided by the Central Bank of Peru, which includes the outstanding balance of loans that firms have with each bank established in Peru. Second, we use firm level data from tax reports provided by the Peruvian Tax Administration Agency, which includes sales, employment, wages, and capital for all firms operating in the formal economy. We complement these primary data sources with *Padrón RUC* provided by the Tax Administration Agency, which includes the industry and location of formal firms, and bank-branch level data provided by the Peruvian Bank Regulator, which includes the total amount of outstanding loans that banks have in each municipality. The richness of our data allows us to explore different mechanisms through which bank competition affects lending and economic development.

We estimate the effects of bank competition using a difference-in-differences estimator, where treatment is defined at the municipality level. Municipalities are treated if the two merged banks operated in the municipality before the merger. While our identification exploits differences in the merged banks' geographical footprint, it does not require for the location of these bank branches to be random, not for the merger to be random. It does not even require municipalities to be similar in the *level* of their covariates. It only requires for treated and control municipalities to be on similar *trends* prior to the merger.

We ensure the identification to be valid in three ways. First, we provide clean, graphical event studies showing that treated and control municipalities were on similar trends for many covariates prior to the merger. Second, in many specifications, we include high dimensionality fixed effects to account for various unobserved time varying shocks at the industry, region, and firm-size level. Third, we show placebo tests using non-small firms, a segment of the market where competition was not affected by the merger.

In the first part of the paper, we study how credit changed following the merger. We document a decline of 12% in total loans to small firms in the average treated municipality. We then explore the role of two channels in accounting for this contraction of credit: a reduction in bank competition or the loss of lending relationships associated with the change in the acquired bank's

ownership. We find that the reduction of loans to small firms is stronger in municipalities where the merger led to a larger increase in the Herfindahl Hirschman Index (HHI) of the banking sector, consistent with the bank competition channel. We also show that the response of credit is robust to the exclusion of *Bank M2*'s customers from the analysis, suggesting that the effects of the merger are not driven by the loss of lending relationships with *Bank M2*. It also rules out the possibility that our results are driven by *Bank M2*'s customers performing significantly worse than other firms. Lastly, we estimate that both merged and non-merged banks reduced their credit supply as the competition shrinks in the municipality, which provides additional support to the bank competition channel.

The second part of the paper quantifies the real effects of this credit reduction. We estimate a decline of 14% in small firms' sales in treated municipalities after the merger. We find a contraction of 17% in capital, 8% in employment, and 13% in total wages of small firms. Then, we test the role of industry-specific needs of external financing in shaping the response of real outcomes. We compute the average firm size in the industry to proxy for the needs of external financing. Intuitively, industries where the average firm operates at a larger scale are characterized by large fixed costs. Both, the scale of operations and fixed costs, determine the needs of external financing (Buera et al. (2011), Fonseca and Matray (2021)). In particular, we use the stock of capital to define firm size, and rank industries according to the average capital per firm. We then split our sample in two groups of industries, each of them accounting for 50 percent of small firms' total capital. We find that total sales of small firms operating in industries with high needs of external financing decline by 20% in treated locations after the merger. We find a contraction of 24% in capital for the same group of firms. In contrast, total sales of small firms operating in industries with low needs of external financing decline only by 7%, and capital exhibits a minor contraction of 3%. Our results suggest that industry-specific needs of external financing play a crucial role in shaping the response of real outcomes to changes in bank competition.

We estimate how bank competition affects entry and exit at the local level. We find that the number of small firms declined by 3% in treated municipalities after the merger, although this effect is nos statistically significant. We then unpack the response of the number of small firms into the response of the number of entrants and exiting firms, and show that the null effect on the number of small firms masks an important decline of business dynamism. We estimate a contraction of 8% in the number of entrants that is partially offset by a reduction of 6% in the number of exiting firms. The decline of business dynamism suggest a new channel through which

bank competition affects economic development, namely that the contraction of credit supply discourage entry decisions, favoring incumbent firms with less competition of potential entrants.

In the third part of our paper, we rely on our firm-level data to explore two margins of heterogeneity in the response of firms. First, we estimate the response of small firms with different marginal returns to capital to shed light on the effects of bank competition on capital misallocation across small firms. We focus on industries with high needs of external financing that explain the contraction of capital in treated municipalities. Following the methodology developed in Bau and Matray (2020), we define marginal returns to capital as the ratio of sales over capital for small firms operating in the same industry. We rank small firms within industries according to this measure and split each industry in four quartiles. We find null effects on capital and labor for the average small firm with low returns, those in the bottom quartile. Small firms in the second and third quartile experience an average decline of 5% and 7% in capital and labor, respectively. The average effects on small firms with high returns, those in the top quartile, are 7% for both, capital and labor. We interpret these results through the lens of standard macro-development models with financial frictions, where firms with high marginal returns are severely credit constrained, and thus, more affected by changes in financial conditions (e.g., Moll (2014), Midrigan and Xu (2014)).

Secondly, we estimate the response of large firms and how it affected industry concentration. We find an expansion of 3% in sales for the average large firm, and a 3% increase in concentration in the average industry. We test whether our results are driven by *local GE effects* through which large firms expand by taking over the share of the market previously attended by shrinking small firms. We estimate the response of firms in industries with low and high needs of external financing. Consistent with our municipality-level results, the average small firm operating in industries with high needs of external financing experience a 5% contraction in sales, while the average small firm operating in industries with low needs of external financing is not affected. We find that large firms expand in the same industries where small firms shrink. The average large firm operating in industries with high needs of external financing experience an increase of 8% in sales, while the rest of firms are not affected. Our results indicate that *local GE effects* are crucial to understand how bank competition affects real outcomes, and provide a mechanism through which financial shocks affect competition in the real economy. In our setting, low bank competition is a negative supply side shock to small firms; then, in equilibrium, large firms respond by attending the market share of shrinking small firms, increasing market concentration.

Our results suggest that low bank competition has detrimental effects on economic development. We document three novel channels through which low bank competition distorts the allocation of resources in our setting: (i) reallocating resources away from small firms with high marginal returns to capital, (ii) concentrating economic activity towards large firms, and (iii) favoring incumbent firms over potential entrants. These findings have important policy implications, mainly in developing economies with highly concentrated banking sectors. Promoting bank competition can improve the allocation of resources across firms, and policy makers should take into account potential losses in terms of allocative efficiency when designing merger regulations.

Related Literature Our paper contributes to four main strands of literature. First, we contribute to the literature studying the effects of bank competition on credit and real outcomes (e.g., Petersen and Rajan (1995); Cetorelli and Gambera (2001); Black and Strahan (2002); Cetorelli and Strahan (2006); Bertrand et al. (2007); Hombert and Matray (2016); Fraisse et al. (2018); Mayordomo et al. (2020); Carlson et al. (2021); Joaquim et al. (2020)). A priori, the effects of bank competition are unclear, particularly in contexts where informational problems are more relevant (e.g., Stiglitz and Weiss (1981); Petersen and Rajan (1995); Panetta et al. (2009); Vives (2016); Crawford et al. (2018); Ioannidou et al. (2020); Albertazzi et al. (2021)). Our first contribution to this literature is to provide empirical evidence that low bank competition has negative effects on credit and real outcomes in the context of Peru, a developing country where informational problems are likely to be more important.

Additionally, most of the previous work has relied on regional data to estimate the effect of bank competition.[3] Even though, estimating the response of regional-level outcomes is crucial to understand the overall effect of bank competition, such level of aggregation does not allow us to identify heterogeneous effects across firms, within industries and regions, that may constitute important mechanisms through which bank competition affects the real economy[4]. Our second contribution to this literature is to uncover three novel channels through which bank competition affects real outcomes. First, small firms with high marginal returns to capital are more affected, resulting in an increase of capital misallocation. Second, large firms respond in equilibrium by taking over the share of the market previously attended by small firms, increasing industry concentration. Third, low bank competition discourages entry decisions, favoring incumbent firms over potential entrants, and reducing business dynamism.

[3]Notable exceptions are Bertrand et al. (2007), estimating the effects of banking deregulation on firm and industry dynamics in France; Hombert and Matray (2016), studying the effects on industry innovation and inventors' mobility; and Carlson et al. (2021), estimating the effects on banks' risk-taking behavior.

[4]On the role of heterogeneity to understand the effects of financial shocks on households, see for example Peydró et al. (2021) and Andersen et al. (2021)

Second, we contribute to the literature of misallocation (Restuccia and Rogerson (2008); Hsieh and Klenow (2009); Restuccia and Rogerson (2017); Baqaee and Farhi (2019)), and in particular, to the empirical literature that has identified sources of misallocation (Gopinath et al. (2017); Larrain and Stumpner (2017); Bai et al. (2018); Bau and Matray (2020)). We add to this literature in two ways. First, our quasi-experimental setting allows us to cleanly isolate the effect of bank competition on capital misallocation, holding constant other factors that may also affect the allocation of resources in the economy. Second, our paper exploits variation across municipalities over time within the same country, which allows us to hold the institutional setting constant. Third, by focusing on small firms we avoid potential differences in technology or market power across firms, that could otherwise lead to misleading calculations of the response of capital misallocation.

Third, our paper is closely related to the literature studying the relationship between financial institutions and industry concentration. This literature has highlighted the role of two characteristics of financial markets: bank competition (Cetorelli and Strahan (2006); Saidi and Streitz (2021)), and low interest rates (Liu et al. (2019); Kroen et al. (2021)). We contribute to this literature by providing empirical evidence that low bank competition can increase industry concentration, and documenting that *local general equilibrium effects* play a crucial role in driving this effect. In our setting, low bank competition is a negative supply side shock to small firms, and in equilibrium, large firms respond by taking over the market share of small firms, leading to an increase in concentration in the non-financial sector.

Finally, our paper is related to the broader, empirical literature studying the effects of financial frictions on economic development. One important strand of this literature exploits randomized controlled trials to study the implications of access to microcredit in developing countries (Banerjee et al. (2015a); Banerjee et al. (2015b); Banerjee et al. (2019)). Another relevant strand of this literature looks at quasi-experimental evidence (Guiso et al. (2004); Paravisini (2008); Banerjee and Duflo (2014); Ponticelli and Alencar (2016); Fonseca and Van Doornik (2021), Fonseca and Matray (2021)). We make two contributions to this literature. First, we study the effects of a large shock, named a decline in bank competition, capable of generating important effects, even among firms that are not directly affected, such as large firms. These *local general equilibrium effects* have important implications for the concentration of economic activity. Second, our data allows us to follow individual firms over time, which is crucial to measure the reallocation effects of bank competition, that we show have important implications for capital misallocation.

The reminder of this paper is organized as follows. Section 2 provides a background of the Peruvian banking sector and the merger decision. We describe our main data sources and the empirical approach in section 3. Section 4 shows the effects on credit and section 5 the effects on real outcomes. Section 6 explores the heterogeneous effects across firms. Section 7 concludes.

2 Institutional Background and Merger Decision

This section provides a brief description of the Peruvian banking sector, highlighting the fact that merged banks competed among small firms. We also provide a background on the merger episode, describing the events that triggered the merger decision.

2.1 Peruvian Banking Sector

Similar to other emerging markets, the banking sector in Peru is highly concentrated. Table 1 reports the participation of banks in the market of corporate loans in 2010. Panel A considers the whole market of corporate loans, where the five largest banks account for 80 percent of total corporate loans. The merged banks, *Bank M1* and *Bank M2*, provide 32% and 4% of these loans, respectively. However, the loans of *Bank M2* were not equally distributed between small and large firms. Instead, they were concentrated among small businesses. Panel B reports the participation of banks in the segment of small firms, where *Bank M1* and *Bank M2* are the two main banks, and account for 21% and 15% of the market, respectively. Panel C shows the market shares of each bank in the segment of large firms. We can observe that *Bank M1* is the largest bank, while *Bank M2* provided only 0.2% of loans. Moreover, the value of these loans provided by *Bank M2* represent only 4% of its total portfolio. Thus, *Bank M1* and *Bank M2* competed only in the segment of small firms.

2.2 Merger Decision

The Peruvian economy went through a slowdown as a consequence of the decline in the price of the main exported commodities, gold, silver, and cooper, since 2011-2012. Figure 1 plots the growth rates of GDP, consumption and investment in Peru between 2010 and 2018. In the pre-merger period of 2010-2013, the annual growth rates of GDP, consumption and investment, were 6.1%, 6.8 and 11.2%, respectively. In the period 2014-2018, the annual growth rates declined to 3.2, 3.6, and -1.5%, respectively. Financial institutions were affected, in particular

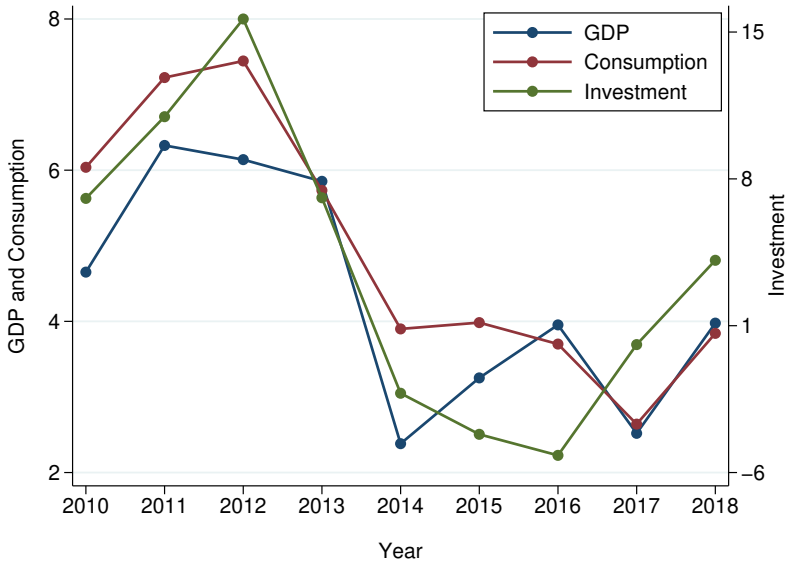
those specialized in small businesses who experienced an increase in delinquency rates from 5% in 2010-2013 to 8% in 2014.

Table 1: Share Loans to Firms provided by Banks in 2010

Panel A: *Total Loans to Firms*		*Panel B:* *Loans to Small Firms*		*Panel C:* *Loans to Large Firms*	
Bank M1	32	**Bank M1**	21	**Bank M1**	36
Bank A	22	**Bank M2**	15	Bank A	27
Bank B	15	Bank B	14	Bank B	16
Bank C	7	Bank A	7	Bank C	9
Bank M2	4	Bank D	5	Bank E	3
				Bank M2	*0.2*

Source: Peruvian Bank Supervisor.
Banks are defined as conglomerates. *Bank M2* ranked 13th in the market of loans to large firms.
Because of the data use agreement, we can only reveal the identity of the banks upon request.

Figure 1: Peruvian Economic Growth Rates (%) in 2010-2018



Source: Central Bank of Peru.

At the same time, the main shareholders of *Bank M2* had operations in other Latin American countries, and they were expanding these operations since 2010, requiring external financing. As *Bank M2*'s portfolio deteriorated in Peru, they faced an increase in the cost of external

funding, and in December 2013, they decided to sell *Bank M2* and prioritize their operations abroad.[5] *Bank M1* decided to acquire *Bank M2* in February 2014, and the Bank Supervisor approved the merger in March 2014.

3 Data and Empirical Strategy

This section provides a description of the two main datasets used in this paper, credit registry and tax reports, covering the universe of firms operating in the formal economy between 2010 and 2018. We also describe the difference-in-differences estimator used to quantify the effect of the merger on municipality-level outcomes.

3.1 Credit Registry Data

We use loan-level data from the *Reporte Crediticio Consolidado* provided by the Central Bank of Peru to estimate the effect of the merger on credit, and test the role of two channels, bank competition and change in the acquired bank's ownership, in shaping this effect. Our dataset includes the outstanding balance of loans that firms have with each bank established in Peru. Like most credit registry data, interest rates are not included in our dataset. Firms have a unique ID used for tax purposes that we use to merge our credit registry data with *Padrón RUC*, a dataset containing firms' industry (ISIC 4 digits) and municipality, and an indicator of whether the firm is small or not according to the definition of the Tax Administration Agency.[6] We exclude firms with total loans below USD 5 000, who represent one percent of total loans to small firms. The top panel of Table 2 provides descriptive statistics for small borrowers, i,e. small firms with at least one bank loan. Columns 1 and 2 show that the average balance of credit of small borrowers is USD 137 000 and the average number of lending relationships is 2.4. Table A1 reports descriptive statistics for large borrowers.

3.2 Tax Reports

Our second dataset is a panel of firms provided by the Tax Administration Agency used to estimate the response of firms' real outcomes and test the role of industry-specific needs of external financing in shaping this response. This dataset includes sales, employment, and

[5] See Chu (2017) for a comprehensive analysis of this merger.

[6] Small firms are those with annual sales do not exceed USD 2 million. Throughout the text, we refer to large firms as those with annual sales above USD 2 million.

capital for the universe of firms operating in the formal sector. We can not merge this dataset with our credit registry data as they are provided by different institutions. We exclude the smallest firms representing one percent of small firms' total sales. This dataset is suitable to compute marginal returns to capital at the firm-level and estimate potential heterogeneous effects across firms with different returns. The bottom panel of Table 2 reports descriptive statistics for small firms. Columns 1 and 2 show that the average small firm sells USD 812 000, has 27 workers, and operates with a stock of capital valued at USD 909 000. Table A1 reports descriptive statistics for large firms.

Table 2: Characteristics of Small Firms

	All Municipalities		Treated		Non-treated	
	Mean	Median	Mean	Median	Mean	Median
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Registry						
Loans	137	47	115	47	180	47
Num. of Lenders	2.4	2.0	2.4	2.0	2.3	2.0
Distinct firms	21,497		14,139		7,358	
Tax Reports						
Sales	812	504	773	487	859	526
Capital	909	352	754	339	1 095	367
Num. Workers	27	13	25	12	30	15
Distinct firms	20,875		11,407		9,468	

Notes: Pre-merger values. Loans, sales, and capital in USD thousand. We consider a balanced panel of firms used to estimate average effects. We trim firms in the bottom of the loan size distribution accounting for 1% of total loans in our Credit Registry data. We trim firms in the bottom of the sales distribution accounting for 1% of total sales in our Tax Reports data.

3.3 Local Credit Markets and Exposure to the Merger

We assume that local credit markets are defined at the municipality level.[7] We use bank-branch level data to provide evidence that supports our assumption. First, we identify the locations where banks operate, i.e. where banks have at least one branch providing loans. Then, we compute the amount of loans that small firms borrow from banks operating in the same municipality. Figure A1 in the Appendix shows that small firms borrow 95% of loans from banks that operate in the same municipality. We also compute the amount of loans that

[7]There is a vast empirical evidence that firms rely on local banks in developed economies, e.g. Petersen and Rajan (1994); Nguyen (2019), but less is known about the dependence on local banks in developing countries.

small firms borrow from banks operating in surrounding municipalities, within 5, 10, and 15 miles. Figure A1 shows that small firms borrow 98% of loans from banks operating within 5 miles, and the rest is borrowed from banks operating within 15 miles. These shares did not change after the merger. We only consider municipalities with two or more banks and where at least one of the merged banks operated in 2011. We have 161 municipalities that account for 99% of firms' total loans in Peru.

We define two measures of treatment at the municipality level. First, a discrete measure of treatment defined in equation (1), which is equal to one if the two merged banks operated in the municipality in 2011, the first year of our bank-branch level data. We use this measure to estimate the average effect of the merger.

$$\text{Treatment}_m = \mathbb{1}\left\{\text{Loans}_{\text{BCP},m,2011} > 0\right\} \times \mathbb{1}\left\{\text{Loans}_{\text{MB},m,2011} > 0\right\} \tag{1}$$

Second, we define a continuum measure of treatment equal to the change in the Herfindahl Hirschman Index (HHI) of the banking sector associated with the merger:

$$\text{Treatment}_m^{\text{C}} = \ln \overline{\text{HHI}}_{m,2011} - \ln \text{HHI}_{m,2011} \tag{2}$$

where $\overline{\text{HHI}}_{m,2011}$ is the HHI in municipality m computed under the assumption that *Bank M1* and *Bank M2* operated as one single bank in 2011, and $\text{HHI}_{m,2011}$ is the actual HHI in 2011. This measure allows us to rank municipalities based on the change in bank competition associated with the merger and then test the role of bank competition in shaping the response of credit. This measure is equal to zero when only one of the two merged banks operates in the municipality.

There are 65 treated municipalities and 96 municipalities in the control group. Columns 3-6 in Table 2 provide descriptive statistics for small firms located in treated and non-treated municipalities. The average small firm operating in treated locations is smaller in terms of loans, sales, capital, and employment. The distribution of the number of lending relationships is similar in these two groups of municipalities. Table A1 in the Appendix, provide descriptive statistics for large firms in treated and non-treated locations.

We report descriptive statistics at the municipality level in Table 3. Columns 1 and 2 show that local credit markets are highly concentrated, the average HHI is 0.32.[8] Municipalities

[8]The Department of Justice in the United States considers markets in which the HHI is between 0.15 and

have 10 banks on average, and USD 5 000 of loans percapita.[9] Columns 3-6 show that treated municipalities are larger and less concentrated on average. There are 15 banks operating in the average treated location, and only 6 banks in the average non-treated municipality. Finally, we plot the geographical distribution of municipalities in Figure A2 in the Appendix. We can notice that treated and control municipalities are fairly well distributed, with both types of municipalities within most of the regions.

Table 3: Characteristics of Municipalities

	All Municipalities		Treated		Non-treated	
	Mean (1)	Median (2)	Mean (3)	Median (4)	Mean (5)	Median (6)
Bank-branch data						
HHI	0.32	0.27	0.20	0.17	0.40	0.34
Loans percapita	5	2	6	4	3	1
Num. banks	10	8	15	15	6	5
Distinct municipalities	161		65		96	

Notes. Pre-merger values. Loans per capita in USD thousand.

3.4 Empirical Framework

We quantify the effects of the merger on municipality-level outcomes estimating the following difference-in-differences equation:

$$\ln Y_{mrt} = \theta \times \text{Treatment}_m \times \text{Post}_t + \sum_{q=1}^{4} X_m^q \times \delta_t + \delta_m + \delta_{rt} + u_{mrt} \tag{3}$$

where $\ln Y_{mrt}$ denotes the outcome variable in municipality m, region r, and year t. We estimate the response of credit, sales, capital, employment, and total wages. Treatment_m is defined in equation (1), and Post_t is an indicator variable equal to one in the post-merger period, i.e. if $t \geq 2014$. X_m^q is a set of fixed effects for each quartile of the municipality size distribution, defined before the merger, and interacted with year fixed effects.[10] We include municipality fixed effects δ_m to control for any time-invariant unobserved heterogeneity at the municipality-level,

0.25 to be moderately concentrated, and consider markets in which the HHI is in excess of 0.25 to be highly concentrated.

[9] Our bank-branch level data includes loans to firms and individuals altogether.

[10] Our two measures of municipality size are total loans percapita and number of banks.

and time-varying region fixed effects δ_{rt} to control for aggregate shocks affecting municipalities in the same region.[11] Standard errors are clustered at the municipality level.

The coefficient of interest is θ, which captures the effect of the merger on a set of municipality-level outcomes. We identify this parameter comparing treated and control municipalities before and after the merger. By including the set of fixed effects described above, we compare municipalities within cells defined by region and municipality size bin. Our identification exploits differences in the merged banks' geographical footprint, and it only requires for treated and control municipalities, within these cells, to be on similar *trends* prior to the merger.

We discuss two potential sources of bias in a standard difference-in-differences regression and how our framework deals with them. First, as we discussed previously, non-treated municipalities are smaller on average. Our estimator could be biased if such municipalities grow at higher rates, consistent with a notion of economic convergence across municipalities. Besides providing clean, graphical event studies showing that treated and control municipalities were on similar trends for many covariates prior to the merger, we include fully flexible time-varying fixed effects for each quartile of the size distribution of municipalities, accounting for potential differences in growth rates, and any time varying unobserved shock affecting differently municipalities with different size. Second, the merger decision could have been triggered by shocks affecting treated municipalities only, and our estimator could capture the effects of such shocks instead of the effects of bank competition. We show placebo tests using large firms that were not served by the acquired bank, and thus, represent a segment of the market where competition was not affected by the merger. Finally, we estimate the response of credit and real outcomes at the firm level, which allows us to control for any time-invariant unobserved heterogeneity across firms, and include time-varying industry fixed effects to control for any shock affecting firms in the same industry. We provide a further discussion of our firm-level specification in Appendix B.

4 Effects on Credit

We start by estimating how credit changed for small firms following the merger. We aggregate our data at the municipality level and estimate equation (3), where the dependent variables are the log of credit to small and large firms. Table 4 reports our results. In columns 1 to 3, we consider total credit to small firms, who represent the segment of the market where the two

[11] Peru has 25 regions or *departamentos*. Our results are robust to excluding these fixed effects.

merged banks competed. In our benchmark specification reported in column 3, total credit to small firms declines by 12.3% in treated municipalities relative to non-treated municipalities after the merger. Our results are robust to excluding fixed effects as we can see in columns 1 and 2.

Table 4: Average Effect of the Merger on Credit

	Small			Large		
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment$_m$× Post$_t$	-0.144***	-0.147***	-0.123**	0.052	0.038	0.043
	(0.044)	(0.047)	(0.062)	(0.048)	(0.051)	(0.059)
Fixed Effects						
Year	✓	✗	✗	✓	✗	✗
Municipality	✓	✓	✓	✓	✓	✓
Muni. size-Year	✗	✓	✓	✗	✓	✓
Region-Year	✗	✗	✓	✗	✗	✓
Observations	1,431	1,431	1,431	1,071	1,071	1,071

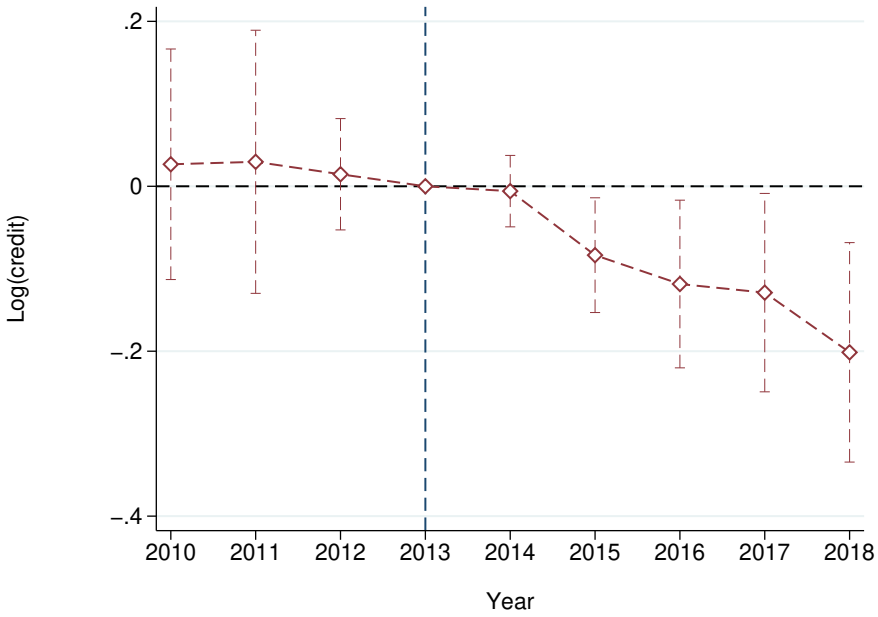
Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Figure 2 plots the event study graph for the response of credit to small firms. We show the estimated yearly treatment effect before and after the merger, including the same fixed effects used in our benchmark specification. We normalize the year before the merger to zero. We can see that there is no effect of being treated before the merger, which validates our identifying assumption.[12] Figure A3 in the Appendix plots event-study graphs for the other specifications that exclude fixed effects, showing no evidence of pre-trends. We perform a placebo test by estimating equation (3) considering total loans to large firms, who represent the segment of the market of corporate loans where competition was not affected by the merger, as our dependent variable. Results are reported in columns 4 to 6. The point estimate reported in column 6 is positive, albeit not statistically significant. We provide event study graphs in Figure A4 in the Appendix. We can see null effects before and after the merger, ruling out the possibility that the effects on loans to small firms are spurious, and driven by unobserved shocks that affect

[12]To be precise, our identifying assumption requires that, absent of the shock, treated and control municipalities would have followed parallel trends, which is impossible to test in the post period.

treated municipalities and trigger the merger decision. Our results are robust to excluding Lima, the capital of Peru, which contains 30 municipalities accounting for 70 percent of total loans to small businesses, as we can observe in Table A2. Finally, our event-study coefficients are robust to using the approach developed by de Chaisemartin and D'Haultfœuille (2020), as we show in Figure A5. These findings indicate that the hypothesis of less competition providing incentives for banks to expand credit supply does not play a role in shaping the average effect of the merger on total loans to small firms.

Figure 2: Event Study Graphs for the Average Effect of the Merger on Credit



Notes. This figure reports the event study graph for the average effect of the merger on total credit to small firms. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being treated and year fixed effects. The confidence interval is at the 95% level.

We explore the role of two channels in accounting for this contraction of credit: a reduction in bank competition and the loss of lending relationships associated with the change in the acquired bank's ownership. We estimate equation (3) using our continuum measure of treatment defined in equation (2). Our results are reported in Table 5. Column (1) shows that municipalities with one standard deviation higher exposure, i.e. continuum treatment, exhibit a decline of 5.1% in total credit to small firms. We provide event study graphs in Figure A6 in the Appendix, where we can observe null effects before the merger. These results are consistent with the bank competition channel.

The acquisition of *Bank M2* implied a change in ownership that may affect the value of lending relationships of merged banks' customers.[13] To test whether this potential loss of lending relationships drives our results, we split the total loans to small firms into the loans provided by the two merged banks and the loans provided by non-merged banks. Table 5 reports our results. Columns 2 and 3 show that merged banks reduced total lending by 16.2% and non-merged banks by 10.1%, and these effects are statistically equivalent. Figure A7 in the Appendix plots event study graphs for the response of credit to small firms, provided by merged and non-merged banks, showing no evidence of pre-trends. Our results indicate that the effect of the merger is not driven by the loss of lending relationships associated with the change in the acquired bank's ownership, but that instead, all banks serving the market of small firms reduced their credit supply as the competition shrinks in the municipality. They also rule out the possibility that our results are driven by merged banks' customers performing significantly worse than other firms.

Table 5: Average Effect of the Merger on Credit. Bank Competition and Lending Relationships

	Continuum Treatment (1)	Merged banks (2)	Non-merged banks (3)
$\text{Treatment}_m^{\text{C}} \times \text{Post}_t$	-0.051**		
	(0.024)		
$\text{Treatment}_m \times \text{Post}_t$		-0.162*	-0.101*
		(0.096)	(0.057)
Fixed Effects			
Municipality	✓	✓	✓
Muni. size-Year	✓	✓	✓
Region-Year	✓	✓	✓
Observations	1,431	1,431	1,431

Notes. All dependent variables are in logs. Treatment_m is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, $\text{Treatment}_m^{\text{C}}$ is a continuum measure of treatment defined in equation (2), and Post_t is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

[13] For example, after the merger, *Bank M1* decided that *Bank M2* will be the only bank in the segment of small firms, which may affect the lending relationships of *Bank M1*' clients. It is also possible that *Bank M1* has different criteria to evaluate loan applications, affecting the lending relationships of *Bank M2*'s clients.

5 Effects on Real Outcomes

In this section we estimate the response of real outcomes. We start by quantifying the average effect of bank competition on sales, capital, labor, and total wages of small firms. Then we explore the role of industry-specific needs of external financing in shaping these effects. Finally, we explore how bank competition distorts entry and exit decisions.

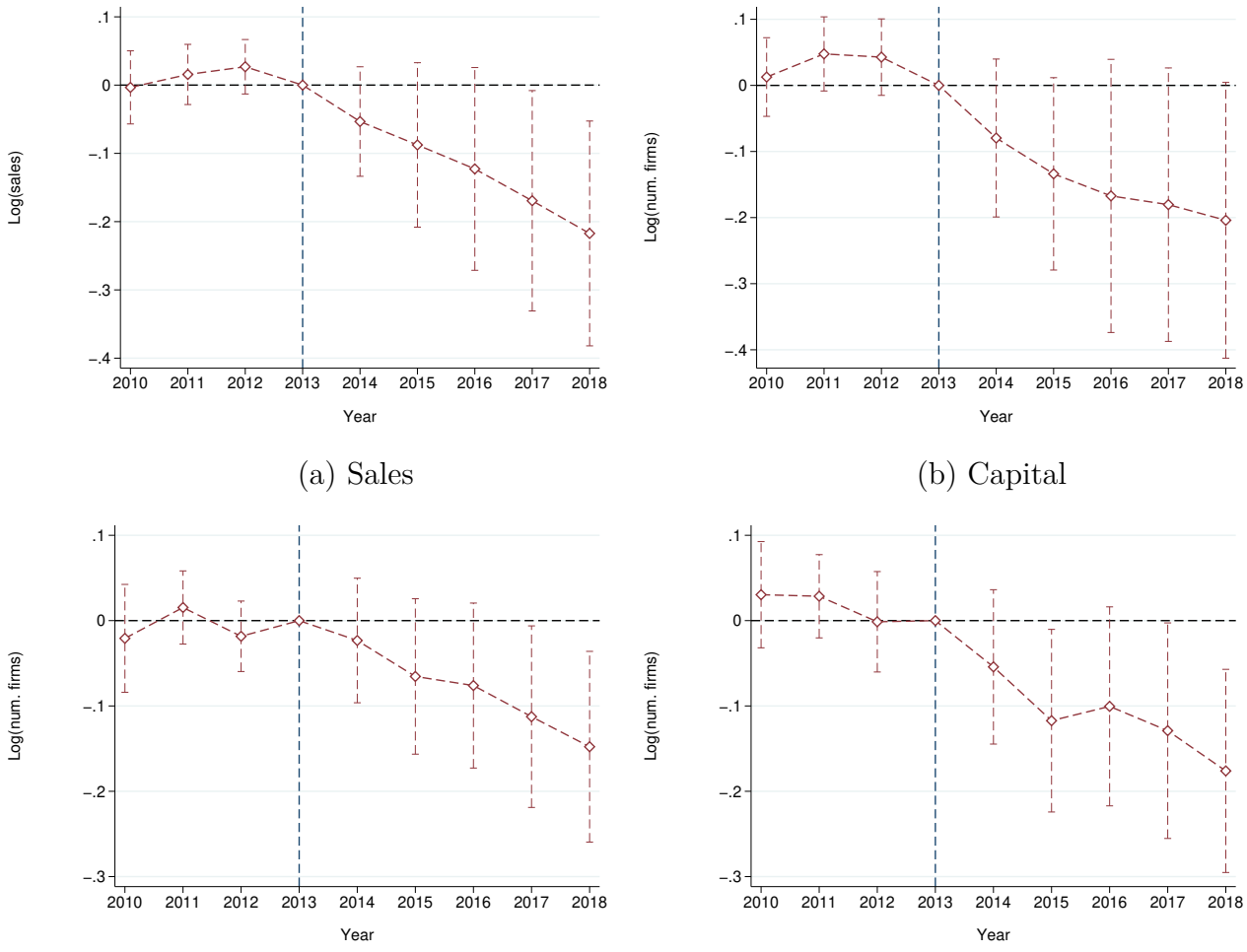
We estimate equation (3) using the log of sales, capital, labor, and total wages, as dependent variables. Table 6 reports our results. Consistent with the decline of credit, column 1 shows that treated municipalities experience a contraction of 14% in total sales of small firms after the merger. Columns 2 and 3 report a contraction of 17% in capital and 8% in employment, suggesting important complementarities between capital and labor. Column 4 shows that total wages decline by 13%, indicating a reduction in average earnings for the remaining workers. To assess whether these effects are driven by pre-trends, we plot event study graphs for the four variables in Figure 3. We find null effects of being treated before the merger for all these variables.

Table 6: Average Effect of the Merger on Small Firms Real Outcomes

	Sales	Capital	Employment	Total Wages
	(1)	(2)	(3)	(4)
Treatment$_m$× Post$_t$	-0.138**	-0.174**	-0.080*	-0.127**
	(0.067)	(0.087)	(0.044)	(0.053)
Fixed Effects				
Municipality	✓	✓	✓	✓
Muni. size-Year	✓	✓	✓	✓
Region-Year	✓	✓	✓	✓
Observations	1,431	1,431	1,431	1,431

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Figure 3: Event Study Graphs for the Local Effect of the Merger on Small Firms



(a) Sales

(b) Capital

(c) Labor

(d) Total wages

Notes. This figure reports the event study graph for the average effect of the merger on total credit to small firms. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being treated and year fixed effects. The confidence interval is at the 95% level.

Industry-specific needs of external financing

If firms have different needs of external financing, we may expect heterogeneous effects of bank competition on real outcomes. One explanation for the presence of different needs of external financing is that fixed costs of operation vary across industries (e.g., Buera et al. (2011); Buera et al. (2021)). There are industries with large fixed costs, like manufacturing, where firms operate at a larger scale in equilibrium, and industries where fixed costs are small,

like services, and firms can operate at a lower scale in equilibrium. These two characteristics of industries, scale of operations and fixed costs, determine the needs of external financing, and the vulnerability of firms to financial conditions. Following Buera et al. (2011) and Fonseca and Matray (2021), we proxy for the industry-specific scale of operations using the average firm size in each industry. Specifically, we compute the average capital per firm in a given industry to proxy for the needs of external financing, using pre-merger data. We rank industries accordingly, and split our sample in two groups of industries, each of them accounting for 50 percent of small firms' total capital. We then estimate the effect of the merger in each group. The hypothesis predicts stronger effects in industries where the average firm is larger.

Table 7: Effects on Economic Activity and the Role of Scale of Operations

	Low Needs of Ext. Financing				*High Needs of Ext. Financing*			
	Sales	Capital	Labor	Total wages	Sales	Capital	Labor	Total wages
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment$_m$× Post$_t$	-0.065	-0.029	-0.053	-0.097*	-0.196**	-0.240**	-0.085	-0.134*
	(0.050)	(0.051)	(0.043)	(0.053)	(0.102)	(0.119)	(0.064)	(0.076)
Fixed Effects								
Municipality	✓	✓	✓	✓	✓	✓	✓	✓
Muni. size-Year	✓	✓	✓	✓	✓	✓	✓	✓
Region-Year	✓	✓	✓	✓	✓	✓	✓	✓
Observations	1,431	1,431	1,431	1,431	1,431	1,431	1,431	1,431

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. We rank industries according to the average capital per firm, and split them in two groups, each of them accounting for 50 percent of small firms' total capital before the merger. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Results are reported in Table 7. Columns 1 to 4 show the response of small firms' real outcomes in treated municipalities relative to non-treated ones, considering only small firms operating in industries with low needs of external financing.[14] We find a modest and not statistically significant decline in sales, capital and labor, and a 10% decline in total wages. Columns 5 to 8 show the effects of the merger on small firms operating in industries with high needs of external financing. We find a strong decline in sales and capital, by 20% and 24%, respectively. Employment shrinks by 8% and total wages by 13%. In both groups of

[14]These industries represent 75% of small firms and 50% of total capital of small firms.

industries, the average earnings of remaining workers drop by 5%. Table A9 in the Appendix reports similar results using firm-level data where we control for a large set of fixed effects. Our findings indicate that industry-specific needs of external financing determine the response of real outcomes.

Extensive margin

Bank competition may also affect the number of firms in the economy by distorting entry and exit decisions. To quantify this effect, we unpack the change in the number of firms into the contribution of entrants and exiters as follows:

$$\frac{\text{Num. Firms}_{2018} - \text{Num. Firms}_{2010}}{\text{Num. Firms}_{2010}} = \frac{\sum_{t=2011}^{2018} \text{Num. Entrants}_t}{\text{Num. Firms}_{2010}} - \frac{\sum_{t=2011}^{2018} \text{Num. Exiters}_t}{\text{Num. Firms}_{2010}} \quad (4)$$

Then, we estimate the response of each of these three outcomes using the following specification:

$$Y_{mr} = \theta \text{Treatment}_m + \Gamma X_m + \delta_r + u_{mr} \quad (5)$$

where Y_{mr} represents each of the three ratios defined in equation (4) for municipality m and region r. Notice that we have to collapse our data set and compute all the variables at the municipality level. We do this because of two reasons. First, it allows us to quantify the exact contribution of entry and exit margins in the response of the number of small firms. Second, entry and exit is very intermittent at the annual level, leading to large standard errors when estimating our municipality-year specification.

We report our results in Table 8. Column 1 shows a negative, albeit not significant effect of th merger on the number of small firms. However, this null effect masks an important decline of business dynamism. We estimate a contraction of 8.3% in the number of entrants that is reported in column 2. This effect favors incumbent firms with less competition of potential entrants. Column 3 shows a 5.6% decline in the number of exiting firms, indicating that the positive effect of less competition dominates the negative effect of less credit when small firms choose whether to stay or exit the market. These effects are in line with the response of extensive margins in bank credit markets. Table A3 in the Appendix reports the effect of the merger on the number of small borrowers, and the contribution of entry and exit. We find a significant reduction in the creation of loans to new borrowers.

Our results are consistent with macro-development models in which better financial conditions allows productive but poor individuals to obtain credit and become entrepreneurs, leading to an increase in exit rates of low-productivity but unconstrained incumbents (e.g., Giné and Townsend (2004), Buera et al. (2011), Kaboski and Townsend (2011)). Our results suggest a new channel through which bank competition affects economic development, namely that the contraction of credit supply discourage entry decisions and reduces business dynamism.

Table 8: Effects on Number of Firms and Entry/Exit Decisions

	Num. of Small Firms (1)	Num. of Entrant Small Firms (2)	Num. of Exiting Small Firms (3)
Treatment_m	-0.027	-0.083**	-0.056***
	(0.019)	(0.040)	(0.021)
Fixed Effects			
Region	✓	✓	✓
Muni. size	✓	✓	✓
Observations	160	160	160

Notes. Column 1 reports the effects of the merger on the percentage change of number of small firms between 2010 and 2018, defined in the left hand side of equation (4). Columns 2 and 3 report the contribution of entry and exit defined in the right hand side of equation (4). Treatment_m is an indicator variable equal to one if the two merged banks operated in municipality m before the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

6 Heterogeneous Effects

In this section, we rely on our firm-level data to explore two margins of heterogeneity in the response of firms. First, we estimate the response of small firms with different marginal returns to capital, to shed light on the effects of the merger on capital misallocation. Second, we estimate the response of large firms and how it affected the levels of industry concentration.

6.1 Reallocation of Capital across Small Firms

We start by quantifying the response of capital for the average small firm operating in industries with high needs of external financing.[15] We estimate equation (7) described in Appendix B. Our results are reported in Table A8. Consistent with our municipality-level estimation results, we find a decline of 5.2% in capital for the average small firm. We plot the event-study graph in Figure A9, which shows no evidence of pre-trends. Column 2 of Table A9 in the Appendix reports null effects on capital for small firms operating in industries with low needs of external financing.

The effects of bank competition could be dampened if the estimated contraction of capital is concentrated among small firms with investment opportunities that generate low returns, or otherwise amplified if the affected small firms are those with high returns to capital. We follow the methodology developed in Bau and Matray (2020) to explore the implications of the potentially heterogeneous response of capital across small firms with different returns.

Conceptual Framework

We follow the misallocation literature that models the differences in marginal returns as a consequence of different wedges that firms face when purchasing inputs (Restuccia and Rogerson (2008), Hsieh and Klenow (2009)). This setting provides a clear link between the dispersion of marginal returns and aggregate productivity. Let τ_i^x denote the wedge faced by firm i when acquiring input x. Then, the cost faced by firm i is $(1+\tau_i^x)p^x$, where $x \in \{K, L, M\}$, and K, L, and M denote capital, labor, and materials, respectively. Thus, firm i with technology $f_i(K_i, L_i, M_i)$ maximizes the following profit function:

$$\pi_i = p_i f_i(K_i, L_i, M_i) - \sum_{x \in \{K,L,M\}} (1+\tau_i^x) p^x x_i$$

Assuming decreasing returns in each input, the first order condition for input x is given by the following equation:[16]

[15] Remember that these industries explain the decline of capital at the municipality-level.

[16] Notice that we are abstracting from markups in this setting. If we consider that firms have different market power, denoted by markup μ_i, the optimal condition would be given by:

$$p_i \frac{\partial f_i(K_i, L_i, M_i)}{\partial x_i} = \mu_i (1+\tau_i^x) p^x$$

Thus, differences in marginal returns to input x would involve both wedges and markups.

$$p_i \frac{\partial f_i(K_i, L_i, M_i)}{\partial x_i} = (1 + \tau_i^x) p^x$$

Thus, firms with higher marginal revenue productivity of input x (MRPX) have higher wedges on this input, τ_i^x. At the cost of abusing terminology, we refer to MRPX as marginal return to input x. A very important implication of having firms with different MRPX is that, by reallocating input x from low-MRPX firms towards high-MRPX firms, we can increase aggregate revenue using the same amount of input x, which will be reflected in an increase in aggegate productivity. Then, the dispersion of MRPX is a measure of misallocation of input x, and whether the decline in capital generated by the merger is concentrated among small firms with high or low marginal returns has important implications for aggregate productivity through its effects on capital misallocation.

We can show this relationship in an explicit way by using changes in the Solow residual, measured by the net output growth minus the net input growth, to proxy for changes in aggregate productivity. We denote the Solow residual for a group of firms T, e.g. firms in treated municipalities, as follows:

$$\Delta \text{Solow}_T = \Delta \text{Net Output}_T - \Delta \text{Net Input}_T$$

Relying on Petrin and Levinsohn (2012), Baqaee and Farhi (2019), and Bau and Matray (2020), we can express the Solow residual, up to a first order approximation, as follows:

$$\Delta \text{Solow}_T \approx \sum_{i \in T} \lambda_i \Delta \log A_i + \sum_{\substack{i \in T \\ x \in \{K,L,M\}}} \lambda_i \alpha_i^x \frac{\tau_i^x}{1 + \tau_i^x} \Delta \log x_i \tag{6}$$

where λ_i is the ratio of firm i's sales respect to the total sales in treated municipalities, $\Delta \log A_i$ is the change in total factor productivity (TFPQ), α_i^x is the output elasticity with respect to x, τ_i^x is a standardized measure of firm-specific input wedges prior to the merger, and $\Delta \log x_i$ is the change in the log of input x consumed by firm i. The second term in the right hand side of equation (6) denotes the effect of misallocation on aggregate productivity. Then, if firms with positive wedges (high returns) experience a larger contraction of inputs relative to firms with negative wedges (low returns), the Solow residual will decline.

We are interested in the response of capital misallocation, because capital is the most responsive input, mainly in industries with high needs of external financing, and also because there is empirical evidence showing that capital misallocation is a particularly relevant problem

in developing economies (Banerjee and Duflo (2005)). It is important to mention that the macro-development literature models financial frictions as one fundamental reason of capital misallocation.[17] In this setting, marginal returns indicate how financially constrained firms are. For example, small firms with higher marginal returns are expected to be severely constrained, they would like to borrow to accumulate more capital but they can not because they are credit constrained. To the extent that low bank competition worsen financial conditions, we may expect that small firms that were ex-ante more constrained, i.e. those with higher returns, would be more affected.

Measuring MRPK in the Data

We now discuss how to measure MRPK in the data. First, we assume that small firms have the following Cobb-Douglas revenue production function:

$$\text{Revenue}_{ijt} = \text{TFPR}_{ijt} K_{ijt}^{\alpha_j^k} L_{ijt}^{\alpha_j^l} M_{ijt}^{\alpha_j^m}$$

where K_{ijt}, L_{ijt}, and M_{ijt}, denote capital, labor, and materials, respectively, and TFPR_{ijt} represents firm unobserved productivity. Thus, MRPK is defined as follows:

$$\text{MRPK} = \alpha_j^k \frac{\text{Revenue}_{ijt}}{K_{ijt}}$$

Then, we assume that small firms operating in the same industry face the same α_j^k, which implies that the average product of capital, i.e. the ratio of revenue over capital, follows the same distribution as MRPK across small firms within the same industry. We sort small firms within industries based on this ratio of revenue over capital computed with pre-merger data, and split industries in four quartiles. Then, we estimate equation (7) in each quartile.[18]

[17] See for example Moll (2014), Midrigan and Xu (2014), Buera and Moll (2015).

[18] Notice that we focus only on small firms because the merger reduced the level of competition in this segment of the market of corporate loans. However, by considering only small firms we also avoid two main concerns in the misallocation literature. First, the possibility that small and large firms operate different technologies, e.g. large firms could be more capital intensive (higher α_j^k), and the inferred wedges could be misleading. Second, the possibility that heterogeneous marginal returns may reflect differences in monopsony power in inputs markets between small and large firms.

Results

Table 9 reports our estimation results. Columns 1 and 2 show that the merger has null effects on small firms with low returns to capital.[19] Columns 3 to 6 show that capital is more affected among small firms with higher returns. Small firms located in quartiles 2 and 3 experience a contraction of 5% in capital, and those in the top quartile shrink by 7%. Labor also declines among these firms, suggesting important complementarities in the use of capital and labor.

Our results indicate that low bank competition reallocates inputs away from small firms with high marginal returns, increasing capital misallocation. We interpret our results through the lens of standard macro-development models with financial frictions, in which marginal returns reflect how binding are credit constraints. Since low bank competition reduces the availability of credit, severely constrained small firms, i.e. small firms with high returns, are more affected.

Table 9: Effects of the Merger by Firms' Ex-ante Marginal Return to Capital

	Q1 of MRPK		*Q2-Q3 of MRPK*		*Q4 of MRPK*	
	Capital	Labor	Capital	Labor	Capital	Labor
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment$_m$× Post$_t$	-0.010	0.005	-0.052**	-0.065**	-0.072**	-0.066*
	(0.031)	(0.032)	(0.026)	(0.030)	(0.031)	(0.034)
Observations	11,466	11,466	18,513	18,513	13,959	13,959
Fixed Effects						
Firm	✓	✓	✓	✓	✓	✓
Firm size-Year	✓	✓	✓	✓	✓	✓
Muni. size-Year	✓	✓	✓	✓	✓	✓
Sector-Year	✓	✓	✓	✓	✓	✓
Region-Year	✓	✓	✓	✓	✓	✓

Notes. All dependent variables are in logs. We consider industries with high needs of external financing. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. We also include a vector of fixed effects for each quartile of the distribution of sales across small firms before the merger, interacted with year fixed effects. We rank small firms within industries according to the ratio Revenue/Capital and split each industry in quartiles. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

[19] We split small firms in quartiles. The first quartile represent 30% of total capital of small firms in industries with high needs of external financing. The second and third quartile represent 34% and the top quartile 36%.

6.2 Reallocation of Sales towards Large Firms

We have shown that the decline in bank competition was a negative supply side shock for small firms, who experience a reduction in the availability of credit, and consequently reduce sales and demand less capital and labor. Large firms, on the other hand, represent a segment of the market of corporate loans where competition was not affected by the merger. Consistent with this, we find null effects on total loans to large firms. However, it is still possible to observe a response of large firms' real outcomes. For example, large firms may expand by taking over the market share previously attended by shrinking small firms. This *local GE effect* has important implications for industry concentration. We quantify the role of this channel by estimating the firm-level regression defined in equation (7), using the log of sales as our dependent variable, and considering all industries in the economy, independently on their needs of external financing.

Table 10: Average Effect of the Merger on Sales and Industry Concentration

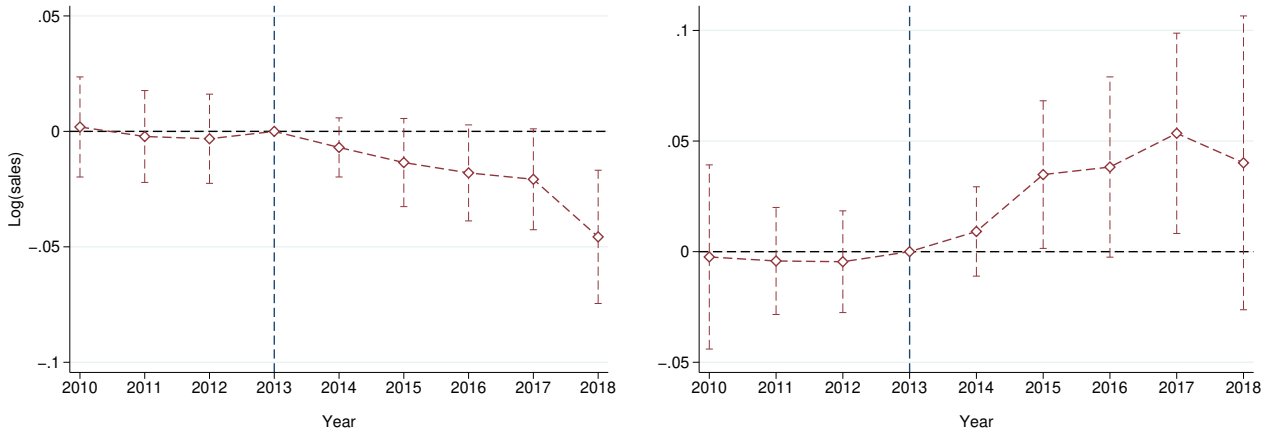
	Small	Large	HHI
	(1)	(2)	(3)
Treatment$_m$× Post$_t$	-0.020**	0.033*	0.032*
	(0.009)	(0.020)	(0.016)
Fixed Effects			
Firm	✓	✓	✗
Firm size-Year	✓	✓	✗
Muni. size-Year	✓	✓	✓
Sector-Year	✓	✓	✓
Region-Year	✓	✓	✓
Controls	✓	✓	✓
Observations	187,650	51,183	19,528

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. We also include a vector of fixed effects for each quartile of the distribution of sales across small firms (column 1) and large firms (column 2) before the merger, interacted with year fixed effects. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Table 10 reports our results. Column 1 shows that the average small firm operating in a treated municipality experience a contraction of 2% in total sales, consistent with our municipality-level results. Column 2 reports that the average large firm expands in terms of

sales by 3.3% after the merger. We plot event study graphs for these effects in Figure 4, which shows that being in an treated municipality has null effects on small and large firms before the merger. Finally, column 3 shows the response of industry concentration.[20] We find that the contraction of small firms and the expansion of large firms led to a 3.2% increase in concentration for the average industry.

Figure 4: Event Study Graphs for the Average Effect of the Merger on Sales



(a) Small firms (b) Large firms

Notes. This figure reports the event study graph for the average effect of the merger on small and large firms' credit. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being in a treated municipality and year fixed effects. The confidence interval is at the 95% level.

We now test whether our results are driven by *local GE effects* through which large firms expand by taking over the market share previously attended by shrinking small firms. We estimate the response of large firms' sales in industries with low and high needs of external financing. Given that the contraction of small firms is deeper in industries with high needs of external financing, if *local GE effects* are driving our results, we may expect a stronger increase in sales among large firms operating in these industries.

We report our results in Table 11. Columns 1 and 3 show that, consistent with our

[20] We estimate the following municipality-industry level regression:

$$\ln Y_{jmrt} = \theta \text{Treatment}_m \times \text{Post}_t + \sum_{q=1}^{4} X_m^q \times \delta_t + \delta_m + \delta_{rt} + \delta_{jt} + u_{jmrt}$$

where $\ln Y_{jmrt}$ is the log of HHI in industry j, municipality m, region r, and year t. We include municipality fixed effects, and time-varying region and industry fixed effects.

municipality-level results, small firms experience a 5% contraction in sales in industries with high needs of external financing, while small firms operating in industries with low needs of external financing are not affected. Columns 2 and 4 show that large firms expand in the same industries where small firms shrink. Large firms operating in industries with high needs of external financing expand by 8%, while the rest of large firms are not significantly affected. Our results indicate that *local GE effects* are crucial to understand how bank competition affects real outcomes, and provide a mechanism through which competition in financial markets affects competition in the real economy

Table 11: Average Effect of the Merger on Small and Large Firms' Sales by Industry

	Low Needs of Ext. financing		*High Needs of Ext. financing*	
	Small	Large	Small	Large
	(1)	(2)	(3)	(4)
Treatment$_m$× Post$_t$	-0.010	0.003	-0.049**	0.084**
	(0.011)	(0.026)	(0.021)	(0.034)
Observations	143,370	30,609	44,280	20,565
Fixed Effects				
Firm	✓	✓	✓	✓
Firm size-Year	✓	✓	✓	✓
Muni. size-Year	✓	✓	✓	✓
Sector-Year	✓	✓	✓	✓
Region-Year	✓	✓	✓	✓

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. We also include a vector of fixed effects for each quartile of the distribution of sales across small firms (columns 1 and 3) and large firms (columns 2 and 4) before the merger, interacted with year fixed effects. We rank industries according to the average capital per firm, and split them in two groups, each of them accounting for 50 percent of small firms' total capital before the merger. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

7 Conclusions

In this paper, we estimate the effects of bank competition on economic development, specifically on capital misallocation and industry concentration. We study a merger episode between the

two largest banks serving to small businesses in Peru. By exploiting differences in the banks' geographical footprint, we can estimate how the merger changed the degree of competition in the local banking markets where these two banks operated, and how it affected the supply of credit and the allocation of resources across heterogeneous firms.

We present empirical evidence that low bank competition has detrimental effects on credit and economic activity, mainly in industries with high needs of external financing. We document three novel channels through which low bank competition distorts the allocation of resources across firms in our setting: (i) reallocating resources away from small firms with high marginal returns to capital, (ii) concentrating economic activity towards large firms, and (iii) favoring incumbent firms over potential entrants.

Our findings have important policy implications, mainly for developing countries with highly concentrated banking sectors. Promoting competition in financial markets can improve the allocation of resources across firms, and, when designing merger regulations, policy makers should take into consideration the distorting effects of mergers in the allocation of resources in the economy.

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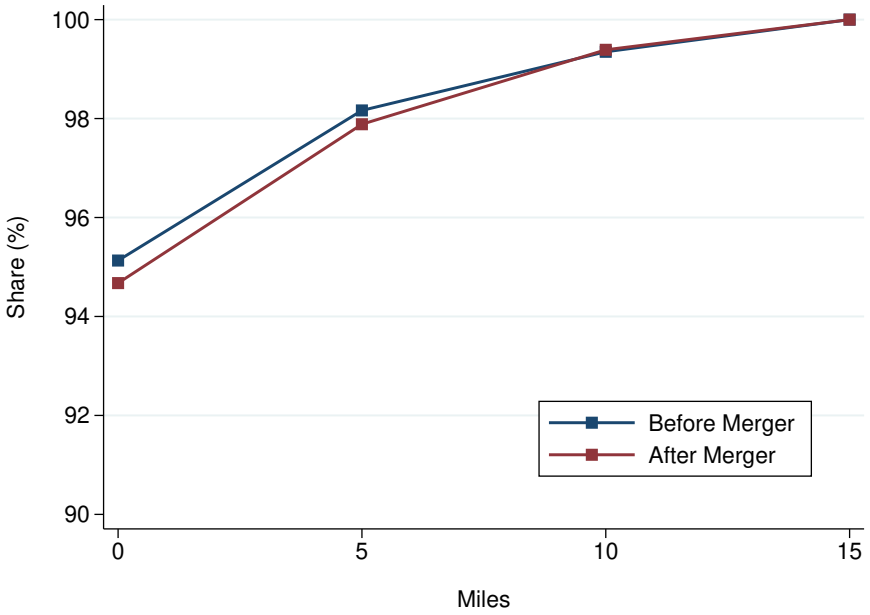
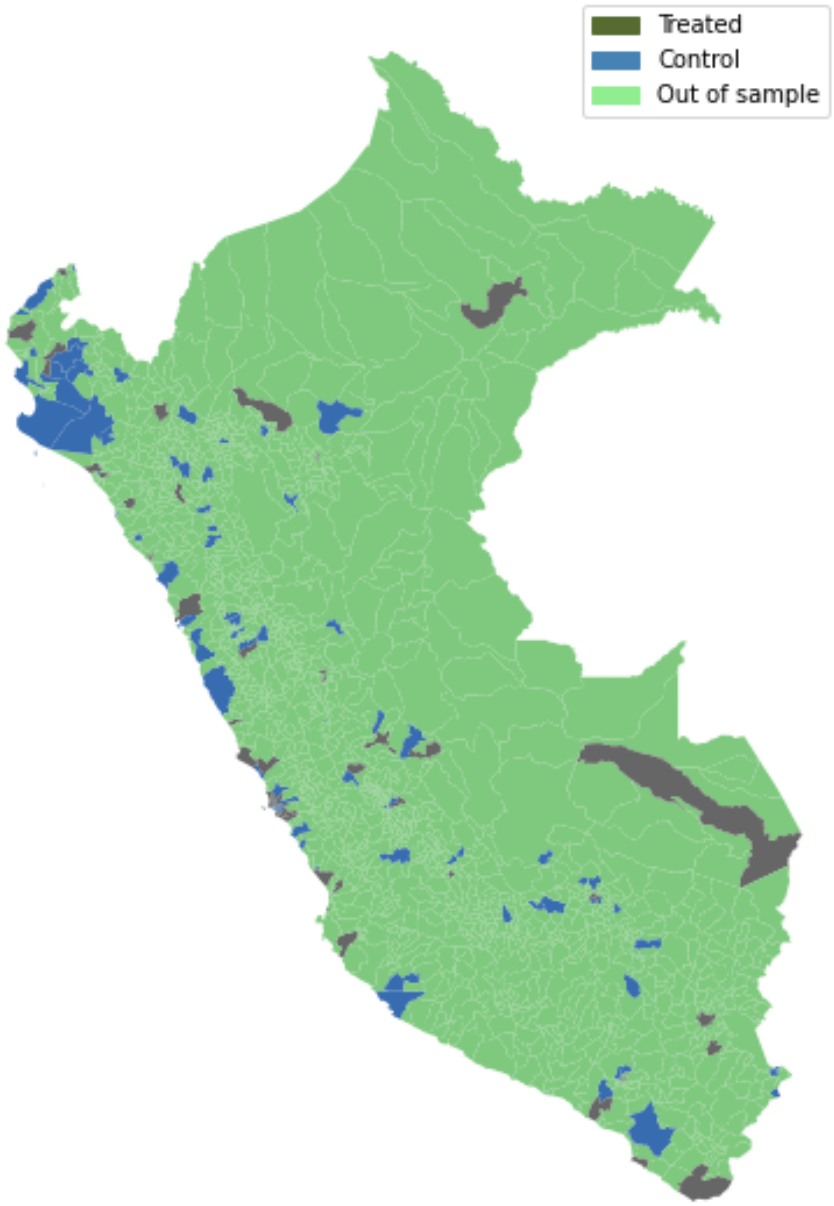
Appendix A. Figures and Tables

Figure A1: Share of Loans provided by Banks with branches close to Firm's Location



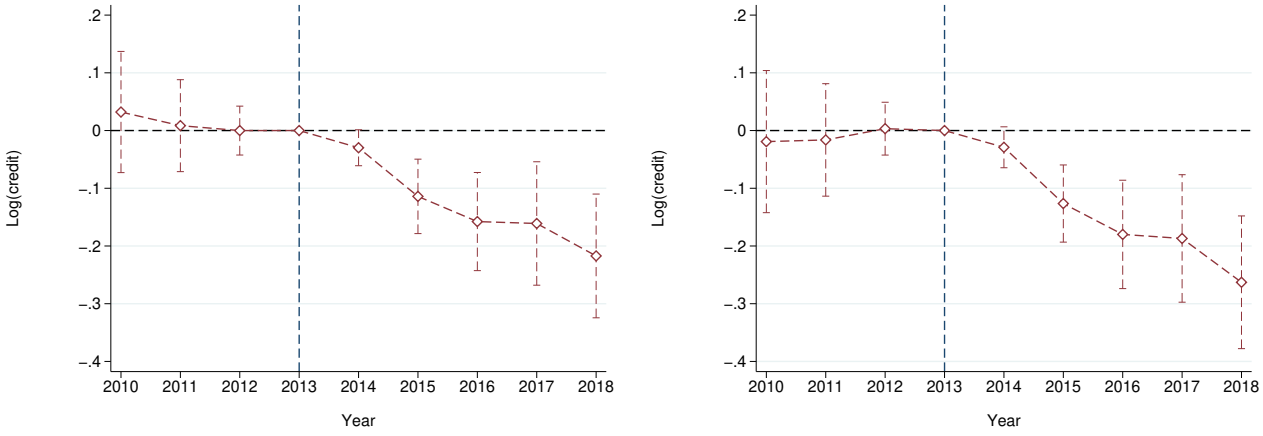
Notes. This figure shows the share of loans that small firms borrow from banks operating in its own municipality, and from banks operating in municipalities located within 5, 10, and 15 miles.

Figure A2: Geographical Distribution of Exposed and Non-Exposed Municipalities in Peru



Notes. This figure shows the geographical distribution of municipalities. Color dark-green represents treated municipalities, color blue indicates control municipalities, and color light-green are out of our sample.

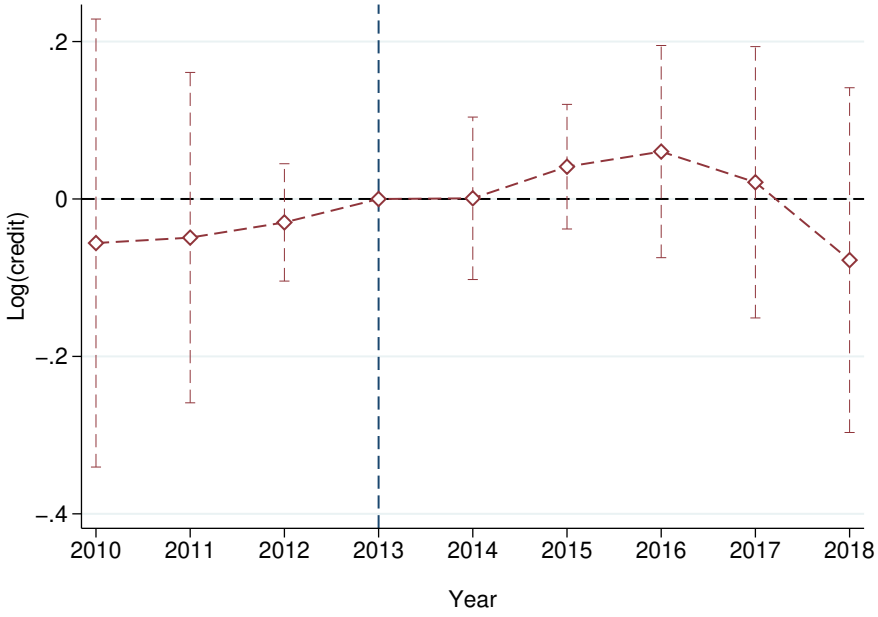
Figure A3: Event Study for the Average Effect of the Merger on Loans to Small Firms



(a) Municipality and Year FE (b) Municipality, and Muni. Size-year FE

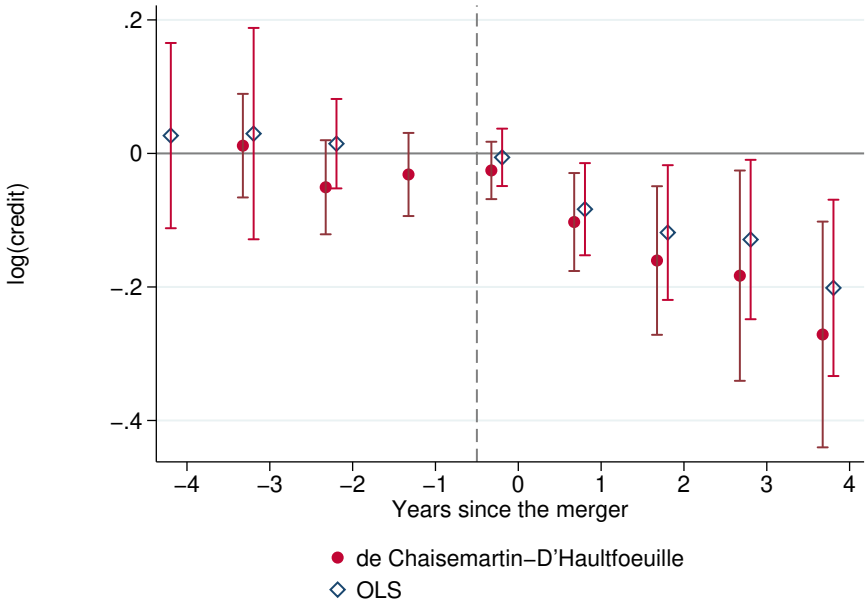
Notes. This figure reports the event study graphs for the average effect of the merger on small firms' credit. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being in a treated municipality and year fixed effects. The confidence interval is at the 95% level.

Figure A4: Event Study for the Average Effect of the Merger on Loans to Large Firms



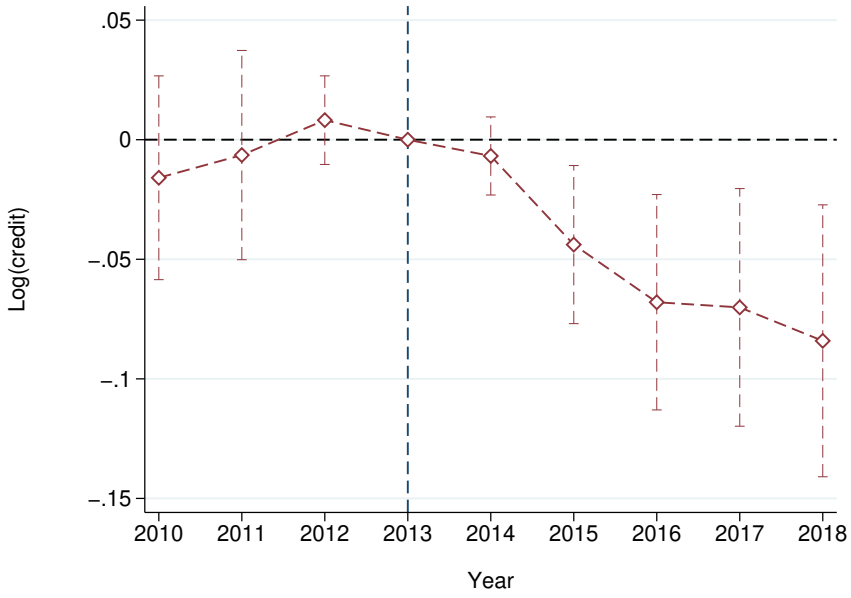
Notes. This figure reports the event study graph for the average effect of the merger on small firms' credit. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being in a treated municipality and year fixed effects. The confidence interval is at the 95% level.

Figure A5: Event Study for the Average Effect of the Merger on Loans to Small Firms: de Chaisemartin and D'Haultfœuille (2020)



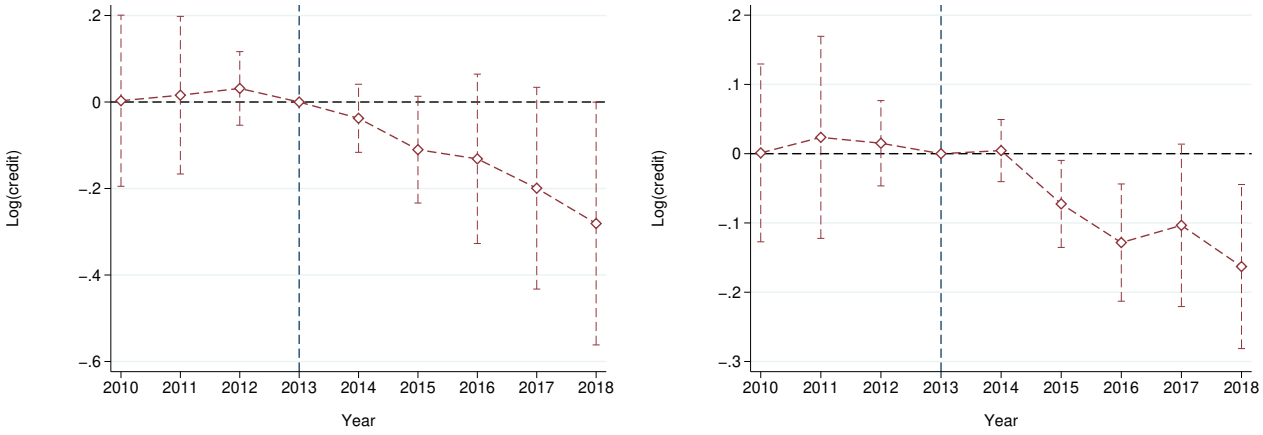
Notes. This figure reports the event study graph for the average effect of the merger on small firms' credit. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being in a treated municipality and year fixed effects. The confidence interval is at the 95% level.

Figure A6: Event Study for the Effect of 1 SD Higher Exposure on Loans to Small Firms



Notes. This figure reports the event study graph for the average effect of the continuum measure of treatment on total credit to small firms. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between the continuum treatment measure, in standard deviations, and year fixed effects. The confidence interval is at the 95% level.

Figure A7: Event Study Graphs for the Local Effect of the Merger on Credit



(a) Merged banks (b) Non-merged banks

Notes. This figure reports the event study graph for the average effect of the merger on total credit to small firms. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being treated and year fixed effects. The confidence interval is at the 95% level.

Table A1: Characteristics of Large Firms

	All Municipalities		Treated		Non-treated	
	Mean	Median	Mean	Median	Mean	Median
	(1)	(2)	(3)	(4)	(5)	(6)
Credit Registry						
Loans	3.7	0.6	3.0	0.6	4.4	0.6
Num. of Lenders	3.2	3.0	3.3	3.0	3.1	3.0
Distinct firms	4,165		2,217		1,948	
Tax Reports						
Sales	29.2	6.1	20.5	5.9	38	6.4
Capital	54.3	4.5	24.6	4.2	84	5
Num. Workers	300	86	251	80	350	93
Distinct firms	5,713		2,852		2,861	

Notes: Pre-merger values. Loans, sales, and capital in USD million. We consider a balanced panel of firms used to estimate average effects of large firms. We trim firms in the bottom of the loan size distribution accounting for 1% of total loans in our Credit Registry data. We trim firms in the bottom of the sales distribution accounting for 1% of total sales in our Tax Reports data.

Table A2: Effects of the Merger on Credit Excluding Lima.

	Small		
	(1)	(2)	(3)
Treatment$_m$× Post$_t$	-0.158***	-0.158**	-0.120
	(0.048)	(0.065)	(0.105)
Fixed Effects			
Year	✓	✗	✗
Municipality	✓	✓	✓
Region-Year	✗	✓	✓
Muni. size-Year	✗	✗	✓
Observations	1,020	1,020	1,020

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. We include a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger, interacted with year fixed effects. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Table A3: Effects on Number of Small Borrowers and Entry/Exit from Bank Credit Market

	Num. of Small Borrowers (1)	Num. of New Small Borrowers (2)	Num. of Exiting Small Borrowers (3)
Treatment_m	0.053	-0.271**	-0.324***
	(0.038)	(0.135)	(0.124)
Fixed Effects			
Region	✓	✓	✓
Muni. size	✓	✓	✓
Observations	160	160	160

Notes. Column 1 reports the effects of the merger on the percentage change of number of small borrowers between 2010 and 2018, defined in the left hand side of equation (4). Columns 2 and 3 report the response of entry to and exit from bank credit markets defined following the right hand side of equation (4). Treatment_m is an indicator variable equal to one if the two merged banks operated in municipality m before the merger. Muni. size denotes a vector of fixed effects for each quartile of the distribution of total loans percapita and number of banks across municipalities before the merger. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Appendix B. Firm-level analysis

In this section we describe the difference-in-differences estimator used to quantify the effects of the merger at the firm-level. We then report the response of credit and real outcomes for small and large firms separately. Notice that there are two main differences respect to the empirical equation estimated in sections 4 and 5. First, here we focus on a balanced panel of firms, i.e. firms that are present before and after the merger. Second, we include a set of high dimensional fixed effects that control for unobserved time-invariant heterogeneity at the firm level and time-varying shocks at the industry-year level.

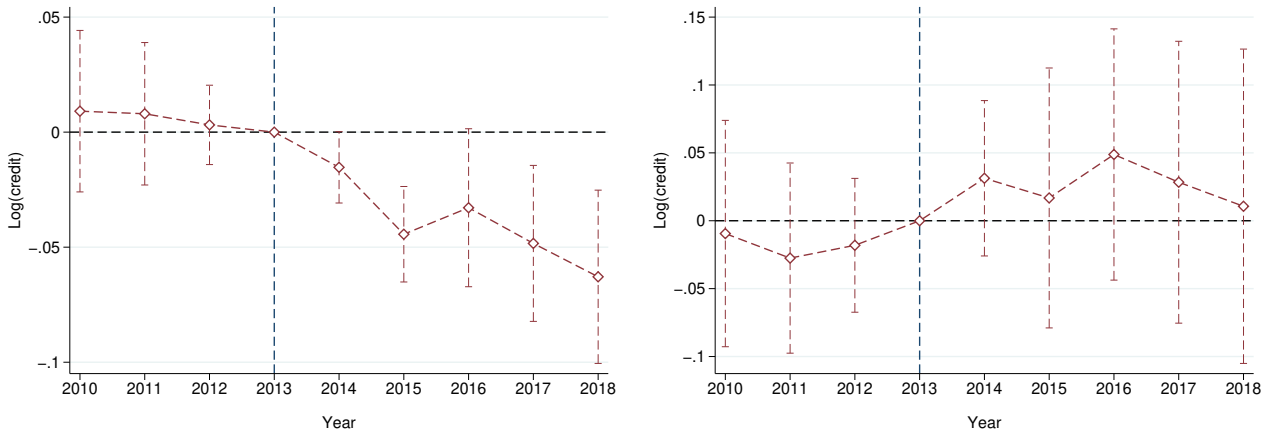
We estimate the following regression:

$$\ln Y_{ijmrt} = \theta \times \text{Treatment}_m \times \text{Post}_t + \sum_{q=1}^{4} X_{im}^q \times \delta_t + \gamma \text{age}_{it} + \delta_i + \delta_{jt} + \delta_{rt} + u_{ijmt} \qquad (7)$$

where $\ln Y_{ijmrt}$ denotes the outcome of a firm i operating in industry j, municipality m, region r, and year t. We estimate the response of loans, sales, capital, and employment. Treatment_m is defined by equation (1) in the main text, and Post_t is an indicator variable equal to one if $t \geq 2014$. X_{im} is a vector of fixed effects for each quartile of the municipality size distribution, as we discussed in the main text, and also for the firm size distribution, measured by loan size (when estimating the response of credit) and sales (when estimating the response of real outcomes). We include firm fixed effects δ_i to control for any time-invariant unobserved heterogeneity at the firm-level, and time-varying industry and region fixed effects, δ_{jt} and δ_{rt}, to control for aggregate shocks affecting firms in a given industry and region, respectively. Standard errors are clustered at the municipality level.

The coefficient of interest is θ, which captures the effect of the merger on different firm-level outcomes. We identify this parameter comparing firms operating in exposed municipalities with firms operating in non-exposed municipalities before and after the merger. By including the set of fixed effects described above, we compare firms within cells defined by industry, region, and size bin. Our identification exploits differences in the merged banks' geographical footprint, and it only requires for firms in treated and control municipalities, within these cells, to be on similar *trends* prior to the merger.

Figure A8: Event Study Graphs for the Average Effect of the Merger on Credit



(a) Small firms (b) Large firms

Notes. This figure reports the event study graphs for the average effect of the merger on credit at the firm-level. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being in a treated municipality and year fixed effects. The confidence interval is at the 95% level.

Table A4: Average Effect of the Merger on Credit

	Small				Large			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment$_m$× Post$_t$	-0.046***	-0.062***	-0.057***	-0.045***	-0.004	0.017	0.032	0.041
	(0.013)	(0.016)	(0.015)	(0.013)	(0.037)	(0.037)	(0.047)	(0.040)
Fixed Effects								
Year	✓	✓	✓	✓	✓	✓	✓	✓
Firm	✓	✓	✓	✓	✓	✓	✓	✓
Firm size-Year	✗	✓	✓	✓	✗	✓	✓	✓
Muni. size-Year	✗	✓	✓	✓	✗	✓	✓	✓
Sector-Year	✗	✗	✓	✓	✗	✗	✓	✓
Region-Year	✗	✗	✗	✓	✗	✗	✗	✓
Controls	✓	✓	✓	✓	✓	✓	✓	✓
Observations	195,551	195,551	195,551	195,551	36,693	36,693	36,693	36,693

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. Firm size and Muni. size denote a vector of fixed effects for each quartile of the distribution of firm loans before the merger, and the distribution of total loans percapita and number of banks across municipalities before the merger, respectively. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Table A5: Average Effect of the Merger on Credit - Bank Competition and Bank's Ownership

	Continuum Treatment (1)	Excluding Bank M2's Clients (2)
$\text{Treatment}_m^{\text{C}} \times \text{Post}_t$	-0.014**	
	(0.007)	
$\text{Treatment}_m \times \text{Post}_t$		-0.038***
		(0.012)
Fixed Effects		
Firm	✓	✓
Firm size-Year	✓	✓
Muni. size-Year	✓	✓
Sector-Year	✓	✓
Region-Year	✓	✓
Controls	✓	✓
Observations	195,551	171,418

Notes. All dependent variables are in logs. Treatment_m is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post_t is an indicator variable equal to one after the merger. $\text{Treatment}_m^{\text{C}}$ is a continuum measure of treatment defined in equation (2). Firm size and Muni. size denote a vector of fixed effects for each quartile of the distribution of firm loans before the merger, and the distribution of total loans percapita and number of banks across municipalities before the merger, respectively. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Table A6: Average Effect of the Merger on Credit by Tercile of Exposure.

	(1)
Treatment $\text{T1}_m \times \text{Post}_t$	-0.029**
	(0.014)
Treatment $\text{T2}_m \times \text{Post}_t$	-0.040*
	(0.022)
Treatment $\text{T3}_m \times \text{Post}_t$	-0.052***
	(0.018)
Fixed Effects	
Firm	✓
Firm size-Year	✓
Muni. size-Year	✓
Sector-Year	✓
Region-Year	✓
Controls	✓
Observations	195,551

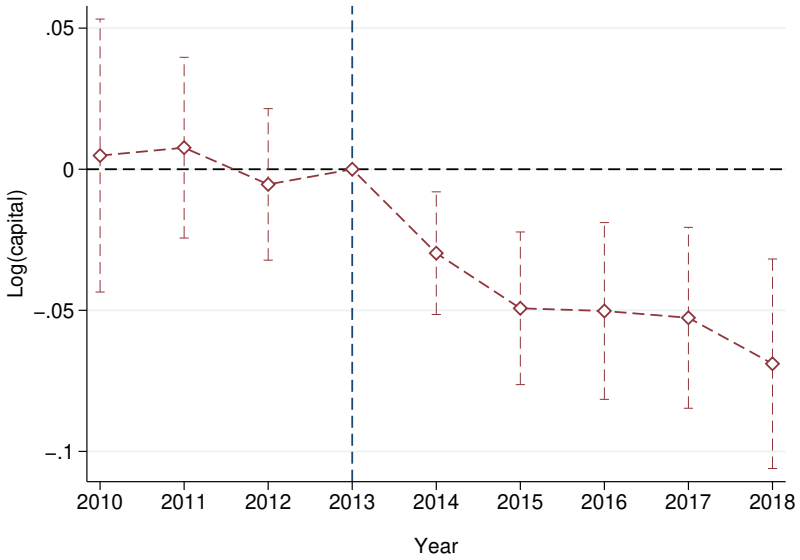
Notes. Treatment T1_m indicates whether the firm operates in a treated municipality in the bottom tercile of the continuum treatment measure, Treatment T2_m in the middle, and Treatment T3_m in the top tercile.

Table A7: Effects of the Merger on Credit Excluding Lima.

	(1)
Treatment$_m$× Post$_t$	-0.057*
	(0.033)
Fixed Effects	
Firm	✓
Firm size-Year	✓
Muni. size-Year	✓
Sector-Year	✓
Region-Year	✓
Controls	✓
Observations	84,480

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. Firm size and Muni. size denote a vector of fixed effects for each quartile of the distribution of firm loans before the merger, and the distribution of total loans percapita and number of banks across municipalities before the merger, respectively. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Figure A9: Event Study Graphs for the Effect of the Merger on Small Firms' Capital in Industries with Higher Needs of External Financing



Notes. This figure reports the event study graph for the average effect of the merger on large firms' credit. The dependent variable is in logs. The merger takes place in 2014. Each dot is the coefficient on the interaction between being in a treated municipality and year fixed effects. The confidence interval is at the 95% level.

Table A8: Effects of the Merger on Capital for the Average Small Firm in Industries with High Needs of External Financing

	Small firms' capital
	(1)
Treatment$_m$× Post$_t$	-0.052***
	(0.018)
Fixed Effects	
Firm	✓
Firm size-Year	✓
Muni. size-Year	✓
Sector-Year	✓
Region-Year	✓
Controls	44,280
Observations	44,280

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. Firm size and Muni. size denote a vector of fixed effects for each quartile of the distribution of firm loans before the merger, and the distribution of total loans percapita and number of banks across municipalities before the merger, respectively. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.

Table A9: Effects on Small Firms' Economic Activity

	Low Needs of Ext. Financing			*High Needs of Ext. Financing*		
	Sales	Capital	Labor	Sales	Capital	Labor
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment$_m$× Post$_t$	-0.010	0.019	-0.006	-0.049**	-0.052***	-0.043**
	(0.011)	(0.012)	(0.011)	(0.021)	(0.018)	(0.018)
Fixed Effects						
Firm	✓	✓	✓	✓	✓	✓
Firm size-Year	✓	✓	✓	✓	✓	✓
Muni. size-Year	✓	✓	✓	✓	✓	✓
Sector-Year	✓	✓	✓	✓	✓	✓
Region-Year	✓	✓	✓	✓	✓	✓
Controls	✓	✓	✓	✓	✓	✓
Observations	143,370	143,370	143,370	44,280	44,280	44,280

Notes. All dependent variables are in logs. Treatment$_m$ is an indicator variable equal to one if the two merged banks operated in municipality m before the merger, and Post$_t$ is an indicator variable equal to one after the merger. Firm size and Muni. size denote a vector of fixed effects for each quartile of the distribution of firm loans before the merger, and the distribution of total loans percapita and number of banks across municipalities before the merger, respectively. We rank industries according to the average capital per firm, and split them in two groups, each of them accounting for 50 percent of small firms' total capital before the merger. Standard errors are clustered at the municipality level. *, **, and *** denote 10, 5, and 1% statistical significance respectively.