Bank Ownership and Product Market Competition

Xiaotian Liu*

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Abstract

This paper studies how bank ownership of industrial firms affects their market power. We find that bank ownership increases firms' markups, while bank ownership of industry rivals reduces firms' markups. Using bank mergers that generate exogenous shocks to bank ownership of industry rivals, we employ a difference-in-differences analysis to establish causality inference. The mechanism analyses show that the decreased markup effect is stronger for competitive industries and R&D intensive firms. Besides, firms are more likely to switch banks, especially when banks have more private information of them. We also find increased costs of loans for the affected firms.

Keywords: Bank ownership, product market competition, market power

JEL: E23, G20, G21, L10, L11

*Department of Economics and Finance, City University of Hong Kong, 83rd Tat Chee Avenue, Kowloon, Hong Kong SAR. Email: xtliu7-c@my.cityu.edu.hk

1. Introduction

The past thirty years have witnessed an increasing trend of bank ownership of industrial firms. The percentage of U.S. public firms held by bank with at least 5% of outstanding common stocks has increased from around 13% in 1990 to about 64% in 2018, as shown in Figure 1. Two reasons could explain this phenomenon. First, the enactment of the Gramm-Leach-Bliley Act in 1999 allowed commercial banks to invest equity share of industrial firms.[1] Second, commercial banks could consolidate with other non-bank institutions as a response to deregulations, which reinforced the trend of bank ownership of industrial firms.

[Insert Figure 1 Here]

There is an old debate on how commercial banks shape the product market competition[2]. For instance, Cestone and White (2003) formulate a model showing that banks are prone to deter new entrant firms by reducing credit availability when they are allowed to hold equity-like claims in the incumbent firms. Recently, two papers reawakened this research question. Saidi and Streitz (2021) suggest that bank credit concentration could raise anti-competition concerns because common lenders internalize competition externality by reducing loan spreads to same-industry borrowers. De Franco et al. (2020) show that when a firm shares common lenders with competitors, the firm faces potential risk of information leakage and is more likely to switch banks. Meanwhile, another stream of literature explores how the prevalence of common institutional investors induces less aggressive competition.[3]

[1]Before the legal change in 1999, banks' stock investment was 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)). The GLBA allowed banks that become financial holding companies (FHCs) to hold equity shares of firms with no limitations (Haubrich and Santos (2003); Santos and Rumble (2006)).

[2]Most studies are conducted in early 2000, including Cestone and White (2003), Cetorelli (2004), and Cetorelli and Strahan (2006).

[3]For example, Azar et al. (2018, 2021) find that common ownership leads to higher prices in the airline and banking industries. Gutiérrez and Philippon (2018) provide evidence that firms conduct lower investment when common ownership is prevalent. Xie and Gerakos (2020) document that firms enjoy less market entry in the pharmaceutical industry when sharing common ownership. Anton et al.

Our paper aims to provide a new angle to this question. As important financial intermediaries, if commercial banks become equity holders of industrial firms, how does the bank ownership explain the product market competition and the dispersion in markup.[4] There are two possible mechanisms through which bank equity holders realize influence on firms' competition. First, bank ownership could enhance firms competitive advantage in financing. Theoretically, Cestone and White (2003) suggest that banks that hold equity-like claims of incumbent firms are reluctant to lend to new entrant firms due to the conflicts of interest. We conjecture that banks may allocate financing resources to firms in the stock portfolios; and other firms could experience increased costs of loans. We term this as the "financing channel".

Second, bank ownership could enhance firms competitive advantage in information. Asker and Ljungqvist (2010) and De Franco et al. (2020) suggest that firms face higher risks of information leakage if their underwriting bank or lending bank have interactions with their competitors. A similar concern could arise when banks become equity holders of industry rivals. Having the proprietary information disclosed to industry rivals could threaten firms' prospects in the product market.[5] We conjecture that firms with bank ownership could enjoy information advantage, while other firms experience risks of information leakage. We term this as the "information channel".

The literal textbook definition of market power is a firm's capacity to set the price above marginal cost. The magnitude of market power is tied to the size of the gap between price and marginal cost; typically, we call the size of this gap as the "markup" if expressed in a multiplicative manner and the "margin" when expressed as a difference. Following De Loecker et al. (2020), we estimate the firm-level markup using the "product function

(2021) explain how common ownership induces weakened manager incentives, which is the underlying mechanism of reduced competition.

[4]The industrial organization literature has shown a dramatic increase of market power and a reallocation of market power from low- to high-markup firms during the past decades (Syverson (2019); De Loecker et al. (2020)). De Loecker et al. (2020) find that the aggregated markups start to rise from 21% above marginal cost to 60% as of 2018, which is driven mainly by the upper tail of markup distribution.

[5]The proprietary costs literature has discussed the potential risks of information leakage (Ellis et al. (2012); Boone et al. (2016); Glaeser (2018); Klasa et al. (2018)). For instance, Ellis et al. (2012) show that firms tradeoff on disclosing customer identity details because such disclosures can be observed by potential rivals, thus facilitating rivals to compete with them.

approach". Following the empirical finance literature, we use the firm-level profit margin (measured by the difference of sales and costs of good sold divided by sales) as our second measure of market power.[6]

Using a large sample of U.S. public firms between 1990 and 2019, we start with the relation between bank ownership and firm market power, as depicted in Panel A of Figure 2. We measure bank ownership with two variables: one is an indicator variable of whether any bank block-holds a firm, and another is the fraction of a firm's shares held by bank blockholders. In the OLS regression, we control a full set of time-variant characteristics and yearly and firm fixed effects to capture omitted variables. We find that firms with bank blockholders experience higher markups (profit margins) than other firms without bank blockholders.

[Insert Figure 2 Here]

Despite of the positive effect on firm itself, bank ownership could impede other firms in the same industry. In doing so, we study a scenario wherein a firm's industry rivals are block-held by banks, as depicted in Panel B of Figure 2. Similarly, we construct two variables to measure bank ownership of industry rivals: one is an indicator variable of whether any bank block-holds a firm's industry rival, and another is the fraction of an industry rival's shares held by bank blockholders. In the OLS framework, we find that firms whose industry rivals with bank blockholders experience lower markups (profit margin) than other firms whose industry rivals are without bank blockholders.

Whether banks hold equity shares of a firm is endogenous determined. Specifically, firms with better performance could attract more banks to invest their outstanding shares. Inspired by He and Huang (2017) and Chu (2018), we utilize mergers between lenders of affected firms and institutional shareholders of industry rivals to establish causality of bank ownership. Suppose a firm's industry rivals are block-held by an institutional

[6]Some studies use sale-based market share as the measure of market power. However, three concerns arise of using market share to measure market power. First, it assumes that firms compete in the standard Cournot oligopoly model, in which firms strategically choose the quantity of producing a homogeneous product. In reality, most industries are not well approximated by the Cournot model (Syverson (2019)). Second, market share only contains information of sales, rather than costs and profits. Third, the conceptual problem with market share as a measure of market power is that it is an outcome, not the core determinant of how competitive an industry is.

shareholder, which later merges with a lender of the firm. In this case, the industry rivals obtain a new bank blockholder through the merger, so we classify the firm as a treatment sample. Conversely, if none of a firm's industry rivals have institutional shareholders that merge with lenders of the firm, the industry rivals cannot obtain a new bank blockholder through any merger; hence, we classify the firm as a control sample.

In the difference-in-differences (DID) test, we find that the formation of bank ownership of industry rivals leads to reduced markups (profit margins). The validity of the DID estimation relies on the parallel trend assumption (Roberts and Whited (2013)). We find that the markup (profit margin) of the treatment and control firms follows a parallel trend during the five years before the merger, while their difference in markup (profit margin) becomes significantly negative once the merger is completed.

The competitive nature between a firm and its industry rivals indicates that one side gains and another loses. As the value of a bank's stock investment in the industry rivals gradually increases, the bank's incentive to prioritize the profit of holding the industry rivals' stocks also increases. In the cross-sectional analysis, we find that the adverse effect on markup (profit margin) is stronger if banks' investment share in the rivals (measured by the market value of a bank's stock holding in the industry rivals divided by the market value of the bank's total investment) is above the median. We also find that the effect is stronger if the bank is a long-term investor (Bushee (1998, 2001)).

We next examine underlying channels. As stated before, bank ownership of industry rivals could increase firms' financing costs or raise potential risks of information leakage, which could induce firms to switch banks. Conversely, the information asymmetries between inside and outside lenders could increase firms' switching costs (Degryse and Ongena (2008); Ioannidou and Ongena (2010)), so firms need to tradeoff between risks of not switching banks and potential switching costs. Using a set of loans issued by our sample firms, we find the formation of bank ownership of industry rivals leads to a higher likelihood of bank switching, suggesting that the risks of bank ownership of industry rivals exceed the switching cost.

We then assess the evolution of firms' costs of loans if banks form block-ownership with the industry rivals. In the DID setting, we find a slight increase in loan spreads for treatment firms, and the effect are more concentrated for firms that switch their banks after the merger event. The result is consistent with the hypothesis that bank ownership

of industry rivals could reduce firms' competitive advantage in financing.

To pin down the information channel, we examine the heterogeneity of firms' sensitivity to information leakage. We measure firms' proprietary costs with three variables: (1) whether firms produce homogeneous products; (2) whether the market product fluidity is high; and (3) whether firms do intensive R&D activities. In the cross-sectional analysis, We find that the adverse effect on market power is stronger for highly competitive industries and R&D intensive firms. We then construct three variables to measure the intensity of banks' private information of firms: (1) whether a bank-firm pair has intensive past lending; (2) whether the relationship is durable; and (3) whether their locations are geographic proximal. In the cross-sectional analysis, we find that the bank switching effect is stronger when banks possess more private information of firms.

Our paper has three major contributions. First of all, our paper provides a new angle on how banks shape product market competition. Prior studies focus on the role of creditors (Cetorelli (2004); Cetorelli and Strahan (2006); Saidi and Streitz (2021)), while we emphasize the role of equity holders played by banks. Our paper is closely related to Cestone and White (2003). Their model suggests that, in an imperfect competitive financial market, equity-like claims could incentivize banks to deter entry; and our paper provides empirical evidence to their theory. To realize their influence over competition, banks could reduce credit availability (Cestone and White (2003); Cetorelli (2004)) or increase loan pricing (Saidi and Streitz (2021)) of the new entrant firms. Despite of the financing channel, our paper shows that information channel is another plausible mechanism. To our knowledge, our paper is the first to study the within-industry reallocation of market power in the bank and competition literature, while prior studies focus on the overall effect at the industry level (Saidi and Streitz (2021)).

Second, our paper contributes to the common ownership literature. We also confirm that the effect of bank equity holding is not driven by cases if banks simultaneously hold equity shares of same-industry firms (e.g., Azar et al. (2018, 2021); Anton et al. (2021)). Our bank equity holding effect may be contaminated by the common ownership effect in which banks simultaneously holds equity of same-industry firms (e.g., Azar et al. (2018, 2021); Anton et al. (2021)). We rule out this possibility and confirms the effect of banks' equity holding on shaping the product market competition.

Lastly, our paper is related to a line of research on banks' equity holding. Early studies

in this area focused on the direct effects; for example, how banks' equity holding affects firms' debt capacity, valuation, and performance (Gorton and Schmid (2000); Morck et al. (2000); Santos and Rumble (2006); Santos and Wilson (2017)). Our paper extends this and discuss the impact of bank ownership on the product market competition.

2. Data, Sample and Variables

We start with all U.S. firms in the Compustat database, excluding financial firms (SIC from 6000 to 6999) and utility firms (SIC from 4900 to 4999). We require firms to have outstanding shares traded on the NYSE, AMEX, and NASDAQ in the CRSP database. We also 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 then group firms into industries based on their historic three-digit SIC code in the Compustat database, and require that each industry have at least five consecutive years for at least three firms.[7] We follow Saidi and Streitz (2021) and define industries at the three-digit SIC level. In the robustness check, we also use the four-digit NAICS code and TNIC3 industry classification (Hoberg and Phillips (2010, 2016)) to define industries. The above sample selection process results in 85,688 observations from 1990 to 2019. Table 1 reports the summary statistics of variables.[8] We winsorized all continuous variables at the 1st and 99th percentile to reduce the effect of outliers.

2.1. Measuring market power

The markup of price over marginal cost is a basic measure of market power (Syverson (2019); Berry et al. (2019); Basu (2019)). If firms compete in a perfect competition market, a profit-maximizing firm could set price equal to its marginal cost, and the markup equals to one. If firms compete in an imperfect competition market, a firm will produce at the quantity where marginal revenue equals to marginal cost, and the price could exceed marginal cost. The magnitude of market power is tied to the size of the gap between price and marginal cost; typically, we call the size of this gap as the "markup" if expressed as a multiplicative and the "margin" when expressed as a difference.

[7]We extract the historical SIC codes in the Compustat database, which is available since 1988.

[8]We report sample construction details in Appendix A1 and the variable definitions in Appendix A2.

Some empirical finance studies use sale-based market share to measure market power. However, several concerns arise when using market share to measure market power. First, it assumes that firms compete in the standard Cournot oligopoly model. In this model, a number of firms with various marginal costs strategically choose the quantity they produce a homogeneous product, and the market price is determined by the equilibrium of aggregated demand and supply of the whole market. In reality, most industries are not well approximated by the Cournot model (Syverson (2019)). Second, market share only contains information of sales, rather than costs and profits. Third, the conceptual problem of using market share to measure market power is that it is an outcome of competition, rather than the core determinant of how competitive an industry is. Based on these considerations, we do not use market share to measure market power.

Following De Loecker and Warzynski (2012) (DLW), we estimate the firm-level markup (*Markup*) using the production function approach. There are two advantages of DLW. First, we do not need to assume the competition strategies across industries (De Loecker and Warzynski (2012)). Second, DLW allows us to use firms' accounting data to estimate markup, while other method needs product-level information.[9] Following De Loecker et al. (2020), we use the cost of goods sold (i.e., $COGS$) as the variant input and estimate the firm-level markup.

Our second measure is profit margin (*Profit margin*). The profit margin (i.e., Lerner index) measures the difference between the price and marginal costs over the price (Lerner (1934); Tirole (1988)). Following Gaspar and Massa (2006) and Peress (2010)), we estimate a firm's 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 cost of goods sold.[10] Panel A of Table 1 provides statistics of firms' market power. The average markup is 1.603, and the average profit margin is 0.352.

Traina (2018) and Basu (2019) show that some variate inputs, e.g., overhead costs and labor payments, have been shifted into the selling, general, and administrative expense (i.e.,SGA) during the past two decades. They suggest that the sum of $COGS$ and SGA as a comprehensive variate input could be more suitable to estimate the firm-level markup

[9]For example, the demand approach requires plant-level information (e.g., price and output quantity) to estimate a firm's markup (Hall (2018)).

[10]This estimation approach assumes that the marginal cost equals to the average cost of a firm.

and profit margin. In the robustness check, we use the sum of *COGS* and *SGA* as the variant input and re-estimate firms' markup and profit margin.

2.2. Measuring bank ownership

To measure bank ownership of industrial firms, we rely on the Thomson Reuters S13F database for the institutional holding data and the LPC DealScan database for the bank lender information.[11] We implement the fuzzy matching algorithm in SAS and match the two databases by lenders' name from the DealScan database and institutional investors' name from the S13F database. To enhance the accuracy of name matching, we manually check with information on the FDIC BankFind website and the original S13F reports on the SEC Edgar website. We clean the data along several dimensions. First, we exclude observations if the equity holdings are missing, and we aggregate the equity holding to the parent-level if a bank files under multiple affiliated funds. Then, to obtain the precise holding data around the period when a bank is involved in a merger, we refer to the merger information in the SDC M&A database and manually check the S13F data when the merger was under negotiation.[12]

Following Santos and Rumble (2006), we define a bank as a blockholder of a firm if the bank holds at least 5% of the outstanding shares of the firm during the four consecutive quarters in a given year. We construct three alternative measures of bank ownership of firm itself (also known as "bank-firm connection"). *HoldFirm(d)* is an indicator variable that equals one if a firm has at least one bank blockholder, and zero otherwise. *FirmShare* is the aggregated fraction of a firm's outstanding shares held by its bank blockholders. *NumBank* is the number of bank institutions that are blockholder of a firm.

We next construct four alternative variables to gauge bank ownership of industry rivals (also known as "bank-rival connection"). *HoldRival(d)* is an indicator variable that equals one if at least one industry rival is block-held by bank investors, and zero otherwise. *RivalShare* is the aggregated fraction of an industry rival's outstanding shares held by bank blockholders. *NumRival* is the number of industry rivals that are block-held by bank investors. *NumBank_HoldRival* is the number of banks that block-hold a firm's

[11] We rely on the corrected S13F data in the WRDS SEC Analytics Suite because the old WRDS version of the S13F data was subject to data quality issues from 2010 to 2016.

[12] In this process, we correct the fund identifier numbers and equity holdings of Mellon Bank, Barclays, and Bank of America.

industry rivals. Following Asker and Ljungqvist (2010), we define a firm's industry rivals as the ten largest firms in the three-digit SIC industry (ranked by Compustat net sales), excluding the firm itself.

Panel B of Table 1 summarize the cross-sectional variations of bank ownership. Around 32.3% of the observations have bank-firm connections. On average, the fraction of a firm's shares held by bank blockholders is about 2.8% and the average number of bank blockholders is 0.43. Conditional on a firm is block-held by bank investors, the fraction of its shares held by bank blockholders is about 8.6%. The next four rows reports the statistics of bank ownership of industry rivals. Around 90.5% of the observations have bank-rival connections. On average, the fraction of a industry rival's shares held by bank blockholders is about 7.7%. Conditional on an industry rival is block-held by bank investors, the fraction of its shares held by bank blockholders is about 8.5%. Besides, the average number of industry rivals held by banks is 3.63, and around 3.01 bank investors block-hold the industry rivals.

2.3. Control variables

A firm with better performance could attract more bank investors to purchase its stocks. To alleviate this concern, we control a set of time-variant characteristics to capture the concerns of omitted variables. Following the existing literature (Morck et al. (2000); Santos and Rumble (2006); Gaspar and Massa (2006)), we control the firm-level factors including firm size, leverage ratio, cash holding ratio, profitability, market to book ratio, capital investment, and R&D expenditure. To capture the heterogeneity of market structure, we follow Saidi and Streitz (2021) and control the industry concentration (*HHI*). To separate the effect of bank ownership from that of institutional ownership or block-holding in general (He and Huang (2017)), we control the total institutional ownership (*InstOwn*) and the number of blockholders (*NumBlock*).

We next control several confounding factors that may bias the effect of bank ownership on competition. First, if a firm shares the same institutional shareholder with its industry rivals, the firm could enjoy higher market power (e.g., Azar et al. (2018, 2021); Anton et al. (2021)). Hence, we control an indicator variable, *CommonOwn(d)*, of whether a firm shares common bank blockholders with its industry rivals. Second, when a firm and its industry rivals share the same lenders, the firm could enjoy less competition because common lenders may internalize competition externalities by reducing loan spreads (Saidi

and Streitz (2021)). Hence, we control an indicator variable, *CommonLender(d)*, of whether a firm shares common bank lenders with its industry rivals.

Panel C of Table 1 provides statistics of these control variables. For example, on average, the firm size is 211.8 million USD, the leverage ratio is 21.3%, the cash holding ratio is 18.9%, and the market to book ratio is 1.76. On average, 39.5% of a firm's outstanding shares are held by institutional investors, and each firm has 1.77 blockholders. Around 46.9% of the firm-years have common institutional investors with the industry rivals, and 26.1% of them have common lenders with the industry rivals.

[Insert Table 1 Here]

3. OLS Analysis

If a bank holds equity shares of a firm, the bank ownership could empower the firm's competitive advantage in financing and information; thus, firms could experience higher market power in the product market. We start with the relation between bank ownership on firms' market power, as shown in Panel A of Figure 2. To examine this conjecture, we estimate various forms of the following OLS models:

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

where i denotes the firm and t denotes the year. The outcome variable is one of the two measures of market power of firm i during fiscal year t. *BankHoldFirm* is one of the two measures of bank-firm connection during year *t-1*: *FirmShare* and *HoldFirm(d)*. *Control* is a set of time-variant characteristics discussed in Table 1. We control the year fixed effects to capture the time trend. Prior studies suggest that about two-thirds of the variance in performance are attributed to firm effect (Mauri and Michaels (1998); Short et al. (2007)), hence we control the firm fixed effect to capture time-invariant factors that are correlated with firms' bank ownership and market power.

Panel A of Table 2 reports the estimation of bank-firm connections. The coefficients of *FirmShare* are significantly positive in columns 1 and 3; on average, a one-standard-deviation increase of *FirmShare* could increase firms' markup (profit margin) from the sample average by 1.04 (0.64) percentage points. The coefficients of *HoldFirm(d)* are also significantly positive in columns 2 and 4, suggesting that the markup (profit margin) is

0.027 (0.004) higher for firms that are block-held by banks compared with other firms without bank blockholders. Considering that the markup (profit margin) has a standard deviation of 1.164 (0.269) and an interquartile range of 0.628 (0.293), the magnitude of this effect is economically considerable. The result suggests that bank ownership could increase the market power of firm itself.[13]

Despite of the positive effect on firm itself, bank ownership could also impede other firms in the same industry by reducing its competitive advantages in financing and information. In doing so, we study the scenario wherein a firm's industry rivals are block-held by banks, as shown in Panel B of Figure 2. To assess the effect of bank ownership of industry rivals on firms' market power, we estimate the following OLS model:

$$MarketPower_{i,t} = \alpha + \beta_1 BankHoldRival_{i,t-1} + \gamma' Control_{i,t-1} + \tau_t + \epsilon_{i,t} \quad (2)$$

where i denotes the firm and t denotes the year. The outcome variable is one of the two measures of market power of firm i during fiscal year t. *BankHoldRival* is one of the two measures of bank-rival connection during year *t-1*: *RivalShare* and *HoldRival(d)*. *Control* is a set of time-variant characteristics discussed in Table 1. In all regressions, we control the year fixed effects to capture the time trend and the two-digit SIC industry fixed effect to capture the time-invariant industry-level factors.

Panel B of Table 2 reports the estimation of bank-rival connections. Consistent with the hypothesis that bank-rival connections reduce firms' market power, the coefficients of *RivalShare* are significantly negative in columns 1 and 3. On average, a one-standard-deviation increase of *RivalShare* will decrease firms' markup (profit margin) by 1.01 (0.73) percentage points from the sample average. In columns 2 and 4, the coefficients of *HoldRival(d)* are significantly negative, suggesting that the markup (profit margin) is 0.042 (0.009) lower for firms whose industry rivals are block-held by banks, compared with other firms whose industry rivals have no bank blockholders. Considering that the markup (profit margin) has a standard deviation of 1.164 (0.269) and an interquartile range of 0.628 (0.293), the magnitude of this adverse effect is economically considerable.

[Insert Table 2 Here]

We provide robustness checks on alternative measures of bank ownership as discussed

[13] As suggested by Berry et al. (2019), ...

in Panel B of Table 1. To reduce the right-skewed distribution of these variables, we use the natural logarithm of one plus them. The coefficients of *Ln(NumBank)* are all significantly positive, while the coefficient of *Ln(NumBank_HoldRival)* and *Ln(NumRival)* are significantly negative. The results are consistent with our baseline OLS results and are reported in the Online Appendix.

4. Identification

4.1. Bank mergers as a quasi-natural experiment

Bank ownership of industrial firms is not randomly determined. The first concern is that some omitted factors could affect both bank ownership of a firm and its competitive strength. To solve this, we control a set of time-variant characteristics and industry/firm fixed effects to capture the omitted variables in the OLS analysis. However, firms with better performance could attract more attention of banks to invest their stocks, which could result in reverse causality. We utilize mergers between lenders of affected firms and institutional shareholders of firms' industry rivals to design a difference-in-differences experiment to address potential endogeneity problems.[14]

Suppose two institutions are involved in a merger; one serves as the relationship bank of a firm before the merger (i.e., merging bank), and another serves as the blockholder of the firm's industry rivals before the merger (i.e., merging institutional shareholder). Once the two institutions merged, the merged institution usually maintains the acquired stock portfolios for a relatively long period, especially for those block equity investments (He and Huang (2017)). The merger event helps the industry rivals to obtain a new bank blockholder, thus yielding a treatment to the affected firm. Hereafter, we refer to this strategy as bank mergers because one merging institution is a bank.

Our identification relies on the assumption that the merging decision of two institutions is unrelated to the fundamental characteristics of an individual firm in portfolios of either institution. This assumption is almost true because a bank often lends to hundreds of borrowers and an institutional shareholder usually holds hundreds of stocks at

[14]Our identification is inspired by the institution mergers in the existing literature, in which one institution obtains stock holdings of another institution through a merger, thus generating exogenous shocks to firms' common ownership with rivals (He and Huang (2017)) or firms' dual holding (Chu (2018)). We make some adjustments and adapt to our analysis.

any point in time. Besides, prior studies suggest that mergers between two financial institutions are largely driven by the consolidation in the financial sectors in response to deregulation or business strategic consideration of institutions themselves (DeYoung et al. (2009); He and Huang (2017)).[15] Hence, bank mergers provide an ideal laboratory to generate an exogenous variation to bank ownership.

We filter bank mergers from the SDC M&A database with the following criteria. First, the merging bank should be a lead lender that has issued syndication loans or sole-lender loans in the LPC DealScan database (Jiang et al. (2010)).[16] Second, the merging institutional shareholder should have filings in the Thomson Reuters S13F database.[17] Third, mergers were completed within one year after the announcement (He and Huang (2017)). These selection processes result in 158 bank mergers from 1991 to 2018.

4.2. Identifying treatment and control sample

We rely on mergers between lenders of affected firms and institutional shareholders of firms' industry rivals to generate exogenous variations to bank ownership of industry rivals. To identify the treatment sample, we require a firm to have outstanding loans with the merging bank during the past twelve months before the merger announcement.[18] We also require that the merging institutional shareholder holds more than 5% of outstanding shares of any of the firm's industry rivals at the quarter immediately before the merger. We exclude two cases from our treatment sample. First, if any merging institution lends to a firm and simultaneously holds block shares of any of the firm's industry rivals before the merger, we exclude the firm because it is already treated before the merger. Second, if a firm is treated by multiple merger events, we only keep the first-time treatment.

To identify the control sample, we require a firm to have outstanding loans with

[15]The Gramma-Leach-Bliley Act allowed commercial banks to consolidate with securities firms, investment banks, and insurance firms, resulting in a wave of financial mergers in early 2000. An example is the merger between Bank of American and FleetBoston in 2003.

[16]We focus on lead lenders because they maintain more monitoring power, bear more due diligence duties, and retain a larger share of loans (Sufi (2007)).

[17]We link the two databases by fuzzy matching the institutions' name. We then manually check with lenders' information on the FDIC BankFind websites to enhance accuracy.

[18]We use the DealScan-Compustat borrower linking table (Chava and Roberts (2008)) to align firms in the Compustat database with their relationship banks in the Dealscan database.

the merging bank during the past twelve months before the merger announcement, but another merging institutional shareholder does not hold block shares of its industry rivals during the quarter immediately before the merger. The only difference between the treatment and control sample is that for the latter, the merging institutional shareholder does not hold block shares of the industry rivals so that the industry rivals of control firms cannot experience an increase bank ownership through a merger event. Appendix A3 illustrates the details of the identification strategy.[19]

The length of the event window is a tradeoff between relevance and accuracy. A short window may fail to capture meaningful changes in firms' product market performance in response to bank mergers, while a long window could incorporate too much noise irrelevant to the event. Following He and Huang (2017), we study the symmetric seven-year window around bank mergers (i.e., three years before the merger announcement and three years after the merger completion, plus the event year). If a merger event involves no treatment firm, we exclude it from our sample. There are 12,257 firm-year observations from twenty-nine bank mergers between 1991 and 2015. Appendix A4 provides a complete list of these valid bank mergers.

Figure 3 plots the distribution of bank mergers and treatment firms across calendar years. There is little clustering of merger deals and treatment firms in particular years, suggesting that our DID result is unlikely to be driven by unobservable macroeconomic conditions that coincidentally correlated with bank ownership status. A key advantage of our identification strategy is that the multiple merger events that treat firms at various times, which could mitigate the concern that potential omitted variables coinciding with a single shock that directly affect the outcome variable.

[Insert Figure 3 Here]

[19] A limitation of our strategy is that it cannot constitute an exogenous variation to the bank ownership of firm itself. Suppose a firm has outstanding loans with the merging bank before the merger, and another merging institutional shareholder holds block shares of the firm before the merger. After the two institution merged, the firm experiences an increase of dual holding, rather than experiences an increase of bank ownership.

4.3. DID estimation

We now examine how the formation of bank ownership of industry rivals due to bank mergers affects firms' market power. We estimate the following DID model:

$$MarketPower_{i,j,t} = \beta_1 Treat \times Post + \beta_2 Post + \gamma' Control_{i,t-1} + \delta_{i,j} + \tau_t + \epsilon_{i,j,t} \quad (3)$$

where i denotes the affected firm, j denotes the merger event, and t denotes the calendar year. The outcome variable is one of the two measures of market power: *Markup* and *Profit margin*. *Treat* equals one if a firm's relationship bank obtains block shares of its industry rivals by merging with another institutional shareholder, and zero otherwise. *Post* equals one if an observation is after the completion of a merger, and zero otherwise. *Control* is the full set of time-variant control variables discussed in Table 1. We control the firm fixed effect to capture the time-invariant factors across firms and control the calendar year fixed effect to capture the time trend. In the most stringent specification, we control the firm×merger fixed effect.[20] We cluster standard errors at the merger level, given that the treatment effect is identified at the merger level.

Panel A of Table 3 presents the DID result. In all columns, the coefficients before *Treat*×*Post* are significantly negative, suggesting that treatment firms, whose industry rivals obtain a new bank block-ownership through bank mergers, exhibit lower market power than control firms. On average, the markup (profit margin) is 0.054 (0.013) lower for treatment firms than those control firms. Given that the markup (profit margin) in our DID sample has a standard deviation of 0.728 (0.187) and an interquartile range of 0.503 (0.252), the magnitude of this effect is economically considerable.

[Insert Table 3 Here]

Next, we verify the premise that the quasi-natural experiment does lead to an increase in bank ownership of industry rivals. We construct alternative measures of bank-rival connection with respect to the two merging institutions because the variations to the bank ownership of industry rivals are caused by the two institutions involved in the mergers. *RivalShare* is the aggregated fraction of an industry rival's equity shares the

[20] Note that a firm could appear in multiple bank mergers as control samples; thus, a more conservative way is to control the firm×merger fixed effect and the coefficient of *Treat* is unidentified.

merging institutions hold at each quarter-end during the seven-year window around mergers. *Ln(NumRival)* is the natural logarithm of one plus the number of industry rivals the merging institutions hold at each quarter-end within the seven-year window. *HoldRival(d)* is an indicator variable that equals one if the merging institutions hold a firm's industry rivals at each quarter-end within the seven-year window, and zero otherwise. There are 35,482 firm-quarter observations during the symmetric seven-year window.

Panel B of Table 3 reports the DID results of bank mergers on bank ownership of industry rivals. We control the full set of time-variant characteristics as discussed before. Through columns 1 to 4, the coefficients before *Treat*×*Post* are significantly positive, where the outcome variables are *RivalShare* and *Ln(NumRival)*. The coefficients in columns 5 and 6 are only significant on the margin when using *HoldRival(d)* as the outcome variable. These results suggest that treatment firms experience a significant increase in bank ownership of the industry rivals than those control firms.

4.4. Validity of DID experiment

As stated before, treatment and control samples belong to different industries in our baseline DID analysis. In the Online Appendix, we check the percentage of treatment and control firms distributed across the three-digit SIC industries, and we find that both treatment firms and control firms broadly spread across industries. This mitigates the concern that unobservable factors of particular industries drive the DID result.

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 year indicators ($Year^k$), interact them with *Treat*×*Post* and estimate the following equation:

$$MarketPower_{i,j,t} = \alpha + \sum_{k=-5}^{k=5} \beta_k Treat \times Year^{\mathrm{k}} + \sum_{k=-5}^{k=5} \beta_{2k} Year^{\mathrm{k}} + \delta_{i,j} + \tau_t + \epsilon_{i,j,t} \quad (4)$$

where i denotes the affected firm, j denotes the merger event, and t denote the calendar year, respectively. $Year^k$ equals one if a firm-year observation happens to be year k relative to the event year, and zero otherwise. We control the firm×merger fixed effect and calendar year fixed effect. Figure 4 plots the dynamic of coefficients estimated around mergers. In Panel A (Panel B), the coefficients of the pre-event periods are close to zero, and the coefficients become significantly negative since the completion of mergers and reach their minimum value three years later. The evidence provides further confidence

that the markup (profit margin) of treatment firms and control firms closely follows a parallel trend during the five years leading up to mergers.[21]

[Insert Figure 4 Here]

4.5. Robustness checks of the DID analysis

We conduct several robustness checks for our DID estimation. First, our DID design implicitly requires that firms have outstanding loans with the merging bank before the merger. A concern could arise that our DID result is driven by firms with lending relationships with the merging bank. To this end, we complement our baseline DID sample with same-industry peers with no lending relationship with the merging bank. Suppose a firm A whose industry rivals (R^A) are block-held by an institutional shareholder, which later merges with a lender of the firm. We classify firm A and other peers (i.e., A_1, A_2, A_3, etc.) in the same industry (except those R^A) into the treatment sample.[22] In contrast, suppose a firm B whose industry rivals (R^B) have no institutional shareholders that merge with lenders of the firm. We classify firm B and other peers (i.e., B_1, B_2, B_3, etc.) in the same industry (except those R^B) into the treatment sample. The results still hold when using the alternative DID sample.

Second, around 32% of our treatment firms are affected in mergers during the 2008 financial crisis. For example, Bank of America acquired Merrill Lynch in September 2008 because the latter institution was in a bailout due to the aftermath of the crisis. A challenge to our identification strategy is that the treatment effect could be contaminated by the differential responses of treatment or control firms to the crisis. To this end, we restrict our sample to mergers outside the crisis period. The results continue to hold after we exclude mergers announced in 2008.

Third, we use the three-digit SIC industry classification to define industries in the baseline analysis. To assess the robustness of results to the choice of industry classification, we repeat the DID analysis using two alternative industry classifications: the

[21] In the Online Appendix, we also compare the characteristics of treatment and control firms during the year before bank mergers. We find that the bank ownership of industry rivals are indifferent between the two groups, except a slight difference in *HoldRival(d)*. Other covariates have no significant difference between the two groups.

[22] Once a bank merger treats an industry, we no longer consider subsequent bank mergers that may treat firms in that industry.

four-digit NAICS codes from Compustat and the text-based network industry classification (TNIC3) provided by Hoberg and Phillips (2010, 2016).[23] The results still hold when using alternative industry classifications.

Fourth, firms usually report their operating expenses in two data items: the cost of goods sold (i.e., *COGS*) and the selling, general, and administrative expenses (i.e., *SGA*). The recent two decades have witnessed a shift of many firms to report their operating expenses into *SGA*. Using *COGS* as the only component of operating expense could overestimate firms' market power. Following Traina (2018) and Basu (2019), we use the sum of *COGS* and *SGA* as the variant input and estimate firms' markup (profit margin). We repeat our DID analysis with the alternative measures of markup (profit margin), and the results still hold.

In the baseline DID analysis, we choose the symmetric seven-year window around bank mergers to conduct our baseline DID estimation. To assess the robustness of results to the choice of the event window, we use the symmetric three-year window and the symmetric five-year window as alternative event windows, and the results still hold. We report all mentioned robustness check in the Online Appendix.

5. Additional Analysis

Our evidence so far is consistent with the hypothesis that bank ownership affects firms' market power: on the one hand, it increases the market power of firm itself; on the other hand, it impedes other firms without bank ownership in the product market. We also establish causality inference using the DID analysis. In this section, we conduct additional analyses to reinforce our baseline results relying on the DID setting as discussed in the previous section.

5.1. Banks' incentives to prioritize stock holdings of the rivals

The competitive nature between a firm and its industry rivals indicates that one side gains and the other loses. As the value of a bank's stock investment in the industry rivals gradually increases, the bank's incentive to prioritize the profit of holding the industry rivals' stocks also increases. We construct an indicator variable to measure the bank's

[23]The SIC and NAICS codes define industry boundaries by firms' production process, while TNIC3 codes define industry boundaries based on the products that firms supply to the market.

incentive. *Important rivals(d)* is an indicator that equals one if a bank's investment share in the rivals (measured by the market value of a bank's stock holding in the industry rivals divided by the market value of the bank's total investment) is above the median, and zero otherwise. We expect that the effect of bank mergers on market power is stronger when the industry rivals represent a large share of the bank's stock investment.

As a complement analysis, we examine the bank's attitude towards pursuing long-term profit in the stock market. *Dedicated bank(d)* is an indicator that equals one if the bank is a long-term investor, and zero otherwise (Bushee (1998, 2001)). We expect that the adverse effect on market power is stronger when banks are long-term investors.

We interact the two variables with *Treat*×*Post* and the time-variant control variables in Equation (3). In columns 1 and 3 of Table 4, the coefficients of *Treat*×*Post* and *Treat*×*Post*×*Important rivals(d)* are significantly negative. Consistent with our hypothesis, this result suggests that the adverse effect on market power is stronger when industry rivals represent a large share of the bank's stock investment. In columns 2 and 4, the coefficients of *Treat*×*Post* and *Treat*×*Post*×*Dedicated bank(d)* are significantly negative, suggesting that the effect is stronger when banks are long-term investors.

[Insert Table 4 Here]

5.2. Mechanism analysis

Theoretically, Cestone and White (2003) suggest that banks are reluctant to lend to new entrant firms because this could hinder the incumbent firms, especially when they hold equity-like claims of the incumbent firms. When a bank becomes a blockholder of the industry rivals of a firm, it could consider the firm as potential threat that reduces the value of stock investment in the rivals. As financial intermediaries, banks may charge higher loan spreads, reduce the loan amount, or require more collaterals when lending to the affected firms. Financial frictions could distort firms' decisions to upgrade the cost-reducing technology. Less efficient firms intend to charge higher price to cover their production costs, which could push customers to more efficient rivals; as a result, firms have to experience reduced markups (Syverson (2019); Altomonte et al. (2021)). We term this mechanism as the "financing channel".

Having the proprietary information disclosed to industry rivals could threaten firms'

prospects in the product market.[24] When firms bear higher risks of information leakage, they are more prone to lose market power in the product market. As information intermediaries, banks could intentionally or unintentionally leak borrowers private information to other divisions within financial conglomerates.[25] Moreover, Asker and Ljungqvist (2010) and De Franco et al. (2020) suggest that firms face higher risks of information leakage if their underwriting bank or lending bank have interactions with their competitors. A similar concern could arise when banks form equity ownership with the industry rivals, and we term this mechanism as the "information channel".

5.2.1. Bank switching around bank mergers

Bank ownership of industry rivals could generate competitive disadvantages in financing or information, imposing firms to switch away from their banks. However, the information asymmetries between the inside and outside lenders could prevent firms from switching to outside lenders smoothly (Degryse and Ongena (2008) for a literature review; Ioannidou and Ongena (2010)) Therefore, firms need to tradeoff between the benefits of switching banks (i.e., avoiding potentials risks of bank ownership of industry rivals) and the switching costs (i.e., higher costs of loans charged by outside lenders).

To assess firms' bank switch behavior, we extract syndicated loans and sole-lender loans from the DealScan database, excluding loans with missing values of loan spreads, loan amount, and loan maturity. We focus on loans initiated within the symmetric seven-year window around bank mergers. This procedure yields 11,539 loans issued by 1,108 distinct firms. We further exclude first-time loans, which cannot involve a switching behavior. This procedure reduces the sample into 11,081 loans by 1,094 distinct firms.[26]

Following Asker and Ljungqvist (2010), we code *Switch bank(d)* as one if a firm fails to retain every lead banks from the most recent loan, and zero otherwise. We estimate

[24] Ellis et al. (2012), Boone et al. (2016), Glaeser (2018), and Klasa et al. (2018) have discussed this concern. For example, firms tradeoff on disclosing customer identities because such disclosures can be observed by potential rivals, thus facilitating rivals to compete with them (Ellis et al. (2012)).

[25] Acharya and Johnson (2007), Massa and Rehman (2008), Ivashina and Sun (2011) and Chen and Martin (2011) provide empirical evidence on the information flows within financial conglomerates.

[26] Appendix A2 describes the details of how we constructed the loan-level DID sample.

the linear probability model as follows[27]:

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

where l denotes the loan, i denotes the firm, j denotes the merger event, and t denotes the calendar year, respectively. We control the time-variant characteristics as discussed in Table 1, and the year-quarter fixed effect. Panel A of Table 5 reports the results. We gradually control the industry fixed effect, the firm fixed effect, and the firm×merger fixed effect through column 1 to 3. The coefficients of *Treat*×*Post* are positive and statistically significant. The treatment effects are economically significant; the average switching rate in the treatment group is 8.1 percentage points greater than in the control group. The results suggest that the benefits of switching exceed the switching costs.

As stated before, the information asymmetry problem could prevent the firm from switching to outside lenders smoothly. We construct two variables to measure firms' information asymmetry. *Not rated(d)* is an indicator that equals one if a firm has no S&P senior debt rating, 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 does not have multiple lending relationships during the past five years except the merging bank, and zero otherwise.

We interact the two variables with *Treat*×*Post* and the time-variant control variables in Equation (5). Panel B of Table 5 reports the results. The coefficients of the triple DID terms are slightly negative but not significant. Consistent with the overall effect on bank switching in Panel A, the cross-sectional evidence provide further confidence that our sample firms are less subject to the information asymmetry problem.

[Insert Table 5 Here]

5.2.2. Costs of loans around bank mergers

To examine the financing channel, we construct three variables to measure the costs of loans. *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 in a loan,

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

and zero otherwise. *Ln(Loan amount)* is the natural logarithm of the dollar amount (in million USD) borrowed in a loan. Table 6 reports the result of estimating Equation (5) with *Loan spreads*. In all columns, we control a full set of loan characteristics, and dummies of loan type and purpose. We also control the time-variant characteristics as discussed in Table 1, and the year-quarter fixed effect. Through columns 1 to 3, we gradually control the industry fixed effect, the firm fixed effect, and the firm×merger fixed effect. The coefficients of *Treat*×*Post* are significantly positive.

In columns 4 and 5, we further split the loan sample based on whether firms switch their banks after the merger events, and we find that the increased loan spreads effect is more concentrated for firms that switch banks. Taken together, the formation of bank ownership of industry rivals due to bank mergers increases the loan spreads of treatment firms, which is consistent with the financing channel. For other non-pricing loan terms, we find no evidence that the formation of bank ownership of industry rivals increases the collaterals and reduce the loan amount. We report the results in the Online appendix.

[Insert Table 6 Here]

5.2.3. Firms' sensitivity to information leakage

Evidence from market power analysis To pin down the information channel, we construct three variables to measure firms' proprietary costs. *Strategic substitute(d)* is an indicator that equals one if an industry produces substitute goods and is considered to be highly competitive, and zero if an industry produces complementary goods (Chod and Lyandres (2011); Saidi and Streitz (2021)).[28] *Fluid market(d)* is an indicator that equals one if the product fluidity in a market is above the median, and zero otherwise (Hoberg and Phillips (2010, 2016)). *High-tech firm(d)* is an indicator that equals one if the number of patents filed by a firm is above the industry median, and zero otherwise (Kogan et al. (2017)). We conjecture that the adverse effect on market power is stronger for highly competitive industries and when firms do intensive R&D activities.

We interact the three variables with *Treat*×*Post* and the time-variant control variables in Equation (3), with results reported in Panel A of Table 7. The coefficients of the triple DID term are all significantly positive except column 5. Consistent with our expectation,

[28]Prior studies indicate that industry-level factors (i.e., the nature of product market competition) are associated with firms' proprietary costs (Asker and Ljungqvist (2010)).

the decreased market power effect is stronger for highly competitive industries and when firms do intensive R&D activities.

Evidence from bank switching analysis When a bank becomes equity holder of a firm's industry rivals, potential risks of information leakage could impose the firm to switch banks. A strong bank-firm relationship allows the bank to accumulate more soft information of its borrowers (Petersen and Rajan (1994); Berger and Udell (1995); Bharath et al. (2007, 2011)).[29] We can utilize the bank switching analysis and zoom into the heterogeneity of banks' information advantage of the firm.

We measure the intensity of bank's information advantage of the firm with three variables. *Intensive lending(d)* is an indicator that equals one if the bank's lending share to the firm (measured by the volume of loans the firm borrowed from the bank divided by the total volume loans of the firm) is above the median, and zero otherwise. *Long duration(d)* is an indicator that equals one if the duration of the bank-firm relationship is above the median, and zero otherwise. The geographic proximity of the bank to its borrower could facilitate the bank to obtain private information from the firm (Petersen and Rajan (2002); Agarwal and Hauswald (2010)). *Neighbor bank(d)* is an indicator that equals one if the geographic distance between the firm and the bank headquarter is below the median, and zero otherwise. We conjecture that the bank switching effect is stronger when banks have more private information of firms.

We interact the three variables with $Treat \times Post$ and the time-variant control variables in Equation (4). Panel B of Table 7 reports the results. In columns 1 to 3, the coefficients of the DID term are close to zero, and the coefficients of the triple DID terms are significantly positive. This result suggests that effect of bank mergers on bank switching is stronger when a bank possess more inside information of the firm, which is consistent with the proprietary information leakage channel.

[Insert Table 7 Here]

6. Conclusion

In this paper, we study how bank ownership of industrial firms affects firms' competitive strength in the product market. On the one hand, we find that bank ownership of

[29] Banks collect borrowers' private information during the due diligence and monitoring, especially when they are lead lenders of syndicated loans (Boot and Thakor (2000); Sufi (2007)).

firms could increase market power. On the other hand, bank ownership of industry rivals could reduce firms' market power. Using bank mergers to design an exogenous variation to bank ownership, we establish causality of this research question. We find that the formation of bank ownership of industry rivals leads to lower markup (profit margin) and a higher likelihood of bank switching. The effect is stronger for highly competitive industries, R&D intensive firms, and if the bank has more private information about the firm.

References

Acharya, Viral V., and Timothy C. Johnson, 2007, Insider trading in credit derivatives, *Journal of Financial Economics* 84, 110–141.

Agarwal, Sumit, and Robert Hauswald, 2010, Distance and private information in lending, *Review of Financial Studies* 23, 2757–2788.

Altomonte, Carlo, Domenico Favoino, Monica Morlacco, and Tommaso Sonno, 2021, Markups, intangible capital, and heterogeneous financial frictions, *Working Paper* .

Angrist, Joshua D., and Jörn-Steffen Pischke, 2009, *Mostly Harmless Econometrics: An Empiricist's Companion* (Princeton University Press), Princeton, NJ.

Anton, Miguel, Florian Ederer, Mireia Gine, and Martin C. Schmalz, 2021, Common ownership, competition, and top management incentives, *SSRN Electronic Journal* Ross School of Business Paper No. 1328.

Asker, John, and Alexander Ljungqvist, 2010, Competition and the structure of vertical relationships in capital markets, *Journal of Political Economy* 118, 599–647.

Azar, José, Sahil Raina, and Martin Schmalz, 2021, Ultimate ownership and bank competition, *Financial Management* 1–43.

Azar, José, Martin C. Schmalz, and Isabel Tecu, 2018, Anticompetitive effects of common ownership, *Journal of Finance* 73, 1513–1565.

Barth, James R., R. Dan Brumbaugh, and James A. Wilcox, 2000, Policy watch: The repeal of Glass-Steagall and the advent of broad banking, *Journal of Economic Perspectives* 14, 191–204.

Basu, Susanto, 2019, Are price-cost markups rising in the United States? A discussion of the evidence, *Journal of Economic Perspectives* 33, 3–22.

Berger, Allen N, and Gregory F Udell, 1995, Relationship Lending and Lines of Credit in Small Firm Finance, *Journal of Business* 68, 351–381.

Berry, Steven, Martin Gaynor, and Fiona Scott Morton, 2019, Do increasing markups matter? Lessons from empirical industrial organization, *Journal of Economic Perspectives* 33, 44–68.

Bharath, Sreedhar, Sandeep Dahiya, Anthony Saunders, and Anand Srinivasan, 2007, So what do I get? The bank's view of lending relationships, *Journal of Financial Economics* 85, 368–419.

Bharath, Sreedhar T., Sandeep Dahiya, Anthony Saunders, and Anand Srinivasan, 2011, Lending relationships and loan contract terms, *Review of Financial Studies* 24, 1141–1203.

Boone, Audra L., Ioannis V. Floros, and Shane A. Johnson, 2016, Redacting proprietary information at the initial public offering, *Journal of Financial Economics* 120, 102–123.

Boot, Arnoud W.A., and Anjan V. Thakor, 2000, Can relationship banking survive competition?, *Journal of Finance* 55, 679–713.

Bushee, Brian J., 1998, The influence of institutional investors on myopic R&D investment behavior, *Accounting Review* 73, 305–333.

Bushee, Brian J., 2001, Do institutional investors prefer near-term earnings over long-run value?, *Contemporary Accounting Research* 18, 207–246.

Cestone, Giacinta, and Lucy White, 2003, Anticompetitive financial contracting: The design of financial claims, *Journal of Finance* 58, 2109–2142.

Cetorelli, Nicola, 2004, Real effects of bank competition, *Journal of Money, Credit and Banking* 36, 543–558.

Cetorelli, Nicola, and Philip E Strahan, 2006, Finance as a barrier to entry: Bank competition and industry structure in local U.S. markets, *Journal of Finance* 61, 437–461.

Chava, Sudheer, and Michael R. Roberts, 2008, How does financing impact investment? the role of debt covenants, *Journal of Finance* 63, 2085–2121.

Chen, Ting, and Xiumin Martin, 2011, Do bank-affiliated analysts benefit from lending relationships?, *Journal of Accounting Research* 49, 633–675.

Chod, Jiri, and Evgeny Lyandres, 2011, Strategic IPOs and product market competition, *Journal of Financial Economics* 100, 45–67.

Chu, Yongqiang, 2018, Shareholder-creditor conflict and payout policy: Evidence from mergers between lenders and shareholders, *Review of Financial Studies* 31, 3098–3121.

De Franco, Gus, Alexander Edwards, and Scott Liao, 2020, Product market peers in lending, *Management Science* Forthcoming.

De Loecker, Jan, Jan Eeckhout, and Gabriel Unger, 2020, The rise of market power and the macroeconomic implications, *Quarterly Journal of Economics* 135, 561–644.

De Loecker, Jan, and Frederic Warzynski, 2012, Markups and firm-level export status, *American Economic Review* 102, 2437–2471.

Degryse, Hans, and Steven Ongena, 2008, Competition and regulation in the banking sector: A review of the empirical evidence on the sources of bank rents, in *Handbook of financial intermediation and banking*, 483–554 (Netherlands).

DeYoung, Robert, Douglas D. Evanoff, and Philip Molyneux, 2009, Mergers and acquisitions of financial institutions: A review of the post-2000 literature, *Journal of Financial Services Research* 36, 87–110.

Ellis, Jesse A., C. Edward Fee, and Shawn E. Thomas, 2012, Proprietary costs and the disclosure of information about customers, *Journal of Accounting Research* 50, 685–727.

Gaspar, José Miguel, and Massimo Massa, 2006, Idiosyncratic volatility and product market competition, *Journal of Business* 79, 3125–3152.

Glaeser, Stephen, 2018, The effects of proprietary information on corporate disclosure and transparency: Evidence from trade secrets, *Journal of Accounting and Economics* 66, 163–193.

Gorton, Gary, and Frank A Schmid, 2000, Universal banking and the performance of German firms, *Journal of Financial Economics* 58, 29–80.

Gutiérrez, Germán, and Thomas Philippon, 2018, Ownership, Concentration, and Investment, *AEA Papers and Proceedings* 108, 432–437.

Hall, Robert, 2018, New evidence on the markup of prices over marginal costs and the role of mega-firms in the US economy, *National Bureau of Economic Research* No. w24574.

Haubrich, Joseph G., and João A.C. Santos, 2003, Alternative forms of mixing banking with commerce: Evidence from American history, *Financial Markets, Institutions and Instruments* 12, 121–164.

He, Jie, and Jiekun Huang, 2017, Product market competition in a world of cross-ownership: Evidence from institutional blockholdings, *Review of Financial Studies* 30, 2674–2718.

Hoberg, Gerard, and Gordon Phillips, 2010, Product market synergies and competition in mergers and acquisitions: A text-based analysis, *Review of Financial Studies* 23, 3773–3811.

Hoberg, Gerard, and Gordon Phillips, 2016, Text-based network industries and endogenous product differentiation, *Journal of Political Economy* 124, 1423–1465.

Ioannidou, Vasso, and Steven Ongena, 2010, "Time for a change": Loan conditions and bank behavior when firms switch banks, *Journal of Finance* 65, 1847–1877.

Ivashina, Victoria, and Zheng Sun, 2011, Institutional stock trading on loan market information, *Journal of Financial Economics* 100, 284–303.

Jiang, Wei, Kai Li, and Pei Shao, 2010, When shareholders are creditors: Effects of the simultaneous holding of equity and debt by non-commercial banking institutions, *Review of Financial Studies* 23, 3595–3637.

Klasa, Sandy, Hernán Ortiz-Molina, Matthew Serfling, and Shweta Srinivasan, 2018, Protection of trade secrets and capital structure decisions, *Journal of Financial Economics* 128, 266–286.

Kogan, Leonid, Dimitris Papanikolaou, Amit Seru, and Noah Stoffman, 2017, Technological innovation, resource allocation, and growth, *Quarterly Journal of Economics* 132, 665–712.

Lancaster, Tony, 2000, The incidental parameter problem since 1948, *Journal of Econometrics* 95, 391–413.

Lerner, A. P., 1934, The concept of monopoly and the measurement of monopoly power, *Review of Economic Studies* 157–175.

Massa, Massimo, and Zahid Rehman, 2008, Information flows within financial conglomerates: Evidence from the banks-mutual funds relation, *Journal of Financial Economics* 89, 288–306.

Mauri, Alfredo J., and Max P. Michaels, 1998, Firm and industry effects within strategic management: an empirical examination, *Strategic Management Journal* 19, 211–219.

Morck, Randall, Masao Nakamura, and Anil Shivdasani, 2000, Banks, ownership structure, and firm value in Japan, *Journal of Business* 73, 539–567.

Peress, Joel, 2010, Product market competition, insider trading, and stock market efficiency, *Journal of Finance* 65, 1–43.

Petersen, Mitchell A., and Raghuram G. Rajan, 1994, The benefits of lending relationships: Evidence from small business data, *Journal of Finance* 49, 3–37.

Petersen, Mitchell A., and Raghuram G. Rajan, 2002, Does distance still matter? The information revolution in small business lending, *Journal of Finance* 57, 2533–2570.

Roberts, Michael R., and Toni M. Whited, 2013, Endogeneity in empirical corporate finance, in *Handbook of the Economics of Finance*, 493–572.

Saidi, Farzad, and Daniel Streitz, 2021, Bank concentration and product market competition, *The Review of Financial Studies* 00, 1–37.

Santos, João A.C., and Adrienne S. Rumble, 2006, The American keiretsu and universal banks: Investing, voting and sitting on nonfinancials' corporate boards, *Journal of Financial Economics* 80, 419–454.

Santos, João A.C., and Kristin E. Wilson, 2017, Does banks' corporate control lower funding costs? Evidence from US banks' control over firms' voting rights, *Journal of Financial Services Research* 51, 283–311.

Short, Jeremy C., David J. Ketchen Jr., Timothy B. Palmer, and G. Tomas M. Hult, 2007, Firm, strategic group, and industry influences on performance, *Strategic Management Journal* 28, 147–167.

Sufi, Amir, 2007, Information asymmetry and financing arrangements: Evidence from syndicated loans, *Journal of Finance* 62, 629–668.

Syverson, Chad, 2019, Macroeconomics and market power: Context, implications, and open questions, *Journal of Economic Perspectives* 33, 23–43.

Tirole, Jean, 1988, *The theory of industrial organization* (MIT press).

Traina, James, 2018, Is aggregate market power increasing? Production trends using financial statements., *Available at SSRN:* https://ssrn.com/abstract=3120849 or http://dx.doi.org/10.2139/ssrn.3120849.

Xie, Jin, and Joseph Gerakos, 2020, The Anticompetitive Effects of Common Ownership: The Case of Paragraph IV Generic Entry, *AEA Papers and Proceedings* 110, 569–572.

Appendix A1. Sample selection

Panel A: *OLS sample (Table 1 and Table 2)*	Removed	Remained
Compustat×CRSP U.S. firms from 1990 to 2019.		140,094
Exclude financial firms and utility firms.	(31,575)	108,488
An industry should have at least five consecutive year data for at least three firms.	(841)	107,647
Firms with total assets larger than one million, total sales larger than one million, total sales larger than the earnings before the interest and taxes, and with missing values of main variables.	(21,959)	85,688
Panel B. *Firm-level DID sample (Table 3, Table 4 and Table 7)*	Remove	Remain
Firm-year observations that satisfy the initial requirements in Panel A.		187,594
Exclude firms whose relationship banks are not involved in a bank merger.	(168,359)	19,234
Exclude bank mergers without treatment firms.	(2,760)	16,474
Firm-year observations within the symmetric seven-year window around mergers.	(4,217)	12,257
Panel C. *Loan-level DID sample (Table 5 and Table 6)*	Removed	Remained
Loans issued by firms that satisfy the initial requirements in Panel A.		157,127
Exclude firms whose relationship banks are not involved in a bank merger.	(134,121)	23,006
Exclude bank mergers without treatment firms.	(6,229)	16,777
Loans issued within the symmetric seven-year window around mergers.	(5,238)	11,539
Exclude the first-time loans in the bank switch analysis.	(458)	11,081

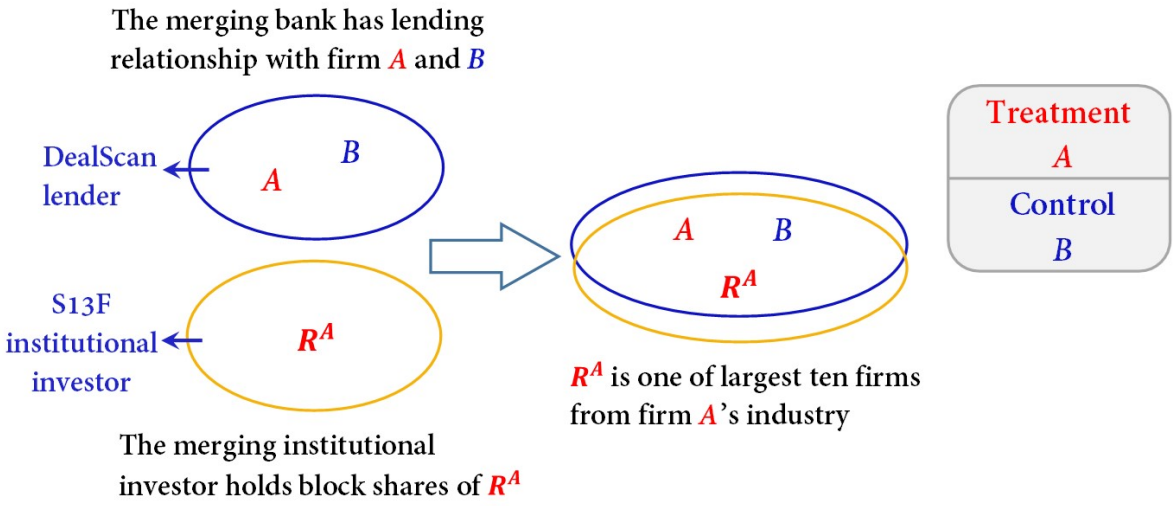
Appendix A2. Variable Definition

Variables	Description
Measures of market power	
Markup	Price-to-marginal cost ratio, estimated by the production function approach in De Loecker et al. (2020).
Profit margin	$=(Sale_t\text{-}COGS_t)/Sale_t$
Measures of bank-firm connection	
FirmShare	The aggregated fraction of a firm's outstanding share held by its bank blockholders.
NumBank	The number of banks that hold block shares of a firm.
HoldFirm(d)	An indicator that equals one if a firm has at least one bank shareholder holding more than 5% of the firm's outstanding shares during the consecutive four quarters of year *t-1*, and zero otherwise.
Measures of bank-rival connection	
RivalShare	The aggregated fraction of an industry rival's outstanding shares held by the rival's bank blockholders.
NumRival	The number of a firm's industry rivals that are blockheld by bank investors.
NumBank	The number of banks that hold block shares of a firm's industry rivals.
HoldRival(d)	An indicator that equals one if a firm's industry rivals have at least one bank shareholder holding more than 5% shares of the rival during the consecutive four quarters of year *t-1*, and zero otherwise.
Control variables	
Asset	Firm's total asset (in million USD).
Debt/Asset	Total debt scaled by total asset.
Cash/Asset	Cash and cash equivalent scaled by total asset.
ROA	Net income scaled by total asset.
MarketToBook	Market value of equity over book value of equity.
Capex/Asset	Capital expenditure scaled by total asset.
R&D/Sale	Expenditure on R&D over total sale.
HHI	The sum of the square of firms' market share in the three-digit SIC industry.
InstOwn	The fraction of shares held by institutional investors.
NumBlock	The number of blockholders of a firm.
CommonOwn(d)	An indicator that equals one of if a firm simultaneously shares the same blockholders with its industry rivals, and zero otherwise.
CommonLender(d)	An indicator that equals one of if a firm simultaneously shares the same lenders with its industry rivals, and zero otherwise.
Variables in the DID analysis	
Treat(d)	An indicator that equals one if a firm's relationship bank becomes a blockholder of its industry rivals by merging with another institution, and zero otherwise.

(Continued in next page)

(Continued)

Post(d)	An indicator that equals one if an observation is after the completion of a merger, and zero otherwise.
Loan-level variables	
Switch bank(d)	An indicator that equals one if a firm fails to retain every lead banks from the most recent loan, and zero otherwise.
Loan spreads	The annual spreads (in bps) paid for a loan.
Collateral(d)	An indicator that equals one if a loan is secured, and zero otherwise.
Loan amount	The borrowing amount of a loan (in million USD).
Heterogeneity variables	
Important rivals(d)	An indicator that equals one if the bank's investment share in the industry rivals (measured by the market value of a bank's stock holding of industry rivals divided by the market value of the bank's total stock investment) is above the median, and zero otherwise.
Dedicated bank(d)	An indicator that equals one if a bank is a long-term investor, and zero otherwise (Bushee (1998, 2001)).
Not rated(d)	An indicator that equals one if a firm has no S&P senior debt rating, and zero otherwise.
Sole lender(d)	An indicator that equals one if a firm does not have multiple lending relationships during the past five years except the merging bank, 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)).
Fluid market(d)	An indicator that equals one if the product fluidity of a market is above the industry median, and zero otherwise (Hoberg and Phillips (2010, 2016)).
High-tech firm(d)	An indicator that equals one if the number of patents filed by a firm is above the industry median, and zero otherwise.
Intensive lending(d)	An indicator that equals one if a bank's lending share (measured by the volume of loans the firm borrowed from the bank divided by the total volume loans of the firm during the past three years) is above the median, and zero otherwise.
Long duration(d)	An indicator that equals one if the duration of a 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 the bank headquarter is below the median, and zero otherwise.



Appendix A3. Identifying treatment and control sample

This figure depicts how we identify treatment and control firms in the DID analysis. Suppose a firm A whose industry rivals (R^A) are block-held by an institutional shareholder, which later merges with a lender of the firm. In this case, the industry rivals (R^A) could obtain a new bank blockholder through the merger, so we classify firm A as a treatment sample. In contrast, suppose a firm B whose industry rivals (R^B) have no institutional shareholders that merge with lenders of the firm. In that case, industry rivals (R^B) cannot obtain a new bank blockholder through any merger, so we classify firm B as a control sample. Following Asker and Ljungqvist (2010), we define the industry rivals as the largest ten firms from the industry.

Appendix A4. Bank mergers in the 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 of bank ownership of industry rivals. In our identification strategy, one merging institution is a bank that has loan data in the DealScan database, and another is an institutional investor in the S13F database. We report the announcement date, the effective date, and the name of the two merging institutions.

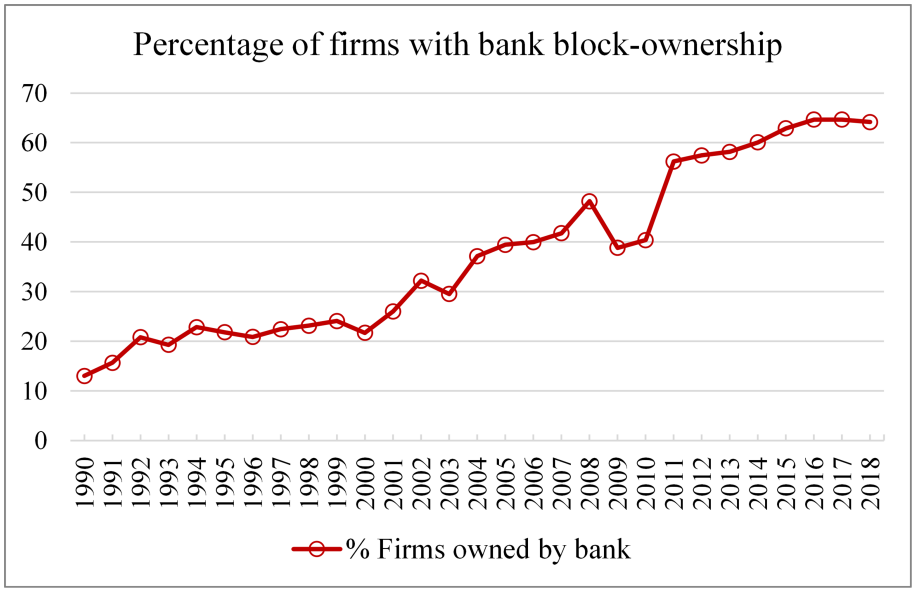


Figure 1. Evolution of bank ownership of industrial firms
The line represents the percentage of firms with bank block-ownership each year. We select all U.S. public firms from the Compustat×CRSP universe, excluding financial firms (SIC from 6000 to 6999) and utility firms (SIC from 4900 to 4999). If a DealScan bank holds more than 5% of a firm's outstanding shares during the four consecutive quarters of a calendar year, we define that the firm has a bank blockholder. See Panel A of Appendix A1 for the details of sample construction.

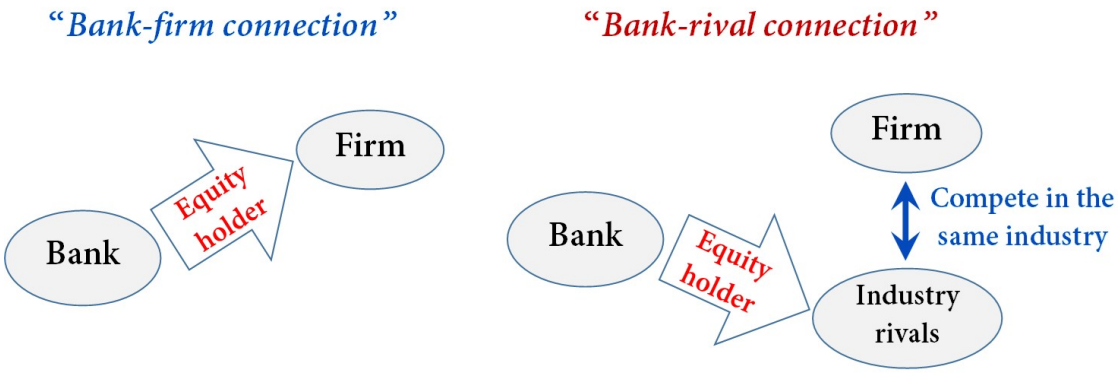


Figure 2. Effects of bank ownership of industrial firms
The left graph depicts the situation when bank investors hold block shares of a firm itself (referred to as the "bank ownership" or "bank-firm connection"). The right graph depicts the situation when bank investors hold block shares of a firm's industry rivals (referred to as the "bank ownership of industry rivals" or "bank-rival connection"). Following Asker and Ljungqvist (2010), we define the industry rivals as the largest ten firms in an industry, excluding the firm itself.

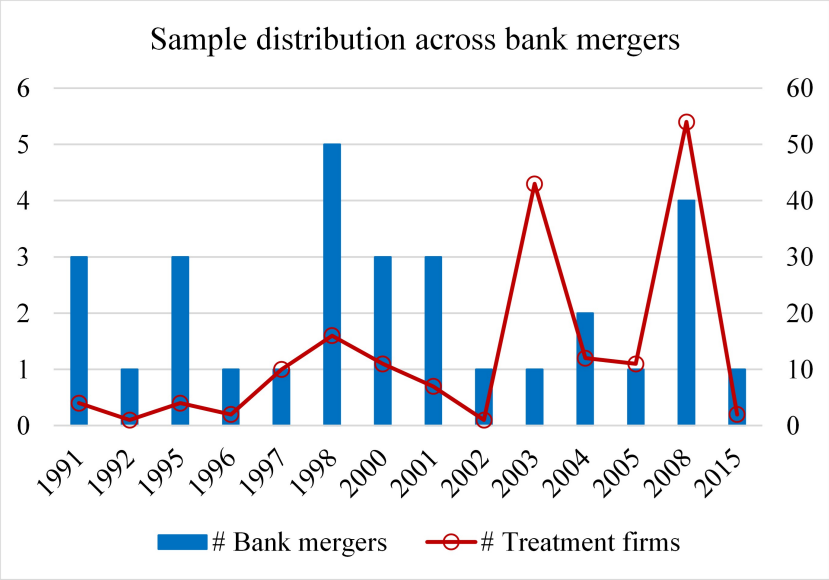
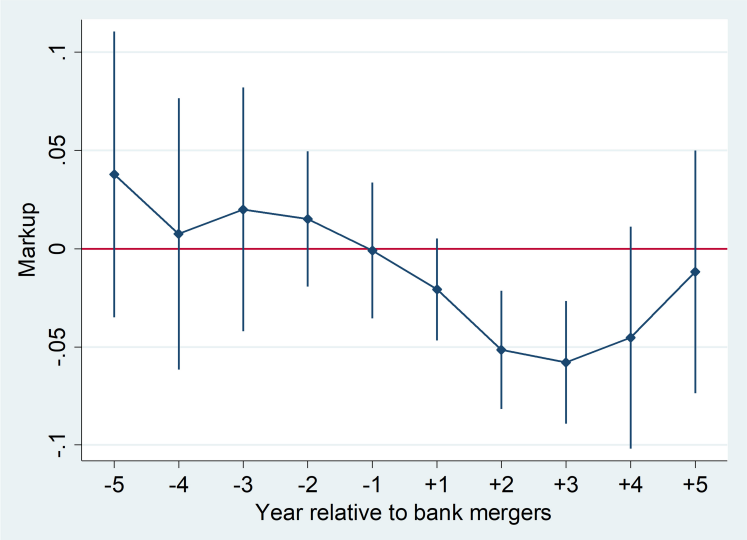
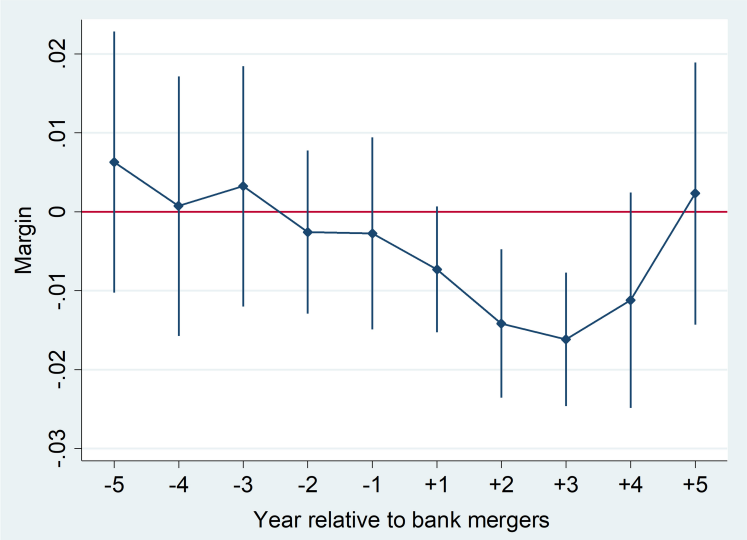


Figure 3. Distribution of bank mergers and treatment sample
The blue bars represent the number of bank mergers announced each calendar year (with the axis on the left). The red line represents the number of treatment firms in each year (with the axis on the right). There are twenty-nine bank mergers from 1991 and 2015 in our DID experiment.



Panel A. Markup



Panel B. Margin

Figure 4. Dynamics of coefficients of bank mergers and firms' market power This figure depicts the coefficients of estimating $Markup_{i,j,t} = \alpha + \sum_{k=-5}^{k=5} \beta_k Treat \times Year^{\mathrm{k}} + \sum_{k=-5}^{k=5} \beta_{2k} Year^{\mathrm{k}} + \delta_{i,j} + \tau_t + \epsilon_{i,j,t}$, where i denotes the affected firm, j denotes the merger event, and t denotes the calendar year, respectively. The outcome variable in Panel A (Panel B) is firm-level markup (profit margin). 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.

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	P25	Median	P75
Panel A. Measures of market power					
Markup	1.603	1.164	1.050	1.257	1.678
Profit margin	0.352	0.269	0.219	0.348	0.512
Panel B. Measures of bank ownership					
FirmShare	0.028	0.045	0	0	0.060
NumBank	0.431	0.708	0	0	1
HoldFirm(d)	0.323	0.468	0	0	1
RivalShare	0.077	0.032	0.065	0.077	0.096
NumRival	3.525	2.473	2	3	5
NumBank_HoldRival	2.968	1.933	2	3	4
HoldRival(d)	0.905	0.293	1	1	1
Panel C. Control variables					
Ln(Asset)	5.356	1.991	3.871	5.252	6.760
Debt/Asset	0.213	0.202	0.020	0.176	0.341
Cash/Asset	0.189	0.215	0.028	0.101	0.279
ROA	0.085	0.185	0.043	0.118	0.182
MarketToBook	1.763	1.601	0.823	1.223	2.036
Capex/Asset	0.060	0.065	0.019	0.038	0.074
R&D/Sale	0.128	0.465	0	0.001	0.068
HHI	0.208	0.163	0.093	0.158	0.266
InstOwn	0.395	0.284	0.137	0.358	0.641
Ln(NumBlock)	0.571	0.569	0	0.693	1.099
CommonOwn(d)	0.469	0.499	0	0	1
CommonLender(d)	0.261	0.439	0	0	1

This table presents the descriptive statistics of variables in the OLS analysis. We select all U.S. public firms from the Compustat×CRSP universe, excluding financial firms (SIC from 6000 to 6999) and utility firms (SIC from 4900 to 4999). Our sample ranges from 1990 to 2019. There are 85,688 firm-year observations. All continuous variables are winsorized at the 1^{st} and 99^{th} percentiles. See Appendix A1 for variable definitions.

Table 2. Bank ownership and market power: the OLS estimation

Panel A. The effect of bank-firm connection

	Markup		Profit margin	
	(1)	(2)	(3)	(4)
FirmShare	0.382***		0.056***	
	(4.071)		(2.875)	
HoldFirm(d)		0.027***		0.004**
		(3.467)		(2.095)
Ln(Asset)	0.002	0.003	-0.005**	-0.005**
	(0.159)	(0.234)	(-2.185)	(-2.106)
Debt/Asset	0.099**	0.098**	0.036***	0.035***
	(2.325)	(2.300)	(4.056)	(4.037)
Cash/Asset	0.074	0.073	-0.025**	-0.025**
	(1.295)	(1.284)	(-2.212)	(-2.217)
ROA	0.427***	0.427***	0.131***	0.131***
	(8.089)	(8.077)	(11.418)	(11.409)
MarketToBook	0.033***	0.034***	0.007***	0.007***
	(5.747)	(5.764)	(5.805)	(5.815)
CapEx/Asset	-0.079	-0.078	-0.038*	-0.038*
	(-0.982)	(-0.977)	(-1.898)	(-1.894)
R&D/Sale	-0.240***	-0.240***	-0.109***	-0.109***
	(-4.917)	(-4.916)	(-8.922)	(-8.918)
HHI	-0.155***	-0.155***	-0.030***	-0.030***
	(-4.879)	(-4.901)	(-3.629)	(-3.640)
InstOwn	0.067*	0.061	0.019**	0.018**
	(1.694)	(1.570)	(2.557)	(2.472)
Ln(NumBlock)	-0.009	-0.011	-0.004*	-0.005**
	(-0.700)	(-0.917)	(-1.885)	(-2.087)
CommonOwn(d)	0.000	0.004	0.001	0.002
	(0.030)	(0.392)	(0.544)	(0.882)
CommonLender(d)	-0.005	-0.005	-0.003	-0.003
	(-0.495)	(-0.458)	(-1.178)	(-1.150)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	84,505	84,505	84,505	84,505
R-squared	0.755	0.755	0.761	0.761

Panel B. The effect of bank-rival connection

	Markup		Profit margin	
	(1)	(2)	(3)	(4)
RivalShare	-0.399**		-0.081**	
	(-2.461)		(-2.211)	
HoldRival(d)		-0.042**		-0.009**
		(-2.508)		(-2.210)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	85,688	85,688	85,688	85,688
R-squared	0.218	0.218	0.336	0.336

This table presents the OLS estimation of how bank ownership affects 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). *Profit margin* is the firm's gross profit margin, defined as $(Sale\text{-}COGS)/Sale$. If a bank holds more than 5% of a firm's outstanding shares during the four consecutive quarters of a calendar year, we define the bank as the firm's bank blockholder. Panel A reports the estimation of how bank ownership of a firm itself affects the firm's market power. *FirmShare* is the total fraction of a firm's share held by its bank blockholders. *HoldFirm(d)* equals one if a firm has at least one bank blockholder, and zero otherwise. Panel B reports the estimation of how bank ownership of a firm's industry rivals affects the firm's market power. *RivalShare* is the total fraction of shares held by banks in a firm's industry rivals. *HoldRival(d)* equals one if a firm's industry rivals have at least one bank blockholder, and zero otherwise. We define the industry rivals as the ten largest firms in the three-digit SIC industry (ranked by Compustat net sales), excluding the firm itself. In Panel B, we control the same set of time-variant characteristics as in column 1 of Panel A. 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 experiment: The effect of bank mergers

Panel A. The effect on market power

	Markup		Profit margin	
	(1)	(2)	(3)	(4)
Treat×Post	-0.050***	-0.054***	-0.012***	-0.013***
	(-4.662)	(-4.711)	(-4.105)	(-4.209)
Treat	-0.002		-0.000	
	(-0.107)		(-0.010)	
Post	0.003	-0.013	-0.001	-0.004
	(0.467)	(-1.083)	(-0.421)	(-1.613)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	No	Yes	No
Firm×Merger FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	12,257	12,247	12,257	12,247
R-squared	0.866	0.885	0.892	0.904

Panel B. The effect on bank ownership of industry rivals

	RivalShare		Ln(NumRival)		HoldRival(d)	
	(1)	(2)	(3)	(4)	(5)	(6)
Treat×Post	0.012***	0.012***	0.268**	0.264**	0.111	0.111
	(3.795)	(3.724)	(2.131)	(2.088)	(1.662)	(1.647)
Post	0.001	0.001	-0.133	-0.130	-0.086	-0.085
	(0.516)	(0.519)	(-0.710)	(-0.699)	(-0.854)	(-0.851)
Controls	No	Yes	No	Yes	No	Yes
Firm×Merger FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	35,482	35,482	35,482	35,482	35,482	35,482
R-squared	0.498	0.499	0.737	0.738	0.519	0.520

This table presents the DID estimation of how bank mergers affect firms' market power and bank ownership of industry rivals. If a firm's industry rivals obtain a new bank blockholder due to a merger event, we classify the firm as a treatment sample. Conversely, if none of a firm's industry rivals obtain a new bank blockholder through a merger event, we classify the firm as a control sample. We define the industry rivals as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry, excluding the firm itself. *Post(d)* equals one if an observation is after the completion of a merger, and zero otherwise. We focus on the symmetric seven-year window around bank mergers. Panel A reports results using yearly *Markup* and *Profit margin* as the outcome variables. Panel B reports results using quarterly measures of bank-rival connection as the outcome variables. *RivalShare* is the fraction of an industry rival's shares held by the merging institutions at each quarter-end during the symmetric seven-year window. *Ln(NumRival)* is the natural logarithm of one plus the number of industry rivals block-held by the merging institutions at each quarter-end during the seven-year window. *HoldRival(d)* is an indicator variable

that equals one if the merging institutions hold block shares of the firm's industry rivals at each quarter-end during the seven-year window, and zero otherwise. We control the full set of control variables as shown in Table 2. 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. Heterogeneity of banks' incentive to prioritize its interest from the industry rivals

	Markup		Profit margin	
	(1)	(2)	(3)	(4)
Treat×Post×Important rivals(d)	-0.079**		-0.021**	
	(-2.291)		(-2.215)	
Treat×Post×Dedicated bank(d)		-0.164***		-0.032***
		(-3.979)		(-2.966)
Treat×Post	-0.047***	-0.052***	-0.009***	-0.011***
	(-3.902)	(-5.372)	(-2.854)	(-4.186)
Post	-0.042***	-0.041***	-0.012***	-0.012***
	(-3.002)	(-2.986)	(-3.053)	(-3.050)
Controls	Yes	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	10,305	10,305	10,305	10,305
R-squared	0.881	0.881	0.906	0.906

This table presents the heterogeneity of banks' incentives to prioritize its interest from holding the stocks of the industry rivals. *Markup* is the price-to-marginal cost ratio of a firm, estimated by the production function approach in De Loecker et al. (2020). *Profit margin* is the gross profit margin of a firm, defined as (*Sale-COGS*)/*Sale*. *Important rivals(d)* equals one if a bank's investment share in the industry rivals (measured by the market value of rivals' shares divided by the market value of a bank's total stock portfolio) is above the median, and zero otherwise. *Dedicated bank(d)* equals one if a bank is a long-term investor, and zero otherwise (Bushee (1998, 2001)). We also interact the moderator variables with the full set of control variables as shown in Equation (1). 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 formation of bank ownership of industry rivals and bank switch

Panel A. DID estimation

	Switch bank(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 bank(d)	
	(1)	(2)
Treat×Post×Not rated(d)	-0.066	
	(-0.912)	
Treat×Post×Sole lender(d)		-0.060
		(-0.445)
Treat×Post	0.110**	0.094*
	(2.589)	(1.981)
Post	0.059**	0.032
	(2.717)	(1.420)
Controls	Yes	Yes
Firm×Merger FE	Yes	Yes
Year-Qtr FE	Yes	Yes
Observations	11,000	11,000
R-squared	0.434	0.438

This table reports the results of how the formation of bank ownership of industry rivals affects firms' probability of bank switch. *Switch bank(d)* equals one if a firm fails to retain every lead banks from the most recent loan, and zero otherwise. If a firm's industry rivals obtain a new bank blockholder due to a merger event, we classify the firm as a treatment sample. Conversely, if none of a firm's industry rivals obtain a new bank blockholder through a merger event, we classify the firm as a control sample. We define the industry rivals as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry, excluding the firm itself. *Post(d)* equals one if an observation is after the merger completion, and zero otherwise. We focus on the symmetric seven-year window

around mergers. Panel B reports the cross-sectional test on the heterogeneity of firms' information asymmetry. *Not rated(d)* equals one if a firm has no S&P senior debt rating, and zero otherwise. *Sole lender(d)* equals one if a firm does not have multiple lending relationship during the past five years except the merging bank, and zero otherwise. We also interact the moderator variables with the full set of control variables. 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. The formation of bank ownership of industry rivals and cost of loans

	Loan spreads				
				Not switch	Switch
	(1)	(2)	(3)	(4)	(5)
Treat×Post	16.012*	14.265**	9.745	-9.380	24.217**
	(1.720)	(2.122)	(1.634)	(-1.638)	(2.069)
Treat	-8.018	3.346			
	(-1.561)	(0.600)			
Post	-4.606*	-3.786	-3.375	-2.071	-3.864
	(-1.852)	(-1.413)	(-1.137)	(-0.608)	(-0.945)
Controls	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	No	No	No
Firm FE	No	Yes	No	No	No
Firm×Merger FE	No	No	Yes	Yes	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes	Yes
Observations	11,539	11,528	11,500	5,628	5,858
R-squared	0.679	0.773	0.795	0.810	0.795

This table reports the DID result of how the formation of bank ownership of industry rivals affects firms' cost of loans. *Loan spreads* is the annual spreads (in bps) of a loan. If a firm's industry rivals obtain a new bank blockholder due to a merger event, we classify the firm as a treatment sample. Conversely, if none of a firm's industry rivals obtain a new bank blockholder through a merger event, we classify the firm as a control sample. We define the industry rivals as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry, excluding the firm itself. *Post(d)* equals one if a loan is after the merger completion, and zero otherwise. We focus on loans issued within the symmetric seven-year window around mergers. In columns 4 and 5, we split the sample based on whether firms switch banks after mergers. Despite of the control variables in Table 2, we also control the loan purpose, loan type, loan maturity, and whether the loan is secured. The standard errors 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. Heterogeneity of firms' sensitivity to information leakage

Panel A. Heterogeneity of firms' proprietary costs

	Markup			Profit margin		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat×Post×Strategic substitute(d)	-0.077**			-0.017**		
	(-2.299)			(-2.265)		
Treat×Post×Fluid market(d)		-0.065*			-0.012	
		(-1.798)			(-1.231)	
Treat×Post×High-tech firm(d)			-0.095***			-0.019**
			(-2.863)			(-2.142)
Treat×Post	-0.029**	-0.033***	-0.015	-0.006*	-0.008**	-0.004
	(-2.456)	(-3.187)	(-0.615)	(-1.819)	(-2.312)	(-0.732)
Post	-0.056**	-0.067***	-0.072***	-0.015***	-0.019***	-0.014***
	(-2.342)	(-3.179)	(-3.409)	(-2.758)	(-4.075)	(-2.786)
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	9,818	10,120	10,305	9,818	10,120	10,305
R-squared	0.879	0.883	0.882	0.904	0.907	0.907

Panel B. Heterogeneity of banks' private information of firms

	Switch bank(d)		
	(1)	(2)	(3)
Treat×Post×Intensive lending(d)	0.156**		
	(2.238)		
Treat×Post×Long duration(d)		0.175**	
		(2.433)	
Treat×Post×Neighbor bank(d)			0.217**
			(2.106)
Treat×Post	0.019	0.004	0.050
	(0.315)	(0.080)	(1.324)
Post	0.069***	0.069***	0.068***
	(3.367)	(3.323)	(3.354)
Controls	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes
Calendar Qtr FE	Yes	Yes	Yes
Observations	11,000	11,000	11,000
R-squared	0.432	0.432	0.432

This table presents the heterogeneity analysis on firms' sensitivity to information leakage. *Markup* is the price-to-marginal cost ratio of a firm, estimated by the production function approach in De Loecker et al. (2020). Panel A reports the heterogeneity effect of firms' proprietary costs on firms' market power. *Profit margin* is the gross profit margin of a firm, defined as $(Sale\text{-}COGS)/Sale$. *Strategic substitute(d)* equals one if an industry competes in strategic substitutes, and zero if it competes in strategic complements (Chod and Lyandres (2011)). *Fluid market(d)* equals to one if the product fluidity is above the median, and zero otherwise Hoberg and Phillips (2010, 2016). *High-tech firm(d)* equals one if the number of patents filed by a firm is above the industry median, and zero otherwise. We also interact three moderator variables with the full set of control variables. Panel B reports the heterogeneity effect of the banks' private information of firms on firms' bank switch behavior. *Switch bank(d)* as one if a firm fails to retain every lead banks from the most recent loan, and zero otherwise. *Intensive lending(d)* equals one if the bank's lending share to the firm (measured by the volume of loans the firm borrowed from the bank divided by the total volume loans of the firm) is above the median, and zero otherwise. *Long duration(d)* equals one if the duration of the bank-firm pair is above the median, and zero otherwise. *Neighbor bank(d)* equals one if the geographic distance between the firm and the bank headquarter is below the median, 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.

Online Appendix

Table IA.I. Alternative measure of bank ownership in OLS analysis

Panel A. The effect of bank-firm connection

	Markup	Profit margin
	(1)	(2)
Ln(NumBank)	0.041***	0.006***
	(4.005)	(2.810)
Controls	Yes	Yes
Firm FE	Yes	Yes
Year FE	Yes	Yes
Observations	84,505	84,505
R-squared	0.755	0.761

Panel B. The effect of bank-rival connection

	Markup		Profit margin	
	(1)	(2)	(3)	(4)
Ln(NumBank_HoldRival)	-0.064***		-0.007***	
	(-5.810)		(-2.939)	
Ln(NumRival)		-0.046***		-0.008***
		(-3.865)		(-2.926)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	85,688	85,688	85,688	85,688
R-squared	0.219	0.218	0.336	0.336

This table presents the robustness results of the OLS analysis. *Markup* is the price-to-marginal cost ratio of a firm, estimated by the production function approach in De Loecker et al. (2020). *Profit margin* is the firm's gross profit margin, defined as (*Sale*-*COGS*)/*Sale*. If a bank holds more than 5% of a firm's outstanding shares during the four consecutive quarters of a calendar year, we define the bank as the firm's bank blockholder. Panel A reports the effect of bank ownership if firm itself, where *Ln(NumBank)* is the natural logarithm of one plus the number of a firm's bank blockholders. Panel B reports the effect of bank ownership of the industry rivals. *Ln(NumBank_HoldRival)* is the natural logarithm of one plus the distinct number of banks that hold block shares of a firm's industry rivals. *Ln(NumRival)* is the natural logarithm of one plus the distinct number of industry rivals block-held by banks. We define the industry rivals as the ten largest firms in the three-digit SIC industry (ranked by Compustat net sales), excluding the firm itself. 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 IA.II. Covariates comparison during the year before bank mergers

Variables	Treatment sample	Control sample	Difference
	(1)	(2)	(1)-(2)
# Firms	168	1650	
RivalShare	0.014	0.012	0.002*
Ln(NumRival)	1.704	1.735	-0.0310
HoldRival(d)	0.900	0.945	-0.045**
Ln(Asset)	6.995	7.057	-0.062
Debt/Asset	0.319	0.298	0.021
Cash/Asset	0.070	0.077	-0.007
ROA	0.144	0.154	-0.010
MarketToBook	1.397	1.469	-0.073
CapEx/Asset	0.057	0.068	-0.011*
R&D/Sale	0.010	0.018	-0.008**
HHI	0.236	0.239	-0.003
InstOwn	0.550	0.540	0.010
Ln(NumBlock)	0.989	0.939	0.050
CommonOwn(d)	0.571	0.487	0.085**
CommonLender(d)	0.649	0.592	0.057

This table compares the mean value of the characteristics between the treatment and the control samples before a bank acquires a block-ownership of the industry rivals of an affected firm. We follow the criteria in Panel B of Appendix A1 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 samples are significantly different from zero at the 1%, 5%, and 10% level, respectively. Variable definitions can be found in Appendix A1.

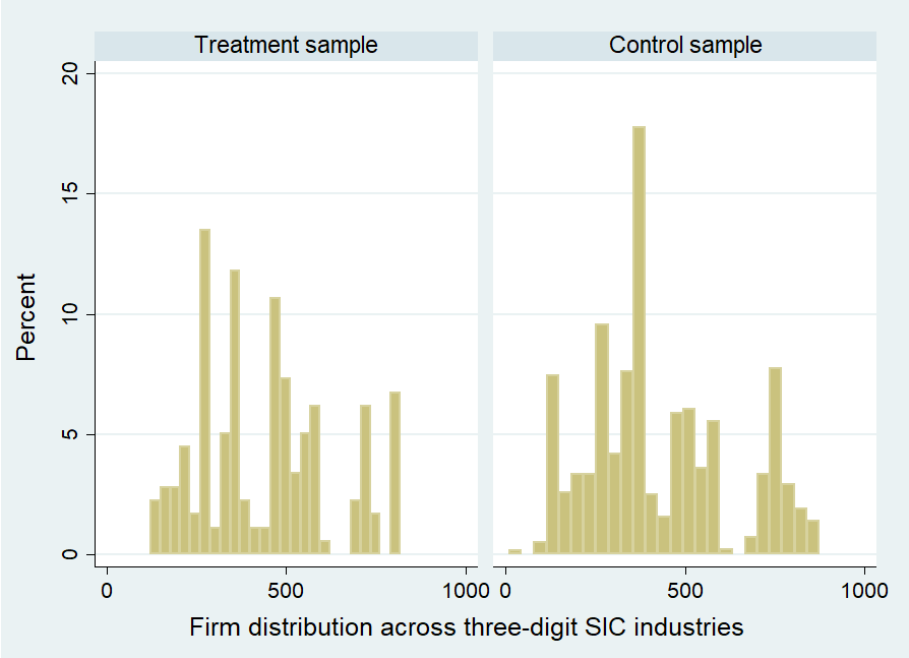


Figure IA.1. Industry distribution: treatment versus control firms
This figure plots the distribution of firms across industries. We draw the percentage of firms distributed across the three-digit SIC industry, where the left panel is for the treatment sample and the right panel is for the control sample.

Table IA.III. Robustness checks for the DID analysis

Panel A. Alternative DID sample

	Markup		Profit margin	
	(1)	(2)	(3)	(4)
Treat×Post	-0.031**	-0.028*	-0.007**	-0.006*
	(-2.402)	(-2.047)	(-2.124)	(-1.846)
Treat	-0.003		-0.005	
	(-0.288)		(-1.651)	
Post	-0.002	-0.000	-0.002***	-0.001*
	(-1.342)	(-0.076)	(-7.022)	(-1.757)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	No	Yes	No
Firm×Merger FE	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	97,185	97,151	97,185	97,151
R-squared	0.856	0.880	0.872	0.892

Panel B. Exclude merger during financial crisis

	Markup	Profit margin
	(1)	(2)
Treat×Post	-0.051***	-0.011***
	(-4.047)	(-2.843)
Post	0.001	-0.004*
	(0.084)	(-1.965)
Controls	Yes	Yes
Firm×Merger FE	Yes	Yes
Year FE	Yes	Yes
Observations	8,499	8,499
R-squared	0.895	0.921

Panel C. Alternative industry classifications and alternative measures

	Markup			Profit margin		
	(1) NAICS4	(2) TNIC3	(3) COGS+SGA	(4) NAICS4	(5) TNIC3	(6) COGS+SGA
Treat×Post	-0.043**	-0.047***	-0.025***	-0.009	-0.013***	-0.016***
	(-2.107)	(-3.710)	(-3.931)	(-1.562)	(-4.205)	(-3.594)
Post	0.009	0.001	-0.006	-0.001	-0.004	-0.003
	(0.922)	(0.082)	(-1.061)	(-0.556)	(-1.629)	(-1.054)
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	12,711	12,668	9,654	12,711	12,668	10,549
R-squared	0.893	0.884	0.874	0.909	0.905	0.859

Panel D. Alternative event windows

	Markup		Profit margin	
	(1) 3yrs win	(2) 5yrs win	(3) 3yrs win	(4) 5yrs win
Treat×Post	-0.026*	-0.044***	-0.009**	-0.011***
	(-1.971)	(-4.266)	(-2.142)	(-3.288)
Post	0.004	-0.001	-0.003	-0.002
	(0.211)	(-0.061)	(-0.694)	(-0.580)
Controls	Yes	Yes	Yes	Yes
Firm×Merger FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	4,774	7,745	4,774	7,745
R-squared	0.941	0.908	0.948	0.926

This table presents the robustness checks of DID analysis. *Treat(d)* equals one if a firm's industry rivals obtains a new bank blockholder due to a merger event, and zero otherwise. *Post(d)* equals one if an observation is after the merger completion, and zero otherwise. Panel A reports the result with an alternative DID sample, in which we complement our baseline DID sample with same-industry peers that have no lending relationship with the merging bank. Panel B reports the result of excluding mergers that were announced in 2008. Panel C reports the results with alternative industry classifications and measures of market power. Columns 1 and 4 use the four-digit NAICS code to define the industry group of a firm, and columns 2 and 5 use TNIC3 classification (Hoberg and Phillips (2010, 2016)). In columns 3 and 6, we use the sum of *COGS* and *SGA* as the production cost when estimating firms' markups and profit margins. Panel D reports the results with various event windows, where columns 1 and 3 use the symmetric three-year window and columns 2 and 4 use the symmetric five-year window around bank mergers. In all regressions, we control the full set of control variables as in column 3, Panel A of 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.

Table IA.IV. The formation of bank ownership of industry rivals and non-pricing loan terms

	Collateral(d)			Ln(Loan amount)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat×Post	-0.061	-0.045	-0.055	0.075	-0.026	-0.001
	(-1.211)	(-0.888)	(-1.121)	(1.477)	(-0.529)	(-0.018)
Treat	-0.001	0.052*		-0.057	-0.032	
	(-0.017)	(2.034)		(-1.275)	(-0.659)	
Post	0.003	0.012	0.004	-0.007	0.047*	0.036
	(0.316)	(1.414)	(0.238)	(-0.429)	(2.054)	(1.232)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	No	Yes	No	No
Firm FE	No	Yes	No	No	Yes	No
Firm×Merger FE	No	No	Yes	No	No	Yes
Year-Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,539	11,528	11,500	11,539	11,528	11,500
R-squared	0.485	0.656	0.697	0.582	0.679	0.705

This table reports the effect of the formation of bank ownership of industry rivals on firms' non-pricing loan terms, based on the sample in Table 6. *Collateral(d)* equals one if a loan is secured, and zero otherwise. *Loan amount* is the borrowing amount (in million USD) of a loan. If a firm's relationship bank becomes a blockholder of its industry rivals by merging with another institution, the firm is treated by the merger. We define the industry rivals as the ten largest firms (ranked by Compustat net sales) in a three-digit SIC industry, excluding the firm itself. *Post(d)* equals one if a loan is after the merger completion, and zero otherwise. In all regressions, we control a full set of loan factors (i.e., loan purpose, loan type, and loan maturity) and firm-level controls. The standard errors are clustered at the merger level, ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. See Appendix A1 for all variable definitions.

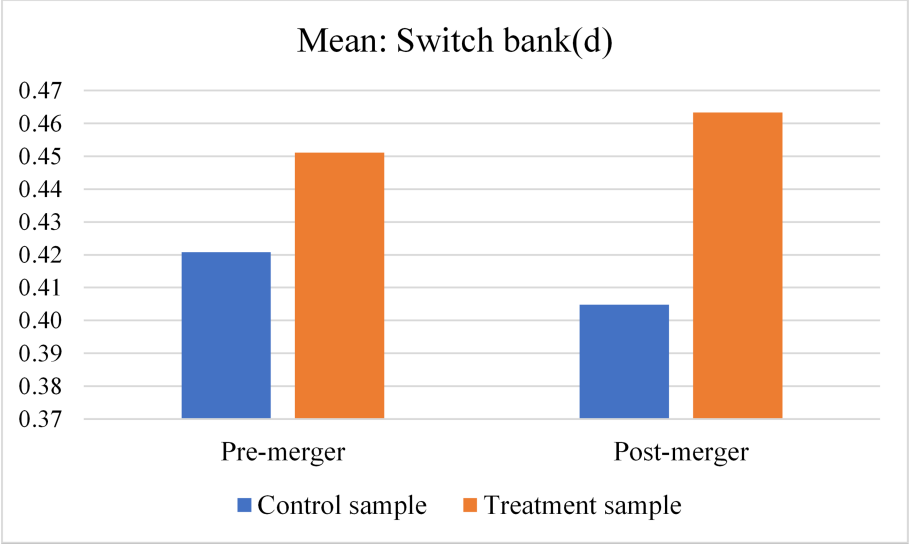


Figure IA.2. The likelihood of firms' bank switch
This figure compares the difference of firms' bank switch between treatment firms and control firms. We code *Switch bank(d)* as one if a firm fails to retain every lead banks from the most recent loan, and zero otherwise.

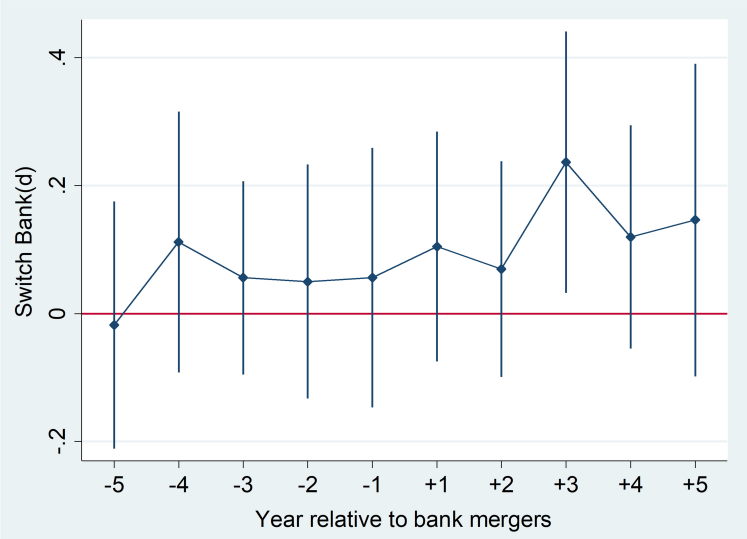


Figure IA.3. Dynamics of coefficient estimates: the formation of bank ownership of industry rivals and firms' bank switch
This figure depicts the coefficients of estimating $SwitchBank(d)_{l,i,j,t} = \alpha + \sum_{k=-5}^{k=5} \beta_k Treat \times Year^{\mathrm{k}} + \sum_{k=-5}^{k=5} \beta_{2k} Year^{\mathrm{k}} + \delta_{i,j} + \tau_t + \epsilon_{l,i,j,t}$, where l denotes the loan, i denotes the firm, j denotes the merger event, and t denotes the calendar year, respectively. We code *Switch bank(d)* as one if a firm fails to retain every lead banks from the most recent 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.