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The competitive effect of a bank megamerger on credit supply☆

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ABSTRACT

We study the effect of a merger between two large banks on credit market competition. We identify the competitive effect of the merger using matched loan-level and firm-level data and exploiting variation in the merging banks' market overlap across local lending markets. On the credit market side, we find a reduction in lending, in particular through termination of relationships. In the average market, bank credit decreases by 2.7%. On the real side, firm exit increases by 4%, whereas firms that do not exit and firms that start up experience no adverse real effect on investment and employment.

1. Introduction

Modern banking markets are dominated by megabanks. The preeminence of megabanks is the result of several decades of mergers and acquisitions in the banking industry, spurred by deregulation and technological developments. High concentration of banking markets was achieved through mergers among small banks and acquisitions of small banks by larger banks. As a result of these highly concentrated banking markets, mergers among megabanks become common. While the effects of traditional mergers among small banks and between small and large banks are well-understood (Berger et al., 1999; Amel et al., 2004), much less is known about bank megamergers.

Studying mergers between megabanks is instructive not only because such mergers have become more frequent in the recent period, but also and more importantly because their potential effects are different from those of traditional mergers. The literature has identified three main effects of traditional mergers: (a) change in lending technology; (b) efficiency gains; and (c) change in market power. Regarding (a), many studies have analyzed how small banks acquired by larger ones change their lending practices and shift away from small business lending (for instance Berger et al. (1998) and Peek and Rosengren (1998)). The usual explanation for this pattern is that small banks tend to rely on relationship lending whereas large banks rely more on arm's length lending (Stein, 2002; Berger and Udell, 2002). This line of thought suggests that mergers between large banks are less likely to generate such changes because they already use similar lending technologies. Regarding (b), consolidation among small banks has been shown to generate efficiency gains at least until up to a certain size, whereas the evidence is mixed on whether mergers involving larger banks generate scale economies or run into decreasing returns to scale (Amel et al., 2004).

In contrast, earlier literature suggests that (c) becomes more important as bank size grows larger. Studies of mergers between small and medium-sized banks show that they can increase market power and harm the provision of credit, in particular when merging banks have significant market overlap (Sapienza, 2002) and when they are large (Erel, 2011). However, it remains an open question as to whether these results can be extrapolated to mergers between the type of very large banks that have emerged in the last decade. On the one hand, the emergence of megabanks is associated to higher levels of concentration, which suggests that anti-competitive effects may become more severe. On the other hand, competition between large banks may be of a different nature than competition between small banks, for instance because they rely on different lending technologies. Ultimately, the external validity of previous studies for megamergers is an empirical question, which is the focus of this paper: Do mergers between megabanks lead to a reduction in credit supply to small and medium-sized businesses?

To make progress on this question, we rely on matched loan-level and firm-level data to analyze the merger between two large banks. Two European banks ("Bank A" and "Bank B" hereafter) combined at the end of the 2000s to form a new banking group.

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Before the merger, Bank A and Bank B had respectively 400 billions euros and 600 billions euros in total assets, which represent about 20% and 30% of annual domestic GDP. As a matter of comparison, both banks had higher total assets relative to domestic GDP than the largest US bank.[1] Regarding business lending, Bank A and Bank B were the fourth and sixth largest banks of the country, with national market shares of 10.2% and 5.1%. With a total market share of 15.3%, the merged bank became the second largest bank for firm lending. The merger increased the average local Herfindahl-Hirschman Index (HHI) from 1,900 to 2,100, with substantial heterogeneity across local markets.

Our empirical strategy to identify the effect of the merger that operates through the increase in concentration is the following. We compare lending outcomes in local markets in which both merging banks had large market shares prior to the merger ("treated" local markets) with lending outcomes in local markets in which only one of the merging banks or none of them had large market shares prior to the merger ("control" local markets). In the former type of local market the merger leads to a significant increase in concentration, whereas in the latter it does not. The use of loan-level data is crucial for our empirical design because it enables us to include firm fixed effects and estimate how the amount of credit extended by different banks to the same borrower changes after the merger (as in Khwaja and Mian (2008) and Jimenez et al. (2012)). We are thus able to isolate the effect of the merger on credit supply holding fixed firm-specific credit demand. Furthermore, the use of bank fixed effects allows us to control for changes in strategy or management efficiency at the bank level.

We have three main sets of results. First, we find that the merging banks reduce lending in local markets where their market shares overlapped prior to the merger relative to local markets in which at least one of the merging banks had a small market share. We estimate that in the average market the merging banks reduce credit supply by 5.3% relative to non-merging banks. This estimate hinges on the identifying assumption that firm-level credit demand shocks are evenly spread out across lenders, which ensures that they are absorbed by firm fixed effects. This assumption might be violated if firms strategically aim at maintaining several lending relationships to reduce their dependence to a single bank; if firms use different banks to obtain different types of credit (e.g., long term vs. credit lines) as suggested for instance by Paravisini et al. (2016); or if credit demand to the largest banks is more procyclical. We design several tests to rule out such confounding explanations. We also show that the reduction in credit by the merging banks mainly takes place at the extensive margin: they extend less credit through new relationships (both to new firms or to existing firms) and reduce disproportionately lending by terminating relationships.

Second, we analyze whether the reduction in lending by the merging banks is offset by other banks increasing credit supply. To account for these substitution effects, we sum loan amounts over all the banks up to the firm level and compare total bank credit for firms in local markets in which both merging banks had large pre-merger market shares relative to firms in local markets in which the merging banks had low pre-merger market shares. We find a reduction in bank credit of a similar order of magnitude as in the specification at the firm-bank level. Estimated substitution effects are thus weak.

Third, we ask whether this reduction in bank credit has real effects. To this aim, we match the loan-level data with firms' annual financial statements. Our central result is that the main real effect of the merger is to increase firm exit, whereas continuing firms experience no adverse effect. The increase in firm exit is consistent with the analysis at the firm-bank level showing that a significant part of the reduction in lending operates through the termination of relationships. Our estimate implies that in the average market the merger leads to an increase in the exit probability by 0.3 percentage points per year, which represents a 4% increase. In contrast, for firms that do not exit, we show that they experience no significant change in investment and employment.

Our paper contributes to the literature on the competitive effects of bank mergers along two dimensions. First, it extends earlier studies to the case of mergers between megabanks. Sapienza (2002) studies bank mergers in Italy during the early 1990s and find that, while on average loan rates decrease post merger, the result is reversed in local markets in which the merging banks' market shares overlap. Specifically, in local markets in which the target bank operates, mergers lead to an increase in the loan rate when the market share of the acquirer exceeds 6% (see Table IV in Sapienza (2002)). As a matter of comparison, the pre-merger market shares of Bank A and Bank B were respectively 10.2% and 5.1%. Erel (2011) studies bank mergers in the U.S. between 1990 and 2000 and find that loan rates decrease post merger except in the case of mega-acquirers, which are defined as banks with total assets above $10 billion. Bank A and Bank B had total assets of about € 400 billion and € 600 billion, respectively, well above that threshold. Erel (2011) also shows that loan rates increase when the merging banks' market shares have significant market overlap. It is tempting to extrapolate these results and hypothesize that anti-competitive effects become more and more acute as the size of banks involved in mergers keeps growing, but there little direct evidence on this. Our paper attempts to fill this gap.

A few papers have analyzed the competitive effects of bank megamergers. Carow et al. (2006) study the ten largest domestic U.S. bank mergers between 1991 and 2001 and Fraser et al. (2011) consider the six largest U.S. bank mergers between 1992 and 2006. These papers find that firms borrowing from banks involved in megamergers experience a negative stock price reaction when the merging banks have substantial geographic overlap, suggesting that megabanks are able to exercise market power and extract rents from borrowers. The megabanks considered in these papers are of similar size as Bank A and Bank B. Our contribution is to identify the channel through which borrowers might be hurt by megamergers by estimating the effect on bank lending using exhaustive loan-level data.

Second, we contribute to the literature by studying the real effects of bank mergers. This contribution is allowed by access to firm-level accounting data that can be matched to the exhaustive loan-level data. We can therefore assess how the reduction in credit supply caused by the megamerger affects real outcomes such as firm exit and entry, capital expenditures and employment.

Another strand of the bank merger literature has focused on the consolidation of the U.S. banking industry and the effect on small business lending due to the increase in bank size and the resulting shift in lending technology (Berger and Udell (1996), Peek and Rosengren(1996; 1998), Strahan and Weston (1998); Berger et al. (1998)). Karceski et al. (2005) find, on a sample of bank mergers from Norway, that borrowers of target banks suffer from mergers while borrowers of acquiring banks benefit, suggesting a strategic focus at the merged bank at the expenses of target borrowers. Degryse et al. (2011) show, on a sample of bank mergers from Belgium, that single-relationship borrowers are more likely to be dropped by target banks. This line of literature demonstrates that the technological, organizational, and strategic changes at target banks can disrupt credit supply to borrowers of target banks, especially when target banks are small. We abstract

[1] At the end of 2015, JPMorgan Chase had total assets worth 11% of US GDP. Moreover, the merging banks were predominantly active in the domestic market, so their high total assets/domestic GDP ratios truly reflect a large domestic presence.

Table 1
Summary statistics.

	Obs.	Mean	S.D.	p25	p50	p75
Panel A: Firm-bank level						
Outstanding loans (k€)	467,828	793	1500	16	76	270
Outstanding loans/Total liabilities	467,828	0.100	0.138	0.009	0.047	0.134
Panel B: Firm level						
Number of bank relations	244,012	1.92	1.01	1	2	2
Outstanding loans/Total liabilities	244,012	0.192	0.192	0.043	0.134	0.283
Market overlap	244,012	0.0055	0.0025	0.0036	0.0054	0.0068
Exit	244,012	0.202	0.402	0	0	0
Net trade credit/Total liabilities	156,513	−0.055	0.228	−0.203	−0.046	0.080
Investment/Total liabilities	156,513	0.045	0.118	0	0.015	0.052
Employment/Total liabilities (worker/k€)	156,513	0.013	0.014	0.005	0.010	0.017
Interest expense/Total liabilities	156,513	0.011	0.015	0.002	0.007	0.015

Note: Panel A reports summary statistics on loan amounts at the firm-bank relationship level. Panel B reports reports summary statistics at firm level.

from these considerations in our empirical investigation of mega-banks. On the theory side, Milbourn et al. (1999) propose that bank megamergers may be motivated by an increase in scope. This motive is likely absent in our empirical setup because the merging banks offer a similar range of products.

2. Empirical design

2.1. The merger

Bank A and Bank B were universal banks providing a wide range of financial products and services. In the mid 2000s, the investment banking and asset management operations of the two banks were merged to form a single investment bank, which was jointly owned by Bank A and Bank B. While there was initially no public plan for integration of their commercial banking businesses, large losses in their joint investment bank led Bank A and Bank B to consolidate their commercial banking activities three years later. The fact that the merger of the commercial banks was motivated by losses in investment banking suggests that the banks' decision to merge was likely exogenous to the performance of their portfolios of corporate loans or to lending opportunities. Our empirical strategy will nevertheless account for potential reverse causality by relying on geographical variation in market shares.

The merger was noticed to the domestic competition authority and cleared after two months. The only remedy imposed by the competition authority relates to a small overseas local market, where the banks committed to keep independent their branch networks and legal structures in order to prevent coordination. We will drop this small local market from our sample. For the rest of the domestic market, Bank A and Bank B's central bodies merged three months after the initial notification. The merged entity retained the two separate retail banking brands and branch networks. Although the two merging banks as well as the merged entity have a partially decentralized governance structure, a central committee defines strategic orientations, including pricing, at the national level.

2.2. Data

We use two main sources of data from the national central bank.[2] We obtain loan-level data from the credit register, which contains information on loans extended by every bank to every firm located in the country. At the end of each quarter, we observe the loan amount for each firm-bank pair such that the total loan amount for this pair exceeds € 25,000 (possibly over several loans of smaller size). The loan amounts are further broken down into several categories including short-term vs. long-term with a threshold at one year of maturity, drawn vs. undrawn credit facilities, and leases. We complement loan-level data with firms' annual financial statement and employment information. The firm-level data covers firms with annual turnover above € 750,000.

To construct our main sample, we start from the loan data and keep firms that can be matched with firm-level accounting information. The sample is therefore restricted to firms with annual turnover above € 750,000. We exclude state-owned companies and firms controlled by local or regional governments. We denote by T the year in which the merger was announced and completed. We exclude year T from the sample period and define the pre-merger period as $(T-3)$Q1 to $(T-1)$Q4 and the post-merger period as $(T+1)$Q1 to $(T+2)$Q4. For each firm i and each bank j to which the firm borrows during the sample period, we compute the average loan amount extended by bank j to borrower i over the pre-merger period and over the post-merger period. In the pre-merger period, we pool together the loans made by the two merging banks as if they were already merged. The final sample is a balanced panel of 244,012 firms, the six major commercial banks, and two periods (pre-merger and post-merger).[3] Since we select all firm-bank pairs such that there is a nonzero loan amount in at least one quarter over the entire period, a given firm-bank pair can have a zero loan amount in the pre-merger period or in the post-merger period, but not in both. We normalize firm-bank-level loan amount by firm total liabilities in the pre-merger period. Finally, we compute firm-level bank debt by summing up firm-bank-level loan amounts over all the banks to which the firm borrows.

Table 1 reports summary statistics at the firm-bank level (Panel A) and at the firm level (Panel B). Over the sample period, 46% of firms have a lending relationship with only one bank, 30% have lending relationships with two banks (although not necessarily at the same time), 14% with three banks, 7% with four banks, and 3% with five banks or more. The average bank-firm relationships involves a loan amount of € 793,000, which represents 10% of total liabilities. On average, half of it is long-term (maturity longer than one year) and the rest is split into short-term loans (maturity less than one year), leases, and off-balance sheet items which are reported separately in the credit register and include mainly unused lines of credit. At the firm level, bank credit is on average 19.2% of total liabilities.

[2] Bank of France provides researchers with free access to all the data used in this paper; see https://www.banque-france.fr/en/statistics/access-granular-data/open-data-room.

[3] The six major commercial banks account for 85% of lending to the firms in our sample. In untabulated results, we have checked that including the other small banks leads to similar results.

2.3. Identification strategy

To identify the effect of the merger on lending activity, we need to control for aggregate and bank-specific shocks. For instance, the merging banks may be differently exposed to the credit cycle for reasons unrelated to the merger. Alternatively, they may want to increase lending after the merger to earn political goodwill or avoid scrutiny by competition authorities. In order to isolate the effects of the change in concentration induced by the merger, our identification strategy is to compare local markets in which both merging banks had large market shares prior to the merger ("treated" local markets) to local markets in which only one of the merging banks or none of them had large market shares prior to the merger ("control" local markets). In the former case the merger leads to a significant increase in market concentration, whereas in the latter case it does not. We define *MarketOverlap* as the product of the pre-merger market shares of the merging banks at the local market level. Importantly, the definition of *MarketOverlap* does not use information about post-merger market shares, which depend on banks' endogenous responses to the merger. *MarketOverlap* thus captures the change in concentration induced by the merger that is orthogonal to the endogenous banks' responses to the merger.[4]

The definition of market overlap is similar to the concept of in-market mergers, defined as mergers in local markets where both merging banks operate. The idea of in-market mergers in a banking context was initially used to analyze mergers among small banks or between large and small banks, in which case "treated" local markets were identified with a dummy variable equal to one if both merging banks had any lending activity in the local market (see for instance Sapienza (2002)). We cannot use the same definition for the analysis of megabanks, because they have positive market shares in every single local market. In this case, the natural concept of market overlap is a continuous variable.

Following the domestic competition authority, we define as local markets the local jurisdictions that are about the same size as Metropolitan Statistical Areas (MSAs) in the US. In the US, both academic studies and competition authorities define local banking markets as MSAs (see for instance Erel (2009)). Since our empirical strategy consists in comparing banking markets with a high value of *MarketOverlap* to markets with a low value, we need enough variation across the 95 local markets for our tests to have sufficient statistical power.

Table 1, Panel B reports summary statistics for *MarketOverlap* and Fig. 1 plots its distribution. It ranges from 0.0011 to 0.0141 with a standard deviation of 0.0025 and mean of 0.0055. A visual inspection of Fig. 1 confirms that there is significant variation in *MarketOverlap*. Finally, we perform a consistency check and verify that a higher value value of *MarketOverlap* does predict an increase in local market concentration. We regress the change in the local banking market HHI from the pre-merger period to the post-merger period on *MarketOverlap*. The result is reported in Table 2. The point estimate is positive and statistically significant at the 1% level. *MarketOverlap* is thus a valid measure of the change in bank concentration brought about by the merger.

2.4. Econometric specifications

We estimate how changes in lending outcomes depend on *MarketOverlap*. More specifically, we run the analysis at two different levels of aggregation of the data in order to identify the effect of the merger on two different objects: the credit supply of the merging banks relative to the credit supply of the non-merging banks; and total credit supply. Theory makes different predictions for each of these two notions. For instance, under either Cournot competition or Bertrand competition with differentiated goods and constant marginal costs, the merger between two competitors leads to: a reduction in the equilibrium quantity of the merging parties; an increase in the quantity of the non-merging rivals; and a (weak) reduction in the aggregate quantity (see for instance Vives (2001)). Accordingly, in our banking setup, we expect the credit supply of the merging banks to decrease relative to the credit supply of non-merging banks. On the other hand, total credit supply may decrease or it may be unaffected depending on whether the increase in lending by the non-merging banks partially or fully compensates the reduction in lending by the merging banks.

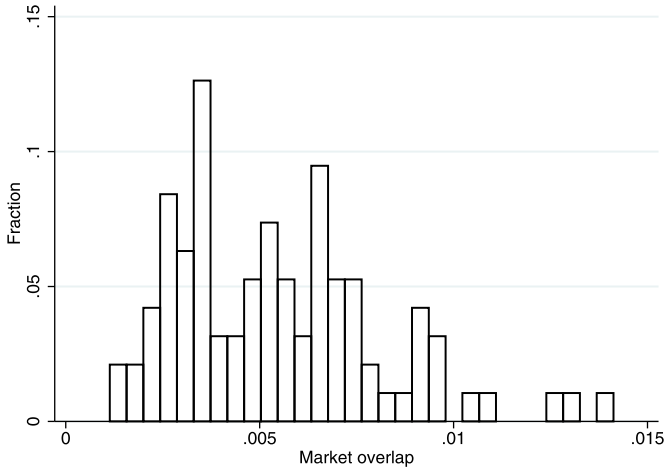

Fig. 1. Distribution of market overlap. *Note:* This graph plots the distribution of *MarketOverlap* over the 95 local banking markets. *MarketOverlap* is equal to the product of the pre-merger local market shares of the merging banks.

Table 2
Market overlap and change in local concentration.

	Change in local HHI (1)
Market overlap	1.02***
	(0.30)
Adjusted-R2	0.11
Observations	95

Note: This table presents the estimate from a linear regression at the local market level of the change in the local banking market HHI on the merging banks' market overlap. The dependent variable is the post-merger HHI minus the pre-merger HHI. *MarketOverlap* is the product of the pre-merger market shares of merging banks. Standard errors are clustered at the local market level. *** indicates statistical significance at the 1% level.

Relative credit supply. To study the effect of the merger on relative credit supply, we analyze the data at the firm-bank level and estimate the *within* firm specification:

$$\Delta Loans_{i,j,k} = \alpha_i + \alpha'_j + \beta\ MergedBank_j \times MarketOverlap_k + \epsilon_{i,j,k}, \quad (1)$$

where $\Delta Loans_{i,j,k}$ is the change in loan amount from the pre-merger to the post-merger period extended to firm i located in local market k by bank j, normalized by pre-merger total liabilities. $MergedBank_j$ is a dummy equal to one for the merged bank (as explained in Section 2.2, the two merging banks are pooled together in a single merged entity throughout the sample period, even before the merger). $MarketOverlap_k$ is the product of the merging

[4] *MarketOverlap* is also related to the Herfindahl index of market concentration: it is equal to half the change in HHI *exogenously* induced by the merger, that is, holding market shares fixed at their pre-merger level. To see it, we can denote pre-merger market shares by s_j where banks are indexed by $j = 1, \ldots, J$ and the merging banks are $j = 1$ and $j = 2$, and calculate the merger-induced change in HHI holding fixed market shares: $\left[(s_1 + s_2)^2 + \sum_{j=3}^{J} s_j^2\right] - \sum_{j=1}^{J} s_j^2 = 2s_1 s_2$.

Table 3
Merging banks' credit supply.

	Change in outstanding loan amount						
Sample/Specification:	(1) *All*	(2) *Multiple lenders*	(3) *Multiple lenders*	(4) *Borrow from merging bank*	(5) *Bank-Industry FE*	(6) *Bank FE* $\times \Delta Unemp$	(7) *Disagg. by credit type*
Market overlap	−0.97***	−0.78**	−1.03***	−0.78**	−1.05***	−1.03***	−0.26***
× Merged bank	(0.36)	(0.36)	(0.34)	(0.37)	(0.34)	(0.33)	(0.085)
Bank FE	Y	Y	Y	Y	–	Y	–
Market FE	Y	Y	–	–	–	–	–
Firm FE			Y	Y	Y	Y	–
Bank-Credit type FE	–	–	–	–	–	–	Y
Firm-Credit type FE	–	–	–	–	–	–	Y
Observations	467,828	354,856	354,856	193,580	354,833	354,856	1,419,424
Adjusted-R2	0.002	0.001	0.19	0.22	0.19	0.19	0.16

Note: This table presents the estimates from linear regressions of the effect of the merger on outstanding loan amounts at the bank-firm level. The dependent variable is the change in outstanding bank credit at the bank-firm-level from the pre-merger period to the post-merger period normalized by pre-merger total liabilities. *MarketOverlap* is the product of the pre-merger market shares of merging banks at the local market level. *MergedBank* is a dummy equal to one for the merged bank. All regressions include bank fixed effects and local market fixed effects. In column (1), the sample comprises all firms in the credit register and the six major banks. In columns (2) and (3), the sample is restricted to firms having relationships with at least two banks, and in column (3) firm fixed effects are included. In column (4), we restrict the sample to firms borrowing from at least one of the merging banks and at least one of the non-merging banks in the pre-merger period. In column (5), we include bank-industry fixed effects. In column (6), we include bank fixed effects with the change in the local unemployment rate. In column (7), we split each observation into four observations by decomposing the total loan amount at the bank-firm level into four types of credit (loans with less than one year of maturity, loans with more than one year of maturity, unused credit facilities, leases) and we estimate a specification including bank-credit type fixed effects and firm-credit type fixed effects. Standard errors are clustered at the local market level. **, and *** indicate statistical significance at the 5% and 1% levels, respectively.

banks' pre-merger market shares and measures the exposure of the local market to the potential anti-competitive effects of the merger.

The inclusion of firm fixed effects α_i implies that we compare the change in loan amount extended by the merging banks relative to the non-merging banks for a given borrower (Khwaja and Mian, 2008; Jimenez et al., 2012). It implies that Eq. (1) is identified off firms borrowing from several banks over the sample period. Under the assumption that firm-specific credit demand shocks are uniform across their different lenders, firm fixed effects absorb firm-specific credit demand shocks and β measures the relative change in credit supply by the merging banks relative to the other banks. In Section 3.2, we shall consider several potential violations of the identifying assumption that firm-specific demand shocks are evenly spread out across lenders.

Bank fixed effects α'_j absorb bank-specific shocks such as differential exposure to the business cycle.[5] They also control for anticipation or reaction effects to the merger happening at the bank level such as potential changes in lending technology, strategy, or management efficiency. Bank fixed effects also control for potential reverse causality. If the decision to merge is influenced by anticipations of future (bright or poor) lending opportunities of the merging banks, such endogenous changes in lending would be absorbed by the bank fixed effects.

Total credit supply. To study the effect of the merger on total credit supply, we analyze the data at the firm level and estimate the *between* firm specification:

$$\Delta Loans_{i,k} = \gamma + \delta\ MarketOverlap_k + Controls_{i,k} + \eta_{i,k}. \quad (2)$$

δ measures the overall effect of the merger taking into account the reaction of non-merging banks. For instance, if the merging banks reduce lending but this reduction is fully offset by more lending by the other banks, then β will be negative in (1) and δ will be zero in (2).

It is no longer possible to include firm fixed effects in (2) because they would absorb the variation in *MarketOverlap* off which δ is identified. It implies that firm-specific credit demand shocks cannot be fully absorbed. We will rely on two complementary approaches to address this caveat. First, we will assess whether firm-level credit demand shocks are correlated with the effects of the merger we seek to identify. To implement this test, we will estimate Eq. (1) with and without firm fixed effects and compare the estimates of β. A large discrepancy would indicate that failing to control for credit demand shocks undermines the validity of the specification without firm fixed effects. Conversely, a small discrepancy would imply that not controlling for firm fixed effects in Eq. (2) does not lead to a biased estimate of δ.

Second, we will control directly for credit demand shocks by including a series of control variables. Specifically, we include in Eq. (2): industry fixed effects (88 categories), non-parametric controls for size by including dummies for sales brackets (15 categories), broad region fixed effects where a region contains on average five local markets, and the change in the local unemployment rate to capture the local business cycle.

3. Relative credit supply

3.1. Baseline result

The estimation results for specification (1) at the firm-bank level are reported in Table 3. In column (1), when firm fixed effects are not included, we find that borrowing from the merging banks decreases relative to the non-merging banks in local banking markets in which the increase in market power is expected to be stronger. The drop in loan amount is statistically significant at the 1% level with standard errors clustered at the local market level.

To gauge the economic significance of the point estimate, we calculate the estimated effect of the merger for a firm at the sample average of *MarketOverlap*, which is 0.0055. For the average firm, the merger leads to a decline in borrowing from the merging banks relative to the other banks equal to $0.97 \times 0.0055 = 0.53\%$ of total liabilities. Given that the average loan from the merging banks is equal to 10% of total liabilities, our point estimate implies an average 5.3% decline in borrowing from the merging banks relative to non-merging banks.

We then proceed to include firm fixed effects to control for firm-specific credit demand shocks. In this case, the identification comes from comparing the change in loan amounts across banks within firms. It implies that β is only identified off firms borrow-

[5] Because regression Eq. (1) is in first difference, including bank fixed effects has the same impact as including bank-time fixed effects in a regression in level, i.e., they capture any bank-specific change in lending from the pre-merger period to the post-merger period.

ing from multiple banks. We thus drop single-bank firms from the sample in this specification. To make the estimates of β with and without firm fixed effects more comparable, column (2) reports the result of the specification without firm fixed effects on the sample of firms borrowing from multiple banks. The coefficient estimate is negative, statistically different from zero at the 5% level, and not statistically different from the coefficient estimated on the entire sample in column (1) (p-value of 0.60).

The estimate with firm fixed effects in column (3) is negative, statistically different from zero at the 1% level, and not statistically different from the coefficient estimated on the entire sample in column (1) (p-value of 0.87) nor from the coefficient estimated on the multi-bank sample in column (2) (p-value of 0.46). This suggests that unobserved firm-specific credit demand shocks are not correlated with market overlap. This result is important for the validity of the firm-level specification (2) without fixed effects.

3.2. Potential violations of the identifying assumption

The identifying assumption of the within firm specification is that firms' credit demand shocks are evenly distributed across their different lenders. Under this assumption, firm fixed effects perfectly absorb firm-specific credit demand shocks. In this section, we consider several potential violations of this assumption and develop tests to rule them out.

A first potential violation arises if borrowers value having lending relationships with several independent banks to diversify their sources of funding and avoid hold-up problems. In this case, a firm borrowing only from merging banks prior to the merger may want to demand less credit from the merging banks and start borrowing from a non-merging bank to reduce its exposure to the merged bank. Because such a situation is more likely in local markets where both merging banks have large market shares, a potential concern is that this diversification motive drives our results. To test whether it is the case, we re-estimate the effect of the merger on the subsample of borrowers which had, prior to the merger, at least one relationship with a merging bank and at least one relationship with a non-merging bank. For these firms, the incentives to diversify their sources of bank credit should not be affected by the merger. In column (4), we find that our result holds for these firms with a similar economic magnitude as in the entire sample. Thus, our results are not explained by firms demanding less credit from the merging banks in order to diversify their sources of funding.

A second potential violation of the identifying assumption is that the merger may lead to a large exposure of the merged bank to some geographical areas or industries. For instance, suppose that the two merging banks tend to have large market shares in local markets that have a strong sectoral specialization. In this case, the merger will increase the merged bank's exposure to industries in which the local markets with a high value of *MarketOverlap* are specialized. The merged bank may want to reduce its exposure to these industries for risk-management purposes. This reaction would lead the bank to reduce lending in local markets with high market overlap. To control for this potentially confounding risk-management motive, we include in our baseline regression industry-bank fixed effects. These fixed effects control for any change in lending behavior of the merging banks that are driven by industry effects such as industry diversification. In column (5), we find that our result is robust to controlling for such diversification motives.

Another potential violation of the identifying assumption arises if the merging banks are more exposed to local credit demand shocks in local markets with high market overlap. This could happen for instance if large banks in a given local market tend to be more pro-cyclical. To account for such confounding effects, in column (6) we control for the local business cycle proxied by the change in the local unemployment rate interacted with bank fixed effects. The point estimate is barely affected, showing that our result is not explained by a differential exposure of the merging banks to local demand shocks.

The last confounding factor we consider is the possibility that firms obtain different types of loans from different banks. For instance, a firm may secure long term financing from a first bank while obtaining credit lines from another bank. In this case, the assumption that firm-specific credit demand shocks are uniform across lenders is less appealing. Fortunately, the data allow us to observe the amount of each type of credit for each firm-bank pair. We can therefore control for the type of credit and estimate the change in lending within each type of credit for each firm. Specifically, we decompose the total loan amount for each firm-bank relationships into four components: amount of loans with maturity shorter than one year, amount of loans with maturity longer than one year, amount of undrawn credit facilities, and amount of leases. The data has now four times as many observations as before because there are four observations per firm-bank pair corresponding to the change in loan amount for each of the four types of credit for the firm-bank relationship. Then, we estimate the effect of the merger on the merging banks' credit supply controlling for credit type-specific demand shocks by including firm-credit type fixed effects and bank-credit type fixed effects. The result is reported in column (7). We find a negative coefficient on the merged bank dummy interacted with market overlap, statistically significant at the 1% level. The magnitude of the coefficient reflects the average change in credit supply of the merging banks for each type of loan. Given that there are four categories, we need to multiply the coefficient by four to obtain the total effect on credit supply. Doing so yields an economic effect of a similar magnitude as the one in the specification of column (3) pooling all types all loans. Thus, demand shocks specific to different types of credit do not drive our results.[6]

3.3. Extensive margin and firm entry

The decline in lending can come from the intensive margin and from the extensive margin. At the intensive margin, the merging banks may reduce the loan amount to firms to which they extend credit both before and after the merger. At the extensive margin, the merging banks may extend less credit through newly initiated relationships or they may cut credit by terminating relationships. A Cournot model of banking competition predicts that the merged bank cuts lending but not at which margin it does so. On the one hand, the bank may become less aggressive at trying to attract new borrowers. Under this channel, we would expect a reduction in lending through newly initiated relationships. On the other hand, the bank may become less aggressive in pricing loans to existing customers, leading these borrowers to reduce their demand for credit from the merged bank. Under this channel, we would expect a reduction in lending at the intensive margin and/or through terminated relationships.

To capture the change in lending along the different margins, we decompose the change in loan amount into three components: the change in loan amount for continued relationships (defined as positive loan amounts both before and after the merger); the change in loan amount for newly initiated relationships (zero loan amount before the merger and positive after); and the change in loan amount for terminated relationships (positive loan amount

[6] We have also re-run this regression excluding, for each borrower, all the observations corresponding to loan types never used by the borrower during the sample period. In this case, the number of observations drops to 607,180 and the magnitude of the point estimate increases to −0.452 significant at the 1% level.

Table 4
Extensive margin and firm entry.

	Firm-level change in loan amount for:			Market-level
	continued relationships (1)	initiated relationships (2)	terminated relationships (3)	firm entry growth (4)
Market overlap × Merged bank	−0.22	−0.49***	−0.33***	−19**
	(0.26)	(0.095)	(0.11)	(7.3)
Bank FE	Y	Y	Y	Y
Firm FE	Y	Y	Y	–
Market FE	–	–	–	Y
Adjusted-R2	0.11	0.13	0.38	0.19
Observations	354,856	354,856	354,856	570

Note: This table presents the estimates from linear regressions of the effect of the merger on outstanding loan amounts at the intensive and extensive margins at the bank-firm level. In column (1), the dependent variable is the change in outstanding bank credit at the bank-firm-level from the pre-merger period to the post-merger period normalized by pre-merger total liabilities when the outstanding loan amount is strictly positive in the pre-merger period and in the post-merger period, and zero otherwise. In column (2), it is the change in loan amount when the loan amount is zero in the pre-merger period and strictly positive in the post-merger period, and zero otherwise. In column (3), it is the change in loan amount when the loan amount is strictly positive in the pre-merger period and zero in the post-merger period, and zero otherwise. In column (4), the data is the bank-local market level and the dependent variable is the change in log number of entrants in each local market obtaining funding from each bank from the pre-merger period to the post-merger period. *MarketOverlap* is the product of the pre-merger market shares of merging banks at the local market level. *MergedBank* is a dummy equal to one for the merged bank. Regressions in columns (1) to (3) include bank and firm fixed effects and the regression in column (4) includes bank and local market fixed effects. Standard errors are clustered at the local market level. ** and *** indicate statistical significance at the 5% and 1% levels, respectively.

before the merger and zero after). We estimate the effect of the merger on lending by the merging banks along each of the three margins using the within firm specification (1).

In Table 4, columns (1) to (3), we find that the merging banks cut lending along all three margins. Moreover, the effect is significantly stronger at the extensive margin. Change in lending through newly initiated relationships account for one half of total effect. Change in lending through terminated relationships account for one third of it. In contrast, change in lending at the intensive margin is also negative but statistically insignificant.

The analysis is conducted on the sample of borrowers that are already in the data in the pre-merger period. The results thus imply that the merging banks reduce the amount of credit extended through new relationships with firms that already exist prior to the merger. This raises the question of whether the merging banks also reduce lending to entrants. To study this question, we estimate the effect of the merger on firm entry. We define entrants as firms that appear for the first time in the credit register.[7] For each entrant, we identify the bank(s) from which it obtains credit on the entry year. We measure entry at the local market-bank level as the number of entrants in each local market that borrow from each bank. We compute entry in the pre-merger period, in the post-merger period, and the growth rate of entry from the pre-merger to the post-merger period. We estimate a specification at the bank-local market level similar to Eq. (1) using the growth rate of entry financed by each bank in each local market as the dependent variable. Since the data is now aggregated at the bank-local market level, the firm fixed effect is replaced with a local market fixed effect.

Results on firm entry are reported in column (4). The coefficient on the interaction between market overlap and the merged bank dummy is negative and statistically significant at the 5% level. The point estimate implies that, in the average market, the number of entrants financed by the merging banks decreases by $19 \times 0.0055 = 10\%$ relative to the number of entrants obtaining credit from non-merging banks. This result is consistent with our finding that the reduction in credit supply operates mainly at the extensive margin. The merging banks extend less credit through new relationships, both to firms that already borrow from other banks and to firms with no prior bank financing.

4. Total credit supply and real effects

4.1. Bank credit

The previous section establishes that, in local markets in which the merger leads to a large increase in banking concentration, lending by the merging banks declines relative to the non-merging banks. There are two possible interpretations of this result. The first one is that the merging banks reduce lending supply while the other banks do not change lending. Borrowers thus receive less bank credit in total. The alternative interpretation is that the merging banks reduce lending while the other banks increase lending. In this case, the amount of credit received by borrowers decreases by less than the reduction in lending by the merging banks because borrowers substitute loans from the merging banks with loans from the non-merging banks. If the substitution effect is one-for-one, bank credit does not decrease.

To determine which interpretation prevails in the data, we estimate Eq. (2), which focuses on the change in total bank credit at the firm level, that is, we sum loan amounts over all the banks from which the firm receives credit. We then regress the change in firm-level bank credit on *MarketOverlap*. Because we now work at the firm level, it is no longer possible to include firm fixed effects to control for credit demand. There is however one piece of evidence that suggests that demand effects may not bias coefficients estimated without firm fixed effects. The analysis at the firm-bank level in Table 3 reveals that the estimated effects of the merger are similar whether firm fixed effects are included (column (2)) or not (column (1)). This similarity suggests that omitting firm fixed effects does not lead to a systematic bias in the estimated effect of the merger on credit supply. We nevertheless seek to control for remaining unobserved heterogeneity by including industry fixed effects, firm size bin dummies, broad region dummies, and the change in local unemployment rate as additional control variables.

Results at the firm level are reported in Table 5. In column (1), the dependent variable is the change in total bank credit, normalized by pre-merger total liabilities. The coefficient on *MarketOverlap* is negative and statistically significant at the 5% level. The point estimate is of a similar magnitude as in the specification at the bank-firm level in Table 3. Substitution by other banks thus ap-

[7] Because firms appear in the credit register when their bank debt exceeds € 25,000, our measure of entry excludes very small firms and self-employed individuals. However, given that these firms contribute to a small fraction of aggregate value creation, the focus on non-tiny firms makes economic sense.

Table 5
Total credit supply and exit.

	Change in bank credit				Exit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	*All*	*All*	*Control: "zero active merging" banks"*	*Control: "one active merging" bank"*	*All*	*All*	*Turnover > € 1M*	*All*
Market overlap	−0.95**	−0.73	−1.4***	−1.2**	6.6**	7.8**	7**	
	(0.41)	(0.6)	(0.45)	(0.56)	(2.7)	(3.5)	(3.3)	
Sum market shares		−0.019				−0.1		
		(0.041)				(0.22)		
Market overlap × Small								7.4**
								(3)
Market overlap × Medium								−0.85
								(5.8)
Market overlap × Large								1.7
								(5.3)
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Adjusted-R2/Pseudo-R2	0.045	0.045	0.046	0.045	0.081	0.081	0.051	0.081
Observations	244,011	244,011	188,810	184,288	244,011	244,011	183,519	244,011

Note: This table analyzes the effect of the merger on firm-level outcome variables. In columns (1) to (4), we estimate a linear regression model where the dependent variable is the change in outstanding bank credit at the firm-level from the pre-merger period to the post-merger period normalized by pre-merger total liabilities. In colum (3), we restrict the sample to "treated" local markets (above-median market overlap) and control local markets with "zero active merging banks" (below-median sum of merging banks' market shares within below-median market overlap). In column (4), we restrict the sample to "treated" local markets and control local markets with "one active merging bank" (above-median sum of merging banks' market shares within below-median market overlap). In columns (5) to (8), we estimate a Probit model for the probability of firm exit in the post-merger period. In column (5), the sample is restricted to firms with pre-merger annual turnover over € 1 million to avoid threshold effects. *MarketOverlap* is the product of the pre-merger market shares of merging banks at the local market level. *SumMarketShares* is the sum of the pre-merger market shares of merging banks at the local market level. *Small, Medium*, and *Large* are firm-level dummy variables equal to one if pre-merger employment is less than 50 employees, between 50 and 100 employees, and more than 100 employees, respectively. All regressions include industry fixed effects, size bin dummies, broad region dummies, and the change in the local market unemployment rate. ** and *** indicate statistical significance at the 5% and 1% levels, respectively.

pears to be weak. The average firm experiences a merger-induced decline in bank credit of $0.95 \times 0.0055 = 0.5\%$ of total liabilities. Given that average bank credit is 19.2% of total liabilities, this reduction amounts to a 2.7% decrease in bank credit.

One might be worried that markets with a high level of *MarketOverlap* are markets where the merging banks have large market shares, and merging banks might be more present in areas affected by shocks unrelated to the merger for some (unfortunate) reason. This effect would generate a spurious correlation between credit growth and market overlap that is unrelated to the merger. We rely on the functional form of *MarketOverlap* to rule out this concern. The idea is to exploit the fact that *MarketOverlap* is the product the merging banks' market shares. Intuitively, the merger leads to a large increase in concentration when the merging banks' have large and relatively symmetric market shares, but not when only one has a very large market share. To illustrate the idea, a market where both merging banks have market shares of 20% experiences a large increase in concentration, whereas a market where one bank has a market share of 40% and the other has a market share of 0% experiences no change in concentration. Following this intuition, we include in the baseline regression the sum of the merging banks' market shares and test whether the effect on lending is explained by the mere presence of the merging banks (i.e., by the sum of their market shares) or by the increase in concentration (i.e., by *MarketOverlap*). The caveat in this test is that the two variables are highly correlated (correlation is 0.81), which reduces the statistical power to estimate each of them separately. This does not create any bias though, but will increase the standard errors and reduce statistical significance.

The result of this robustness test is reported in column (2). The coefficient of *MarketOverlap* is similar to the one in the baseline regression, although not statistically significant at conventional levels because of the expected reduction in statistical power (p-value is 0.22). In contrast, the coefficient on the sum of the merging banks' market shares is close to 0 with a p-value of 0.65. Therefore, there is no evidence that our result is explained by the merging banks being more active in specific areas affected differently by the business cycle. Instead, it is the joint presence of the merging banks that drives the result, which lends support to the interpretation that the reduction in lending is explained by the increase in concentration induced by the merger.

The logic that the competitive effect of the merger is captured by the product, rather than the sum, of the merging banks' market shares can be exploited to identify potential efficiency gains in lending technology brought about by the merger. Consider local markets where the product of merging banks' market shares (*MarketOverlap*) is small. These markets play the role of the control group in our analysis because the merger does not lead to a large change in concentration in these markets. Among these markets, some have low market shares of both merging banks and would thus not benefit from potential efficiency gains induced by the merger; we call these local markets the "zero active merging banks" control group. Others have a high market share of one of the merging banks (the other one having a low market share since the products of the market shares is small) and would thus benefit from efficiency gains; we call these local markets the "one active merging banks" control group. Comparing local markets with high market overlap (the treated group) to each one of the control groups allows us to disentangle the competitive effects from the efficiency gains of the merger. Specifically, if the merger leads to efficiency gains, we expect bank credit in the treated group to decrease more relative to the "one active merging banks" control group than relative to the "zero active merging banks" control group.

To operationalize this test, we proceed as follows. First, we classify local markets with above-median market overlap as the "treated group". Among local markets with below-median market overlap, we classify those with a sum of the merging banks' market shares above median as the "one active merging banks" control group and those below median as the "zero active merging banks". Columns (3) and (4) report the regression results on the subsamples made of the treated group and each one of the control groups.

In both cases, the coefficient on market overlap remains negative and statistically significant. However, the coefficient estimate using the "zero active merging banks" control group is not statistically different from the one using the "one active merging banks" control group (p-value of 0.67). Thus, the merger does not lead to detectable efficiency gains in lending technology.

In the following sections, we analyze the implications of the reduction in credit supply for real and financial outcomes at the firm level: firm exit, cost of credit, use of trade credit, investment, and employment.

4.2. Firm exit

We define firm exit as a situation where a firm disappears simultaneously from the credit register and from the file containing firms' annual financial statements. Given the coverage of both datasets, an exit event corresponds to a firm that either (a) stops its operations altogether or (b) whose bank credit drops below € 25,000 *and* its turnover drops below € 750,000. The latter situation may not correspond to a complete cessation of business, but it is at the minimum a sign of underperformance. To further make sure that our definition of exit does capture temporary firm underperformance, we also impose that the firm disappears from both datasets permanently. Our measure of exit should thus be interpreted broadly as a measure of permanent product market underperformance—possibly leading to exit. Under this definition, 20.2% of firms present in the data one year before the merger exit within two years after the merger, which yields an exit rate of about 6.5% per year.

In column (5) of Table 5, we estimate a Probit model for the probability of exit in the post-merger period using as explanatory variables *MarketOverlap* and the same set of control variables as before. The coefficient on *MarketOverlap* is positive and significant at the 5% level. This result is consistent with the analysis at the firm-bank level showing that the merging banks reduce lending through the termination of relationships (see column (3) of Table 4). To estimate the economic magnitude of the effect, we calculate for each firm the estimated change in exit probability when increasing *MarketOverlap* from zero to its actual value. Taking the sample average of this number, we obtain that the merger increases the average exit probability by 0.9 percentage points over a three-year horizon, that is, by 0.3 percentage points per year. Given the unconditional annual exit rate of 6.5%, this represents a 4% relative increase in exit probability.

To further check that increased firm exit is driven by the change in concentration brought about by the merger, we follow the same methodology as in Section 4.1 and control by the sum of the merging banks' market shares in the Probit model. As discussed previously, this specification allows us to isolate the effect of the increase in concentration holding fixed the total market presence of the merging banks. The drawback of this robustness test is that it reduces statistical power. The result is reported in column (6). Reassuringly, the coefficient on *MarketOverlap* is barely affected and the economic magnitude of the effect is the same as in column (5).

Another potential concern is that our definition of exit captures situations where a firm starts from a level of turnover slightly above the threshold for being included in the firm accounting data (€ 750,000) and goes slightly below this threshold and at the same time stops borrowing from banks. Such a situation would be classified as a firm exit according to our definition but it may not represent actual economic distress. To rule out such cases, we exclude firms with annual turnover below € 1 million in the pre-merger period. In the worst case scenario for our identification strategy, a firm would drop from the firm accounting data because its turnover goes from just above € 1 million to just below € 750,000. Such a situation would still correspond to a 25% drop in turnover, arguably a significant level of underperformance (remember that we also impose that turnover does not bounce back above € 750,000 in the future and that the firm does not obtain any bank loan in the current period or in any future period). The result of this robustness test is reported in column (7). Reassuringly, the point estimate is similar to the one in the full sample. Our result is thus not explained by threshold effects.

Higher firm exit leads to job losses. To quantify this effect, we do a simple back-of-the-envelop calculation and multiply the estimated effect of the merger on the exit rate (+0.9 percentage points in the baseline specification in column (5)) by the average pre-merger employment of firms that exit in the post-merger period (23 jobs). Compared to the unconditional average pre-merger employment (42 jobs), this calculation implies that the merger reduces employment by $0.009 \times 23/42 = 0.5\%$ over a three-year horizon.

The above calculation is valid if the average size of firms that exit post-merger is not affected by the merger. To test whether this assumption holds in the data, we interact *MarketOverlap* with pre-merger firm size. We use a non-parametric specification and classify firms into three size bins according to their pre-merger employment: less than 50 employees (small), between 50 and 100 employees (medium), and more than 100 employees (large). The result reported in column (8) shows that the exit probability increases only for firms with less than 50 employees. This result is not surprising as larger firms are less fragile and less sensitive to shocks to local banking markets. It implies that the above back-of-the-envelop calculation over-estimates job losses. To obtain a more accurate estimate, we restrict the calculation to small firms because the effect is not significant for medium-sized and large firms. For each small firm, we multiply its pre-merger employment by the change in exit probability from increasing *MarketOverlap* from zero to its actual value as estimated in column (8). Taking the average over all small firms, we obtain that the merger destructs 1% of jobs in small firms over three years. Given that small firms account for one-quarter of total employment, this represent a 0.25% reduction in total employment over a three-year horizon. Accounting for the size composition of exiting firms thus reduces by half the estimated effect of the merger on aggregate job losses.

4.3. Capital structure and investment

We now focus on the sample of firms which do not exit and examine the change in financial and real outcomes for these firms. We also restrict the sample to firms for which interest expense, accounts receivable, accounts payable, capital expenditures, and employment are all non-missing in order to work on a constant sample of firms in this part of the analysis.

We start by re-estimating the effect of the merger on total bank credit for the subsample of continuing firms. In column (1) of Table 6, we find a negative coefficient on market overlap, which is 40% smaller in magnitude than the coefficient estimated on the entire sample of firms in column (1) of Table 5. The interpretation is that 40% of the merger-induced decrease in bank credit is explained by (and causes) firm exit. The rest is explained by a reduction in bank lending to continuing firms.

We now study whether the reduction in bank credit is accompanied by an increase in the cost of bank credit for the subsample of continuing firms. Unfortunately, credit register data does not have interest rate information. Instead, we use the variable "*Interests and assimilated expenses*" from the firm-level accounting data, which we divide by total liabilities, and we interpret the ratio as the cost of credit as for instance in Cornaggia and Li (2018). Two caveats regarding this proxy are in order. First, it does not adjust for the loan characteristics. For instance, if bank loans come with stronger covenants or a higher level of collateralization (which are

Table 6
Real effects for continuing firms and new firms.

	Firm-level change in:					Market-level
	Bank credit (1)	Interest expense (2)	Net trade credit (3)	Investment (4)	Employment (5)	Entry growth (6)
Market overlap	−0.58*	−0.02	0.036	−0.11	0.017	−0.46
	(0.32)	(0.027)	(0.36)	(0.53)	(0.014)	(4.1)
Industry FE	Y	Y	Y	Y	Y	
Controls	Y	Y	Y	Y	Y	Y
Adjusted-R2	0.022	0.007	0.005	0.002	0.015	0.57
Observations	156,513	156,513	156,513	156,513	156,513	95

Note: This table presents the estimates from linear regressions of the effect of the merger on real outcomes at the firm level in columns (1) to (5) and at the local market level in column (6). In columns (1) to (5), the sample is made of continuing firms that are operate both before and after the merger. The dependent variable is the change in a firm-level outcome variable normalized by pre-merger total liabilities, where the firm-level outcome variable is outstanding bank credit in column (1), accounts payable minus accounts receivable in column (2), capital expenditures in column (3), employment in column (4), and interest expenses in column (5). In column (6), the data is at the market level and the dependent variable is the change in log number of entrants from the pre-merger period to the post-merger period. *MarketOverlap* is the product of the pre-merger market shares of merging banks at the local market level. Column (1) to (5) include industry fixed effects. All regressions include as controls: size bin dummies, broad region dummies, and the change in the local market unemployment rate. In all regressions, standard errors are clustered at the local market level. * indicates statistical significance at the 10% level.

not reported in the data), we might observe a decrease in interest expense that should not necessarily be interpreted as cheaper bank credit. The second caveat is that "*Interests and assimilated expenses*" include interest expense on other liabilities than bank debt. Column (2) reports the regression result using the change in the cost of credit from the pre-merger period to the post-merger period as the dependent variable. The coefficient on market overlap is statistically insignificant and economically small. It might suggest that the reduction in bank credit supply plays out through quantities but not prices. Alternatively, the tightening of bank credit might be accompanied by stricter covenants or a higher level of collateralization offsetting the increase in interest rate.

We then analyze how firms react to the merger-induced reduction in credit supply. First, we ask on whether firms react by taking on more credit from suppliers and extending less credit to customers. Because trade credit is typically more expensive than bank credit, everything else equal firms should prefer to borrow from banks than from suppliers. However, when bank credit becomes tight, firms may be forced to turn to suppliers to obtain credit. Similarly, firms may be forced to reduce the provision of credit to their customers. We define net trade credit as accounts payable minus accounts receivable and compute the change in net trade credit from the pre-merger period to the post-merger period that we normalize by pre-merger total liabilities as before.

In column (3), the coefficient on market overlap is positive, which goes in the direction of firms substituting trade credit for bank credit, but the magnitude of the effect is negligible both economically and statistically. Thus, firms do not seem to be able or to be willing to substitute bank credit with trade credit. One potential explanation for this result is that firms have local suppliers and/or customers that are affected by the same credit supply shock as themselves. In this case, shocks to the provision of bank credit spills over to the provision of inter-firm credit.

Next, we analyze whether the reduction in credit supply has real effects on investment and employment. In column (4), the dependent variable is the change in capital expenditures from the pre-merger period to the post-merger period normalized by pre-merger total liabilities. The coefficient on market overlap is negative, but economically and statistically insignificant. In column (5), we study the effect on the change in employment and do not find any significant effect. One possible explanation for the absence of real effects on firms that do not exit, is that the rigidity of the domestic labor market makes employment sticky and relatively insensitive to credit supply shocks in the short run. To the extent that labor and capital are complementary factors of production, the stickiness of employment spills over to capital expenditures. This interpretation should nevertheless be taken with a grain a salt following recent findings in labor economics that job flows in European labor markets are as dynamic as in the US despite the higher level of employment protection (Duhautois and Petit, 2015). The analysis of labor market rigidity in Europe is beyond the scope of this paper.

Finally, we study the effect of the merger on firm entry. We follow the same approach as in Section 3.3 to analyze entry, but we now measure entry at the local market level (instead of at the bank-local market level) to estimate the total effect of the merger accounting for potential substitution from non-merging banks. In column (6) of Table 6, we regress the growth rate of the total number of entrants in each local market on *MarketOverlap*. We find that the merger has no significant effect on entry growth. Taken together with the bank-level analysis showing that the merging banks reduce lending to new firms (see column (4) of Table 4), these results imply that non-merging banks increase lending to entrants and fully offset the reduction in lending by the merging banks. As a result, the merger does not affect total entry growth. Overall, the data describe a consistent pattern where both incumbent firms that do not exit as well as new firms experience no adverse real effects. The only adverse real effect that is detectable in the data is a higher exit rate for incumbents firms.

5. Concluding remarks

While traditional bank mergers involving small and medium-sized banks have been motivated by increasing returns to scale and scope and have led to changes in lending technologies, we hypothesize in this paper that market power is a key issue in modern megabank mergers. We test this hypothesis in the context of a merger between two large banks and identify its competitive effect on small and medium-sized corporate borrowers. On the credit market side, we find that the merging banks reduce lending. On the real side of the economy, this tightening of credit leads to higher firm exit, while the rest of firms that do not exit and firms that start up show no sign of lower investment rate or shrinking employment.

A possible explanation for the lack of negative real effects—but for the higher exit rate—is that a small number of very large banks is enough to produce a competitive marketplace. This interpretation however requires several qualifications. First, our observation period spans up to two years after the merger. One might consider that the anti-competitive effects of concentrated banking markets may take time to materialize, which make them difficult to detect

empirically. Second, with six banks holding more than 80% of total domestic banking assets, the experiment that we analyze takes place in a mature market by international standards. However, the wave of banking consolidation may not be over and it remains an open question as to whether our results would hold up at higher levels of concentration.

The strength of our analysis is the plausible exogeneity of the natural experiment we exploit. The flipside is that it includes only one megamerger event.This raises the issue of the external validity of the results. Two key characteristics of the domestic banking market we analyze is that it is dominated by a small number of large universal banks and that it is a major source of funding for SMEs. The former has become a defining feature of banking markets in many countries, suggesting that the experience in the country we study is informative outside of its borders. The importance of bank funding is also pervasive in continental Europe and in Japan, as well as in the US and in the UK for small businesses.

Supplementary material

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