Real Effect of Bank's Block-holding on Firm's Market Power

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Abstract

This paper finds that bank equity holdings of industrial firms have a profound impact on the product market competition. Relying on the exogenous variation of bank equity holdings from bank mergers, we conduct a difference-in-differences (DID) experiment. We find that firms experience lower profit margins and a higher likelihood of bank switch when their banks become shareholders of their rivals. In contrast, firms with bank shareholders enjoy higher profit margins and gain more market power. The effect is more pronounced in highly competitive industries, for R&D intensive firms, and when banks have more proprietary information of the borrowing firms.

Keywords: Bank's equity holding; product market competition; market power

JEL: E23, G20, G21, L10, L11

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1 Introduction

The enactment of the Gramm-Leach-Bliley Act (GLBA) in 1999 led to an increasing trend of bank's equity holding in the non-financial sectors (Barth et al. (2000); Haubrich and Santos (2003); Santos and Rumble (2006)). Before that, banks' equity investment in non-financial firms are generally prohibited in the U.S. — only bank holding companies (BHCs) were allowed to hold up to 5% of voting stocks and up to 25% of voting and non-voting stocks (Barth et al. (2000)). Since 1999, the GLBA allowed banks that become financial holding companies (FHCs) to make equity investments in non-financial firms, with no limit on the fraction of the firm that the bank could hold (Santos and Rumble (2006)). As shown in Figure 1, the percentage shares of U.S. public firms held by bank shareholders has increased from 10% in 1990 to about 35% in 2018. This phenomenon has raised concerns among banking regulators (Krainer (2000); Walter (2003); Blair (2004)). For example, Krainer (2000) and Blair (2004) suggest that when a bank owns equity shares of a firm, the bank could deny credit to the competitors of its holding firm. This could intensify the conflicts of interests between firms where banks form equity holdings (hereafter referred to as *B-H firms*) and firms where banks do not have equity holdings (hereafter referred to as *non-B-H firms*), causing distortion and misallocation of financial resources.[1] However, their studies have remained at the theoretical stage and have not yet been verified by empirical data. Our paper aims to fill this gap and provides empirical evidence for this question.

[Insert Figure 1 Here]

A recent empirical work by Saidi and Streitz (2021) documents that bank credit concentration in an industry could raise anti-competition concerns. In an industry-level study, they suggest that a higher incidence of common lenders leads to less aggressive competition because banks internalize the competition externality by reducing loan rates to borrowers in the same industry. Similarly, De Franco et al. (2020) find that sharing a common lender with competitors could heighten potential risks of information leakage, which induces firms to switch banks. Our paper extends their works in two aspects. First, Saidi and Streitz

[1]Furthermore, the term *B-H* is used in this paper as a qualifier when referring to firms and/or rivals of firms. It may thus be applied when referring to firms or rivals where banks form block equity holdings.

(2021) and De Franco et al. (2020) study the case when banks act as pure creditors of firms in the same industry. They study how common lender relationship could affect the product market competition. Instead, we emphasize the case when a bank, who is lenders to some firms in an industry, also forms equity holdings of other firms in the same industry. As a result, the bank's incentives could deviate from the original one that acts as a pure creditor, and we study how this deviation affects the competition between the *B-H firms* and *non-B-H firms*. Second, in Saidi and Streitz (2021), bank could induce anti-competitive effect and the overall industry are benefited from the softened competition. However, we find that a bank with equity holdings of some firms could preferentially support its *B-H firms*. As a result, *B-H firms* enjoy higher competitive strength, while other *non-B-H firms* suffer from reduced market powers. To our knowledge, our study is the first to investigate the within industry heterogeneity for this stream of literature.

To design our empirical tests, we focus on the formation of bank's block-holding of the leading firms in an industry and its impact on the product market competition. Specifically, we study how the formation of bank's block-holding of the leading firms affects other firms in that industry. We hypothesize that the formation of the bank's block-holding of the leading firms will hurt the market power of *non-B-H firms*; at the same time, those *B-H firms* could enjoy higher market power. To examine this hypothesis, we first analyze the impact on the *non-B-H firms* in our main analysis and then provide an auxiliary analysis of the effect on those *B-H firms*.

Two non-mutually exclusive mechanisms are underlying this conjecture. One channel is the financial resource distortion. Specifically, *B-H firms* could gain financing advantage over their competitors. Blair (2004) suggests that the *B-H firms* and other *non-B-H firms* are competing in the product market, which gives banks the incentives to allocate credit resources to their holding firms. Cestone and White (2003) indicate that banks could reduce credits to new entrant firms to deter entry. As a result, the *B-H firms* enjoy lower debt financing costs and more debt capacity, while other *non-B-H firms* face tightened credit conditions.

On the other hand, Asker and Ljungqvist (2010) and De Franco et al. (2020) indicate that potential risks could arise when the same industry firms share the same underwriting invest-

ment banks or the same lending banks. To be specific, the banks could leak commercially sensitive information to competitors. The existing literature also suggests that lending banks could intentionally or unintentionally pass private information of their borrowing clients to other divisions within the financial conglomerates (Acharya and Johnson (2007); Massa and Rehman (2008); Ivashina and Sun (2011); Chen and Martin (2011)). This proprietary information leakage could cause competitive threats to firms (Boone et al. (2016); Glaeser (2018); Klasa et al. (2018)). Hence, we propose "proprietary information leakage" as an alternative channel of our hypothesis.

Given this, we study the scenario wherein a firm's lending bank (henceforth known as "relationship bank") establishes a block-holding with its top rivals (henceforth known as "*B-H rivals*"), and how this phenomenon affects the competitive strength of the firm (henceforth known as "affected firm"). Following Asker and Ljungqvist (2010), we define the top rivals as the ten largest firms in the three-digit SIC industry of an affected firm (ranked by Compustat net sales), excluding the affected firm itself. We focus on these top rivals because only large firms with enough market shares can significantly influence a firm's competition. We also require that affected firms have a lending relationship with banks because the lending relationship is necessary for us to pin down the aforementioned mechanisms.

To address the endogeneity problems and establish causality, we follow Asker and Ljungqvist (2010) and He and Huang (2017) to exploit bank mergers as an exogenous shock to the bank's block-holding of the top rivals. In the DID framework, we find that a firm whose bank obtains block-holdings of its top rivals through a bank merger (henceforth known as "rival-obtaining bank mergers") suffers a decreased markup (gross profit margin) compared with those firms whose banks do not obtain equities of their top rivals. Since the validity of the DID estimation relies on the parallel trend assumption, we examine the dynamic effect of rival-obtaining bank mergers on the market power of the affected firms. The adverse effect on market power only appears after the bank obtains block-holdings of the top rivals through mergers. This diagnostic test suggests that our baseline DID results are unlikely to be driven by the nonparallel trend of the treatment and control firms.

When a bank owns block-shares of the top rivals, the financial resource distortion or the proprietary information leakage concerns could discourage a firm's borrowing from the

bank, increasing the firm's probability of switching banks. However, the decision to switch relationship banks is a trade-off between the potential risks of information leakage and the cost of switching. For the latter, the hold-up problem could hinder a firm from switching banks smoothly because a firm with information asymmetry bears higher switching costs. We find that rival-obtaining bank mergers increase the probability of firms to switch banks. The switching effect is stronger if the bank has more inside information over the firm and is not sensitive for firms with serious information asymmetry problems.

We then conduct a loan-level test to pin down the financial resource distortion channel. Specifically, we analyze the borrowing costs of firms if banks block-hold their top rivals. We find that the rival-obtaining bank mergers lead to a slight increase in loan spreads and a higher probability that banks require collaterals. However, the increased debt financing costs are concentrated for firms that switch banks after the mergers, rather than firms that continue to borrow from the bank, which is not consistent with the financial resource distortion hypothesis.

To further pin down the proprietary information leakage channel, we examine the heterogeneity of a firm's sensitivity to information leakage. We use three variables to measure the firm's proprietary costs: (1) the degree of competition of an industry; (2) the value of the intellectual property of a firm; and (3) the bank's private information of a firm. The cross-sectional test suggests that the adverse effect on market power is more pronounced when a firm's industry is highly competitive, when a firm has intensive R&D activities, and when the bank has more private information about the firm. Taken together, we suggest that the adverse effect on market power is consistent with the proprietary information leakage hypothesis.

Since the bank's equity holding could alter the bank incentives, we also examine the heterogeneity of bank's incentives to support the *B-H rivals*. If a bank is a dedicated investor that pursues long-term profits in the stock market, the equity investment should be critical to its overall business. In this case, the adverse effect on market power is stronger if a bank is a dedicated investor. If a bank's holding of the top rivals is important to the bank's total investment, we expect that the adverse effect on market power is more pronounced. However, if an affected firm is a large client of a bank's lending business, we predict that the effect

is less significant. In the cross-sectional analysis, we find that the effect of rival-obtaining bank mergers on market power is less pronounced when the bank considers an affected firm as a resilient borrower (i.e., total borrowing amount exceeds one-third of the bank's total lending). In contrast, the effect is more pronounced when the bank considers the *B-H rivals* as important investments (i.e., the bank's holdings of the top rivals exceeds 2% of its total investment), and when the bank is a dedicated investor defined in Bushee (1998) and Bushee (2001).

Finally, we analyze the impact of rival-obtaining bank mergers on the rivals' market power. To this end, we select the ten largest firms (i.e., top rival) in an industry as our sample. If a top rival is block-held by an institution that merges with a bank creditor of a same-industry firm, we classify the rival as a treatment sample. If the merging institution does not hold a top rival, we classify the rival as a control sample. We find that the rivals in the treatment sample enjoy higher markups (gross profit margins) than those in the control sample. In the cross-sectional test, we find that the effect is stronger if the bank is a long-term investor, if the bank considers the *B-H rivals* as an important stock in its total investment, while the effect is less significant if the bank considers its borrowing firm as a large client in its loan business.

Our paper contributes to the existing literature from three aspects. First, our paper contributes to a broad literature on the effects of the bank's equity holding in firms. The early studies in this area focused on the direct effect of the bank's equity holding on firms' debt capacity, valuation, and performance (Gorton and Schmid (2000); Morck et al. (2000); Santos and Rumble (2006); Santos and Wilson (2017)). After the enactment of the GLBA, the literature began to focus on the potential conflicts of interest if a bank becomes an equity holder of non-financial firms (Barth et al. (2000); Krainer (2000); Walter (2003)). Our paper fills the gap between the theoretical arguments and empirical evidence and sheds light on the underlying mechanism of this issue.

Second, our paper extends the literature on how banks affect product market competition. Cestone and White (2003) formulated a theory on this question. They suggested that banks with market power are reluctant to fund new entrants because this could harm incumbent firms. In a similar vein, Cetorelli (2004) and Cetorelli and Strahan (2006) suggested that

bank financing serves as an entry barrier for new entrant firms and thus reduces competition. Saidi and Streitz (2021) identify the underlying mechanism on how bank concentration reduces industry competition. Specifically, they suggest that a higher incidence of common lenders could internalize competition externalities by reducing debt costs to same-industry firms. Their evidence suggests that the overall industry benefits from less aggressive competition. Based on their work, we emphasize the importance of the bank's equity holding, which could modify the bank's incentives to preferentially support some firms in an industry at the cost of other firms in that industry. We investigate the within-industry effect of bank's equity holdings on firms' market power.

Lastly, our paper adds to the literature studying the information leakage concerns in financial conglomerates. This literature suggests that firms' private information could be passed by the lending desk to other divisions within the financial conglomerates (Acharya and Johnson (2007); Massa and Rehman (2008); Ivashina and Sun (2011); Chen and Martin (2011)). A number of papers emphasize that common lenders or common underwriting banks could facilitate information transfer among same industry competitors (Bhattacharya and Chiesa (1995); Asker and Ljungqvist (2010); De Franco et al. (2020)). Our paper shows that proprietary information leakage by banks relies on two conditions. First, a bank obtains private information about its borrower during due diligence and monitoring. Second, the equity holdings could deviate the bank from its standpoint as a pure creditor, and the bank will preferentially support its *B-H firms*. As a result, those *non-B-H firms* bear higher risks of information leakage.

We organize the rest of the paper as follows. Section 2 develops the hypothesis. Section 3 describes our research design and identification strategy. Section 4 describes the sample, variables and provides descriptive statistics. Section 5 displays the main results, followed by the mechanism analysis in Section 6. Section 7 provides additional discussions. Section 8 concludes.

2 Hypotheses Development

When a firm's lending banks form an equity-holding relationship with its top rivals, the firm bears potential risks from two sources: the bank could reduce debt financing to the firm (i.e., financial resource distortion channel), or it could leak the firm's commercial sensitive information to the rivals (i.e., proprietary information leakage channel). Both channels, which are not mutually exclusive, predict the same adverse effect on the market power of the affected firm. In addition, the disutility of the bank's equity holding of the top rivals mentioned above could discourage the firm's borrowing from the bank, which predicts a higher probability of switching banks. As a result, we have two major hypotheses for this paper:

H1. Decreased market power: If a firm's relationship bank becomes a block-holder of its top rivals, the firm will experience a decreased market power in the product market.

H2. Increased bank switch: If a firm's relationship bank becomes a block-holder of its top rivals, the firm is more likely to switch its relationship bank.

The decision to switch relationship banks is a trade-off between the potential risks of information leakage and the cost of switching. Regarding the former concern, Yosha (1995) and De Franco et al. (2020) suggest that lending banks could leak proprietary information of a (borrower) firm to the firm's current and potential rivals, which could increase the firm's risks of losing competition strength in the product market. Following Bharath et al. (2007), we predict that the bank switch effect is more pronounced if the bank possesses more private information of the firm.

Regarding the latter concern, existing bank-firm relationship literature suggests that hold-up problem could hinder a firm to switch bank smoothly (Degryse and Ongena (2008) for a literature review; Ioannidou and Ongena (2010)). These papers suggest that firms with more serious information asymmetry problems bear higher costs of switching. Therefore, we predict that firms with greater information asymmetry problems are less likely to build a new relationship with an outside bank.

H2a. Information leakage and bank switch: The effect of a bank's block-holding

of a (borrower) firm's top rivals on the firm's bank switch is more pronounced if the bank has more private information of the borrower firm.

H2b. Information asymmetry and bank switch: The effect of bank's block-holding of a borrower firm's top rivals on the firm's bank switch is less pronounced if the borrower firm suffers a greater information asymmetry problem.

We now discuss how we develop the two underlying mechanisms of this paper. First of all, the bank's block-holding of the top rivals could cause a distortion of financial resources. Theoretically, Cestone and White (2003) suggest that banks who lend to incumbent firms are reluctant to provide debt financing to new entrant firms because this could reduce the competitive advantage of the incumbent firms. Similarly, Cetorelli (2004) and Cetorelli and Strahan (2006) suggest that banks could use debt as commitment devices to deter entry. When a bank becomes block-holder of some firms in an industry, it could consider those *non-B-H firms* as potential threats to its holding firms because they compete in the same industry. The bank may explicitly charge higher loan spreads, reduce the loan amount when lending to *non-B-H firms*, or implicitly require them to provide additional collateral. Meanwhile, *B-H firms* could enjoy lower debt financing costs and increased debt capacity from the bank (Krainer (2000); Walter (2003); Blair (2004)). Hence, we predict that *non-B-H firms* sustain harsher debt costs in the loan market, making them lose market power in the product market.

H3. Financial resource distortion hypothesis: If a firm's lending bank becomes a block-holder of its top rivals, the bank could increase loan spreads and reduced loan amount to the *non-B-H firms*. The increased loan costs are concentrated for firms that continue to borrow from the bank. Meanwhile, the *B-H rivals* could enjoy lower loan spreads, lower collateral requirements, and increased loan amounts.

On the other hand, the formation of bank's block-holding of a firm's top rivals could raise the firm's potential risks of proprietary information leakage. Banks obtain private information about their borrowers during the due diligence and monitoring, especially when they are lead lenders of syndicated loans (Petersen and Rajan (1994); Boot and Thakor

(2000); Sufi (2007)). Prior studies suggest that the borrowers' private information could be intentionally or unintentionally passed through the lending desks to other divisions within financial conglomerates (Acharya and Johnson (2007); Massa and Rehman (2008); Ivashina and Sun (2011); Chen and Martin (2011)).

Having the proprietary information disclosed to its top rivals is fatal to a firm as this could threaten the its prospects in the product market (Ellis et al. (2012); Boone et al. (2016); Glaeser (2018); Klasa et al. (2018)). Ellis et al. (2012) show that firms trade off on disclosing details of customer identities because such disclosures can be observed by current and potential rivals, thus facilitating rivals to compete with them. Similarly, Klasa et al. (2018) suggest that losing intellectual property to rivals could cause a competitive threat to a firm. If current and potential rivals observe a firm's trade secrets, they could immediately adjust their competition strategy and exploit market profits in advance. As a result, firms with higher proprietary costs are more prone to fail in the product market competition. We measure the firm's sensitivity to information leakage from three aspects.

First, prior studies indicate that industry-level factors, i.e., the nature of product market competition, could influence firms' costs of proprietary information disclosure. For example, Asker and Ljungqvist (2010) show that increased industry competition due to deregulation accelerates the potential risks of proprietary information leakage. Saidi and Streitz (2021) suggest that an industry that competes in strategic substitutes has a higher competition intensity than one that competes in complementary goods. To this end, we follow Chod and Lyandres (2011) to estimate the industry average of competition strategic measure (CSM). Then we code an industry as competing in strategic substitutes if the CSM is negative, and zero otherwise.

Next, prior studies suggest that R&D-intensive firms are more likely to conceal commercially sensitive information from their rivals, because losing such information could potentially reduce their value (Boone et al. (2016); Glaeser (2018); Klasa et al. (2018)). They also suggest that firms with higher R&D expenditure, intangible assets, and trade secrets could sustain higher proprietary costs. We follow Kogan et al. (2017) and use the number of patents filed by firms to measure the intensity of R&D activities.

Third, when a bank becomes a block-holder of a firm's rivals, it could pass on the firm's

proprietary information to the rivals. Prior studies suggest that the geographic proximity of the borrower to the bank's headquarter is an exogenous measure of the bank's private information of the borrower (Petersen and Rajan (2002); Agarwal and Hauswald (2010)). We follow Hollander and Verriest (2016) and Tian (2011) and use "twenty-five miles" as a cutoff to identify banks that have more private information of the firm.

H4. Proprietary information leakage hypothesis: The adverse effect of a bank's block-holding of a borrower firm's top rivals on the firm's market power is stronger if the degree of industry competition is high, if the firm has higher values of intellectual property, and if the bank has more private information of the firm.

A bank's equity holding of a firm's top rivals alters the bank's incentives towards the firm. This is a key factor that moderates the bank's behavior to support the *B-H rivals*. In the beginning, we assume that a bank is neutral to all firms in the same industry because they are equivalent borrowers in the loan market. Once the bank forms block-holdings of the top rivals of its (borrower) firms, the bank's incentives could deviate from the original one that acts as a pure creditor. This deviation is determined by the relative importance of the *B-H rivals* or the *B-H firm* to the bank. We have a two-side hypothesis on the bank's incentives to support the *B-H rivals*.

If a bank considers the *B-H rivals* as important stocks in its total investment, it is more likely to deviate from its standpoint as a pure creditor and, hence, is more likely to support the *B-H rivals*. We predict that the adverse effect on market power is stronger if the top rivals are important stocks of the bank's total investment. Similarly, if a bank is a dedicated investor that pursues long-term profits in the stock market (Bushee (1998); Bushee (2001)), it would be willing to utilize some of its credit advantage or information advantage to maximize its profits from the stock investment. Based on this consideration, we predict that the adverse effect on market power is stronger if the bank is a long-term investor.

However, if a bank considers a *non-B-H firm* as a large client of its loan business (De Franco et al. (2020)), its profits mostly rely on the lending business with this firm. In this case, the bank's incentives are more aligned to the firm, and we predict that the adverse effect on market power is less pronounced.

H5. Bank's incentives to support the *B-H* rivals: The adverse effect of bank's block-holding of a borrower firm's top rivals on the firm's market power is stronger if the *B-H rivals* are important stock holdings within the bank's total investment, and if the bank is a long-term investor. However, the effect is less pronounced if the *non-B-H firm* is a large client of the bank's loan business.

3 Methodology

3.1 Research Design

To examine the hypotheses mentioned above, we focus on the formation of bank's block-holdings of the top ten firms in an industry. Instead of analyzing the impact on these *B-H firms*, we emphasize the impact on those *non-B-H firms*. In other words, we study how the formation of a bank's block-holding of leading firms in an industry affects other *non-B-H firms* in the same industry. Specifically, we study if a firm's lending bank (i.e., relationship bank) establishes a block-holding with its top rivals (i.e., *B-H rivals*), how this phenomenon will affect the competition strength of the firm (i.e., affected firm or *non-B-H firm*).

Figure 2 depicts the relationships between the firm, its relationship bank, and the firm's top rivals. We require that a firm of our interest has at least one outstanding loan with a bank during the past twelve months. The bank, a creditor of the firm, is also a block-holder of the top rivals of the firm. Following Asker and Ljungqvist (2010), we define the top rivals as the ten largest firms in the three-digit SIC industry (ranked by Compustat net sales), excluding the firm itself. We select the ten largest firms because only firms with enough market share can influence the product market competition. The lending relationship between the firm and the bank is necessary to pin down the underlying mechanisms discussed in Section 2. Despite this, we also require that the *B-H rivals* do not share the same lending bank with the firm, which ensures that our result is not driven by the effect of the common lender.

[Insert Figure 2 Here]

3.2 Identification: bank mergers as a quasi-natural experiment

The endogeneity issue could arise when the omitted variables are correlated with bank's block-holdings and future performance of firms. To address this concern, we follow Asker and Ljungqvist (2010) and He and Huang (2017) and exploit bank mergers as exogenous shocks to the bank's block-holding. Consider two merging institutions, one (the acquirer) serves as the lead lender of an affected firm, and another (the target) serves as the block-holder of the top rivals of the affected firm. After the two institutions have merged, the acquirer institution usually takes over the whole stock portfolios of the target institution and will maintain the block-holdings for a relatively long period.

Our exogenous shock relies on the assumption that the decision that two institutions merge is unrelated to the fundamental characteristics of the affected firms. Since banks often have hundreds of borrower firms at any point in time, they are unlikely to make merger decisions based on factors related to an individual borrower. Similarly, an institutional investor usually holds hundreds of stock portfolio firms at any point in time, so its merger decision is not purely motivated by factors related to one particular firm.

Besides, prior studies suggest that mergers between two financial institutions are largely driven by the consolidation of financial conglomerates in response to deregulation or motivated by the strategic and synergistic consideration of institutions themselves (DeYoung et al. (2009); He and Huang (2017)). Taken together, we believe that mergers between a bank institution and a financial institution (i.e.,"bank merger") can provide a plausibly exogenous shock to a bank's block-holding.

4 Data, Sample and Variables

4.1 Firm-level OLS sample

We start with all U.S. firms in the Compustat database. We require firms to have outstanding shares traded on the NYSE, AMEX, and NASDAQ in the CRSP database. We then group the firms into industries based on their historic three-digit SIC code in the Compustat database. We require that each industry have at least five consecutive years for

at least three firms. This allows us to calculate the bank's block-holding of the top rivals for industries with a meaningful series of years.

We then collect the information of firms' relationship banks from the LPC DealScan database. To align the firms in the Compustat database with their relationship banks in the Dealscan database, we rely on the DealScan-Compustat borrower linking table provided by Chava and Roberts (2008). A firm included into our sample should have at least one outstanding loan with a commercial bank or a bank holding company during the twelve months before a the start of a fiscal year. Following Jiang et al. (2010), we select both syndication loans and sole-lender loans, and we exclude loans with missing information on loan spreads, loan amount, or loan maturity. As Sufi (2007) suggested, we focus on lead banks because lead banks maintain more monitoring power, bear more due diligence duties, and retain a larger share of loans. We exclude financial firms (SIC from 6000 to 6999) and utility firms (SIC from 4900 to 4999). We further require firms to have total assets larger than one million USD, total sales larger than one million USD, total sales larger than the earnings before interest and taxes, and no missing values of the main financial variables.

We extract institutional holdings from the Thomson Reuters S13f Institutional Holding database. The WRDS version of the S13F data was subject to data quality issues from 2010 to 2016. Hence, we rely on the corrected S13F data in the WRDS SEC Analytics Suite to extract the institutional holding data.[2] We clean the data along several dimensions. First, we exclude observations if the holdings are missing. Second, we aggregate the equity holdings at the family institution-level if an institution reports its holdings under multiple funds. Following Ben-David et al. (2021), we aggregate the equity holdings of Blackrock, which controls six affiliated funds. Third, to obtain the precise holdings around the period when an institution is involved in a merger, we refer to the merger information in the SDC Merger and Acquisition database and manually check the S13F holding data when the merger was under negotiation. To obtain banks' equity holding of industrial firms, we first implement the fuzzy matching algorithm in SAS and match the two databases by the lender's name from the DealScan database and the fund's name from the S13F database. Then we manually check the accuracy of the matched bank-fund pairs with information on the FDIC BankFind

[2]The corrected data was published in June 2018 after a joint effort of Thomson Reuters and WRDS.

website and the original S13F reports on the SEC Edgar website.

These selections generate a firm-year panel with 37,035 observations by 4,485 distinct firms from 1990 to 2019. This constitutes our firm-level OLS sample. The sample period starts from 1990 because the DealScan database has a comprehensive coverage of syndication loans from the early 1990s. The sample construction details are summarized in Panel A of Appendix A2.

4.2 Firm-level DID sample

As discussed before, we rely on bank mergers, which yield exogenous shocks to the bank's block-holding of a firm's top rivals, as our identification strategy. We follow Asker and Ljungqvist (2010) and He and Huang (2017) to filter the bank merger events. We require that: (1) the merger between the two financial institutions (or their parent firms) was announced between 1991 and 2018;[3] (2) at least one institution has a lender identifier in the DealScan database; (3) the merger was completed within one year after the announcement. We hand-code the bank merger sample with lender information in the DealScan database and institutional investor information in the Thomson Reuters S13F database.[4] After this process, we obtain 158 bank mergers from 1991 to 2018.

For each bank merger, we identify treatment firms as those whose relationship banks are more likely to obtain block-holdings of a firm's top rivals through the merger. Specifically, we require that: (1) the affected firm has at least one outstanding loan with one merging institution during the past twelve months before the merger is announced; (2) any of the firm's top rivals was held by another merging institution with at least 5% of its shares at the quarter before the merger. To classify a firm into the control sample, we require it to have outstanding loans with the same merging bank as the treatment firms but require that another merging institution does not hold block shares of its top rivals. The only difference between the treatment firms and control firms is that for the latter, another

[3]The OLS sample ranges from 1990 to 2019, so we require that each merger has at least one year observation for the pre-event and post-event periods in the DID analysis.

[4]Based on the names of the acquirer and the target institution, we link the two databases by the fuzzy matching algorithm in SAS. After this, we manually check with lenders' public information on the FDIC BankFind websites.

merging institution does not hold significant equity shares of their top rivals, so that the banks cannot become block-holders of the top rivals as a result of the bank mergers. Following Asker and Ljungqvist (2010), we define "top rivals" as the ten largest firms in the three-digit SIC industry (ranked by Compustat net sales), excluding the firm itself.[5] Hereafter, we use "rival-obtaining bank mergers" to represent the merger events of our DID analysis.

The length of the event window is a trade-off between relevance and accuracy. On the one hand, a short window would not allow us to capture meaningful changes in the product market performance in response to the rival-obtaining bank mergers. On the other hand, a long window could incorporate too much noise that is irrelevant to the event. Following He and Huang (2017), we choose to study a symmetric seven-year window around the event year (i.e., three years before the merger announcement and three years after the merger completion, plus the event year). If a bank merger involves no treatment firm, we exclude them from our sample. There are 11,228 firm-year observations from twenty-nine bank mergers between 1991 and 2015. Panel B of Appendix A1 describes how we constructed the firm-level DID sample, and Appendix A2 provides a complete list of these valid bank mergers.

Figure 3 plots the distribution of bank mergers over time and the frequency of treatment firms in each merger. There is little clustering of merger deals and treatment firms in particular years. This feature suggests that our DID result is less likely to be driven by the unobservable macroeconomic condition that coincidentally correlated with the bank's block-holding status. In the Online Appendix, we also check the percentage of treatment and control firms across industries. Both treatment firms and control firms are broadly spread across industries, which mitigates the concern that our DID result is driven by unobservable factors of particular industries.

[Insert Figure 3 Here]

[5] In an untabulated table, we define top rivals by the four-digit NAICS industry code and TNIC3 industry code by Hoberg and Phillips (2016). The results are robust.

4.3 Loan-level DID sample

With the treatment firms and control firms identified in Section 4.2, we then implement the loan-level analysis on the *non-B-H firms*. We extract all syndicated loans and sole-lender loans from the DealScan database during the same sample period. A firm should have at least one relationship bank involved in a bank merger for inclusion in our sample. As discussed before, this requirement allows us to pin down the two underlying mechanisms. We exclude observations with missing values of loan spreads, loan amount, and loan maturity. After these selections, there are 11,561 loans issued by 1,108 distinct firms during a symmetric seven-year window around the bank mergers. To implement the DID test on the firm's behavior of bank switch, we further exclude the first loans initiated by the firms. This procedure leaves us 11,102 observations by 1,094 distinct firms. Panel C of Appendix A2 describes the details of how we constructed the loan-level DID sample.

4.4 Measuring bank's block-holding of top rivals

Following Santos and Rumble (2006), we define a bank's equity holding of an industrial firm as a block if it exceeds 5% of the outstanding shares of the firm. We construct four alternative measures in the OLS analysis to gauge the bank's block-holding of the top rivals in a given year. The first measure, *BankHoldRival(d)* is a dummy variable that equals one if any of a firm's relationship banks hold at least 5% of any of the top rivals during the four consecutive quarters of the prior year, and zero otherwise. The second measure, *NumRivals*, is the number of top rivals that are block-held by a firm's relationship banks. The third measure, *NumBanks*, is the number of relationship banks that are also block-holders of a firm's top rivals. The fourth measure, *Sum(RivalShare)*, is the aggregated fraction of the top rivals' outstanding shares that a firm's relationship bank holds during the four consecutive quarters of the prior year.

4.5 Measuring market power

The baseline result examines whether the bank's block-holdings of a firm's top rivals hurt the firm's market power. We use the firm-level markup (*Markup*) as the main variable

to measure market power. *Markup* measures the price-to-marginal costs when producing one unit of the good. Following De Loecker and Warzynski (2012) (DLW), we estimate the firm-level markup using the production function approach. There are two advantages of DLW's method. First, with the production function approach, we do not need to assume the strategy that firms use to compete in different industries (De Loecker and Warzynski (2012)). Second, it allows us to use firms' accounting information in their financial statements, rather than the price and output quantity information at the product-level.[6] Therefore, we believe that DLW's method is more appropriate for the purposes of our study.

Following De Loecker et al. (2020), we estimate the firm-level markup, *Markup*, in which *COGS* is used as the production cost. Traina (2018) and Basu (2019) suggest that some variate inputs, e.g., overhead costs and labor payments, have been shifted into *SGA* in the past two decades. They argue that the sum of *COGS* and *SGA* as a comprehensive variate input could be more suitable to estimate the firm-level markup. In the robustness check, we use the sum of *COGS* and *SGA* as the production cost and estimate the firm's markup.

Gross profit margin (*Margin*) is our second measure of the firm-level market power. The gross profit margin (i.e., Lerner index) measures the difference between the price and marginal costs over the price (Lerner (1934); Tirole (1988)). Following the empirical finance literature (Gaspar and Massa (2006); Peress (2010)), we define a firm's gross profit margin as the ratio of the operating profit to the total sales, where the operating profit is the difference between the firm's total sales (*Sale*) and the costs of goods sold (*COGS*).[7]

4.6 Other variables and summary statistics

To examine whether the rival-obtaining bank mergers increase the probability of a firm to switch bank, we construct a dummy variable that indicates the firm's bank-switching behavior. Following Asker and Ljungqvist (2010), we code *Switch(d)* as one if a firm changes

[6] In the production function approach, we can directly use firm-level data, e.g., total sales (*Sale*), cost of goods sold (*COGS*) and the selling, general and administration expense (*SGA*) from the Compustat database to estimate the firm-level markup. In other estimation methods, e.g., the demand approach by Hall (2018)), we need the plant-level information to estimate a firm's markup.

[7] In the robustness check, we use the sum of *COGS* and *SGA* as production cost and measure the firm's gross profit margin.

(drops) all its relationship banks in the previous and latest loan when issuing a new loan, and code as zero if any of the firm's relationship banks are retained.

To study how the rival-obtaining bank mergers affect the bank's financial resource allocation to the affected firms, we emphasize the impact on the borrowing costs of these firms. Following existing literature (Sufi (2007); Bharath et al. (2011)), we use loan-level data in the DealScan database and construct three measures. *Loan spreads* is the annual spreads (in bps) paid for the drawn part of a loan. *Collateral(d)* is an indicator that equals one if the bank requires collateral for a loan, and zero otherwise. *Loan amount* is the dollar amount (in million USD) that a firm borrows in a loan facility.

The time-variant characteristics of firms could bias our estimation of how the bank's block-holding of the top rivals affects the product market performance of these firms. To alleviate this concern, we control a vector of firm characteristics following existing literature (Morck et al. (2000); Santos and Rumble (2006); Gaspar and Massa (2006)), including firm size, leverage ratio, cash holding ratio, profitability, market to book ratio, sale growth, capital investment, and R&D expenditure. To capture the heterogeneity of a firm's competition strength and the intensity of industry competition, we follow Saidi and Streitz (2021) and control the firm's market share (*MktShr*) and the industry concentration (*HHI*). Furthermore, we control the total institutional ownership (*InstOwn*) and the number of the borrower's block-holders (*NumBlock*) to separate the effect of bank's block-holding of the top rivals from that of institutional ownership or block-holders in general (He and Huang (2017)). The details of variable definitions are shown in Appendix A1.

We winsorized all continuous variables at the 1^{st} and 99^{th} percentile to reduce the effect of outliers. Panel A of Table 1 provides descriptive statistics of the firm-level OLS sample. The first two rows summarize the market power of firms in our sample: the average markup is 1.457, and the average gross profit margin is 0.357. The next four rows summarize the cross-sectional variations of the bank's block-holdings of the top rivals. In our sample, about 6.1% of the observations have a bank-rival connection. The rest of the panel summarizes our control variables. The average total assets is about 837 million USD. The average leverage ratio is 28.9%, the average cash holding ratio is 9.8%, the average ROA is 13.7%, the average market to book ratio is 1.38, and the average market share is 10.4%. Besides, around 55%

of a firm's common shares are held by institutional investors, and each firm has 1.45 block-holders on average. In the loan-level DID sample (Panel B), around 40.5% of the loans are coded as Switch(d)=1. The average annual spreads paid for the drawn part of loans is 157 basis points, the average loan amount is 585 million USD, the average maturity is 47 months, and around 44% of the loans are required to provide collateral.

[Insert Table 1 Here]

5 Main Results

5.1 Bank's block-holdings of top rivals and firm's market power

5.1.1 OLS estimation

Before presenting the effect of rival-obtaining bank mergers on the market power of affected firms, we first present the OLS estimation results for the effect of a bank's block-holding of the top rivals on the market power of the affected firms as a preliminary result. We estimate the following specification:

$$MarketPower_{i,t} = \alpha + \beta_1 BankHoldMeasure_{i,t-1} + \gamma' Control_{i,t-1} + \delta_i + \tau_t + \epsilon_{i,t} \quad (1)$$

where i denotes the affected firm, and t denotes the year. The dependent variable is the firm's market power defined as before. *BankHoldMeasure*, is one of the four proxies for the bank's block-holding of firm *i*'s top rivals over fiscal year *t-1*. To reduce the skewed distribution of *NumRivals* and *NumBanks*, we use the natural logarithm of one plus these variables in the OLS regression. *Control* is a vector of the time-variant firm characteristics that may affect the product market prospects of a firm in the future. We control the two-digit SIC industry fixed effect to capture the time-invariant characteristics of an industry that is simultaneously correlated with the bank's block-holdings of the top rivals and the market power of the affected firms.

Panel A of Table 2 reports the OLS results of Equation (1), using *BankHoldRival(d)* as the measure for the bank's block-holdings of the top rivals. Consistent with the hypothesis

that the existence of the bank block-holder of the top rivals hurts the market power of the affected firms, the coefficients of *BankHoldRival(d)* are significantly negative. Columns 2 and 4 suggest that a firm's markup (gross profit margin) is 0.054 (0.009) lower if the bank block-holds its top rivals, compared with a firm whose bank does not block-hold its top rivals. Considering that the markup (gross profit margin) has an interquartile range of 0.485 (0.25) and a standard deviation of 0.807 (0.189), the magnitude of this effect is economically meaningful. Panel B reports the results of three alternative measures of the bank's block-holding of the top rivals, and the coefficients are still significantly negative.

[Insert Table 2 Here]

5.1.2 Baseline DID analysis

The OLS analysis shows that the effect of the bank's block-holding of the top rivals is valid for a broader sample of the affected firms. However, whether a top rival is block-held by a bank is potentially endogenous. To address this endogenous problem, we rely on mergers between relationship banks of the affected firms and block-holders of the top rivals to generate plausibly exogenous variations to the bank's block-holdings of the top rivals. By implementing a DID experiment, we examine the effect of rival-obtaining bank mergers on the market power of the affected firms. We estimate the following specification:

$$MarketPower_{i,j,t} = \beta_1 Treat \times Post + \beta_2 Post + \gamma' Control_{i,t-1} + \delta_{i,j} + \tau_t + \epsilon_{i,j,t} \quad (2)$$

where i denotes the affected firm, j denotes the bank merger, and t denotes the calendar year. *MarketPower* is one of the two measures of a firm's market power: *Markup* or *Margin*. *Treat* equals one if an affected firm's relationship bank obtains a block-holding of any of the firm's top rivals upon merging with another institution, and zero otherwise. *Post* equals one if a firm-year observation is after the completion of a merger, and zero otherwise. *Control* is a vector of firm characteristics, as discussed in Equation (1). We control the firm fixed effect to capture the time-invariant factors across firms, and we control the calendar year fixed effect to capture the time trend. In the most stringent specification, we control the

firm×merger fixed effect.[8] To address the concern of auto-correlation, we cluster standard errors at the merger level, given that the treatment variable is identified at the merger level. The coefficient β_1 captures the marginal effect of the rival-obtaining bank mergers on the market power of the affected firms.

Table 3 presents the DID results of estimating Equation (2). Columns 1 and 2 report the results for *Markup*, and columns 3 and 4 report the results for *Margin*. In all columns, we control the full vector of the control variables and fixed effects. The coefficients of *Treat*×*Post* are significantly negative. We find that the economic magnitudes are also considerable; on average, the rival-obtaining bank mergers decrease the markup (gross profit margin) by approximately 3.56% (3.6%) when compared with the sample average. Several robustness tests are conducted to ensure that our DID estimations of firms' market power are robust, with results reported in the Online Appendix.

[Insert Table 3 Here]

5.1.3 Validity of DID experiment

The validity of the DID estimation critically depends on the parallel trends assumption (Roberts and Whited (2013)). To this end, we introduce a series of lead-lag dummies into the DID specification, interact them with *Treat*×*Post*, and estimate the equation as follows:

$$MarketPower_{i,j,t} = \alpha + \sum_{k=-5}^{k=5} \beta_k Treat \times Year^{\mathrm{k}} + \beta_2 Post + \delta_{i,j} + \tau_t + \epsilon_{i,j,t} \quad (3)$$

where i, j and t denotes affected firm, bank merger, and calendar year, respectively. *MarketPower* is one of the two measures of market power. $Year^k$ equals one if a firm-year observation happens to be year k relative to the event year, and zero otherwise. As before, we control the firm×merger fixed effect and calendar year fixed effect. Panel A (Panel B) of Figure 4 plots the coefficients estimated for *Markup* (*Margin*). The coefficients of the pre-event periods are close to zero, suggesting that the markup (gross profit margin) of the

[8] Due to the way we construct the control sample, a firm could appear in multiple bank mergers. Hence, a more conservative way is to control the firm×merger fixed effect. After that, the coefficient of *Treat* is unidentified.

treatment firms and the control firms closely follows a parallel trend during the five years leading up to the mergers. The coefficients become significantly negative after the completion of mergers (i.e., $Year^1$) and reach their minimum value three years after the merger (i.e., $Year^3$). The figure suggests that the market power of the affected firms decreases once their relationship banks become the block-holders of their top rivals.

[Insert Figure 4 Here]

5.2 Bank's block-holdings of top rivals and firm's bank switch

5.2.1 DID estimation

The evidence so far suggests that rival-obtaining bank mergers hurt the market power of the affected firms. When the relationship bank becomes the block-holder of the top rivals of a firm, a natural question that arises is whether this could increase the firm's probability of switching the bank that block-holds its top rivals. To this end, we estimate the following equation:

$$Switch_{l,i,j,t} = \beta_1 Treat \times Post + \beta_2 Post + \gamma' Control_{i,t-1} + \delta_{i,j} + \tau_t + \epsilon_{l,i,j,t} \quad (4)$$

where l, i, j and t denotes the loan observation, the firm, the bank merger, and the calendar year, respectively. *Switch(d)* is an indicator that equals one if firm i changes all its relationship banks when issuing a new loan i, and zero otherwise. We use the linear probability model to estimate Equation (4).[9] The results are reported in Panel A of Table 4. In all regressions, we control the firm characteristics and year-quarter fixed effect. From column 1 to column 3, we gradually control the three-digit SIC industry fixed effect; the firm fixed effect, and the firm×merger fixed effect. The coefficients of *Treat*×*Post* are positive and statistically significant. The magnitude of the coefficients are also meaningful; on average, the firm's probability of bank switch increases from the sample average by approximately

[9]Prior studies suggest that logit or probit models with high-dimension fixed effects can generate biased estimations due to the incidental parameters problem (Lancaster (2000)). We aim to estimate the average marginal effects, so that the linear probability models can estimate reasonably well (Angrist and Pischke (2009)).

2% if a firm is treated by the bank merger. Figure 5 shows the dynamics of the coefficients estimated for the marginal effect on the firms' bank switch before and after the bank mergers.

[Insert Figure 5 Here]

5.2.2 Heterogeneous effect of rival-obtaining bank mergers on bank switch

We now examine the heterogeneous effect of firms' information asymmetry, which could hinder the firm from switching banks smoothly. We construct two variables to measure the firm's information asymmetry. *Not rated(d)* is an indicator that equals one if a firm has no S&P rating for its long-term debt, and zero otherwise. *High-tech firm(d)* is an indicator that equals one if the number of patents registered by a firm is above the industry median, and zero otherwise. Following Sufi (2007), we measure the information asymmetry between a firm and those banks that are not inside lenders of the firm. *Sole lender(d)* is an indicator that equals one if a firm relies on a single bank and does not have multiple lending relationships, and zero otherwise. Panel B of Table 4 reports the cross-sectional results. The coefficients of the triple DID terms are slightly negative but not significant, suggesting that the information asymmetry problem could not be a major concern when firms decide to switch banks.

Next, we examine the heterogeneous effect of a bank's information advantage over the firm, which could cause potential risks of information leakage if the firm continue to borrow from the bank. Following Bharath et al. (2007), we construct two variables to measure the relationship lending intensity. *High loan share(d)* is an indicator that equals one if the bank's lending share is above the median, and zero otherwise. *Long duration(d)* is an indicator that equals one if the duration of the firm-bank lending relationship is above the median, and zero otherwise. Besides, the geographic proximity of a bank to its borrower could facilitate the bank being able to obtain private information from the firm (Hollander and Verriest (2016)). Following the "twenty-minutes rule", *Neighbor bank(d)* is an indicator that equals one if the geographic distance between the bank and the firm is less than twenty-five miles, and zero otherwise (Tian (2011)). Panel C of Table 4 reports the cross-sectional results. The coefficients on the triple DID terms are significantly positive, suggesting that the bank's information advantage over the firm increases the information leakage concern, thus increasing the firm's probability of switching bank.

[Insert Table 4 Here]

6 Mechanism Analysis

As discussed in Section 2, the adverse effect of rival-obtaining bank mergers on the market power of the affected firms can be explained by two underlying channels, financial resource distortion or proprietary information leakage. For the former, we first analyze the costs of loans for the affected firms. Then we analyze the heterogeneous effect of firms' sensitivity to information leakage on their market power to further pin down the second mechanism. After that, we examine the heterogeneity of the bank's incentives to support its holding rivals as a robustness check.

6.1 Rival-obtaining bank mergers and costs of debt

If the financial resource distortion channel works, we expect that banks could allocate the financial resource to the *B-H rivals*, and *non-B-H firms* could be affected by higher prices of borrowing or reduced borrowing amounts from this bank. To this end, we implement the DID experiment on the loan observations and estimate the following specification:

$$LoanTerm_{l,i,j,t} = \beta_1 Treat \times Post + \beta_2 Post + \gamma' Control_{i,t-1} + \eta_l + \delta_{i,j} + \tau_t + \epsilon_{l,i,j,t} \quad (5)$$

where l, i, j and t denotes the loan, the firm, the bank merger, and the calendar year, respectively. We estimate Equation (5) for three outcome variables. *Loan spreads* is the annual spreads (in bps) for the drawn part of a loan. *Collateral(d)* is an indicator of whether a bank requires collaterals. *ln(Loan amount)* is the natural logarithm of the loan amount. To distinguish the heterogeneity between firms that switch banks after bank mergers and those that do not switch banks after the mergers, we interact *Switch(d)* with *Treat*×*Post* and report the results in Table 5. We control the loan characteristics (i.e., loan type and purpose), firm characteristics, and calendar quarter fixed effect in all regressions. We gradually control the three-digit SIC industry fixed effect, the firm fixed effect, and the firm×merger fixed effect. Columns 1 to 3 show the results for *Loan spreads*. The coefficients are significantly positive,

and the positive coefficients are concentrated on firms that switch banks after the mergers. Columns 4 to 6 show the results for *Collateral(d)*. The coefficients are not significant for the whole sample but are significantly positive if firms switch their banks after the merger. Columns 7 to 9 show the results for *ln(Loan amount)*. The coefficients for the sample firms are not significant and are slightly negative if firms switch their banks. The results suggest that those firms that continue to borrow from their relationship banks do not suffer from tightened credit conditions. The increased costs of loans are only found for firms that switch their banks. Overall, the loan-level evidence is not consistent with the financial resource distortion hypothesis.

[Insert Table 5 Here]

6.2 Cross-sectional test on the effect of firms' market power

6.2.1 Firm's sensitivity to information leakage

The proprietary information leakage hypothesis relies on the scenario that the affected firms bear higher proprietary costs (Asker and Ljungqvist (2010)). We use three variables to measure the firm's risk of proprietary information leakage. *Strategic substitute(d)* is an indicator that equals one if a firm's industry produces more substitute goods and is considered to be highly competitive, and zero otherwise (Chod and Lyandres (2011)). *High-tech firm(d)* is an indicator that equals one if the number of patents registered by a firm is above the industry median, and zero otherwise (Kogan et al. (2017)). *Neighbor bank(d)* is an indicator that equals one if the geographic distance between the bank and the firm is less than twenty-five miles, and zero otherwise (Tian (2011); Hollander and Verriest (2016)). We expect the adverse effect on market power to be stronger for firms with higher proprietary costs.

We interact the three moderator variables with *Treat*×*Post* and estimate Equation (2). The cross-sectional results are presented in Panel A of Table 6. In columns 1 to 6, the coefficients are significantly positive, which is consistent with our expectation. The results suggest that the decreased market power is more pronounced when a firm's industry is highly competitive, when a firm has intensive R&D activities, and when the relationship bank possesses more private information about the firm.

[Insert Panel A of Table 6 Here]

6.2.2 Bank's incentives to support its holding rivals

To examine the heterogeneous effect of a bank's incentives on the firm's market power, we analyze the relative importance of the affected firms (i.e.,*non-B-H firm*) and the *B-H rivals* to the bank. We use three variables to measure the two-side heterogeneity. *Resilient borrower(d)* is an indicator that equals one if the affected firm is a larger client whose total borrowing amount exceeds one-third of the bank's total lending, and zero otherwise. *Important rivals(d)* is an indicator that equals one if the bank's equity holding of the top rivals exceeds 2% of its total investment, and zero otherwise. *Dedicated bank(d)* is an indicator that equals one if the bank is a long-term investor as defined in Bushee (1998) and Bushee (2001), and zero otherwise. We expect that the decreased market power is less pronounced if the bank considers the firm as a large client of its loan business, while the effect is more pronounced if the bank considers the rivals as important investments in its stock portfolios and if the bank is a long-term investor.

We interact the three moderator variables with *Treat*×*Post* and estimate Equation (2). The results are presented in Panel B of Table 6. In columns 1 and 2, the coefficients of the interaction term with *Resilient borrower(d)* are positive and even flip the adverse effect as a whole. In columns 3 and 4, the coefficients of the interaction term with *Important rivals(d)* are negative. In columns 5 and 6, the coefficients of the interaction term with *Dedicated bank(d)* are significantly negative. Consistent with our hypothesis, the results suggest that the decreased market power is less pronounced if the bank considers the firm as a resilient borrower, while the effect is more pronounced if the bank considers the *B-H rivals* as important investments in its stock portfolios, and if the bank is a long-term investor.

[Insert Panel B of Table 6 Here]

7 Discussion: Impact on Top Rivals

Our evidence so far is consistent with the hypothesis that the formation of a bank's block-holdings of the top rivals hurts the market power of the affected firms. A question

arises that whether the top rivals benefit from the equity holding relationship with the bank. To this end, we first analyze the effect of rival-obtaining bank mergers on the top rivals' borrowing costs and then analyze the effect on their market power.

We select the ten largest firms in the three-digit SIC industry (ranked by the Compustat net sales) as our sample. As discussed in Section 3.1, we require that at least one firm in the industry has outstanding loans with a bank during the past twelve months and the bank is involved in a bank merger. If another merging institution holds a top rival with at least 5% shares at the quarter before the merger (*RivalTreat*=1), we classify the rival as a treatment sample. For other rivals that another merging institution does not hold, we classify them as control samples (*RivalTreat*=0). After that, we select the loan observations and the fiscal-year observations of our sampled rivals during a symmetric seven-year window around the bank mergers. This process yields 3,484 loans and 3,941 fiscal-year observations by 619 distinct rivals.

7.1 Effect on costs of loans of top rivals

To examine the impact of rival-obtaining bank mergers on the costs of loans of the top rivals, we estimate the following specification:

$$LoanTerm_{l,r,j,t} = \beta_1 RivalTreat \times Post + \beta_2 Post + \gamma' Control_{r,t-1} + \eta_l + \delta_{r,j} + \tau_t + \epsilon_{l,r,j,t} \quad (6)$$

where l, r, j and t denotes the loan, the rival, the bank merger, and the calendar year, respectively. *RivalTreat* equals one if a rival is held by another merging institution with at least 5% shares during the quarter before a merger, and zero otherwise. *Post* equals one if a loan is issued after the completion of the merger, and zero otherwise. We control the loan characteristics (i.e., loan type and purpose), rival characteristics, and calendar quarter fixed effect in all regressions. We gradually control the three-digit SIC industry fixed effect, the rival fixed effect, and the rival×merger fixed effect. The coefficient β_1 captures the marginal effect on the costs of loans of the top rivals.

Panel A of Table 7 reports the results. Columns 1 to 3 show the results for *Loan spreads*. The coefficients are negative but are only significant at the 10% level. From columns 4 to

7, the coefficients are not significant when using *Collateral(d)* and *ln(Loan amount)* as the dependent variables. Overall, we find no evidence that the bank-held rivals enjoy lower debt financing costs and greater debt capacity.

[Insert Panel A of Table 7 Here]

7.2 Effect on the market power of top rivals

In this section, we examine how the rivals' market power changes after the rival-obtaining bank mergers. We estimate the following DID specification:

$$MarketPower_{r,j,t} = \beta_1 RivalTreat \times Post + \beta_2 Post + \gamma' Control_{r,t-1} + \delta_{r,j} + \tau_t + \epsilon_{r,j,t} \quad (7)$$

where r, j and t denotes the rival, the bank merger, and the calendar year, respectively. *MarketPower* denotes the two measures of market power. *RivalTreat* equals one if another merging institution holds a top rival with at least 5% shares during the quarter before a merger, and zero otherwise. *Post* equals one if an observation is after the completion of a merger, and zero otherwise. *Control* is a vector of the control variables in Equation (2), which are measured for the rivals. We also control the rival fixed effect (or the rival×merger fixed effect) and the calendar year fixed effect. The coefficient β_1 captures the marginal effect on the market power of the rivals.

Panel B of Table 7 presents the results from estimating Equation (7). Columns 1 and 2 report the results for *Markup*, and columns 3 and 4 report the results for *Margin*. In all columns, the coefficients of *RivalTreat*×*Post* are negative and statistically significant. The economic magnitudes are also considerable; on average, rival-obtaining bank mergers decrease the markup (gross profit margin) by approximately 1.68% (3.4%) when compared to the sample average.[10]

[Insert Panel B of Table 7 Here]

Following the discussions in Section 6.2, we revisit the cross-sectional analysis for the effect of rival-obtaining bank mergers on the rivals' market power. To examine the het-

[10]The average value of the markup (gross profit margin) is 1.25 (0.32) for the rivals.

erogeneity of banks' incentives to support their holding rivals, we interact *RivalTreat*×*Post* with the three moderator variables: *Resilient borrower(d)*, *Important rivals(d)* and *Dedicated bank(d)*, respectively. We expect the increased market power of the rivals to be less pronounced if an affected firm is a resilient borrower of the bank, while the effect would be more pronounced if the rivals are important stocks in the bank's stock portfolios and if the bank is a long-term investor. The results are tabulated in the Online Appendix. We find that the increased market power of the top rivals is less pronounced if the bank considers the affected firm as a resilient borrower, while the effect is more pronounced if the bank considers the rivals as important investments in its stock portfolios and if the bank is a long-term investor.

At last, we examine the heterogeneity of firms' sensitivity to information leakage. We interact *RivalTreat*×*Post* with the three moderator variables: *Strategic substitute(d)*, *High-tech borrower(d)* and *Neighbor bank(d)*, respectively. The coefficients of the triple terms are not significant, with results reported in the Online Appendix.

8 Conclusion

In this paper, we study how a bank's equity holding in industrial firms affects the firm's market power in the product market. We establish the causality by exploiting bank mergers as exogenous variations to the bank's equity holding and implement a quasi-natural experiment. We find that the formation of a bank's block-holding of the top rivals leads to lower markup (gross profit margin) for the *non-B-H firms*, and these firms are more likely to switch banks. The effect is stronger if an industry is highly competitive, when a firm has intensive R&D activities, and if the bank has more private information about the firm. In the loan-level analysis, we find that the borrowing costs increase slightly, but the effect is more concentrated on firms that switch banks, which is not consistent with the financial resource distortion hypothesis. Taken together, we suggest that "*proprietary information leakage*" is the most plausible mechanism. Meanwhile, we find that the top rivals with bank shareholders enjoy higher market powers, and the bank's incentive to support its holding rivals does matter. Overall, we suggest that a bank's equity holding in industrial firms could

intensify unfair competition. As a result, the *B-H firms* enjoy higher market power while other *non-B-H firms* suffer from diminished market power.

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Appendix A1. Variable Definition

Variables	Description
Main dependent variables	
Markup	Price-to-marginal cost ratio, estimated by the production function approach in De Loecker et al. (2020).
Margin	Gross profit margin, $=(Sale_t\text{-}COGS_t)/Sale_t$
Switch(d)	An indicator that equals one if a firm switches all its relationship banks in a new loan, and zero otherwise.
Measures of rival-bank connection	
BankHoldRival(d)	An indicator that equals one if a firm's relationship bank holds at least 5% share in any of its top rivals during the consecutive four quarters of year *t-1*, and zero otherwise.
NumRivals	Number of top rivals held by relationship banks.
NumBanks	Number of relationship banks that are block-holders of firm's top rivals.
Sum(RivalShare)	The aggregated fraction of rivals' equity shares that a firm's relationship banks hold.
Variables in DID analysis	
Treat(d)	An indicator that equals one if a firm's relationship bank becomes a block-holder of its top rivals by merging with another institution, and zero otherwise.
Post(d)	An indicator that equals one if a firm-year observation is after the completion of a merger, and zero otherwise.
RivalTreat(d)	An indicator that equals one if a top rival is block-held by another merging institution during the quarter before a merger, and zero otherwise.
Variables in the loan-level analysis	
Loan spreads	The annual spreads in bps paid for a loan.
Collateral(d)	An indicator that equals one if a bank requires collateral for a loan, and zero otherwise.
Loan amount	The borrowing amount of a loan (in million USD).
Control variables	
Asset	Firm's total assets (in million USD).
Debt/Asset	Total debt scaled by total assets.
Cash/Asset	Cash and cash equivalent scaled by total assets.
ROA	Net income scaled by total assets.
MarketToBook	Market value of equity over book value of equity.
SaleGrowth	The growth rate of the total sales

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(Continued)

Capex/Asset	Capital expenditure scaled by total assets.
R&D/Sale	Expenditure on R&D over total sales.
MktShr	The ratio of a firm's sales over the total sales of the three-digit SIC industry.
HHI	Sum of square of market share of firms in the three-digit SIC industry.
InstOwn	Sum of firm's shares held by institutional investors.
NumBlock	The number of block-holders of a firm.
Heterogeneity moderators	
Not rated(d)	An indicator that equals one if a firm has no S&P senior unsecured debt rating, and zero otherwise.
High-tech firm(d)	An indicator that equals one if the number of patents registered by a firm is above the industry median during the year before a merger, and zero otherwise.
Sole lender(d)	An indicator that equals one if a firm does not have multiple lending relationships (except the merging bank) during the past five years, and zero otherwise.
High loan share(d)	An indicator that equals one if a bank's lending share (the number of loans a firm borrows from the bank over the total number of loans of the firm during the past five years) is above the median, and zero otherwise.
Long duration(d)	An indicator that equals one if the length of the bank-firm relationship is above the median, and zero otherwise.
Neighbor bank(d)	An indicator that equals one if the geographic distance between a firm and its bank is less than twenty-five miles (i.e., "twenty-minute drive"), and zero otherwise.
Resilient borrower(d)	An indicator that equals one if a firm's borrowing exceeds one-third of a bank's total lending, and zero otherwise.
Important rivals(d)	An indicator that equals one if a bank's holding of a firm's top rivals exceeds 2% of its total investment, and zero otherwise.
Dedicated bank(d)	An indicator that equals one if a bank is a dedicated investor as defined in Bushee (2001), and zero otherwise.
Strategic substitute(d)	An indicator that equals one if an industry competes in strategic substitutes, and zero if it competes in strategic complements (Chod and Lyandres (2011)).

Appendix A2. Sample selection

Panel A: *Firm-level OLS sample (Table 2)*	Removed	Remained
Firms have outstanding loans with banks during the past twelve months.		45,337
Exclude financial firms and utility firms, exclude firms with total assets less than one million, total sales less than one million, and total sales less than the earnings before the interest and taxes	(8,302)	37,035
Panel B. *Firm-level DID sample (Table 3, Table 6)*	**Remove**	**Remain**
Firm-year observations that meet the initial requirements in Panel A.		187,594
Exclude firms whose relationship bank is not involved in a bank merger.	(168,359)	19,234
Exclude bank mergers without treatment firms.	(2,760)	16,474
Firm-year observations that are within the [-3, +3] year-window of bank mergers.	(5,246)	11,228
Panel C. *Loan-level DID sample (Table 4 and Table 5)*	**Removed**	**Remained**
Syndicated loans issued by firms that meet the initial requirements in Panel A.		157,127
Exclude firms whose relationship bank is not involved in a bank merger.	(134,121)	23,006
Exclude bank mergers without treatment firms.	(6,229)	16,777
Loans that are issued within the [-3, +3] year-window of bank mergers.	(5,216)	11,561
Exclude loans that are issued by firms for the first time (i.e., bank switch sample).	(459)	11,102
Panel D. *DID sample for top rivals (Table 7)*	**Remove**	**Remain**
The ten largest firms in a three-digit SIC industry (ranked by Compustat net sales).		10,678
Exclude duplicate observations if a rival is paired with multiple firms.	(4,048)	6,630
Exclude firms with total assets less than one million, total sales larger less than one million, and total sales less than the earnings before the interest and taxes	(1,448)	5,182
Exclude bank mergers during the subprime crisis.	(1,241)	3,941

Appendix A3. Rival-obtaining bank mergers in DID experiment

Announced date	Effective date	Acquirer	Target
7/15/1991	12/31/1991	Chemical bank	Manufacturers Hanover
8/12/1991	4/22/1992	BankAmerica	Security Pacific
10/28/1991	6/18/1992	Comerica	Manufacturers National
7/17/1992	10/29/1993	NationsBank	MNC Financial
2/21/1995	11/30/1995	Fleet Financial	Shawmut National
8/28/1995	3/31/1996	Chemical Bank	Chase Manhattan
8/28/1995	5/3/1996	National City	Integra Financial
8/30/1996	1/6/1997	NationsBank	Boatmen's Bankshares
7/22/1997	11/3/1997	CIBC Wood Gundy	Oppenheimer
2/2/1998	4/30/1998	Hongkong Bank of Canada	National Westminster
4/6/1998	10/8/1998	Travelers	Citicorp
4/13/1998	9/30/1998	NationsBank	BankAmerica
6/8/1998	11/2/1998	Norwest	Wells Fargo
8/28/1998	8/28/1998	UBS AG	SBC Warburg
4/11/2000	8/1/2000	Chase Manhattan	Robert Fleming
10/4/2000	2/27/2001	Firstar	US Bancorp
10/24/2000	4/2/2001	Deutsche Bank	Banque Worms
2/12/2001	7/18/2001	Citigroup	ABN-AMRO
3/19/2001	3/19/2001	CCF Canada	Credit Lyonnais Canada
4/16/2001	9/4/2001	First Union	Wachovia
10/27/2003	4/1/2004	Bank of America	FleetBoston
1/14/2004	7/1/2004	JPMorgan Chase	Bank One
12/16/2004	1/5/2005	Bank of Ireland	Burdale Financial
1/31/2005	7/1/2005	MetLife	Travelers
3/16/2008	5/30/2008	JPMorgan Chase	Bear Stearns
3/28/2008	6/3/2008	US Bank National Assoc.	Mellon 1st Business Bank
9/14/2008	1/1/2009	Bank of America	Merrill Lynch
10/3/2008	12/31/2008	Wells Fargo	Wachovia
12/3/2015	9/6/2016	Raymond James	Deutsche Bank

This table lists bank mergers in the DID analysis. We report the announcement date, the effective date, and name of the two merging institutions.

Figure 1. Evolution of banks' equity holding of non-financial firms
The line represents the percentage of firms with bank shareholders of each year. We select all public firms from the Compustat×CRSP universe, excluding financial and utility firms. If a bank holds at least 0.5% of a firm's outstanding shares, we define that the firm has a bank shareholder.

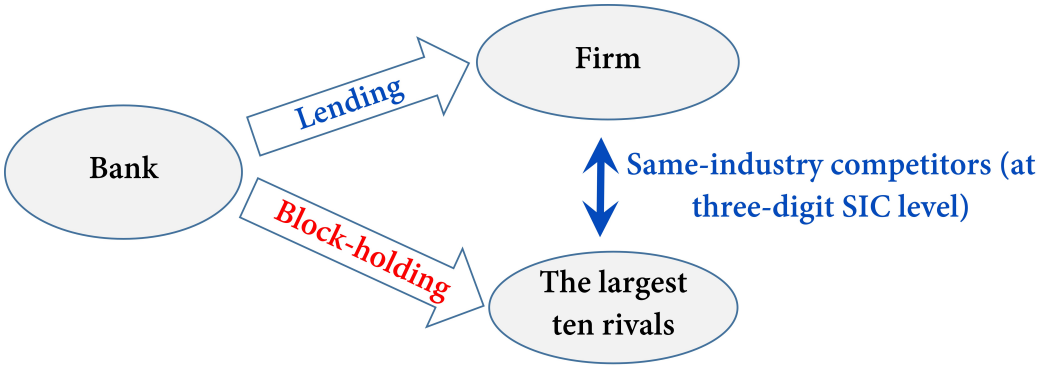


Figure 2. Relationship between a firm, its relationship bank, and its top rivals
This figure depicts the relationship between the three players in this paper. The affected firm, which is of our interest, has outstanding loans with a bank during the past twelve months. The bank, who is the creditor of the affected firm, is also a block-holder of the firm's top rivals. The top rivals, defined as the ten largest firms in the three-digit SIC industry (excluding the firm itself), are competitors of the affected firm. We also restrict that the top rivals do not have lending relationship with the bank.

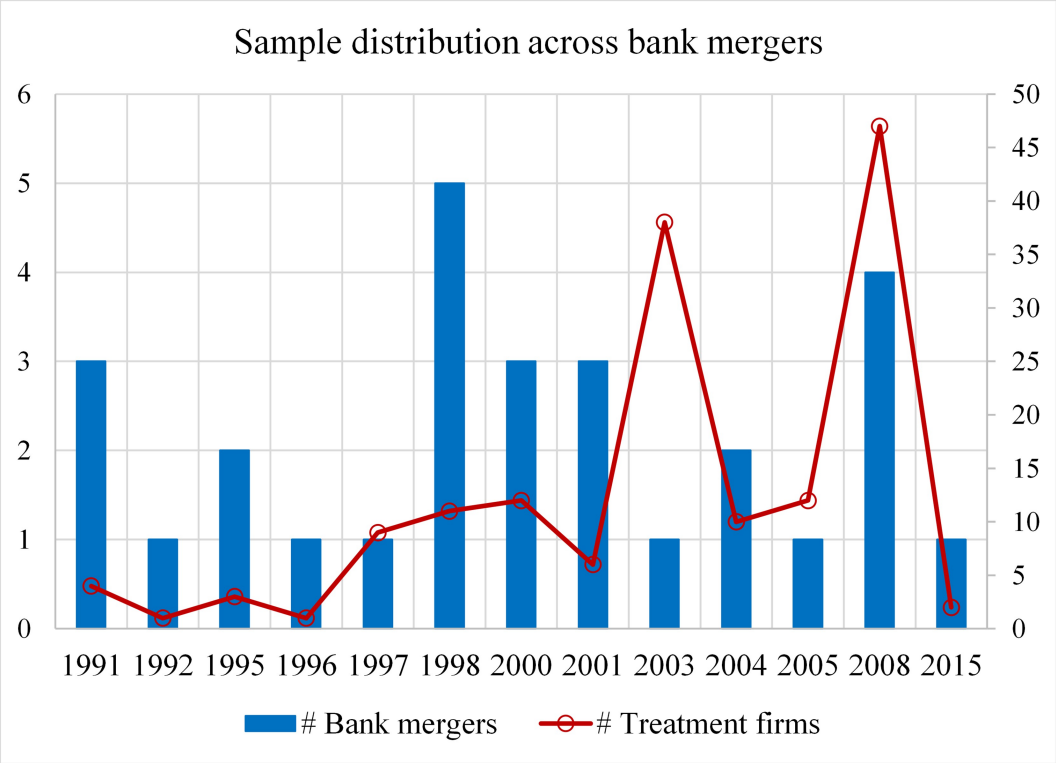
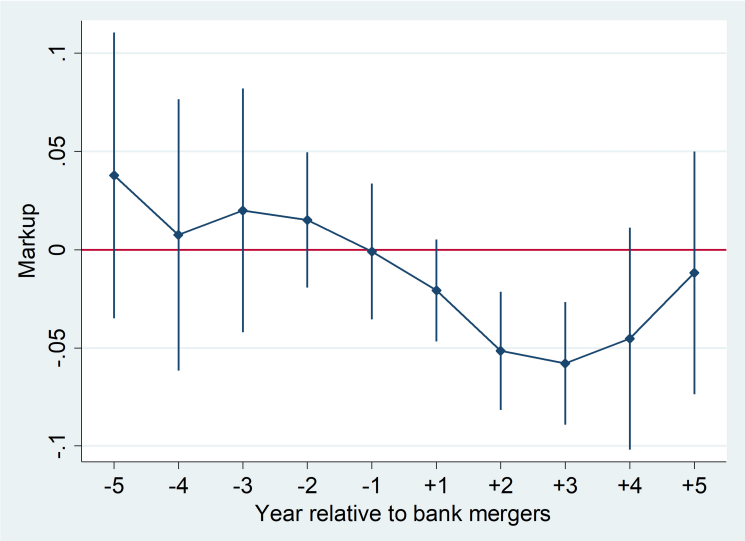
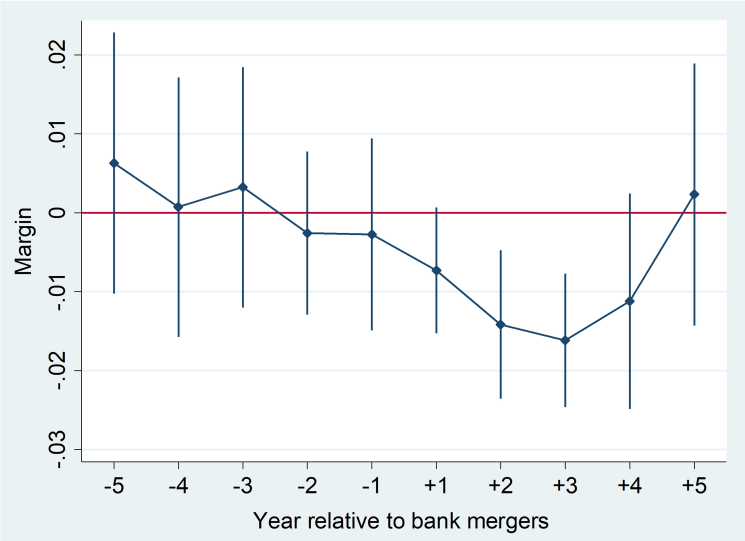


Figure 3. Distribution of bank mergers and treatment sample

The blue bars represent the number of bank mergers that are announced each year, with the axis on the left side. The red line represents the number of firms that are treated by bank mergers, with the axis on the right side. There are twenty-nine bank mergers from 1991 and 2015 in our DID experiment.



Panel A. Markup



Panel B. Margin

Figure 4. Dynamics of coefficient estimated: rival-obtaining bank mergers and firms' market power

This figure depicts the coefficients of estimating $Markup_{i,j,t} = \alpha + \sum_{k=-5}^{k=5} \beta_k Treat \times Year^{\mathrm{k}} + \beta_2 Post + \delta_{i,j} + \tau_t + \epsilon_{i,j,t}$, where i, j and t denotes the affected firm, the bank merger, and the calendar year, respectively. The dependent variables are firms' markup (Panel A) and gross profit margin (Panel B). We control the firm×merger fixed effect and the calendar year fixed effect, and cluster the standard errors at the merger level. The vertical spikes represent the 95% confidential interval of β_k.

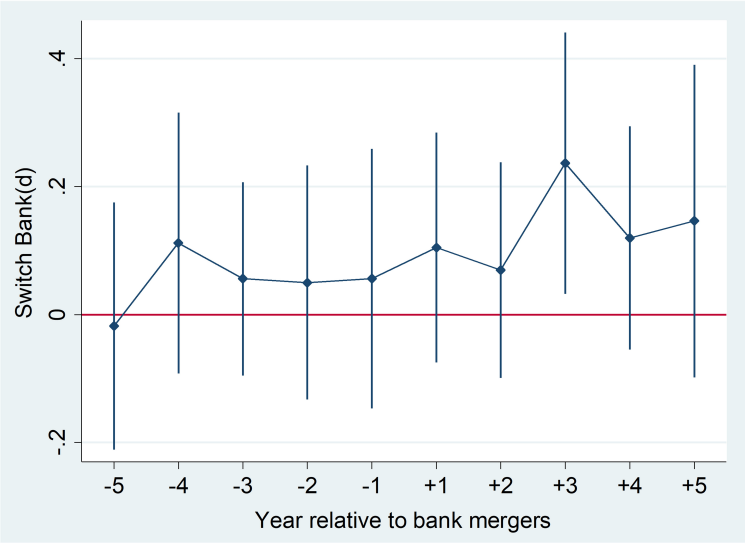


Figure 5. Dynamics of coefficient estimates: rival-obtaining bank mergers and firms' probability bank switch

This figure depicts the coefficients of estimating $Switch(d)_{l,i,j,t} = \alpha + \sum_{k=-5}^{k=5} \beta_k Treat \times Year^{\mathrm{k}} + \beta_2 Post + \delta_{i,j} + \tau_t + \epsilon_{l,i,j,t}$, where l, i, j and t denotes the loan observation, the affected firm, the bank merger, and the calendar year, respectively. Suppose firm i has multiple banks in the last loan, we code $Switch(d)$ as one only if the firm switches all its relationship banks when initiating a new loan, and zero otherwise. In the linear probability model, we control the firm×merger fixed effect and the calendar year fixed effect, and we cluster the standard errors at the merger level. The vertical spikes represent the 95% confidential interval of β_k.

Table 1. Descriptive statistics

Panel A. Firm-level OLS sample

Variable	Mean	Std. Dev.	P25	Median	P75
Markup	1.457	0.807	1.035	1.206	1.520
Margin	0.357	0.189	0.218	0.329	0.468
BankHoldRival(d)	0.061	0.239	0	0	0
Ln(NumRivals+1)	0.045	0.181	0	0	0
Ln(NumBanks+1)	0.043	0.172	0	0	0
Sum(RivalShare)	0.004	0.018	0	0	0
Ln(Asset)	6.731	1.608	5.589	6.707	7.830
Debt/Asset	0.289	0.211	0.133	0.265	0.407
Cash/Asset	0.098	0.116	0.017	0.052	0.136
ROA	0.137	0.095	0.088	0.133	0.185
MarketToBook	1.380	0.936	0.790	1.097	1.642
SaleGrowth	0.119	0.277	-0.012	0.073	0.188
Capex/Asset	0.061	0.065	0.021	0.040	0.074
R&D/Sale	0.022	0.050	0	0	0.017
HHI	0.237	0.178	0.104	0.190	0.301
MktShr	0.104	0.179	0.007	0.029	0.109
InstOwn	0.554	0.295	0.321	0.606	0.807
Ln(NumBlock+1)	0.734	0.579	0	0.693	1.099

Panel B. Loan-level DID sample

Variable	Mean	Std. Dev.	P25	Median	P75
Switch(d)	0.405	0.491	0	0	1
Loan spreads (bps)	156.5	119.9	50	125	225
Collateral(d)	0.441	0.496	0	0	1
Loan amount (Millions)	584.8	842.1	100	275	700
Maturity (months)	46.91	24.24	24	60	60

This table presents the descriptive statistics of variables. There are 37,035 firm-year observations from 1990 to 2019 (Panel A) and 11,561 loan observations during the same period (Panel B). All continuous variables are winsorized at the 1^{st} and 99^{th} percentiles. See Appendix A1 for variable definitions.

Table 2. OLS regression of bank's rival-connection on firms' market power

Panel A. *BankHoldRival(d)* as the measure of bank-rival connection

	Markup		Margin	
	(1)	(2)	(3)	(4)
BankHoldRival(d)	-0.089***	-0.054***	-0.018***	-0.009**
	(-4.151)	(-2.729)	(-3.367)	(-2.102)
Ln(Asset)	0.038***	0.026***	0.008***	0.005***
	(3.899)	(2.839)	(3.798)	(2.863)
Debt/Asset	0.328***	0.210***	0.090***	0.065***
	(7.083)	(4.661)	(7.408)	(6.046)
Cash/Asset	0.185**	0.145*	0.026	0.007
	(2.005)	(1.666)	(1.274)	(0.395)
ROA	1.473***	1.727***	0.447***	0.494***
	(9.657)	(12.219)	(16.344)	(20.583)
MarketToBook	0.080***	0.051***	0.030***	0.021***
	(5.546)	(3.943)	(10.756)	(9.043)
SaleGrowth	0.028	-0.037*	-0.015***	-0.026***
	(1.194)	(-1.719)	(-3.042)	(-5.696)
Capex/Asset	1.746***	0.643***	0.296***	0.092**
	(8.026)	(3.289)	(6.990)	(2.445)
R&D/Sale	6.314***	6.886***	1.306***	1.311***
	(14.014)	(15.149)	(23.430)	(23.416)
HHI	-0.336***	-0.027	-0.069***	0.020
	(-6.648)	(-0.544)	(-4.807)	(1.420)
MktShr	-0.164**	-0.198***	-0.046***	-0.056***
	(-2.565)	(-3.225)	(-2.627)	(-3.519)
InstOwn	-0.092**	-0.046	-0.010	0.002
	(-2.570)	(-1.437)	(-1.364)	(0.353)
Ln(NumBlock+1)	0.037***	0.046***	0.004	0.007***
	(2.654)	(3.783)	(1.342)	(3.011)
Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	37,035	37,035	37,035	37,035
R-squared	0.257	0.379	0.265	0.448

Panel B. Alternative measures of bank's block-holding of top rivals

	Markup			Margin		
	(1)	(2)	(3)	(4)	(5)	(6)
Ln(NumRivals+1)	-0.070***			-0.012**		
	(-2.867)			(-2.118)		
Ln(NumBanks+1)		-0.074***			-0.013**	
		(-2.745)			(-2.091)	
Sum(RivalShare)			-0.686***			-0.119**
			(-3.172)			(-2.258)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,035	37,035	37,035	37,035	37,035	37,035
R-squared	0.379	0.379	0.379	0.448	0.448	0.448

Panel C. Alternative variable of firm's profitability

	Operating income/Asset		Net income/Asset	
	(1)	(2)	(3)	(4)
BankHoldRival(d)	-0.003**	-0.002*	-0.003**	-0.004**
	(-2.046)	(-1.946)	(-1.966)	(-2.456)
Controls	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	37,035	37,035	37,035	37,035
R-squared	0.624	0.626	0.398	0.412

This table reports the OLS estimation of how a bank-rival relationship affects a firm's market power. *Markup* is the price-to-marginal cost ratio of the firm, estimated by the production function approach in De Loecker et al. (2020). *Margin* is the firm's gross profit margin, defined as (*Sale-COGS*)/*Sale*. *BankHoldRival(d)* equals one if any of a firm's relationship bank holds at least 5% shares of the firm's top rivals, and zero otherwise. We define a firm's top rivals as the ten largest firms in the three-digit SIC industry (ranked by Compustat net sales), excluding the firm itself. In columns (1) and (3), we control the year fixed effect. In columns (2) and (4), we control the industry fixed effect at the two-digit SIC level. The standard errors reported in the parentheses are clustered at the firm level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

Table 3. DID analysis: bank-rival connection and firms' market power

	Markup		Margin	
	(1)	(2)	(3)	(4)
Treat×Post	-0.054***	-0.056***	-0.012***	-0.013***
	(-3.776)	(-4.177)	(-3.297)	(-3.629)
Treat	0.013		0.004	
	(0.614)		(0.738)	
Post	0.002	-0.004	-0.001	-0.003
	(0.223)	(-0.291)	(-0.512)	(-1.048)
Ln(Asset)	-0.022	-0.028**	-0.004	-0.005*
	(-1.667)	(-2.336)	(-1.405)	(-1.788)
Debt/Asset	0.101	0.100	0.036**	0.026*
	(1.427)	(1.367)	(2.587)	(1.805)
Cash/Asset	0.119	0.134	0.029	0.023
	(1.271)	(1.461)	(1.331)	(1.056)
ROA	0.587***	0.433***	0.244***	0.199***
	(6.643)	(4.834)	(9.095)	(7.223)
MarketToBook	0.016**	0.021***	0.007***	0.008***
	(2.147)	(2.870)	(3.763)	(5.487)
SaleGrowth	-0.016	-0.012	-0.012***	-0.011***
	(-0.801)	(-0.667)	(-3.753)	(-4.001)
Capex/Asset	0.145	0.132	0.002	0.009
	(0.688)	(0.607)	(0.044)	(0.186)
R&D/Sale	0.521**	0.272	0.267**	0.199**
	(2.108)	(1.021)	(2.699)	(2.091)
HHI	-0.185**	-0.154*	-0.037**	-0.026*
	(-2.397)	(-2.014)	(-2.192)	(-1.727)
MktShr	0.043	0.036	-0.011	-0.017
	(0.767)	(0.750)	(-0.873)	(-1.493)
InstOwn	-0.027	-0.012	-0.002	-0.002
	(-1.160)	(-0.583)	(-0.333)	(-0.465)
Ln(NumBlock+1)	-0.007	-0.001	-0.002	-0.002
	(-0.953)	(-0.218)	(-1.123)	(-1.169)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	No	Yes	No
Firm×Merger FE	No	Yes	No	Yes

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(Continued)

Year FE	Yes	Yes	Yes	Yes
Observations	11,228	11,218	11,228	11,218
R-squared	0.866	0.885	0.893	0.905

This table reports the DID estimation of how the formation of a bank's block-holding of the top rivals affects a firm's market power, based on a symmetric [-3, +3] year window around the bank mergers. *Markup* is the price-to-marginal cost ratio of the firm, estimated by the production function approach in De Loecker et al. (2020). *Margin* is the gross profit margin of a firm, defined as (*Sale-COGS*)/*Sale*. If a firm's relationship bank obtains a block-holding in its top rivals by acquiring another institution, the firm is a treated firm. We define the top rivals as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry, excluding the firm itself. A control firm should have loan borrowing from the same merging bank, but another merging institution does not hold shares of its rivals. *Treat(d)* equals one if a firm is a treated firm, and zero otherwise. *Post(d)* equals one if an firm-year observation is after the completion of a merger, and zero otherwise. The standard errors reported in the parentheses are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

Table 4. Bank-rival connection and the probability of firms to switch bank

Panel A. DID estimation

	Switch(d)		
	(1)	(2)	(3)
Treat×Post	0.081*	0.086**	0.089**
	(1.920)	(2.305)	(2.344)
Treat	-0.013	0.025	
	(-0.488)	(0.795)	
Post	-0.013	0.001	0.068***
	(-0.601)	(0.049)	(3.349)
Controls	Yes	Yes	Yes
Industry FE	Yes	No	No
Firm FE	No	Yes	No
Firm×Merger FE	No	No	Yes
Year-Qtr FE	Yes	Yes	Yes
Observations	11,081	11,036	11,000
R-squared	0.155	0.361	0.432

Panel B. Heterogeneity of firms' information asymmetry

	Switch(d)		
	(1)	(2)	(3)
Treat×Post×Not rated(d)	-0.066		
	(-0.912)		
Treat×Post×High-tech firm(d)		-0.049	
		(-0.675)	
Treat×Post×Sole lender(d)			-0.060
			(-0.445)
Treat×Post	0.110**	0.120***	0.094*
	(2.589)	(3.628)	(1.981)
Post	0.059**	0.062**	0.032
	(2.717)	(2.147)	-1.42
Controls	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes
Calendar Qtr FE	Yes	Yes	Yes
Observations	11,000	10,745	11,000
R-squared	0.434	0.433	0.438

Panel C. Heterogeneity of a bank's information advantage over a firm

	Switch(d)		
	(1)	(2)	(3)
Treat×Post×High loan share(d)	0.213**		
	(2.512)		
Treat×Post×Long duration(d)		0.171**	
		(2.360)	
Treat×Post×Neighbor bank(d)			0.262***
			(7.822)
Treat×Post	-0.002	0.006	0.086**
	(-0.031)	(0.098)	(2.189)
Post	0.069***	0.069***	0.068***
	(3.402)	(3.326)	(3.355)
Controls	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes
Observations	11,000	11,000	11,000
R-squared	0.432	0.432	0.432

This table presents the DID estimation of how the formation of a bank's block-holding of the top rivals affects the probability of a firm to switch bank, based on a symmetric [-3, +3] year window around bank mergers. *Switch(d)* equals one if a firm switches all its relationship banks when initiating a new loan, and zero otherwise. If a firm's relationship bank becomes a block-holder of its top rivals by merging with another institution, the firm is treated by the merger event. The top rivals are defined as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry, excluding the affected firm itself. *Treat(d)* equals one if a firm is a treated firm, and zero otherwise. *Post(d)* equals one if a firm-year observation is after the completion of a merger, and zero otherwise. Panel B reports the cross-sectional test of the heterogeneity of firms' information asymmetry. *Not rated(d)* equals one if a firm has no S&P senior unsecured debt rating, and zero otherwise. *High-tech firm(d)* equals one if the number of patents registered by the affected firm is above the industry median during the year before the merger, and zero otherwise. *Sole lender(d)* equals one if a firm does not have multiple lending relationships (except the merging bank) during the past five years, and zero otherwise. Panel C reports the cross-sectional test of the heterogeneity of firms' potential risks of information leakage. *High loan share(d)* equals one if the bank's lending share (the number of loans a firm borrows from the bank over the total number of loans of the firm during the past five years) is above the median, and zero otherwise. *Long duration(d)* equals one if the length of a bank-firm relationship is above the median, and zero otherwise. *Neighbor bank(d)* equals one if the geographic distance between a firm and its relationship bank is less than twenty-five miles (i.e., "twenty-minute drive"), and zero otherwise. We control the firm characteristics as discussed in Table 3. The standard errors reported in the parentheses are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

Table 5. The impact of bank-rival connection on firms' borrowing costs

	Loan spreads			Collateral(d)			Ln(Loan amount)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat×Post×Switch(d)	38.219**	32.896*	30.597*	0.125**	0.138**	0.107	-0.184*	-0.118	-0.083
	(2.553)	(1.945)	(1.945)	(2.327)	(2.208)	(1.624)	(-1.805)	(-1.002)	(-0.796)
Treat×Post	-7.003	-6.015	-8.956	-0.135**	-0.128**	-0.114*	0.173**	0.048	0.050
	(-1.313)	(-0.947)	(-1.536)	(-2.656)	(-2.084)	(-1.895)	(2.164)	(0.661)	(0.756)
Switch(d)	5.943	2.036		0.034	0.043		-0.001	0.192	
	(0.375)	(0.103)		(0.531)	(0.482)		(-0.004)	(0.547)	
Treat	1.136	7.966*		0.022	0.059*		-0.063	-0.082	
	(0.205)	(1.825)		(0.632)	(1.721)		(-0.752)	(-1.208)	
Post	-4.949	-4.860	-5.866*	0.013	0.014	0.005	-0.008	0.053*	0.043
	(-1.343)	(-1.505)	(-1.731)	(1.112)	(1.172)	(0.285)	(-0.321)	(1.771)	(1.119)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	No	Yes	No	No	Yes	No	No
Firm FE	No	Yes	No	No	Yes	No	No	Yes	No
Firm×Merger FE	No	No	Yes	No	No	Yes	No	No	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,539	11,528	11,500	11,539	11,528	11,500	11,539	11,528	11,500
R-squared	0.683	0.774	0.796	0.487	0.657	0.699	0.585	0.680	0.706

This table reports the DID estimation of how the formation of a bank's block-holding of the top rivals affects the borrowing costs of a firm, based on a symmetric [-3, +3] year window around bank mergers. *Loan spreads* is the annual spreads (in bps) paid for a loan. *Collateral(d)* equals one if a bank requires collateral for a loan, and zero otherwise. *Loan amount* is the borrowing amount (in million USD) of a loan. If a firm's relationship bank becomes a block-holder of its top rivals by merging with another institution, the firm is treated by the merger event. The top rivals are defined as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry, excluding the firm itself. *Treat(d)* equals one if a firm is a treated firm, and zero otherwise.

Post(d) equals one if a firm-year observation is after the completion of a merger, and zero otherwise. *Switch(d)* equals one if a firm switches all its relationship banks when issuing a new loan, and zero otherwise. Despite the firm characteristics as discussed in Table 3, we also control a vector of loan characteristics, including loan purpose, loan type, and loan maturity. The standard errors reported in the parentheses are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

Table 6. Cross-sectional analysis on the impact of bank-rival connection on firms' market power

Panel A. Heterogeneity of firms' sensitivity to information leakage

	Markup	Margin	Markup	Margin	Markup	Margin
	(1)	(2)	(3)	(4)	(5)	(6)
Treat×Post×Strategic substitute(d)	-0.074**	-0.015*				
	(-2.226)	(-1.846)				
Treat×Post×High-tech firm(d)			-0.055*	-0.022**		
			(-1.997)	(-2.346)		
Treat×Post×Neighbor bank(d)					-0.093***	-0.044***
					(-3.368)	(-6.099)
Treat×Post	-0.024*	-0.006	-0.033	-0.005	-0.054***	-0.012***
	(-1.980)	(-1.620)	(-1.648)	(-0.997)	(-3.916)	(-4.014)
Post	-0.033	-0.011*	-0.032*	-0.010**	-0.020	-0.009*
	(-1.346)	(-1.855)	(-1.706)	(-2.110)	(-1.112)	(-2.031)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,483	8,483	8,926	8,926	8,926	8,926
R-squared	0.885	0.916	0.887	0.918	0.886	0.918

Panel B. Heterogeneity of a bank's incentives to support its holding rivals

	Markup	Margin	Markup	Margin	Markup	Margin
	(1)	(2)	(3)	(4)	(5)	(6)
Treat×Post×Resilient borrower(d)	0.182***	0.058***				
	(2.945)	(4.790)				
Treat×Post×Important rivals(d)			-0.145*	-0.029		
			(-1.852)	(-1.687)		
Treat×Post×Dedicated bank(d)					-0.157***	-0.026**
					(-3.600)	(-2.380)
Treat×Post	-0.056***	-0.012***	-0.047***	-0.010***	-0.046***	-0.010***
	(-4.069)	(-4.161)	(-5.217)	(-4.173)	(-4.740)	(-4.005)
Post	-0.020	-0.009*	-0.019	-0.009*	-0.019	-0.009*
	(-1.104)	(-2.014)	(-1.074)	(-2.008)	(-1.076)	(-2.023)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,926	8,926	8,926	8,926	8,926	8,926
R-squared	0.886	0.918	0.886	0.918	0.886	0.918

This table presents the cross-sectional analysis on the effect of bank-rival connection on firms' market power. *Markup* is the price-to-marginal cost ratio of a firm, estimated by the production function approach in De Loecker et al. (2020). *Margin* is the gross profit margin of a firm, defined as (*Sale-COGS*)/*Sale*. Panel A reports the heterogeneity impact of firms' sensitivity to information leakage. *Strategic substitute(d)* equals one if an industry competes in strategic substitutes, and zero if it competes in strategic complements (Chod and Lyandres (2011)). *High-tech firm(d)* equals one if the number of patents registered by the affected firm is above the industry median during the year before the merger, and zero otherwise. *Neighbor bank(d)* equals one if the geographic distance between a firm and its relationship bank is less than twenty-five miles (i.e., "twenty-minute drive"), and zero otherwise. Panel B reports the heterogeneity impact of banks' incentives in supporting the non-holding firm or its holding rivals. *Resilient borrower(d)* equals one if a firm's borrowing amount exceeds one-third of the total lending of its bank,

and zero otherwise. *Important rivals(d)* equals one if a bank's holding of the top rivals exceeds 2% of its total investment, and zero otherwise. *Dedicated bank(d)* equals one if a bank is a dedicated investor as defined in Bushee (2001), and zero otherwise. The standard errors reported in the parentheses are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

Table 7. The impact of bank-rival connection on the top rivals

Panel A. Effect on the borrowing costs of the top rivals

	Loan spreads			Collateral(d)			Ln(Loan amount)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
RivalTreat×Post	-13.147	-16.326*	-14.981	-0.009	-0.009	-0.002	-0.074	0.015	0.007
	(-1.411)	(-1.779)	(-1.666)	(-0.272)	(-0.259)	(-0.063)	(-0.900)	(0.195)	(0.104)
RivalTreat	-4.441	-7.357		-0.007	-0.006		0.030	0.010	
	(-0.986)	(-0.996)		(-0.271)	(-0.149)		(0.617)	(0.179)	
Post	2.920	2.134	4.624	-0.000	-0.016	-0.015	0.049	0.021	0.077*
	(0.617)	(0.385)	(0.670)	(-0.010)	(-0.702)	(-0.556)	(1.394)	(0.395)	(1.747)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	No	Yes	No	No	Yes	No	No
Rival FE	No	Yes	No	No	Yes	No	No	Yes	No
Rival×Merger FE	No	No	Yes	No	No	Yes	No	No	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,484	3,451	3,434	3,484	3,451	3,434	3,484	3,451	3,434
R-squared	0.678	0.780	0.795	0.457	0.674	0.710	0.598	0.720	0.737

Panel B. Effect on the market power of the top rivals

	Markup		Margin	
	(1)	(2)	(3)	(4)
RivalTreat×Post	0.021**	0.021***	0.011**	0.011***
	(2.666)	(2.812)	(2.668)	(3.042)
RivalTreat	-0.016*		-0.006	
	(-1.883)		(-0.865)	
Post	-0.003	-0.005	-0.001	-0.004
	(-0.527)	(-0.685)	(-0.188)	(-1.421)
Rival FE	Yes	No	Yes	No
Rival*Merger FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	3,941	3,941	3,941	3,941
R-squared	0.930	0.932	0.937	0.940

This table presents the DID estimation of how the formation of a bank's block-holding of the top rivals affects these rivals, based on a symmetric [-3, +3] year window around the bank mergers. The top rivals are defined as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry. *RivalTreat(d)* equals one if a top rival is block-held by another merging institution before the merger, and zero otherwise. *Post(d)* equals one if an observation is after the completion of a merger, and zero otherwise. Panel A reports the results on the borrowing costs of the top rivals. *Loan spreads* is the annual spreads (in bps) a rival paid for a loan. *Collateral(d)* equals one if a bank requires a rival to provide collateral for a loan, and zero otherwise. *Loan amount* is the borrowing amount (in million USD) of a loan. Panel B reports the results on the market power of the top rivals. *Markup* is the price-to-marginal cost ratio of a rival. *Margin* is the gross profit margin of a rival, defined as (*Sale-COGS*)/*Sale*. In all regressions, we control the control variables as discussed in Table 3, which are measured for the top rivals. In Panel A, we also control a vector of loan characteristics, including loan purpose, loan type, and loan maturity. The standard errors reported in the parentheses are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

Online Appendix

Table AI. Univariate test on OLS sample

	BankHoldRival=1	BankHoldRival=0	Difference
Variables	(1)	(2)	(1)-(2)
# Observations	2,245	34,790	
Markup	1.376	1.463	-0.087***
Margin	0.346	0.357	-0.012***
Ln(Asset)	7.612	6.674	0.939***
Debt/Asset	0.330	0.286	0.043***
Cash/Asset	0.090	0.098	-0.008***
ROA	0.137	0.136	0.001
MarketToBook	1.359	1.381	-0.022
SaleGrowth	0.081	0.121	-0.040***
Capex/Asset	0.050	0.062	-0.012***
R&D/Sale	0.017	0.022	-0.005***
HHI	0.230	0.238	-0.008**
MktShr	0.112	0.103	0.009**
InstOwn	0.666	0.547	0.119***
Ln(NumBlock+1)	0.898	0.723	0.174***

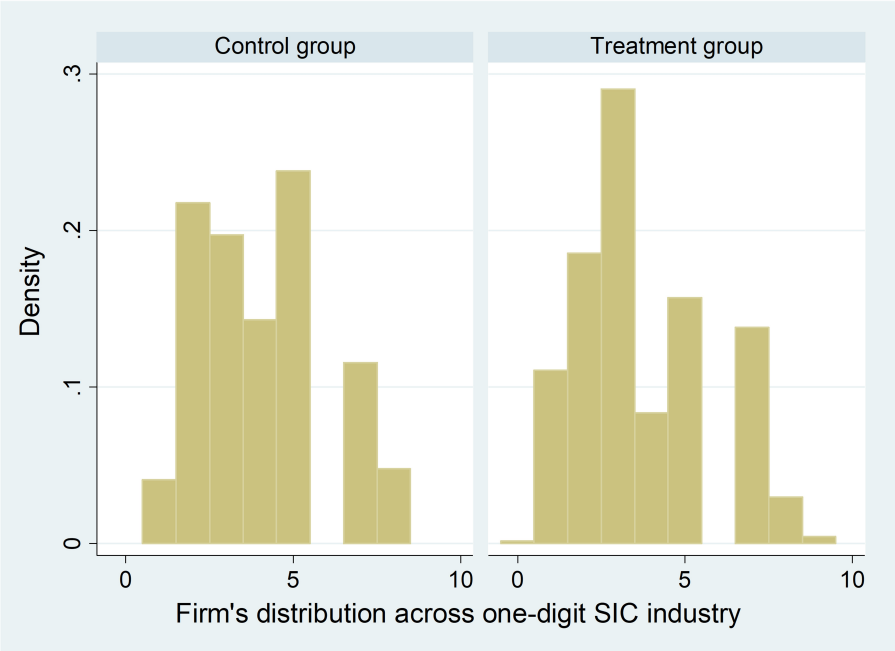
This table reports the bivariate analysis of firms' market power and control variables. There are 37,035 firm-year observations from 1990 to 2019 by U.S. public firms who have outstanding loans in the LPC DealScan database. All variables are winsorised at the 1st and 99th percentiles. Variable definitions can be found in Appendix A1.

Table AII. Validity of DID experiment

Panel A. Covariates comparison during the year before bank mergers

	Treated firms	Control firms	Difference
	(1)	(2)	(1)-(2)
# Firms	147	1,419	
Ln(Asset)	7.219	7.256	-0.037
Debt/Asset	0.332	0.304	0.029
Cash/Asset	0.065	0.072	-0.007
ROA	0.141	0.157	-0.016**
MarketToBook	1.375	1.454	-0.079
SaleGrowth	0.108	0.146	-0.037
Capex/Asset	0.056	0.068	-0.012*
R&D/Sale	0.010	0.016	-0.005*
HHI	0.244	0.244	0.001
MktShr	0.112	0.144	-0.032*
InstOwn	0.575	0.563	0.011
Ln(NumBlock+1)	1.014	0.962	0.052

This table compares the mean value of the firm characteristics between the treatment firms and the control firms before a bank acquires a block-holding of the top rivals of the affected firm. We follow the criteria in Panel B of Appendix A2 to construct the sample. The variables are measured during the year before bank mergers. ***, **, and * indicate the differences in the mean of treatment and control groups are significantly different from zero at the 1%, 5%, and 10% level, respectively. Variable definitions can be found in Appendix A1.



Panel B. Industry distribution: treatment versus control firms

This figure plots the distribution of firms across the industry. We draw the density of firms that distributed across the one-digit SIC industry, where the left panel is for the control sample and the right panel is for the treatment sample.

Table AIII. Robustness checks of DID analysis: bank-rival connection and firms' market power

Panel A. Alternative event windows

	Markup		Margin	
	(1)	(2)	(3)	(4)
	[-1,+1] year window	[-2,+2] year window	[-1,+1] year window	[-2,+2] year window
Treat×Post	-0.028**	-0.047***	-0.009*	-0.012***
	(-2.458)	(-4.362)	(-1.961)	(-2.916)
Post	-0.006	-0.010	-0.004	-0.003
	(-0.303)	(-0.660)	(-1.083)	(-0.892)
Controls	Yes	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	5,162	8,294	5,162	8,294
R-squared	0.941	0.909	0.942	0.921

Panel B. Alternative measures of market power and alternative samples

	Markup			Margin		
	(1)	(2)	(3)	(4)	(5)	(6)
	COGS+SGA	Exclude year 0	Exclude 2008	COGS+SGA	Exclude year 0	Exclude 2008
Treat×Post	-0.028***	-0.056***	-0.051***	-0.020***	-0.013***	-0.010**
	(-3.721)	(-4.177)	(-3.674)	(-4.378)	(-3.629)	(-2.454)
Post	-0.008	-0.004	-0.005	-0.004	-0.003	-0.004
	(-1.182)	(-0.291)	(-0.390)	(-1.364)	(-1.048)	(-1.478)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,302	11,218	8,880	11,218	11,218	8,880
R-squared	0.875	0.885	0.891	0.850	0.905	0.913

Panel C. Differential effect of firms' bank switch

	Markup		Margin	
	(1)	(2)	(3)	(4)
Treat×Post×Switch(d)	-0.014	-0.005	-0.011*	-0.008
	(-0.670)	(-0.274)	(-1.704)	(-1.533)
Treat×Post	-0.048***	-0.056***	-0.007	-0.009
	(-2.782)	(-3.430)	(-1.284)	(-1.655)
Switch(d)	0.103		-0.005	
	(1.029)		(-0.233)	
Treat	0.013		0.006	
	(0.528)		(1.025)	
Post	-0.012	-0.017	-0.007*	-0.008**
	(-1.018)	(-0.996)	(-2.009)	(-2.292)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Firm×Merger FE	No	No	No	No
Year FE	Yes	Yes	Yes	Yes
Observations	11,228	11,218	11,228	11,218
R-squared	0.867	0.886	0.894	0.906

This table presents the robustness checks of Table 3. *Treat(d)* equals one if a bank becomes the block-holder of the top rivals of its borrower firm due to bank mergers, and zero otherwise. *Post(d)* equals one if a firm-year observation is after the completion of a merger, and zero otherwise. In Panel A, columns 1 and 3 use the three-year window, and columns 2 and 4 use the five-year window. In Panel B, columns 1 and 4 use the sum of *COGS* and *SGA* as production cost to measure *Markup* and *Margin*. Columns 2 and 5 exclude the year when a merger is under negotiation. Columns 3 and 6 exclude mergers that are announced in 2008. Panel C compares the differential effect between firms that switch bank and those do not switch bank. *Switch(d)* equals one if a firm switches all its relationship banks when initiating a new loan, and zero otherwise. The standard errors reported in the parentheses are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table AIV. Cross-sectional analysis on the impact of bank-rival connection on market power of the top rivals

Panel A. Heterogeneity of a bank's incentives to support its holding rivals

	Markup	Margin	Markup	Margin	Markup	Margin
	(1)	(2)	(3)	(4)	(5)	(6)
RivalTreat×Post×Resilient borrower(d)	-0.041**	-0.017*				
	(-2.562)	(-1.789)				
RivalTreat×Post×Important rival(d)			0.299**	0.097***		
			(2.447)	(4.174)		
RivalTreat×Post×Dedicated bank(d)					0.047***	0.008
					(2.792)	(1.590)
RivalTreat×Post	0.034***	0.016***	0.021**	0.011**	0.025**	0.013**
	(3.672)	(2.831)	(2.064)	(2.258)	(2.767)	(2.778)
Post	-0.004	-0.002	-0.004	-0.002	-0.004	-0.002
	(-0.290)	(-0.362)	(-0.269)	(-0.345)	(-0.303)	(-0.368)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Rival×Merger FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,325	3,325	3,325	3,325	3,325	3,325
R-squared	0.914	0.940	0.915	0.940	0.914	0.940

Panel B. Heterogeneity of firms' sensitivity to information leakage

	Markup	Margin	Markup	Margin	Markup	Margin
	(1)	(2)	(3)	(4)	(5)	(6)
RivalTreat×Post×Strategic substitute(d)	-0.049	-0.025				
	(-1.310)	(-1.622)				
RivalTreat×Post×High-tech borrower(d)			-0.033	-0.023		
			(-0.800)	(-1.539)		
RivalTreat×Post×Neighbor bank(d)					-0.023*	-0.006
					(-1.762)	(-1.150)
RivalTreat×Post	0.059**	0.028**	0.042**	0.023***	0.027***	0.013***
	(2.395)	(2.503)	(2.661)	(2.831)	(2.870)	(2.790)
Post	0.007	0.000	0.001	0.001	-0.004	-0.002
	(0.603)	(0.072)	(0.119)	(0.271)	(-0.298)	(-0.367)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Rival×Merger FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,104	3,104	3,325	3,325	3,325	3,325
R-squared	0.918	0.944	0.916	0.941	0.914	0.940

This table presents the cross-sectional analysis on the impact of bank-rival connection on rivals' market power, based on a symmetric [-3, +3] year window around bank mergers. The sample is constructed as discussed in Panel B of Table 7. *Markup* is the price-to-marginal cost ratio of a top rival. *Margin* is the gross profit margin of a top rival, defined as (*Sale-COGS*)/*Sale*. *RivalTreat(d)* equals one if a top rival is block-held by another merging institution before the merger, and zero otherwise. *Post(d)* equals one if an observation is after the completion of a merger, and zero otherwise. Panel A reports the heterogeneity of a bank's incentives to support its holding rivals. *Resilient borrower(d)* equals one if a firm's borrowing amount exceeds one-third of the total lending of its bank, and zero otherwise. *Important rivals(d)* equals one if a bank's holding of a top rivals exceeds 2% of the bank's total investment, and zero otherwise. *Dedicated bank(d)* equals one if a bank is a dedicated investor as defined in Bushee (2001), and zero otherwise. Panel B reports the heterogeneity impact of firms' sensitivity to information

leakage. *Strategic substitute(d)* equals one if an industry competes in strategic substitutes, and zero if its competes in strategic complements (Chod and Lyandres (2011)). *High-tech borrower(d)* equals one if the number of patents registered by an affected firm is above the industry median during the year before the merger, and zero otherwise. *Neighbor bank(d)* equals one if the geographic distance between a firm and its relationship bank is less than twenty-five miles (i.e., "twenty-minute drive"), and zero otherwise. In all regressions, we control the control variables as discussed in Table 3, which are measured for the top rivals. The standard errors reported in the parentheses are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

Table AV. The impact of bank-rival connection on firms' costs and sales

Panel A. OLS estimation

	Ln(COGS)		Ln(Sale)		SaleGrowth	
	(1)	(2)	(3)	(4)	(5)	(6)
BankHoldRival(d)	0.077***	0.042**	0.034*	0.016	-0.011**	-0.010**
	(3.029)	(2.034)	(1.828)	(1.067)	(-2.240)	(-1.970)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	37,035	37,035	37,035	37,035	37,035	37,035
R-squared	0.777	0.853	0.860	0.909	0.115	0.133

Panel B. DID estimation

	Ln(COGS)		Ln(Sale)		SaleGrowth	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat×Post	0.049**	0.043*	0.010	0.004	0.036	0.035
	(2.063)	(1.747)	(0.551)	(0.188)	(1.435)	(1.427)
Treat	-0.015		-0.013		-0.018	
	(-0.623)		(-0.626)		(-1.195)	
Post	-0.015**	-0.025*	-0.013	-0.026*	-0.031***	-0.052***
	(-2.104)	(-1.873)	(-1.476)	(-1.826)	(-4.867)	(-3.937)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	No	Yes	No	Yes	No
Firm×Merger FE	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,581	10,571	10,581	10,571	10,581	10,571
R-squared	0.974	0.978	0.978	0.981	0.389	0.418

Panel C. Heterogeneity of a bank's incentives to support its holding rivals

	Ln(COGS)		
	(1)	(2)	(3)
Treat×Post×Resilient borrower(d)	-0.072*		
	(-1.962)		
Treat×Post×Important rivals(d)		0.133	
		(1.082)	
Treat×Post×Dedicated bank(d)			0.257***
			(5.376)
Treat×Post	0.033	0.025	0.018
	(1.475)	(1.456)	(1.110)
Post	-0.036*	-0.037*	-0.037*
	(-1.749)	(-1.786)	(-1.834)
Controls	Yes	Yes	Yes
Firm*Merger FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	8,926	8,926	8,926
R-squared	0.979	0.979	0.979

Panel D. Heterogeneity of firms' sensitivity to information leakage

	Ln(COGS)		
	(1)	(2)	(3)
Treat×Post×Strategic substitute(d)	0.136***		
	(2.984)		
Treat×Post×High-tech borrower(d)		0.080**	
		(2.122)	
Treat×Post×Neighbor bank(d)			0.234***
			(8.705)
Treat×Post	-0.035	0.008	0.031
	(-1.254)	(0.332)	(1.337)
Post	-0.036	-0.020	-0.036*
	(-1.532)	(-0.885)	(-1.731)
Controls	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	8,483	8,926	8,926
R-squared	0.979	0.979	0.979

This table presents the effect of bank-rival connection on firms' costs and sales. *Ln(COGS)* is the natural logarithm of the cost of goods sold. *Ln(Sale)* is the natural logarithm of the total sales. *SaleGrowth* is the increase of the total sales, scaled by its lagged sales. Panel A reports the OLS estimation. *BankHoldRival(d)* equals one if any of a firm's relationship bank holds at least 5% shares of its top rivals, and zero otherwise. The top rivals are defined as the ten largest firms in the three-digit SIC industry (ranked by Compustat net sales), excluding the firm itself. Panel B reports the DID estimation. *Treat(d)* equals one if a firm's relationship bank obtains a block-holding of its top rivals by acquiring another institution, and zero otherwise. *Post(d)* equals one if an observation is after the completion of a merger, and zero otherwise. Panel C and Panel D report the cross-sectional tests. The standard errors reported in the parentheses are clustered at the firm level in Panel A and are clustered at the merger level in other panels, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.