Common Lenders and Product Market Competition*

Farzad Saidi†
Stockholm School of Economics & CEPR

Daniel Streitz‡
Copenhagen Business School

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Abstract

This paper explores how bank concentration affects product market competition of non-financial firms. We argue that sharing common lenders lowers the cost of debt financing in an industry. Exploiting plausibly exogenous variation in banks' industry market shares stemming from bank mergers, we find that high-market-share lenders charge lower loan rates. This is because common lenders internalize potential adverse effects of higher loan rates on the product market behavior among their competing borrowers. In the aggregate, we show that a higher proportion of firms sharing the same lender and higher credit concentration in an industry lead to lower output. Effects are stronger for industries with competition in strategic substitutes. Our findings support the idea that bank concentration helps firms to achieve less competitive outcomes in the product market.

JEL classification: E23, E32, E44, G20, G21, L14

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†Stockholm School of Economics, Swedish House of Finance, Drottninggatan 98, SE-111 60 Stockholm, Sweden. E-mail: farzad.saidi@hhs.se

‡Copenhagen Business School, Department of Finance, Solbjerg Plads 3, DK-2000 Frederiksberg, Denmark. E-mail: dst.fi@cbs.dk

1 Introduction

Markets are connected, e.g., through supply chains. This raises the question to what extent the nature of competition in one market alters that in another market. One such possibility is that a higher market share of vertically integrated firms in an industry affects competition in downstream markets (see, for instance, Hortaçsu and Syverson (2007)). However, little is known about whether such spillover effects of competition are confined to product markets.

In this paper, we argue and show that concentration in the credit market matters for product market competition in non-financial sectors. We start from the premise that debt finance serves as a strategic commitment to a product market strategy. As argued in the seminal paper by Brander and Lewis (1986), higher leverage leads to more aggressive output strategies. However, the empirical evidence on this limited-liability effect of debt is mixed. This may be because it depends on the mode of industry competition, and may not hold for strategic complements (Showalter (1995)). In addition, leverage is typically an endogenous firm-level variable, and finding plausibly exogenous variation in the latter is difficult.

In contrast, we focus on common lenders and debt ownership – i.e., the identity of lenders – rather than leverage. That is, conditional on debt financing, we scrutinize the effect of firms sharing common lenders on product market competition. Our argument is as follows. Based on Brander and Lewis (1986), higher loan rates induce firms to commit to higher output, which has a strategic effect on the output choices of rival firms. Compared to a setting with oligopolistic competition and separate lenders, common lenders maximize the aggregate debt value, and effectively treat their borrowers as a multi-plant firm. As a result, they internalize any potential externalities among their borrowers stemming from output effects of higher loan rates (Poitevin (1989)).

If firms compete in strategic complements, these output externalities lead to higher aggregate output in the industry, thereby possibly maximizing debt value, so there exists no unambiguous need for internalization by a common lender. However, if firms compete in strategic substitutes, a common lender charges lower loan rates so as to internalize any ad-

verse effect on the output decisions of its borrowers. The resulting aggregate output will be lower than it would be for separate lenders. Therefore, common lenders serve as a commitment device for firms' output decisions in the same industry, and centralized financing helps firms to implement less competitive outcomes.

To test this conjecture, we use transaction-level data on syndicated lending at the bank-industry-quarter level in the U.S. Lenders with larger market shares imply a more frequent occurrence of common lenders within industries, and we show that lenders that have issued a large share of the loans outstanding in an industry indeed charge lower cost of debt. By including industry-quarter and bank-quarter fixed effects, our empirical analysis of cost of debt charged by high-market-share lenders at the industry level takes into account time-varying unobserved heterogeneity both at the industry level – such as fluctuations in industry-level demand for loans – and at the bank level – including but not limited to bank-level credit supply. This is true only for firms that compete in strategic substitutes.

This evidence suggests that one benefit of common debt ownership is lower cost of debt. Asker and Ljungqvist (2010) point out a potential downside by considering firms' decision to share underwriting investment banks, namely the possibility of commercially sensitive information leaking to rival firms, which firms may actively try to avoid. Additionally, changes in market shares could reflect a bank's industry expertise and, thus, the cost of monitoring borrowers. By showing that our result pertains to firms competing in strategic substitutes, rather than complements, we rule out a host of alternative explanations – including such informational effects – driving our results.

We further address endogeneity concerns by using variation in banks' industry market shares stemming from bank mergers. In particular, we focus on recent mergers and gradual increases in market shares due to these mergers, irrespective of the level of historical market shares of the merging banks. In this manner, we identify a treatment effect that is unlikely to be due to any pre-merger private information held by the merging banks.

We then examine the implications of common lenders for product market competition by moving our analysis to the aggregate industry-year level. When banks have higher in-

dustry market shares, this implies a higher likelihood of firms sharing common lenders, and translates to a higher concentration in the credit market at the industry level. In line with our conjecture that common lenders facilitate tacit collusion in the product market, we show that industries with a higher credit concentration produce less aggregate output.

To seek further evidence in favor of our alleged mechanism and tie the treatment effect of higher credit concentration closer to the latter, we show that our results are robust to replacing our measure of credit concentration at the industry level by an explanatory variable building on causal estimates of cost of debt. In particular, we predict cost of debt using plausibly exogenous variation in banks' industry market shares stemming from bank mergers, as outlined above. After aggregating up predicted cost of debt across banks within a given industry-year, we use it to explain industry output at the annual level. Consistent with the idea that common lenders serve as a commitment device for firms' product market strategies, we find that lower cost of debt leads to lower industry output.

Our empirical strategy allows for a causal interpretation for the following reasons. First, by including industry-time fixed effects in the estimation of cost of debt, we make sure that our estimated effect of cost of debt on output is not related to any other sources of time-varying unobserved heterogeneity at the industry level. Second, we exploit exogenous variation in cost of debt due to bank mergers, which are unlikely to be motivated by banks' desire to increase their market shares for syndicated loans in specific industries. This is because syndicated lending makes only for a portion of banks' total lending. This allows us to be more specific about the direction of causality, and our evidence speaks to common lenders enabling lower industry output through lower cost of debt, rather than industry (tacit) collusion resulting in lower cost of debt, e.g., due to reduced credit risk (Valta (2012)).

We finish our empirical analysis by testing whether lower output and cost of debt through sharing common lenders is indeed optimal from the firms' point of view. For this purpose, we infer optimality from firms' decisions to switch to high-market-share lenders when given the opportunity to do so. For identification, we exploit the episode of U.S. branching deregulation as a state-level shock allowing firms to switch to out-of-state banks. We find that firms in

deregulated states are more likely to establish new lending relationships with out-of-state banks. Most importantly, the effect is more emphasized for out-of-state banks with high market shares in the same industry as the switching firm. As before, the treatment effect is driven primarily by firms competing in substitutes rather than complements.

In addition, we show that the reverse holds true as well, namely that firms are *less* likely to switch to high-market-share lenders when the marginal benefit of doing so is reduced. For this purpose, we use the passage of leniency laws in the U.S. in 1993 as a negative shock to firms' ability to coordinate on output decisions. In summary, our evidence confirms that firms would find it optimal to share a common lender for the purpose of reducing their cost of debt and subsequently committing to less competitive output.

Our paper is related to Cetorelli and Strahan (2006), who also consider the relationship between concentration in the banking sector and industry structure in product markets, in particular the number of firms and the shape of the firm-size distribution. They find that higher bank competition aids smaller non-financial firms in bank-dependent sectors, whereas the largest establishments are unaffected. These findings suggest that banking concentration constitutes a financial barrier to entry in product markets. Cestone and White (2003) formalize this idea, and argue that investors may use equity, rather than debt, to deter the entry of potential competitors by not funding them. In contrast, we show that sharing a common lender serves as a commitment device for the output decisions of pre-existing competitors in the same industry, irrespective of entry and exit. Our evidence has the potential to shed light on why concentration in the banking sector is correlated with concentration in product markets, as suggested by Cetorelli (2004).

The main idea of a common agent facilitating a less competitive outcome, without entering into explicit collusive agreements, goes back to Bernheim and Whinston (1985). A common agent can be characterized by financial ties. For instance, Azar, Schmalz, and Tecu (2017) analyze the competitive effects of institutional investors holding shares in multiple firms in the airline industry, which they dub "common ownership." Anton, Ederer, Giné, and Schmalz (2017) document such common-ownership effects across different industries,

and Gutiérrez and Philippon (2017) provide evidence that firms under-invest when they operate in industries where common ownership is more prevalent.

In these instances, common ownership is given by the shareholdings of institutional investors. However, institutional investors, such as mutual funds, tend to be passive investors. In contrast, lenders or other types of creditors have control rights and are therefore unlikely to be passive, which motivates our study of the product market implications of common debt ownership.

Common debt ownership can affect outcomes in the product market in multifarious ways. For example, Bhattacharya and Chiesa (1995) consider the possibility that common lenders can facilitate knowledge transfer among competing firms, which would otherwise face the difficulty of legal non-verifiability. In particular, multilateral financing helps to achieve an equilibrium in which only one firm among multiple inventors enters the product market (despite all firms seeking financing for their innovation). The issuance of short-term, rather than long-term, debt plays a crucial role in this mechanism because it enhances recontracting possibilities at the stage new information is acquired by the common lender.

Moreover, Hellwig (1991) argues that monitoring and prevention of too-competitive behavior may be the main purpose of banks with large market shares in certain industries (e.g., the Austrian Kontrollbank in the late 19^{th}/early 20^{th} century). This is because cartels are subject to the moral-hazard problem of individual firms deviating from the collusive equilibrium and undercutting one another. Common lenders to these firms in the same industry have an incentive to discourage such behavior in order to maximize their aggregate gross return. This argument stresses the importance of common financial intermediaries as commitment devices, because these firms would not be able to commit to less competitive outcomes otherwise.

Lastly, the idea that debt finance can serve as a coordination mechanism for less competitive output strategies is consistent with more recent evidence by Dasgupta and Žaldokas (2017), who find that firms issue more equity and subsequently delever when competition increases. We stress the identity of lenders, rather than the fact that firms are levered, to

investigate the link from debt finance to product market competition. We point out the importance of common lenders for the interpretation of the limited-liability effect. Our findings offer an alternative explanation for studies rejecting the existence of a limited-liability effect due to a negative correlation between leverage and output (e.g., Phillips (1995)), namely that firms with common lenders are able to coordinate on their product market strategies.

2 Hypothesis Development

In this paper, we test the hypothesis that sharing common lenders enables firms to achieve a less competitive outcome in the product market. This conjecture is chiefly based on two observations in the theoretical literature, namely the pro-competitive role of debt and common lenders' incentives to internalize externalities among their borrowers. In the following, we lay out these two components and their interplay, and derive testable hypotheses from them.

Brander and Lewis (1986) argue that oligopolistic firms issue debt to commit to more aggressive output strategies, irrespective of whether their competitors share the same lender. If marginal returns to production are higher in better states of the world, leverage commits a firm to a more aggressive output stance: the limited-liability effect.

While closely related to the asset-substitution effect, the limited-liability effect induces firms to choose leverage, taking as given the distribution of earnings (and not the other way around). Its existence may, however, depend crucially on the mode of industry competition. It may not hold for firms competing in complements, as argued by Showalter (1995) and Chevalier and Scharfstein (1996) (for empirical evidence, see Chevalier (1995)).

We base our main conjecture on the general existence of a limited-liability effect, but focus on the identity of lenders. In doing so, we take as given firms' (endogenous) choice of leverage, and consider outcomes associated with loan contracts.

In the model of Brander and Lewis (1986), in which the identity of lenders plays no

role, debt makes firms "tough," which reduces firms' general ability to collude (Maksimovic (1988)). In contrast, common lenders, rather than separate lenders, moderate the pro-competitive effect of debt.[1]

This point is made more concretely by Poitevin (1989) whose model generates empirical predictions which we test in an empirical setting that allows us to focus on the effect of common debt ownership, taking as given firms' financial-structure choices and their demand for debt. We focus on the idea that common lenders help competing firms to precommit to less competitive output. In Poitevin (1989), a common lender can better control the incentive effects of debt and, thus, limit the extent of competition in the output market. Similarly, Spagnolo (2004) argues that a concentrated banking sector can control borrowers' choice of managerial incentives, leading to reduced competition in downstream product markets.

In particular, a common lender internalizes any adverse effects of a higher interest rate r_k on the value of debt of borrower k's competitors. As in Brander and Lewis (1986), a crucial assumption in the model is that marginal returns to production are higher in better states of the world. Therefore, higher cost of debt precommits the firm to a more aggressive stance in the output market. In the case of a duopoly, this implies that a higher rate r_1 is associated with a higher quantity q_1 but a lower quantity q_2. A common lender takes into account the loans' correlation by maximizing the aggregate debt value of both firms. Therefore, a common lender charges a lower interest rate than separate lenders would, so that $\Delta r_k \equiv r_k^{common} - r_k^{separate} < 0$.

The strategic effect of debt increases in the extent of competitive interaction within industries (see Lyandres (2006) for the corresponding empirical evidence). Holding constant such leverage decisions, the rate reduction offered by a common lender, as opposed to separate lenders, depends on the potential externalities of a higher interest rate and, thus, of firm k's more aggressive product-market strategy (as reflected by a higher quantity chosen, q_k).

[1] This is similar to considering – instead of pure debt contracts – warrants, convertible debt, and dividend restrictions in Maksimovic (1988) or managerial incentives in Spagnolo (2005), which commit manager-shareholders to a more conservative behavior. See Cestone (1999) for a comprehensive overview and in-depth discussion of this literature.

Importantly, for a common lender, there is scope for internalizing the externalities of a higher interest rate especially if firms compete in strategic substitutes. In this case, a higher interest rate leads to lower output by competing firms, which does not maximize debt value. In contrast, if they compete in strategic complements, a higher interest rate leads to higher output by all competing firms, which could even maximize debt value. Therefore, we hypothesize that the reduction in loan rates offered by common lenders should be more emphasized in industries in which firms compete in strategic substitutes rather than complements.

Empirically, we approximate the likelihood of firms in the same industry sharing the same lender by means of banks' market shares in terms of lending to a given industry. We summarize our argument about the impact of banks' higher market shares on the cost of debt in an industry in the following testable hypothesis:

Hypothesis 1: *Common lenders internalize the externalities of charging higher loan rates to other firms' output in the same industry and, thus, do not increase loan rates as much as separate lenders would. If a bank has granted a large fraction of the loans in an industry, firms operating in that industry are more likely to share the same lender. Therefore, banks with higher market shares in an industry charge lower loan rates. This effect should be more emphasized for strategic substitutes.*

We next move to firms' output decisions in an industry. In particular, in Poitevin (1989), lower loan rates charged by common lenders lead to less competitive output. For the sake of simplicity, consider a duopoly. In Brander and Lewis (1986), both firms borrow in equilibrium, produce higher output, and are therefore worse off than under a full-equity solution.

In contrast, in Poitevin (1989), a common lender charges a lower loan rate, which precommits the firms to produce less output (given the common assumption in both models that marginal returns to production are higher in better states of the world). This is because to maximize the aggregate debt value of both firms, a common lender incorporates potential externalities that firm 1's output has on its rival's expected debt value. Hence, common lenders moderate the pro-competitive effect of debt.

Hypothesis 2: *If banks' market shares are high, this is associated with higher credit concentration at the industry level. Industries with a higher level of credit concentration produce less aggregate output because of the lower loan rates charged by common lenders.*

According to Poitevin (1989), this outcome is optimal from both the common lender's and the borrowers' point of view. We test whether it is optimal for firms to contract with a common lender (which we approximate by means of banks with high market shares in a given industry) by analyzing their willingness to switch to a high-market-share lender.

The comparison between high-market-share and low-market-share lenders in the data reflects the comparison between a common lender vs. separate lenders in the model. Firms evaluate the difference in expected profits from borrowing from the same vs. another (i.e., their incumbent) lender. This will be a function of the corresponding difference in interest rates charged, Δr_k, so firms are more likely to switch to a high-market-share lender (from a low-market-share lender) if the resulting cost of debt is subsequently reduced more.

As argued above, the spread between the interest rate charged by a common lender vs. separate lenders is an increasing function of the potential externalities of a higher interest rate. The greater the potential externalities, the lower the loan rate charged by a common lender. The scope for internalizing externalities this way is larger when firms compete in strategic substitutes rather than complements. Therefore, we hypothesize:

Hypothesis 3: *When given the opportunity to switch lenders, firms are more likely to switch to high-market-share lenders in their respective industries, and especially so if firms compete in strategic substitutes.*

3 Data and Empirical Methodology

In this section, we first describe our data and key variables before discussing our empirical strategy for testing our hypotheses.

3.1 Sample Selection and Variable Definitions

We obtain transaction-level data on syndicated loans from LPC DealScan. We focus on loans issued to publicly listed or privately held U.S. firms. The sample period is 1990 to 2015.[2] We exclude financial firms (SIC codes 6000-6999), and identify bank-industry lending relationships by focusing on the lead arrangers of syndicated loans.[3] Since our objective is to explore whether lender j's (past) market share in industry i affects the cost of loans to firms in industry i at time t, we aggregate data at the bank-industry-time level *ijt*. We use quarterly frequency when analyzing cost of debt. When analyzing industry output at the industry-time level *it*, we use annual data because of limited data availability (see below for details). Industries are defined using three-digit SIC codes.

Bank Market Share

Our conjecture is that banks' incentives to internalize potential externalities derive from their share of the loans outstanding in an industry. We follow Giannetti and Saidi (2017), and define *Market Share*$_{ijt-4}$ as the proportion of bank j's total loan volume granted to industry i over the aggregate loan volume of industry i in the previous year $(t-4)$. Both the bank's and the industry's loan volumes are measured over the previous five years (that is, the previous 20 quarters from $t-4$ to $t-23$). To reduce noise, we require that at least five firms are active within an industry at any time in the five-year estimation window.

For robustness, we contrast a bank's market share to the share of an industry in a bank's loan portfolio. The difference between *Portfolio share*$_{ijt-4}$ and *Market share*$_{ijt-4}$ is the denominator. We define the former to be equal to the proportion of bank j's total loan

[2] DealScan provides comprehensive information about the U.S. syndicated-loan market from the mid 1980s onwards. We start our sample period in 1990 given that we require a five-year lookback window for the bank market share estimations (see details below). In some tests we have to further restrict the sample period due to limited data availability for supplementary datasets (e.g., BEA data).

[3] We use the lender-parent link table provided in Schwert (2017) to match lead arrangers to their respective bank-holding companies. We exclude foreign banks, i.e., banks incorporated outside of the U.S., as we require information on the bank's state of incorporation when analyzing firm switching decisions around deregulation events (cf. Section 4.3). Further, lending decisions by foreign banks may generally be influenced by different factors relative to domestic banks (see, e.g., Giannetti and Laeven (2012)).

volume to industry i over the aggregate loan volume granted by bank j over the previous five years.

Cost of Borrowing

We use the all-in-spread-drawn (AISD) as our main proxy for the price of a syndicated loan. While the AISD is a reasonable measure for the cost of a term loan, Berg, Saunders, and Steffen (2016) document that the pricing of credit lines is more complex. Most importantly, borrowers do not necessarily have to use the entire loan amount that is committed by the bank, but have the *option* to draw down the loan.

The AISD reflects the payment for the *used* part of a loan commitment. The all-in-spread-undrawn (AISU) is the spread paid by the borrower on the *committed but not used* part of the loan commitment. Berg, Saunders, and Steffen (2016) propose to use the "total cost of borrowing" (TCB) as a measure for the total cost of a loan that takes the difference between AISD and AISU as well as other loan-fee components into account. The main drawback of this measure is that it requires matching loan-level data to Compustat data, and can hence only be estimated for public firms.

We therefore follow Berg, Saunders, Steffen, and Streitz (2017), and calculate the usage weighted spread (UWS) as an alternative loan-pricing proxy. This measure is easily computable for our entire loan sample, and also captures the key pricing aspect for lines of credit, i.e., the difference between AISD and AISU. In particular, the UWS is defined as:

$$\text{USW} = \text{PDD} \times \text{AISD} + (\text{1-PDD}) \times \text{AISU}, \tag{1}$$

where PDD (probability of drawdown) is the probability that a committed loan is actually drawn down. A PDD of one implies that the borrower borrows the entire commitment under the loan agreement, as is the case for term loans, while a PDD of zero implies that the borrower never actually draws down the loan commitment at all.

Berg, Saunders, and Steffen (2016) report that the credit-line drawdown rate is, on

average, $20 - 30\%$ for rated U.S. firms. We report results assuming a PDD of 25% for credit lines.[4] Using a low PDD for credit lines is conservative in our setting. Our sample also comprises non-rated and private firms, i.e., the average PDD in our sample is likely well above 25%. Increasing the PDD would imply that the estimates converge to the AISD results.

Industry Output

To test Hypothesis 2, we require information on industry output. We use data provided by the U.S. Bureau of Economic Analysis (BEA). The BEA provides annual chain-type quantity indices for each industry's gross output for the 1997 to 2015 period.[5] We use the most granular BEA industry classification that is available (403 industries). The BEA industry-level quantitiy index reflects an inflation-adjusted measure of the quantities of gross output produced by the industry *excluding* price change effects.[6] In particuar, the index captures changes in the quantities of goods and services provided by an industry over time. The index is constructed relative to the reference year 2009, i.e., the index is equal to 100 in 2009.

Competitive Strategy Measure

We follow Chod and Lyandres (2011) in constructing a proxy for the degree of competitive interaction among firms in an industry. Assuming that sales proxy for firms' actions, the Competitive Strategy Measure (CSM) is defined as the correlation between the ratio of the change in a firm's profit to the change in its sales and the change in the combined sales of the firm's product market rivals. In particular, for firm k, it is equal to:

$$CSM_k = \text{corr}\left[\frac{\Delta\pi_k}{\Delta S_k}, \Delta S_{-k}\right], \tag{2}$$

[4] The PDD is one for term loans per definition.

[5] We match the BEA data with DealScan by translating BEA industry codes to SIC codes. In particular, we go from BEA industry codes to SIC codes via the NAICE code (see https://www.census.gov/eos/www/naics/concordances/concordances.html). Note that the match is not unique, i.e., some SIC codes are assigned to multiple BEA industries.

[6] Cf. https://www.bea.gov/industry/guide_to_the_interactive_gdp_by_industry_accounts_tables.htm for details on the index construction.

where $\Delta\pi_k$ is the change in firm k's profit, ΔS_k is the change in its sales, and ΔS_{-k} is the change in its rivals' combined sales.

The measure is a direct proxy for the cross-partial derivative of a firm's value with respect to its own and its rivals' competitive actions. In particular, a positive value for CSM_k indicates that firms compete in strategic complements, i.e., firm k's incentives to increase its sales (to maximize its profits) *increase* in its competitors' sales. A negative value for CSM_k corresponds to competition in strategic substitutes, i.e., firm k's incentives to increase its sales (to maximize its profits) *decrease* in its competitors' sales. Thus, we classify industries with a positive (negative) average CSM_k as those in which firms compete in strategic complements (substitutes).

We empirically measure CSM_k following Chod and Lyandres (2011). In particular, we use quarterly Compustat data, and define profit as operating profit before depreciation and rivals' sales as combined sales of all other firms operating in the same industry (three-digit SIC code). Next, we calculate CSM_{kt} for each individual firm k and each quarter t using 20-quarter rolling windows. We require at least ten non-missing observations for changes in sales and profits in the estimation window.[7] CSM_{kt} is then averaged across all firms in industry i by quarter t. We lag CSM_i by one year, i.e., use CSM_{it-4} in all tests. Consistent with Sundaram, John, and John (1996), Chod and Lyandres (2011), and Lyandres (2006), we find that, overall, slightly more than half of the industry-quarters have a negative estimated CSM_{it}.

Descriptive Statistics

In Table 1, we present summary statistics for our main variables. Panel A reports descriptive statistics at the industry-bank-quarter level. The average (median) bank market share in a given industry is 10% (5%).[8] The average (median) portfolio share is only 2% (1%). The

[7] That is, CSM_{kt} estimates based on fewer than ten observations are excluded.

[8] These values are above those reported by Giannetti and Saidi (2017). However, in contrast to Giannetti and Saidi (2017), our sample is limited to quarters with non-zero loans granted to industry i by bank j. This restriction is necessary in our setting given that our aim is to analyze (changes) in cost of debt. In our data, loan prices are only observed in quarters with positive issue volume.

correlation between the portfolio share and the market share is low (1%), indicating that if a bank is important for an industry this does not automatically imply that the industry also accounts for a large share of a bank's portfolio, and vice versa. The avearge (median) loan spread (all-in-drawn-spread) is 231 (220) basis points. The avearge (median) usage weighted spread is 169 (122) basis points.

Panel B reports descriptive statistics at the industry-year level. The average (median) annual industry output index is 115 (108). The average (median) ln(bank HHI), i.e., the logarith of the sum of the squared bank market shares, in a given industry is -1.94% (-1.93%).[9]

[Table 1 here]

3.2 Empirical Strategy

Our basic empirical strategy is threefold, corresponding to Hypothesis 1 at the bank-industry level, Hypothesis 2 at the industry level, and Hypothesis 3 at the bank-firm level.

To test Hypothesis 1, we use a panel structure at the bank-industry-quarter level jit, based on the sample of all completed syndicated loans from 1990 to 2015 granted to industry i for which bank j served as a lead arranger in quarter t. In particular, our first set of tests aims at estimating the effect of banks' market shares in an industry on the cost of debt. In doing so, we use banks' market shares as a proxy for the likelihood that any two firms in a given industry share the same lender. A high market share of bank j in industry i indicates a high likelihood of firms in industry i having a common lender. To capture this empirically, we use our explanatory variable $Market\ Share_{jit-4}$, which is the proportion of bank j's total loan volume granted to industry i over the aggregate loan volume in industry i, measured over five years, from $t-4$ to $t-23$ (20 quarters), starting in the year prior to the year of

[9] We use ln(bank HHI) to account for skewness in the HHI distribution (cf. Gustavo Grullon and Michaely (2017)).

quarter t under consideration. Therefore, our baseline regression specification is:

$$y_{jit} = \beta Market\ Share_{jit-4} + \mu_{ij} + \theta_{it} + \psi_{jt} + \epsilon_{jit}, \tag{3}$$

where the outcome variable y_{jit} is a function of the cost of debt in industry i charged by bank j in quarter t; and μ_{ij}, θ_{it}, and ψ_{jt} denote bank-industry, industry-quarter, and bank-quarter fixed effects, respectively. Standard errors are clustered at the bank level.

In this setting, industry-period fixed effects θ_{it} capture all time-varying unobserved heterogeneity at the industry level, in particular industry-level loan demand across all banking relationships. In addition, bank-period fixed effects ψ_{jt} control for time-varying unobserved heterogeneity at the bank level, e.g., differences in credit supply or other developments, such as differential treatment by concurrent regulatory changes, across banks.

While our fixed-effects structure proves powerful in controlling for many alternative sources of variation that potentially govern the cost of debt in industry i charged by lender j at time t, one may still be concerned about the endogeneity of $Market\ Share_{jit-4}$. In particular, while we control for industry-level loan demand, it may still be that industries with particularly low cost of debt, which tend to be safer, have particular demand for loans granted by high-market-share lenders.

To address this potential source of endogeneity underlying banks' market shares, we introduce two alternative identification strategies that exploit plausibly exogenous variation in market shares stemming from bank mergers. We will enlarge upon these in turn when we present the respective results. The main idea is that we exploit between-industry variation in market shares within bank mergers, while controlling for the overall effect of the two banks merging itself. In particular, we exploit increases in the merged entity's (surviving bank j) market share in industry i due to the merger.

By focusing on (i) recent mergers and (ii) gradual increases in market shares, irrespective of the level of historical market shares of the merging banks, we identify a treatment effect that is unlikely to be due to any pre-merger private information held by the merging banks.

When moving to testing Hypothesis 2, we need to aggregate our estimates at the bank-industry level up to the industry level in order to gauge the effect on industry output. For this purpose, we use a measure of credit concentration, $Bank\ HHI_{it-1}$, at the industry-year level it as our explanatory variable. In doing so, we assume that individual banks' higher market shares in an industry are reflected in higher industry-wide credit concentration. Then, we estimate the following baseline regression specification:

$$output_{it} = \beta Bank\ HHI_{it-1} + \delta_i + \chi_t + \epsilon_{it}, \tag{4}$$

where the outcome variable $output_{it}$ is a measure of output in industry i in year t, and δ_i and χ_t denote industry and year fixed effects, respectively. Standard errors are clustered at the industry level.

Naturally, the aggregation of the data reduces our ability to include fixed effects such as those in (3), making identification concerns more pressing in this instance. In order to address such concerns while tying the treatment effect closer to our asserted mechanism, we will show that our results are robust to replacing $Bank\ HHI_{it-1}$ by an explanatory variable building on causal estimates of cost of debt from our above-described estimation using bank mergers.

In particular, we use the predicted cost of debt, aggregated across banks j within an industry i at time t, to explain industry output at the it level. Besides arguing that bank mergers are plausibly exogenous to developments in cost of debt across industries in the syndicated-loan market, we must also safeguard that our variation in cost of debt stemming from bank mergers be not related to other sources of time-varying unobserved heterogeneity at the industry level that could explain output. We do so by including industry-time fixed effects in the estimation of cost of debt outlined above.

Finally, we move to testing Hypothesis 3 regarding firm-level optimality of switching to high-market-share banks when giving an opportunity to do so. To test this, we build a bank-firm-year panel kjt, and limit the sample to all bank-firm pairs for which a new lending

relationship is established at any point during the sample period. The dependent variable of interest is a dummy variable indicating a new lending relationship established between bank j and firm k in year t. To characterize a lending relationship, we focus on new syndicated loans with bank j as lead arranger from which firm k did not borrow in the last ten years.

The structure of the panel allows for the inclusion of bank-firm, firm-year, and bank-year fixed effects. The remaining level of identifying variation consists of a firm-year-level shock to the ability to switch lenders in conjunction with a bank-level characteristic determining the desirability to switch to said lender j. In our context, the desirability to switch to lender j is a function of its market share in firm k's industry. In particular, we will use an index of interstate banking deregulation based on Rice and Strahan (2010) to identify switching opportunities.

The relaxation of interstate banking barriers opened up the possibility for firms to contract with out-of-state lenders. Hypothesis 3 states that the desirability to switch to an out-of-state lender following a state-level deregulatory shock (in the state in which firm k is incorporated) should be high for out-of-state high-market-share lenders that gained the ability to enter firm k's geographical market. We capture this empirically by estimating:

$$\begin{aligned} \textit{New Rel}_{kjt} \;=\; & \beta_1 \textit{Dereg Index}_{kt} \times \textit{Out-of-State}_{kj} \times \textit{Market Share}_{kjt-1} \\ & + \beta_2 \textit{Dereg Index}_{kt} \times \textit{Out-of-State}_{kj} + \beta_3 \textit{Dereg Index}_{kt} \times \textit{Market Share}_{kjt-1} \\ & + \beta_4 \textit{Out-of-State}_{kj} \times \textit{Market Share}_{kjt-1} + \beta_5 \textit{Market Share}_{kjt-1} \\ & + \mu_{kj} + \theta_{kt} + \psi_{jt} + \epsilon_{kjt}, \end{aligned} \tag{5}$$

where $\textit{New Rel}_{kjt}$ is equal to one if firm k obtained a loan from bank j (as lead arranger) in year t from which the firm did not borrow in the last ten years, $\textit{Dereg Index}_{kt}$ is an index of interstate banking deregulation based on Rice and Strahan (2010), which varies at the level of firm k's state of incorporation over time, $\textit{Out-of-State}_{kj}$ is a dummy variable indicating bank-firm pairs across different, rather than within the same, states, $\textit{Market Share}_{kjt-1}$ is the market share of bank j in firm k's industry (excluding loans granted by bank j to firm

k itself) in year $t-1$; and μ_{kj}, θ_{kt}, and ψ_{jt} denote bank-firm, firm-year, and bank-year fixed effects, respectively. Standard errors are clustered at the firm level.

We hypothesize $\beta_1 > 0$, i.e., firms switch to high-market-share lenders when given the opportunity to do so. In this case, the opportunity to switch opens up because bank j is an out-of-state bank that can – thanks to the deregulation – enter firm k's state. The distinction between out-of-state and same-state banks j with a high market share in firm k's industry is crucial insofar as high-market-share lenders may generally be affected in their credit-supply decisions by the state-level deregulation. To the extent that this is not differentially so for out-of-state vs. same-state banks, we control for this possibility by means of bank-year fixed effects and the interaction term between the deregulation index and banks' market shares.

Finally, we distinguish between firms competing in substitutes and complements. The general limited-liability effect of debt (Brander and Lewis (1986)) should hold irrespective of whether firms in an industry share the same lender or not. However, the internalization of externalities by common lenders pertains primarily to strategic substitutes rather than complements. This distinction helps us to assess the validity of alternative explanations for our findings. For instance, high-market-share lenders likely have better information about an industry, which could be an important reason for firms switching to them, but this should not be any more or less true for substitutes vs. complements. We test this, and show that our results are driven by firms competing in substitutes rather than complements.

4 Results

We now turn to presenting our estimation results. In doing so, we test our hypotheses in the same chronology as in Section 2. That is, we start with documenting the effect of banks' higher market shares on the cost of debt in an industry. Then, we move to investigating the impact of the prominence of common debt ownership on industry output. Finally, we provide evidence that firms find it optimal to switch to common lenders.

4.1 Common Lenders and Cost of Debt

We start by testing Hypothesis 1. For this purpose, we use our bank-industry-time ijt panel, and run regressions using the logged average all-in-drawn spread of all syndicated loans granted to industry i by bank j in quarter t. In all regressions, we control for bank-quarter, industry-quarter, and bank-industry fixed effects. Thus, time-varying unobserved heterogeneity at the bank or industry level do not drive our results, nor do any time-invariant characteristics at the level of the bank-industry match.

After controlling for these fixed effects, we attempt to explain loan spreads at the ijt level by banks' (lagged) market shares in a given industry, *Market share*$_{ijt-4}$. The underlying rationale is that the likelihood of firms in the same industry sharing the same lender is higher when banks' market shares in a given industry are higher.

[Table 2 here]

The results are in Table 2, where we estimate regression specification (3). In line with Hypothesis 1, the first column suggests that banks' higher market shares are associated with significantly lower cost of debt in an industry. We argue that this is due to common lenders' ability to internalize externalities. However, banks' market shares may also capture properties of their loan portfolios. In particular, if banks' market shares are a reflection of their specialization, then our results could plausibly be explained by lenders' informational advantage (Acharya, Hasan, and Saunders (2006); Loutskina and Strahan (2011)).

To test this, in the second column, we replace banks' market shares by their portfolio shares, i.e., the shares of different industries in banks' loan portfolios. After doing so, we find a similar quantitative but statistically insignificant effect. In the third column of Table 2, we run a horse race between banks' market and portfolio shares, and only banks' higher market shares are significantly linked to lower cost of debt. Notably, the inclusion of portfolio shares on the right-hand side leaves the estimated coefficient on market shares virtually unaltered compared to the respective coefficient in the first column. This result is even more

pronounced in the last column where we replace the average all-in-drawn spread as dependent variable by the average usage-weighted spread, as defined in Berg, Saunders, Steffen, and Streitz (2017).

[Table 3 here]

We next test whether the effect of banks' higher market shares on lower cost of debt is more emphasized in industries where firms compete in strategic substitutes rather than complements. This is because there is limited scope for internalizing externalities of output strategies when firms compete in strategic complements. We find this to hold true in Table 3 where we dissect our baseline estimate from the first column of Table 2 by the two types of competition. For this purpose, we use the competitive strategy measure (CSM) introduced by Chod and Lyandres (2011), which captures the degree of competitive interaction and the respective sign of the effect of one firm's output on its competitors' output decisions.

As can be seen by comparing the second to the third column, the cost of debt charged by high-market-share lenders drops only for strategic substitutes, and with a very similar magnitude as in the first column for the full sample. In terms of economic significance, a one-standard-deviation increase in a bank's market share of 0.13 (see Table 1) is associated with a drop in the cost of debt by $0.13 \times 0.19 = 2.47\%$.

[Table 4 here]

Our evidence thus far suggests that high-market-share lenders charge lower loan rates at the industry level, and that they do so despite their strong presence in the respective market. We argue that this is due to the fact that common lenders internalize potential externalities among their borrowers stemming from output effects of higher loan rates. The scope for internalization is limited when firms in the industry compete in complements, so showing that our results pertain to competition in substitutes serves as evidence in favor of our alleged mechanism. Additionally, we would expect these findings to hold primarily for firms that actually rely on bank lending for financing their production.

As a proxy for firms' lack of access to alternative financing sources such as public capital markets, we first use the fraction of private firms among all borrowers in an industry during the time period in which we measure banks' market shares, *Private Borrowers*$_{it-4}$.[10] In the first column of Table 4, we indeed find that the reduction in loan rates charged by high-market-share lenders is driven by the fraction of privately-held borrowers. In the second and third column, we split the sample by industries with a fraction of private borrowers below vs. of at least 50%, and find that banks' market shares are associated with lower loan rates only in the latter subsample. Focussing on this subsample of industries with a fraction of private borrowers of at least 50%, we show in the last two columns that the result – as before – pertains to strategic substitutes.

[Table 5 here]

As a second proxy for reliance on bank financing, we use *Industry Leverage*$_{it-4}$, which is the median leverage ratio across all firms in the same three-digit SIC code, calculated using quarterly Compustat data (restricted to non-financial firms incorporated in the U.S.). The results are in Table 5, and are similar in spirit to our estimates in Table 4. While in the first column, industry leverage bears no additional effect on loan rates, the sample splits in the second and third column reveal that the effect of bank market shares on cost of debt is more prevalent in more highly levered industries. In addition, the effect is even stronger in the top quartile in terms of industry leverage (see column 4), where the effect is also driven by firms competing in substitutes rather than complements (see last two columns).

Note that while industry leverage may not necessarily comprise only bank financing, such as syndicated loans, overall industry indebtedness is still an important ingredient of our mechanism. This is because the existence of output effects among borrowers sharing common lenders depends on the borrowers' general inclination to produce more in response to higher loan rates. This limited-liability effect (Brander and Lewis (1986)) should generally be stronger in more debt-dependent industries.

[10] For this purpose, we determine a firm to be privately held if we cannot match it in the Compustat database.

A lingering concern may be that banks' market shares are endogenous. For instance, despite the fact that we control for industry-quarter fixed effects which absorb time-varying unobserved heterogeneity at the industry level, including but not limited to industry-level loan demand, it may still be that industries with low cost of debt have particular demand for loans granted by high-market-share lenders, possibly because the latter have the ability to provide services that may be offered in conjunction with low-risk loans. Further, increasing market shares might be the result of long-term lending relationships. If a bank's market share in an industry increases as a result of repeat borrowing, lower spreads may simply reflect a decrease in bank monitoring costs over the course of the lending relationship that are (partially) passed on to the borrower (Bharath, Dahiya, Saunders, and Srinivasan (2011)).

One way to address the potential endogeneity governing banks' market shares across industries is to exploit changes in market shares that are plausibly exogenous to industry-level factors. We argue that bank mergers are suitable events in our setting. In particular, the average individual industry only accounts for a small fraction of the total syndicated-loan portfolio of a bank, and overall syndicated lending makes only for a fraction of banks' total lending. Therefore, each industry in the syndicated-loan market constitutes a small portion of banks' balance sheets, so that mergers are unlikely to occur because of industry-specific developments in this credit market alone.

We start with an intuitive difference-in-differences estimation around bank-merger events.[11] For each bank merger, we construct a 16-quarter event window around the merger (i.e., two years pre and two years post merger). The unit of observation is the bank-merger-quarter level, based on the sample of all completed syndicated loans to industry i in the event window for which the *acquiring* bank j served as a lead arranger in quarter t. For each event, we define a continuous treatment variable at the industry level, i.e., the increase in the (industry) market share gained by the acquiring bank as a result of the acquisition (calculated using the *pre-merger* market shares of the target).

The estimation results are reported in Table 6. The estimates in column 1 indicate

[11] We use all bank mergers contained in the lender-parent link table provided in Schwert (2017).

that controlling for (merger-event) industry fixed effects, acquiring banks increase loan rates following bank mergers. This is consistent with a general increase in bank market power as result of the merger. The effect, however, is significantly weaker for industries with a higher treatment intensity, i.e., for larger market-share gains, relative to industries with a lower treatment intensity. In column 2, we additionally include (merger-event) quarter fixed effects to better control for general time trends, and find similar effects.

[Table 6 here]

In addition, we present an instrumental-variable methodology in which we make use of bank mergers in a similar fashion as Giannetti and Saidi (2017). In case of a bank merger in $t-4$, we instrument bank j's market share in industry i in $t-4$ by the sum of the two merging banks' historical market shares in industry i starting in quarter $t-8$, i.e., one year before the merger. Otherwise, our instrument is equal to zero.[12] For the same reasons as those laid out above, we expect the exclusion restriction to hold in the case of our instrument, because we use variation in market shares stemming from syndicated loans in specific industries. Note that general time-varying conditions at the industry level and bank level (e.g., the merger itself) are captured by industry-time and bank-time fixed effects.

The first stage is reported in the first column of Table 7, and is strong. The estimation results from the second stage are in the second column of Table 7, and lend support to a more causal interpretation of banks with higher market shares in industries cutting loan rates.

[Table 7 here]

Our results are consistent with those in Erel (2011), who shows that bank mergers reduce loan spreads on average, which she interprets as evidence of cost savings dominating any

[12] Note that this is not the case in Giannetti and Saidi (2017), who limit their sample to banks that actually merged so as to avoid including zeros for their instrument. This is because they would otherwise assign zero instrumented market shares both for industries unaffected by bank mergers and for the case of no merger at all. This is, however, not a concern for us, as our dependent variable is defined only for instances in which an industry received any loan from a given bank in period t. Therefore, in our case, zero instrumented market shares are more likely to be due to the absence of any bank mergers.

market-power effects. Furthermore, she argues that there exists a non-monotonic relationship between loan spreads and the extent of (geographical) market overlap between the merging banks. In contrast to Erel (2011), we examine loan spreads not at the average bank level, but at the level of bank-industry relationships.[13] In this manner, we find that banks charge lower loan spreads in industries in which they establish larger market shares thanks to mergers with other banks.

4.2 Cost of Debt Charged by Common Lenders and Industry Output

Having shown that industries contracting with high-market-share lenders incur lower cost of debt, we next move to firms' output decisions in an industry, as reflected by our Hypothesis 2. For this purpose, we shift the analysis from the bank-industry-time level ijt to the more aggregate industry-time level it.

When banks' market shares in a given industry are high, this aggregates up to higher credit concentration at the industry level. Therefore, one implication of our previous analysis is that industries with a higher degree of credit concentration incur lower cost of debt. From this it follows that such industries produce less output overall.

We test this in Table 8, by regressing industry output, proxied by the BEA quantity index, on a measure of credit concentration, namely *Bank HHI*$_{it-1}$. After including industry and year fixed effects, as in regression specification (4), we find that higher credit concentration is indeed associated with lower industry output. As reported in column 2, the effect is robust to controlling for the (lagged) total loan amount to borrowers in the industry, i.e., controlling for potential changes in *Bank HHI*$_{it-1}$ that are driven by changes in overall lending.

[Table 8 here]

Gauging the economic significance of these estimates due to our proposed mechanism

[13] In this regard, our analysis is similar in spirit to Fraisse, Hombert, and Lé (2017).

requires the mapping of a one-standard-deviation increase in a bank's market share to the implied credit concentration in a given industry. While it is difficult to estimate such a relationship without specifying the distribution of the remaining market shares, one can calculate an upper bound corresponding to a one-standard-deviation increase in *ln(Bank HHI)*$_{it-1}$, which is equal to 0.65 (see Table 1). Increasing a bank's market share by one standard deviation leads to a reduction in the industry-level output index by at most $0.65 \times 2.461 = 1.6$, which corresponds to about 1.4% of the sample mean of 114.7.

While the results in Table 8 are consistent with Hypothesis 2, they do not necessarily imply a causal effect of credit concentration on industry output. For instance, Valta (2012) provides evidence that concentration in the product market reduces firms' cost of debt. He argues that default risk drops when firms engage in (tacit) collusion, which is subsequently reflected in lower loan spreads. Our mechanism, however, implies the reverse direction of causality: common debt ownership leads to lower spreads which, in turn, lead to less output (and, thus, less product market competition).

To provide evidence in favor of this direction of causality, which is implied by common lenders' internalization of externalities, we replace *Bank HHI*$_{it-1}$ by predicted cost of debt, which we estimate by exploiting plausibly exogenous variation in lenders' market shares due to bank mergers, based on our instrumental-variable estimates in Table 7.

In the first and second column of Table 9, we predict cost of debt based on the first-stage estimates in column 1 of Table 7 without and with all fixed effects, respectively. We then aggregate up the predicted cost of debt across banks j within an industry i at time t, and use it to explain industry output at the it level. Doing so, we find that higher cost of debt increases industry output. Or, as in our Hypothesis 2, lower cost of debt due to common debt ownership leads to lower industry output. In the third column of Table 9, we predict cost of debt based on the full instrumental-variable estimates in column 2 of Table 7. Once again, these causal estimates of cost of debt significantly affect industry output, and the direction is as in our mechanism.

[Table 9 here]

4.3 Inferring Optimality of Common Lenders from Firms' Switching Decisions

We finish our empirical analysis by investigating the optimality of common lenders as well as subsequent cost of debt and output strategies for firms. To this end, we test whether firms switch to high-market-share lenders, thereby increasing the likelihood of sharing common lenders within an industry, when given the chance to do so. Furthermore, we also scrutinize to what extent this switching behavior of firms varies with determinants of the marginal benefits of common debt ownership.

As a shock to firms' scope for switching lenders, we use the differences in regulatory barriers to interstate branching that were gradually removed over time. The staggered state-level banking deregulation wave in the U.S. has been used extensively in the literature, so we only briefly discuss the institutional background here and refer the reader to Rice and Strahan (2010), among others, for an in-depth discussion.

In short, banks had only limited abilities to acquire or open out-of-state branches prior to the passing of the Interstate Banking and Branching Efficiency Act (IBBEA) in 1994, which fully came into effect in 1997. While formally relaxing geographical restrictions for banks, IBBEA granted states the right to erect/maintain entry barriers for out-of-state banks. That is, there was still significant variation across states after 1996, and within states across time, in the extent to which a bank j could expand its business to state s. We hypothesize that a firm k, incorporated in state s, is more likely to establish a new lending relationship with an *out-of-state* lender j if entry barriers are relaxed in state s. Furthermore, given the opportunity to switch, the firm should be more likely to establish a new lending relationship with an out-of-state lender that has a high market share in firm k's industry, and especially so if firm k is in an industry with competition in strategic substitutes.

Note that branching restrictions did not *legally* prohibit firms from borrowing from out-of-

state banks. For instance, a Silicon Valley firm could obtain funding from a New York bank, irrespective of whether the bank was allowed to open a branch in California or not. However, the ability to open/acquire branches closer to (potential) borrowers reduces the physical distance between banks and firms, which lowers banks' cost of information acquisition (see, e.g., Agarwal and Hauswald (2010)).

Thus, the removal of branching restrictions can be viewed as an exogenous reduction in the informational advantage of in-state vs. out-of-state banks, which should positively affect the propensity of contracting with out-of-state banks.[14] As noted above, we conjecture that given a reduction in the cost of switching to out-of-state banks, firms should be particularly likely to establish new relationships with high-market-share banks.

We use the Rice and Strahan (2010) index of interstate branching restrictions to capture the degree to which barriers to interstate branching were erected/removed across states and over time. As in Loutskina and Strahan (2015), we start the sample period in 1994 (the year in which IBBEA was passed), and set the index to four, i.e., the most restrictive value, at the beginning of the sample period for all states.[15] The index is then lowered depending on how a state implements potential means to facilitate entry for out-of-state banks. In our empirical analysis, described in detail below, we use an inverted version of the Rice and Strahan (2010) index such that higher index values correspond to less regulated regimes. That is, our index ranges from 0 (highly regulated) to 4 (deregulated). This transformation is simply done to allow for a more natural interpretation of the regression coefficients in our setting, and does not affect our results. We stop the sample in 2008 as the last regulatory change identified by Rice and Strahan (2010) was implemented in 2005, leaving us with a post-deregulation window of at least three years for each event.

[14] There is ample evidence that geographic proximity also matters in the market for large syndicated loans. For instance, Hollander and Verriest (2016) provide evidence that the closer a borrower is located to a bank branch, the lower the level of asymmetric information between borrower and lender. See also Bharath, Dahiya, Saunders, and Srinivasan (2011) and Dass and Massa (2011), among others.

[15] Rice and Strahan (2010) identify four roadblocks to branch expansion that states can erect: (i) states can impose a minimum age on target institutions of interstate acquirers, (ii) states can restrict de-novo interstate branching, (iii) states can restrict acquisitions of individual branches by out-of-state banks, and (iv) states can impose a deposit cap with respect to interstate bank mergers (i.e., given a cap of x%, an out-of-state bank cannot engange in a merger that would increase its deposit share in the respective state above x%.).

Based on the sample period from 1994 to 2008, we build a panel at the bank-firm-year level with all bank-firm pairs kj for which a new lending relationship is established at any point during the sample period. In the presence of bank-firm, bank-period, and firm-period fixed effects, the identifying variation is at the kjt level. In the first column of Table 10, we find that firms are more likely to establish new relationships with out-of-state banks following a deregulatory episode.[16] Firms are constrained in switching to high-market-share lenders, but do so once this constraint is relaxed.

[Table 10 here]

In the second column, we estimate the full specification (5), and find that – consistent with our Hypothesis 3 – this switching effect is indeed even more emphasized for out-of-state banks with large market shares in firm k's industry. In the last two columns, we split up the sample by firms competing in substitutes (column 3) and complements (column 4). The effect is stronger and significant only for strategic substitutes. In sum, these estimates suggest that firms' switching behavior is in line with their desire to reap the benefits from contracting with a common lender in their industry so as to profit from lower loan spreads and the possibility to commit to less competitive output decisions.

These results relate to Cetorelli and Strahan (2006), who use the interstate-banking deregulation as a source of variation in bank competition, which they find to increase access to credit for small firms in bank-dependent sectors of production. Our results suggest that the estimates in Cetorelli and Strahan (2006) are likely understated.

We find that similar banking-deregulatory episodes as in Cetorelli and Strahan (2006), which they justifiedly claim to have increased bank competition, allowed firms to switch to lenders with large market shares in their respective industries. This leads to more firms within an industry sharing the same lenders, which allows for lower cost of debt and less competitive output in the product market when the overall concentration in the banking sector increases. In this manner, we do not only reveal firms' preference for sharing the

[16] Note that at the firm level, we calculate the market share *excluding* lending to firm k itself. That is, a high market share indicates that bank j is already an active lender to firm k's *competitors*.

same lender, allowing them to achieve a less competitive outcome in the product market, but we also point out that even an overall increase in bank competition (due to deregulation allowing firms to switch lenders) has an adverse effect on competition in the product market.

We use the sample split between strategic substitutes and complements to better disentangle the motivation for switching to a high-market-share lender. Finding an effect only for the former, but not for the latter, suggests that other features of high-market-share lenders, such as better information, are unlikely to attract firms to switch to them when given the opportunity to do so.

If firms switch to high-market-share lenders in order to profit from lower loan rates and the possibility to precommit to lower output, then we should be able to detect the reverse effect – a reduced likelihood of switching to high-market-share banks – in response to a shock that reduces the ability to coordinate on output decisions. For this purpose, we use the passage of leniency laws in the U.S. in 1993. According to Chen and Rey (2013), leniency laws are expected to deter the formation of cartels by reducing the fines or even providing immunity for cartel members that collaborate in conviction cases.

To test this, we use the same sample as in Table 10, but use on the right-hand side an interaction term between a post-1993 indicator and bank j's market share in firm k's industry (excluding loans to firm k). In the first column of Table 11, we find no effect of a bank's market share on firms switching lenders after 1993. This is most likely because the 1993 leniency laws affected primarily highly concentrated industries. To capture this, we add the HHI of firm k's industry on the right-hand side, and include all relevant interactions. We find that firms in highly concentrated industries are significantly less likely to switch to high-market-share lenders after 1993, indicating that the leniency-law introduction in 1993 lowered the marginal benefit of borrowing from a high-market-share bank.

[Table 11 here]

This is in line with our conjecture that firms' switching behavior is motivated by their ability to achieve a less competitive outcome through common lenders. As before, the effect

is stronger for strategic substitutes (column 3) than for strategic complements (column 4), although it is also (weakly) significant for the latter. These results suggest that when the marginal benefit of sharing a common lender in the form of coordinating on lower output is reduced, firms are less likely to switch to high-market-share lenders.

In conjunction with our findings in Table 10, this confirms Hypothesis 3: firms deem it optimal to share a common lender when this gives them the possibility to commit to lower output and to simultaneously profit from cheaper syndicated loans.

5 Conclusion

In this paper, we show that credit concentration matters for product market competition of non-financial firms. When firms competing in substitutes are more likely to share common lenders, they are charged lower cost of debt and produce less output. Our evidence suggests that common lenders serve as a commitment or coordination device for firms' output decisions in the same industry.

Our findings warrant the incorporation of product market competition as a policy parameter in the evaluation of real effects of changes in the financial sector. Future research should zoom in on the generalizability of our results.

To characterize lending relationships, we use transaction-level data on syndicated loans, which make for a specific type of debt claim held by banks, besides a whole range of other, non-debt claims. Furthermore, banking (de)regulation is likely to govern bank concentration in a non-trivial way. We point out the importance of only one facet of bank concentration, namely the occurrence of common lenders, for product market competition. It would be instrumental to shed light on how other facets of bank concentration interact with the relationship between common lenders and product market competition, which we leave for future work.

References

Acharya, V. V., I. Hasan, and A. Saunders (2006): "Should Banks Be Diversified? Evidence from Individual Bank Loan Portfolios," *Journal of Business*, 79(3), 1355–1412.

Agarwal, S., and R. Hauswald (2010): "Distance and Private Information in Lending," *Review of Financial Studies*, 23(7), 2757–2788.

Anton, M., F. Ederer, M. Giné, and M. Schmalz (2017): "Common Ownership, Competition, and Top Management Incentives," *ECGI Finance Working Paper No. 511/2017*.

Asker, J., and A. Ljungqvist (2010): "Competition and the Structure of Vertical Relationships in Capital Markets," *Journal of Political Economy*, 118(3), 599–647.

Azar, J., M. Schmalz, and I. Tecu (2017): "Anti-Competitive Effects of Common Ownership," *Journal of Finance*, forthcoming.

Berg, T., A. Saunders, and S. Steffen (2016): "The Total Costs of Corporate Borrowing in the Loan Market: Don't Ignore the Fees," *Journal of Finance*, 71(3), 1357–1392.

Berg, T., A. Saunders, S. Steffen, and D. Streitz (2017): "Mind the Gap: The Difference between U.S. and European Loan Rates," *Review of Financial Studies*, 30(3), 948–987.

Bernheim, B. D., and M. D. Whinston (1985): "Common Marketing Agency as a Device for Facilitating Collusion," *RAND Journal of Economics*, 16(2), 269–281.

Bharath, S. T., S. Dahiya, A. Saunders, and A. Srinivasan (2011): "Lending Relationships and Loan Contract Terms," *Review of Financial Studies*, 24(4), 1141–1203.

Bhattacharya, S., and G. Chiesa (1995): "Proprietary Information, Financial Intermediation, and Research Incentives," *Journal of Financial Intermediation*, 4(4), 328–357.

Brander, J. A., and T. R. Lewis (1986): "Oligopoly and Financial Structure: The Limited Liability Effect," *American Economic Review*, 76(5), 956–970.

Cestone, G. (1999): "Corporate Financing and Product Market Competition: An Overview," *Giornale degli Economisti e Annali di Economia*, 58(2), 269–300.

Cestone, G., and L. White (2003): "Anticompetitive Financial Contracting: The Design of Financial Claims," *Journal of Finance*, 58(5), 2109–2141.

Cetorelli, N. (2004): "Real Effects of Bank Competition," *Journal of Money, Credit and Banking*, 36(3), 543–558.

Cetorelli, N., and P. E. Strahan (2006): "Finance as a Barrier to Entry: Bank Competition and Industry Structure in Local U.S. Markets," *Journal of Finance*, 61(1), 437–461.

Chen, Z., and P. Rey (2013): "On the Design of Leniency Programs," *Journal of Law & Economics*, 56(4), 917–957.

Chevalier, J. A. (1995): "Capital Structure and Product-Market Competition: Empirical Evidence from the Supermarket Industry," *American Economic Review*, 85(3), 415–435.

Chevalier, J. A., and D. S. Scharfstein (1996): "Capital-Market Imperfections and Countercyclical Markups: Theory and Evidence," *American Economic Review*, 86(4), 703–725.

Chod, J., and E. Lyandres (2011): "Strategic IPOs and Product Market Competition," *Journal of Financial Economics*, 100(1), 45–67.

Dasgupta, S., and A. Žaldokas (2017): "Anti-Collusion Enforcement: Justice for Consumers and Equity for Firms," *HKUST Working Paper*.

Dass, N., and M. Massa (2011): "The Impact of a Strong Bank-Firm Relationship on the Borrowing Firm," *Review of Financial Studies*, 24(4), 1204–1260.

Erel, I. (2011): "The Effect of Bank Mergers on Loan Prices: Evidence from the United States," *Review of Financial Studies*, 24(4), 1068–1101.

Fraisse, H., J. Hombert, and M. Lé (2017): "The Competitive Effect of a Bank Megamerger on Credit Supply," *HEC Paris Working Paper*.

Giannetti, M., and L. Laeven (2012): "The Flight Home Effect: Evidence from the Syndicated Loan Market During Financial Crises," *Journal of Financial Economics*, 104(1), 23–43.

Giannetti, M., and F. Saidi (2017): "Shock Propagation and Banking Structure," *Stockholm School of Economics Working Paper*.

Gustavo Grullon, Y. L., and R. Michaely (2017): "Are U.S. Industries Becoming More Concentrated?," *Working Paper*.

Gutiérrez, G., and T. Philippon (2017): "Investment-less Growth: An Empirical Investigation," *New York University Working Paper*.

Hellwig, M. (1991): "Banking, Financial Intermediation and Corporate Finance," in *European Financial Integration*, ed. by A. Giovannini, and C. Mayer, pp. 35–63. Cambridge University Press.

Hoberg, G., and G. Phillips (2010): "Real and Financial Industry Booms and Busts," *Journal of Finance*, 65(1), 45–86.

Hollander, S., and A. Verriest (2016): "Bridging the Gap: The Design of Bank Loan Contracts and Distance," *Journal of Financial Economics*, 119(2), 399–419.

Hortaçsu, A., and C. Syverson (2007): "Cementing Relationships: Vertical Integration, Foreclosure, Productivity, and Prices," *Journal of Political Economy*, 115(2), 250–301.

Loutskina, E., and P. E. Strahan (2011): "Informed and Uninformed Investment in Housing: The Downside of Diversification," *Review of Financial Studies*, 24(5), 1447–1480.

——— (2015): "Financial integration, housing, and economic volatility," *Journal of Financial Economics*, 115(1), 25–41.

Lyandres, E. (2006): "Capital Structure and Interaction among Firms in Output Markets: Theory and Evidence," *Journal of Business*, 79(5), 2381–2421.

Maksimovic, V. (1988): "Capital Structure in Repeated Oligopolies," *RAND Journal of Economics*, 19(3), 389–407.

Phillips, G. M. (1995): "Increased Debt and Industry Product Markets: An Empirical Analysis," *Journal of Financial Economics*, 37(2), 189–238.

Poitevin, M. (1989): "Collusion and the Banking Structure of a Duopoly," *Canadian Journal of Economics*, 22(2), 263–277.

Rice, T., and P. E. Strahan (2010): "Does Credit Competition Affect Small-Firm Finance?," *Journal of Finance*, 65(3), 861–889.

Schwert, M. (2017): "Bank Capital and Lending Relationships," *Journal of Finance*, forthcoming.

Showalter, D. M. (1995): "Oligopoly and Financial Structure: Comment," *American Economic Review*, 85(3), 647–653.

Spagnolo, G. (2004): "Debt as a (Credible) Collusive Device: 'Everybody Happy But the Consumer'," *Stockholm School of Economics Working Paper*.

——— (2005): "Managerial Incentives and Collusive Behavior," *European Economic Review*, 49(6), 1501–1523.

Sundaram, A. K., T. A. John, and K. John (1996): "An Empirical Analysis of Strategic Competition and Firm Values: The Case of R&D Competition," *Journal of Financial Economics*, 40(3), 459–486.

Valta, P. (2012): "Competition and the Cost of Debt," *Journal of Financial Economics*, 105(3), 661–682.

6 Tables

Table 1: **Descriptive Statistics**

This table reports descriptive statistics for our panel on the industry-bank-quarter level (Panel A) and our panel on the industry-year level (Panel B). The sample period is 1990 to 2015 (except for the BEA industry output, which is only available for the 1997 to 2015 period).

	Min	Median	Max	Mean	Std. Dev	Obs.
Panel A: Industry-Bank-Quarter Sample						
Spread (in bps)	20.00	220.00	800.00	231.09	137.04	33,715
UWS (in bps)	8.88	122.50	800.00	168.65	145.51	30,095
Market Share	0.00	0.05	0.91	0.10	0.13	33,715
Portfolio Share	0.00	0.01	1.00	0.02	0.04	33,715
Panel B: Industry-Year Sample						
Output	44.52	108.71	246.21	114.70	32.46	5,648
ln(Bank HHI)	-8.12	-1.93	0.00	-1.94	0.65	5,648

Table 2: **Bank Market Share and Cost of Debt**

The unit of observation is the bank-industry-quarter level *ijt*, based on the sample of all completed syndicated loans from 1990 to 2015 granted to industry i for which bank j served as a lead arranger in quarter t. Furthermore, the sample is limited to quarters with non-zero loans granted to industry i by bank j. The dependent variable in columns 1-3 is the logged average all-in-drawn spread of all loans granted to industry i by bank j in period t. The dependent variable in column 4 is the logged average usage weighted spread (UWS). The UWS is defined following Berg, Saunders, Steffen, and Streitz (2017): UWS (PDD) = PDD $\times$ AISD + (1-PDD) $\times$ AISU , where PDD is the probability of drawdown, i.e., the probability that a committed loan is actually drawn down. The all-in-drawn spread (AISD) is the spread paid by the borrower on the used part of a loan commitment. The all-in-undrawn spread (AISU) is the spread paid by the borrower on the committed but not used part of the loan commitment. Following Berg, Saunders, Steffen, and Streitz (2017), we a assume a PDD of 25% for credit lines. For term loans the USW is equal to the AISD (i.e., PDD = 100%). Special loan types, i.e., loans that cannot be categorized as term loans or lines of credit, are removed in column 4. *Market Share*$_{ijt-4}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over five years (20 quarters) from $t-4$ to $t-23$. *Portfolio Share*$_{ijt-4}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume granted by bank j, measured over five years (20 quarters) from $t-4$ to $t-23$. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	ln(Spread)	ln(Spread)	ln(Spread)	ln(UWS(25%))
	(1)	(2)	(3)	(4)
Market Share	-0.190***		-0.194***	-0.250**
	(0.065)		(0.071)	(0.099)
Portfolio Share		-0.067	0.065	0.077
		(0.253)	(0.253)	(0.327)
Bank-quarter FE	Yes	Yes	Yes	Yes
Industry-quarter FE	Yes	Yes	Yes	Yes
Bank-industry FE	Yes	Yes	Yes	Yes
Observations	33,715	33,715	33,715	28,910

Table 3: **Bank Market Share and Cost of Debt – Strategic Substitutes vs. Complements**

The unit of observation is the bank-industry-quarter level *ijt*, based on the sample of all completed syndicated loans from 1990 to 2015 granted to industry i for which bank j served as a lead arranger in quarter t. Furthermore, the sample is limited to quarters with non-zero loans granted to industry i by bank j. The dependent variable is the logged average all-in-drawn spread of all loans granted to industry i by bank j in period t. *Market Share*$_{ijt-4}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over five years (20 quarters) from $t-4$ to $t-23$. In column 2 (3), the sample is restricted to industries with competition in strategic substitutes (complements). The strategic substitutes (complements) sample refers to all industry-quarters with negative (positive) average CSM_{kt-4}. The Competitive Strategy Measure (CSM) is a measure of the degree of competitive interaction (see Section 3.1 and Chod and Lyandres (2011) for details). Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	ln(Spread)	ln(Spread)	ln(Spread)
		Type of competition	
		Strategic Substitutes	Strategic Complements
	(1)	(2)	(3)
Market Share	-0.190***	-0.241***	-0.044
	(0.065)	(0.052)	(0.098)
Bank-quarter FE	Yes	Yes	Yes
Industry-quarter FE	Yes	Yes	Yes
Bank-industry FE	Yes	Yes	Yes
Observations	33,715	15,937	13,819

Table 4: **Bank Market Share and Cost of Debt – Fraction of Private Firms in Industry**

The unit of observation is the bank-industry-quarter level *ijt*, based on the sample of all completed syndicated loans from 1990 to 2015 granted to industry i for which bank j served as a lead arranger in quarter t. Furthermore, the sample is limited to quarters with non-zero loans granted to industry i by bank j. The dependent variable is the logged average all-in-drawn spread of all loans granted to industry i by bank j in period t. *Market Share*$_{ijt-4}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over five years (20 quarters) from $t-4$ to $t-23$. *Private Borrowers*$_{it-4}$ is the ratio of private borrowers (firms that cannot be linked to Compustat) to total borrowers in an industry. The ratio is calculated based on all borrowers that have obtained a loan in the past five years (20 quarters) from $t-4$ to $t-23$. In column 2 (3), the sample is restricted to industries with a fraction of private borrowers below (of at least) 50%. In column 4 (5), the sample from column 3 is further restricted to industries with competition in strategic substitutes (complements). The strategic substitutes (complements) sample refers to all industry-quarters with negative (positive) average CSM_{kt-4}. The Competitive Strategy Measure (CSM) is a measure of the degree of competitive interaction (see Section 3.1 and Chod and Lyandres (2011) for details). Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	ln(Spread)	ln(Spread)	ln(Spread)	ln(Spread)	ln(Spread)
		Fraction of Private Borrowers			
		< 50%	>= 50%	>= 50%	>= 50%
				Type of competition	
				Strategic Substitutes	Strategic Complements
	(1)	(2)	(3)	(4)	(5)
Market Share x Private Borrowers	-0.783***				
	(0.227)				
Market Share	0.298**	-0.039	-0.250***	-0.313***	0.025
	(0.146)	(0.076)	(0.072)	(0.108)	(0.102)
Bank-quarter FE	Yes	Yes	Yes	Yes	Yes
Industry-quarter FE	Yes	Yes	Yes	Yes	Yes
Bank-industry FE	Yes	Yes	Yes	Yes	Yes
Observations	33,715	9,625	22,739	10,656	9,239

Table 5: **Bank Market Share and Cost of Debt – Industry Leverage**

The unit of observation is the bank-industry-quarter level *ijt*, based on the sample of all completed syndicated loans from 1990 to 2015 granted to industry i for which bank j served as a lead arranger in quarter t. Furthermore, the sample is limited to quarters with non-zero loans granted to industry i by bank j. The dependent variable is the logged average all-in-drawn spread of all loans granted to industry i by bank j in period t. *Market Share*$_{ijt-4}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over five years (20 quarters) from $t-4$ to $t-23$. *Industry Leverage*$_{it-4}$ is the median leverage ratio across all firms in the same 3-digit SIC code, calculated using quarterly Compustat data (restricted to non-financial firms incorporated in the U.S.). In column 2 (3), the sample is restricted to industries with below-median (above-median) industry leverage. In column 4, the sample is limited to industries in the top quartile of the distribution of industry leverage. In column 5 (6), the sample from column 4 is further restricted to industries with competition in strategic substitutes (complements). The strategic substitutes (complements) sample refers to all industry-quarters with negative (positive) average CSM_{kt-4}. The Competitive Strategy Measure (CSM) is a measure of the degree of competitive interaction (see Section 3.1 and Chod and Lyandres (2011) for details). Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	ln(Spread)	ln(Spread)	ln(Spread)	ln(Spread)	ln(Spread)	ln(Spread)
		Industry Leverage				
		< Median	>= Median	Top 25%	Top 25%	Top 25%
					Type of competition	
					Strategic Substitutes	Strategic Complements
	(1)	(2)	(3)	(4)	(5)	(6)
Market Share x Industry Leverage	0.107					
	(0.337)					
Market Share	-0.264***	-0.179***	-0.211**	-0.387*	-0.775*	0.118
	(0.073)	(0.061)	(0.093)	(0.210)	(0.404)	(0.198)
Bank-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank-industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	30,699	13,448	15,426	6,985	2,715	3,041

Table 6: **Bank Market Share and Cost of Debt – Evidence from Bank Mergers**

This table analyzes the cost of debt around bank-merger events. For each bank merger m, we consider an eight-quarter window prior to the merger (pre-merger window) and an eight-quarter window after the merger (post-merger window). The unit of observation is the merger-industry-quarter level *mit*, based on the sample of all completed syndicated loans to industry i in the 16-quarter window around the merger event m for which the *acquiring* bank served as a lead arranger in quarter t. The sample is limited to quarters with non-zero loans granted to industry i by the acquiring bank. The dependent variable is the logged average all-in-drawn spread of all loans granted to industry i by the acquiring bank in period t. $Post_t$ equals one in the post-merger window, and zero in the pre-merger window. $\Delta MarketShare_{mi}$ is the increase in industry market share gained by the acquiring bank through the acquisition. In particular, it is defined as the pre-merger (last year before the merger) market share of the target bank in industry i. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	ln(Spread)	ln(Spread)
	(1)	(2)
Post x Δ Market Share	-0.877**	-0.339***
	(0.326)	(0.096)
Post	0.152***	
	(0.044)	
Merger-industry FE	Yes	Yes
Merger-period FE	No	Yes
Observations	10,719	10,698

Table 7: **Bank Market Share and Cost of Debt – IV Estimates**

The unit of observation is the bank-industry-quarter level *ijt*, based on the sample of all completed syndicated loans from 1990 to 2015 granted to industry i for which bank j served as a lead arranger in quarter t. Furthermore, the sample is limited to quarters with non-zero loans granted to industry i by bank j. The sample comprises only banks that merged with at least one other bank anytime during the sample period. The first-stage regression is given in column 1. *Merger-implied Market Share*$_{ijt-8}$ is equal to the sum of the two merging banks' market shares in industry i in the last year (four quarters) before a merger in $t-4$. The dependent variable in the second stage is the logged average all-in-drawn spread of all loans granted to industry i by bank j in period t. *Market Share*$_{ijt-4}$ is the proportion of bank j's total loan volume to industry i over the aggregate loan volume in industry i, measured over five years (20 quarters) from $t-4$ to $t-23$. We instrument this variable by *Merger-implied Market Share*$_{ijt-8}$. Robust standard errors, clustered at the bank level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	Market Share	ln(Spread)
	(1)	(2)
Merger-implied market share	0.324***	
	(0.024)	
Market Share (instrumented)		-0.486*
		(0.268)
Bank-quarter FE		Yes
Industry-quarter FE		Yes
Bank-industry FE		Yes
F-statistic	184.69	3.29
Observations	33,715	33,715

Table 8: **Bank HHI and Industry Output**

The unit of observation is the industry-year level, based on the most disaggregated BEA industry definition (403 industries). The sample period is 1997 to 2015. The dependent variable, $Output_{it}$, is the BEA chain-type quantity index for gross output by industry (the index is equal to 100 in the reference year 2009). The index captures changes in the quantities of goods and services provided by an industry over time. *Bank* HHI_{it-1} measures the credit concentration in industry i in period t, and is defined as the sum of the squared bank market shares. Bank market shares are measured over the last five years. *Industry Loan* Amt_{it-1} is the total loan amount obtained by industry i in year $t-1$. Robust standard errors, clustered at the industry level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	Output	Output
	(1)	(2)
ln(Bank HHI)	-2.461*	-2.581**
	(1.271)	(1.269)
ln(Industry Loan Amt)		0.378***
		(0.110)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Observations	5,648	5,648

Table 9: **Bank HHI and Industry Output – Predicted Cost of Debt**

The unit of observation is the industry-year level, based on the most disaggregated BEA industry definition (403 industries). The sample period is 1997 to 2015. The dependent variable, $Output_{it}$, is the BEA chain-type quantity index for gross output by industry (the index is equal to 100 in the reference year 2009). The index captures changes in the quantities of goods and services provided by an industry over time. *Cost of Debt* $(predicted)_{it}$ are the cost of (bank) debt at the industry-year level, predicted using variation in lenders' market shares due to bank mergers (cf. instrumental-variable estimates in Table 7). In column 1 and 2, cost of debt is predicted based on the first-stage estimates in column 1 of Table 7 without and with all fixed effects, respectively. In column 3, cost of debt is predicted based on the full instrumental-variable estimates in column 2 of Table 7. *Industry Loan* Amt_{it-1} is the total loan amount obtained by industry i in year $t-1$. Robust standard errors, clustered at the industry level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	Output	Output	Output
Method:	Reduced form w/o FE	Reduced form w/ FE	Full IV
	(1)	(2)	(3)
Cost of Debt (predicted)	65.309***	206.918***	35.377***
	(16.120)	(51.073)	(11.403)
ln(Industry Loan Amt)	0.210**	0.210**	0.219**
	(0.087)	(0.087)	(0.088)
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	6,187	6,187	6,187

Table 10: **Bank Deregulation and Firms' Switching Lenders**

The unit of observation is the bank-firm-year level kjt. The sample period is 1994 to 2008. *Dereg Index*$_{kt}$ is an index of interstate banking deregulation based on Rice and Strahan (2010). We invert the Rice-Strahan index such that higher index values corresond to less regulated regimes. Therefore, the index ranges from 0 (highly regulated) to 4 (deregulated) based on regulatory changes in the state in which the borrower k is incorporated. *Out-of-State*$_{kj}$ is a dummy variable that indicates interstate bank-firm pairs, i.e., firms that are incorporated in a different state that the lender. *Market Share (ex firm k)*$_{kjt-1}$ is the market share of bank j in firm k's industry in year $t-1$. The market share is defined is the proportion of bank j's total loan volume to borrowers that are in the same industry as firm k (*excluding* loans to firm k itself) over the aggregate loan volume in the industry (*excluding* loans to firm k). The market share is lagged by one year and measured over five years, i.e., $t-1$ to $t-5$. The dependent variable *New Rel*$_{kjt}$ is a dummy variable that equals one if firm k obtains a loan from bank j (as lead arranger) in year t from which the firm has not borrowed in the last ten years, and zero otherwise. The sample is restricted to bank-firm pairs for which a new lending relationship is established at any point during the sample period. In column 3 (4), the sample is restricted to industries with competition in strategic substitutes (complements). The strategic substitutes (complements) sample refers to all bank-firm paris for which the average estimated CSM_{kt-1} is negative (positive). The Competitive Strategy Measure (CSM) is a measure of the degree of competitive interaction (see Section 3.1 and Chod and Lyandres (2011) for details). Robust standard errors, clustered at the firm level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	New Rel	New Rel	New Rel	New Rel
			Type of competition	
			Strategic Substitutes	Strategic Complements
	(1)	(2)	(3)	(4)
Dereg Index x Out-of-State (0/1) x Market Share (ex firm k)		0.045*	0.067**	0.029
		(0.026)	(0.034)	(0.040)
Dereg Index x Out-of-State (0/1)	0.009***	0.009**	0.003	0.015**
	(0.002)	(0.004)	(0.005)	(0.006)
Dereg Index x Market Share (ex firm k)		-0.050**	-0.072**	-0.034
		(0.025)	(0.033)	(0.039)
Out-of-State (0/1) x Market Share (ex firm k)		-0.122	-0.152	-0.153
		(0.078)	(0.103)	(0.127)
Market Share (ex firm k)		0.147*	0.186*	0.191
		(0.076)	(0.099)	(0.124)
Firm-period FE	Yes	Yes	Yes	Yes
Bank-period FE	Yes	Yes	Yes	Yes
Bank-firm FE	Yes	Yes	Yes	Yes
Observations	180,690	137,434	80,314	52,772

Table 11: **Leniency Laws and Firms' Switching Lenders**

The unit of observation is the bank-firm-year level kjt. The sample period is 1991 to 1996. HHI_{kt-1} is the Hoberg-Phillips predicted HHI lagged by one year (cf. Hoberg and Phillips (2010)). *Market Share (ex firm k)*$_{kjt-1}$ is the market share of bank j in firm k's industry in year $t-1$. The market share is defined is the proportion of bank j's total loan volume to borrowers that are in the same industry as firm k (*excluding* loans to firm k itself) over the aggregate loan volume in the industry (*excluding* loans to firm k). The market share is lagged by one year and measured over five years, i.e., $t-1$ to $t-5$. The dependent variable *New Rel*$_{kjt}$ is a dummy variable that equals one if firm k obtains a loan from bank j (as lead arranger) in year t from which the firm has not borrowed in the last ten years, and zero otherwise. The sample is restricted to bank-firm pairs for which a new lending relationship is established at any point during the sample period. In column 3 (4), the sample is restricted to industries with competition in strategic substitutes (complements). The strategic substitutes (complements) sample refers to all bank-firm paris for which the average estimated CSM_{kt-1} is negative (positive). The Competitive Strategy Measure (CSM) is a measure of the degree of competitive interaction (see Section 3.1 and Chod and Lyandres (2011) for details). Robust standard errors, clustered at the firm level, are in parentheses. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Variable:	New Rel	New Rel	New Rel	New Rel
			Type of competition	
			Strategic Substitutes	Strategic Complements
	(1)	(2)	(3)	(4)
HHI x Post-1993 (0/1) x Market Share (ex firm k)		-8.828***	-11.349**	-6.687
		(3.213)	(5.115)	(4.456)
HHI x Market Share (ex firm k)		6.815**	8.544	4.424
		(3.457)	(5.292)	(5.637)
Post-1993 (0/1) x Market Share (ex firm k)	0.085	0.657***	0.824**	0.564
	(0.086)	(0.244)	(0.344)	(0.403)
Market Share (ex firm k)	-0.003	-0.416*	-0.457	-0.382
	(0.090)	(0.253)	(0.351)	(0.441)
Firm-period FE	Yes	Yes	Yes	Yes
Bank-period FE	Yes	Yes	Yes	Yes
Bank-firm FE	Yes	Yes	Yes	Yes
Observations	12,086	10,924	6,703	3,965