Bank Specialization, Control Rights, and Real Effects

Marco Giometti[†], Ozan Guler[‡], and Stefano Pietrosanti[¶]

[†]Universidad Carlos III de Madrid

[‡]Universitat Pompeu Fabra

[¶]Financial Stability Directorate, Bank of Italy

18 November 2023

Abstract. We document the presence of bank specialization in the U.S. syndicated loan market, its implications for financial contracting, and its real effects through the covenant violation channel. Firms borrowing from a bank specialized in their industry (core borrowers) obtain credit with less restrictive financial covenants. When control rights shift to lenders after a covenant violation, specialized banks help their core borrowers by asking for smaller investment cuts, with positive effects on performance. Our evidence offers insights into why bank credit is hard to substitute and suggests that information advantages drive bank specialization, with real effects for borrowing firms.

Keywords: Bank Specialization, Financial Contracting, Covenant Violations, Real Effects.
JEL Classification: L15, L22, G21, G30, G32.

This paper is based on different chapters of the authors' respective Ph.D. dissertations. We are grateful to David Musto, Guillermo Ordóñez, and Michael Roberts for their advice and feedback. We also thank Edoardo Acabbi, Rosalind Bennet, Mitchell Berlin, Emilia Bonaccorsi di Patti, Elena Carletti, Hans Degryse, Olivier De Jonghe, Alessandro Dovis, Marc Flandreau, Emilia Garcia-Appendini, Erik Gilje, Itay Goldstein, Richard Herring, Lorena Keller, Sotirios Kokas, Tong Liu, Mike Mariathasan, David Martinez-Miera, Klaas Mulier, Christian Opp, Francesco Palazzo, Veronica Rappoport, Dominik Supera, and Petra Todd for their feedback and comments. We thank participants in the Philadelphia Fed and Wharton brown-bag seminars, the reading group on Financial Intermediation at Bocconi University, the 20th FDIC Annual Bank Research Conference, the VPDE 14th PhD Workshop in Economics, the 2022 SGF Conference, the 2022 FMCG Conference, the 2022 FMA European Conference, the Summer Workshop on Money, Banking, Payments, and Finance, the 8th Bank of Italy Annual Banking Research Network Workshop, the MadBar Workshop on Corporate Finance and Banking, the 12th FEBS Conference, the FINEST 2023 Spring Workshop, the 30th Finance Forum and the Financial Markets, Shocks and Macroeconomic Policy conference at the Bank of Chile for their comments. We thank Glenn Schepens, Juan Gorostiaga, Marco Pelosi, Olga Briukhova, Lorenzo Schönleber, Carlos Ramirez, and Santiago Truffa for the insightful discussions. We wish to express our special thanks to Greg Nini for sharing the most updated data on covenant violations collected from SEC filings over the years by him and his co-authors. Marco Giometti gratefully acknowledges financial support from the Spanish Ministry of Science and Innovation, project PID2020-114108GB-I00. All errors are our own. The opinions expressed do not necessarily reflect those of the Bank of Italy, the Eurosystem, and their staff. An earlier version of this paper circulated as "Bank Specialization and the Design of Loan Contracts", FDIC Center for Financial Research Working Paper No. 2022-14.

† Marco Giometti (marco.giometti@uc3m.es) ‡ Ozan Guler: ozan.guler@upf.edu; ¶ Stefano Pietrosanti: stefano.pietrosanti@bancaditalia.it

1 Introduction

Diversification of risk plays a central role in established theories of financial intermediation (e.g., Boyd & Prescott, 1986; Diamond, 1984). However, banks tend to concentrate their lending along multiple dimensions (e.g., A. N. Berger & DeYoung, 2001; Carey, Post, & Sharpe, 1998). While the theories explaining this phenomenon focus primarily on the advantages of repeated interaction within credit relationships (Sharpe, 1990) or on the role of market power (Petersen & Rajan, 1995), recent empirical findings have stressed the notion of comparative advantages in lending.

Specifically, it has been recently shown that specialization in lending is common, and loans from specialized banks to firms in the banks' area of specialization (core borrowers, henceforth) have greater size, smaller cost, longer maturity (Blickle, Parlatore, & Saunders, 2023; De Jonghe, Dewachter, Mulier, Ongena, & Schepens, 2020) and are difficult to substitute (Paravisini, Rappoport, & Schnabl, 2023). While these studies bring incremental evidence towards information advantage as the main driver of bank specialization and its effects, direct evidence is limited, as the information distance between lenders and borrowers is difficult to measure and, thus, to link directly to changes in firms' investment and prospects.

This paper fills this gap by providing direct evidence on the linkages between bank specialization and information advantages, as well as the first quantification of the effects on firm investment and performance. To do so, we employ the $2 trillion US syndicated loan market as a laboratory and focus on loan covenants, i.e., restrictions on firms' behaviour written in most syndicated loan contracts (about 60% of the syndicated loans include them) that, if violated, transfer control rights from borrowers to lenders. Studying covenants helps us to gauge whether information advantage drives specialization and its effects for at least two reasons.

First, covenants can be more or less restrictive regarding which actions would constitute a violation, triggering technical default. Theory interprets covenants' strictness as a measure of the information asymmetry between each lender and borrower, i.e., the information distance (Gârleanu & Zwiebel, 2009). According to the theory, the more restrictive the contract, the less information a bank has about a borrower. Thus, looking at covenant tightness upon loan origination, we can directly assess whether specialized banks are closer to their core borrowers

and inspect how specialization links to banks *ex-ante screening* capabilities.

Second, as a covenant violation shifts control rights from borrowers to lenders, potential differences in firm outcomes post-violation can be traced to differences in bank intervention. Indeed, there is a long line of literature using covenants to link financial contracting to real outcomes (e.g., Chava & Roberts, 2008; Falato & Liang, 2016; Nini, Smith, & Sufi, 2012) as well as to the transmission of financial shocks to the real economy (Chodorow-Reich & Falato, 2022). Consequently, covenant violations provide an ideal setting to gauge how specialized banks conduct the *ex-post monitoring* of their core borrowers and how differences between specialized and non-specialized banks' monitoring determine firms' outcomes.

To investigate the relationship between bank specialization and information advantages, we obtain data on the syndicated loans from Refinitiv DealScan and merge it with Compustat. The resulting dataset is a loan-level panel with bank, firm, and loan characteristics from 1996 to 2016.[1] We use this data to estimate the degree of industrial concentration of bank loan portfolios. We then analyze how much banks specialize their lending towards different industries by adapting the approach in Blickle et al. (2023) to our setting. We measure specialization as the ratio between the weight of lending to an industry in each bank's syndicated loan portfolio relative to the weight of credit to that industry in the credit-market-wide portfolio. Intuitively, this measure captures how much a bank's lending activity deviates from a value-weighted market portfolio. In doing so, we account at once for heterogeneity in the size of industries in the economy and in the size of bank industrial lending relative to the bank's overall corporate lending.

First, we find clear evidence of bank specialization. We show that the average bank displays more concentration in lending than what would be implied by the overall distribution of credit in the entire market. Second, we document that banks' portfolio shares in each market display a rightward skewness. That is, it is common for banks to have an above-median concentration in at least some industries. Moreover, each industry consistently displays at least one outlier bank, with a portfolio share that is abnormally large with respect to peers. Finally, specialization is persistent: Banks' relative loan portfolio shares in each industry exhibit a 55% correlation at a

1. We chose this sample period because coverage of the syndicated loan market sharply improved in DealScan after 1995 (Chava & Roberts, 2008).

10-year horizon, suggesting that relative loan portfolio shares capture deep differences across banks.

Second, we investigate whether specialized banks' relationships with their core borrowers are less affected by information frictions. To this end, we examine the relationship between bank specialization and the strictness of loan covenants, our measure of the information distance between the bank and the firm. We employ the measure of covenant strictness developed by Demerjian and Owens (2016), based on the one developed by Murfin (2012). Intuitively, this measure captures the ex-ante probability of violating at least one of the financial covenants embedded in the contract, while taking the correlation between the target financial ratios of each firm into account.

We document that the average loan contract between a bank whose loan share in an industry is twice as large as that of the market and a firm in the same industry includes covenants 4.7 percentage points less restrictive at origination, compared to a loan contract granted by the same bank in the same year-quarter to a firm in an industry in which the bank's concentration is the same as that of the whole credit market. The observed effect is economically and statistically significant. In particular, it amounts to 13% of the unconditional mean of covenant strictness. Importantly, the reduction in covenant strictness is neither compensated by higher interest rate spreads or fees nor by lower maturities or loan amounts. In fact, loans by specialized banks to core borrowers are actually cheaper and larger. The lack of a trade-off with other contract terms aligns with a comparative advantage when lending to core borrowers.[2] Overall, our finding supports a strong relationship between bank specialization and information advantages, suggesting that specialized banks are more efficient in screening their core borrowers and can thus rely on looser covenants.

Finally, we examine whether the results of specialized banks' ex-post monitoring confirm their information advantages, ultimately leading to positive real effects for core borrowers. Indeed, even if ex-ante optimal, covenants may be harmful ex-post and inefficiently curtail firms' investment (Smith & Warner, 1979). If specialized banks' ex-ante looser covenants would come with harsher sanctions in case of violation and, even worse, would drive inferior performance, that would cast doubt on the validity of information advantage as a driver of specialization.

2. Bradley and Roberts (2015) documents a trade-off between covenant strictness and loan yield.

To address this concern, we exploit covenant violations, by employing data from Griffin, Nini, and Smith (2018), who extract violations from firms' SEC filings.[3] Specifically, we use the discontinuous nature of violation events as a source of quasi-exogenous variation in control rights' allocation and their effects (as in, e.g., Chodorow-Reich & Falato, 2022; Falato & Liang, 2016; Nini et al., 2012; Roberts & Sufi, 2009).

In particular, we assume that, after accounting for a host of observables and fixed effects, the violation status is the only relevant change in the nature of the creditor in the quarters just before and just after a violation. Hence, violations cause changes in investment and performance in that time span. Then, looking at differences in the consequences of violation between core and non-core customers of the same bank, at the same time, we can isolate whether bank specialization has real effects. As we have shown before that core covenants are laxer at origination, we stress that such estimates are all lower bounds of the actual real effects. Indeed, core customers' violations require larger missteps, which should likely come with feebler ex-post investment and worse performances. However, that we find the opposite, bolsters the economic significance of our results.

Our results show that, in the four quarters after a covenant violation, the core borrowers of specialized banks experience a relatively lower decrease in investment. In particular, within the same bank, borrowers breaching a covenant see their investment drop by 67 basis points in the four quarters after a violation (almost 20% of the standard deviation of investment).[4] Nonetheless, borrowers in an industry in which that bank is twice as specialized as its own average experience a 30% *smaller* decline in investment, with respect to similar non-core borrowers.

Moreover, we find that core borrowers' measures of performance, such as the log of sales, or operating cash flow over sales, increase more post-violation, while the market-based default probability (measured based on Bharath & Shumway, 2008) increases less. Combined with the effect on investment, this suggests that, when they obtain control rights after a covenant violation, specialized banks tailor their intervention through information advantages, such that

3. We are grateful to Greg Nini for sharing the most updated data on covenant violations collected from SEC filings over the years by him and his co-authors.

4. Broadly in line with the impact magnitudes estimated in related works, such as Chava and Roberts (2008, Table V).

they better discriminate which investment to cut and positively affect borrower performance. Overall, our results suggest that information advantages of specialized banks not only allow them to better screen, but also to better monitor their borrowers.

In all our results, we ensure that our empirical specifications mitigate the endogeneity concerns that might arise from potential bank- and firm-level heterogeneity. First, our models include bank×year-quarter fixed effects, which allow us to compare loans made by the same bank in the same year-quarter, ruling out that unobserved, time-varying lender heterogeneity drives our findings. Then, we control for all time-invariant firm-specific factors through firm fixed effects (or firm-level differences), and for all time-varying factors common to all firms in the same industry and the same year-quarter through industry×year-quarter fixed effects. Finally, we account for a wide range of observable firm characteristics, so that our estimates always compare firms with similar risk, resources, and business opportunities.

We rule out three alternative explanations for our findings on contract design and covenant violations' effects. First, we show that specialization in lending toward an industry reflects more than just a pattern of multiple intense lending relationships with individual firms. Controlling for relationship lending with the variables employed by Prilmeier (2017) does not affect our results.[5] Following Paravisini et al. (2023), we also use bank mergers to further ensure that relationship lending does not explain our results. When two banks merge, banks' borrower-specific soft information associated with relationship lending is unlikely to be transmitted to the acquiring bank (Stein, 2002). In contrast, mergers should not directly affect industry expertise. We show that lending advantages from bank specialization carry over into the merged entity, further suggesting that the industry-specific knowledge is scalable and distinct from relationship lending.

Furthermore, we show that our results are not driven by geographical proximity to individual firms (consistent with Di & Pattison, 2023; Duquerroy, Mazet-Sonilhac, Mésonnier, & Paravisini, 2022) or by banks' large industry market shares. With respect to the latter, Giannetti and Saidi (2019) suggest that lenders with high industry market share internalize the spillovers of their credit decisions for firms in that industry. Thus, our results could reflect banks with

5. Prilmeier (2017) finds a non-linear, quadratic relationship between the intensity of the credit relationship and covenant strictness.

large industry market shares offering looser covenants to attract customers or avoid triggering industry-damaging investment cuts. We show that this is not the case: larger industry market shares are associated with stricter covenants, consistent with the findings by Gorostiaga (2022), while the estimated effect of bank specialization on covenant strictness increases by 55% when we disentangle industrial specialization from industry market-share.[6]

Related literature: This paper is related to three streams of literature. First, we contribute to the literature on specialization by financial intermediaries in credit markets (Acharya, Hasan, & Saunders, 2006; Beck, De Jonghe, & Mulier, 2022; Carey et al., 1998), and in particular on specialization by banks (P. G. Berger, Minnis, & Sutherland, 2017; Blickle et al., 2023; Casado & Martinez-Miera, 2022; De Jonghe et al., 2020; Di & Pattison, 2023; Duquerroy et al., 2022; Gopal, 2021; Jiang & Li, 2022; Paravisini et al., 2023). These studies document the presence of specialization in lending towards foreign export markets (Paravisini et al., 2023), geographical regions (Casado & Martinez-Miera, 2022; Duquerroy et al., 2022), and industries (Blickle et al., 2023; Di & Pattison, 2023; Jiang & Li, 2022). They provide evidence that banks' credit-supply responses to funding shocks depend on the bank's area of specialization (De Jonghe et al., 2020; Jiang & Li, 2022; Paravisini et al., 2023), and that banks offer lower rates and larger credit amounts (Blickle et al., 2023) and are less likely to demand audited financial information (P. G. Berger et al., 2017) in industries where they are specialized. Overall, credit from specialized banks appears difficult to substitute.

Uniquely, we exploit loan covenants to provide direct evidence of specialized banks' information advantage and link it to real effects. Inspecting covenant strictness at loan inception allows us to gauge how specialization changes banks' screening practices and shapes credit contracts and control rights allocation. Looking at covenant violations, instead, allows us to assess how specialization interacts with ex-post monitoring of borrowers and its effects. Ultimately, we find a compelling reason why specialized credit is difficult to substitute for: Bank specialization allows for less strict control rights allocation ex-ante and insures firms against inefficient investment cuts if difficulties emerge.

Second, we contribute to the literature on financial contracting and its determinants by

6. Specifically, Gorostiaga (2022) shows that banks with high market share write stricter covenants to limit debt-funded growth, lowering the risk of their industry exposure.

analyzing the effects of bank specialization on contract terms. Several works highlight the role of borrower or lender characteristics for the determination of loan covenants (e.g. Berlin & Mester, 1992; Billett, King, & Mauer, 2007; Bradley & Roberts, 2015; Demiroglu & James, 2010; Murfin, 2012), or interest rates (e.g. Ivashina, 2009). Closer to our paper, only a few studies stress the importance of jointly considering borrowers' and lenders' characteristics when looking at the determinants of contract features. For example, Prilmeier (2017) shows that relationship lending affects the design of financial covenants. Hubbard, Kuttner, and Palia (2002) and Santos and Winton (2019) document that the interaction of bank capital and firm profitability matters for determining loan spreads. With respect to these studies, we provide an additional joint dimension—the lender's specialization in the borrower's industry—that is relevant for determining pricing and non-pricing terms.

Third and last, we contribute to the literature on covenant violations and firm outcomes. Several studies have exploited this setup to study the implications of financing frictions for firm investment (Chava & Roberts, 2008), employment (Falato & Liang, 2016), firm value (Nini et al., 2012), and CEO turnover (Ferreira, Ferreira, & Mariano, 2018). Closer to our paper, Chodorow-Reich and Falato (2022) study how the effect of covenant violations changes depending on lender characteristics. While they focus on the implications for firms' access to credit depending on a lender's exposure to the 2007-08 financial crisis, we document how the effects of violations on firm-level investment growth and performance change when the lender is specialized in the firm's industry.

The paper proceeds as follows. In Section 2, we describe the sample construction. In Section 3, we illustrate how we measure specialization and provide evidence of bank specialization in the syndicated loan market. In Section 4, we present our identification strategy and sample characteristics. In Section 5, we present our main results, discuss several alternative explanations, and display our robustness checks. In Section 6, we provide concluding remarks.

2 Sample Construction

To characterize specialization and to study its financial and real implications, we construct a sample of syndicated loans matched with bank and firm characteristics. Our two main data

sources are LPC DealScan and Compustat. LPC DealScan contains detailed information on syndicated loans, including loan amounts, covenants, pricing, and maturity. Even though syndicated lending constitutes a fraction (about 60%) of total commercial and industrial bank lending, it is commonly employed to investigate bank lending and the resulting real effects (e.g., Chakraborty, Goldstein, & MacKinlay, 2018; Chodorow-Reich, 2014).

Compustat provides balance-sheet information for both banks and firms. We merge the loan data in Dealscan with borrowers' quarterly financial information in Compustat through the link table provided by Chava and Roberts (2008), which spans the period from 1987 to 2017.[7] We also employ firms' Text-based Fixed Industry Classification (TFIC) developed by Hoberg and Phillips (2010, 2016), which is available for most public companies present in Compustat starting from 1987. We match banks in Dealscan with their quarterly financial information in Compustat using the link table provided by Schwert (2018), which identifies the Bank Holding Company (BHC) of all the DealScan lenders with at least 50 loans, or $10 billion loan volume in the matched DealScan-Compustat sample. We define a bank to be the BHC, not the subsidiary, to ensure that our results are not confounded by the potential correlation between the lending activities of the same BHC's subsidiaries (Houston, James, & Marcus, 1997).

A lending syndicate involves at least one lead arranger and, commonly, further participant banks. Lead arrangers not only supply credit, but also negotiate the loan terms with the borrower, exercise due diligence, and invite participant banks, whereas participant banks solely supply credit and do not deal with the borrower directly. In line with other studies (e.g., Chakraborty et al., 2018; Prilmeier, 2017; Schwert, 2018), we focus only on lead arrangers, because of their active role in designing loan terms and monitoring. They retain the duty to manage the loan and enforce covenants even when they may not retain the entirety of the loan amount on their balance sheets (even if lead arrangers retain a greater loan portion, they may securitize some; see, e.g. Ivashina, 2009).

In this work, we identify lead arrangers using the categorical variable and the textual description of banks' role provided by Dealscan, and follow the procedure outlined in Chakraborty et al. (2018) in doing so.[8] Then, in our baseline analysis, we attribute the whole loan amount

7. The linking table is constantly being updated. As of July 2023, this is the most recent and comprehensive version.

8. Specifically, DealScan has two fields that can be used to determine the lead arranger: a text variable that

to the lead arrangers in the syndicate. If there are multiple lead arrangers, we split the loan amount equally among them. Nonetheless, we show that our analysis is robust to employing many alternative methods for attributing loan shares to lead arrangers (as in e.g., Chodorow-Reich, 2014; De Haas & Van Horen, 2013; Doerr & Schaz, 2021), as well as constructing our specialization measure using only subsets of loans that are more likely to be retained on lead arrangers' balance sheets, e.g. revolvers.

We restrict the sample to loans that originated between 1996 and 2016, because the coverage of the syndicated lending activity and contract terms in Dealscan is sparse before 1996 (Chava & Roberts, 2008). We further restrict the sample to loans provided to borrowers headquartered in the US. We also drop from our sample all loans to financial corporations (Compustat SIC codes from 6000 to 6999).[9]

We first investigate the relationship between bank specialization and the covenant strictness at loan origination, and thus, we must define what a loan is in our analysis. Although the most granular unit of observation in DealScan is a loan facility, we conduct this analysis at the package (a collection of facilities) level, because information on loan covenants is package-specific. Using facility-level observations, rather than package-level observations, would artificially inflate significance levels given the dependence between facility-level observations in the same package (Murfin, 2012). For this reason, we aggregate facility-level information at the package-level by weighting the facility characteristics – loan spread, fees, maturity, and collateral requirements – by the respective facility amounts. Thus, the unit of analysis is the package-bank-firm triplet at a quarterly frequency. Following Murfin (2012), we assume the relevant contracting decisions take place during the quarter before the actual loan starting date, to account for the time lag

defines the lender's role in the syndicate and a yes/no lead arranger credit variable. Chakraborty et al. (2018) define lead arranger, within each syndicate, as the bank that "scores" highest in the following ten-part ranking: "1) lender is denoted as 'Admin Agent', 2) lender is denoted as 'Lead bank', 3) lender is denoted as 'Lead arranger', 4) lender is denoted as 'Mandated lead arranger', 5) lender is denoted as 'Mandated arranger', 6) lender is denoted as either 'Arranger' or 'Agent' and has a 'yes' for the lead arranger credit, 7) lender is denoted as either 'Arranger' or 'Agent' and has a 'no' for the lead arranger credit, 8) lender has a 'yes' for the lead arranger credit but has a role other than those previously listed ('Participant' and 'Secondary investor' are also excluded), 9) lender has a 'no' for the lead arranger credit but has a role other than those previously listed ('Participant' and 'Secondary investor' are also excluded), and 10) lender is denoted as a 'Participant' or 'Secondary investor'." (Chakraborty et al. 2018, Online Appendix, p.1)

9. Note that, to compute our baseline measure of specialization, we retain every loan from 1987 to 2016 for which we can identify a borrower in Compustat and for which the TFIC classification is available, regardless of borrowers' headquarters or SIC codes. Computing the measures of specialization using only loans from 1996 does not affect our results.

between the effective moment in which banks and firms commit to loan contract terms and the legal start date reported by DealScan.

To compute bank specialization, we need to compute each bank's time-varying exposure to each industry.[10] Since DealScan only provides information on loan originations, we create a panel akin to a credit registry, by expanding the data over the maturity of the loan (as in e.g., Chakraborty et al., 2018; Doerr & Schaz, 2021). We assume each loan is outstanding until the original end date, or, if the information is available on DealScan, until the amended end date.[11] In this way, we obtain a dynamic representation of the commercial lending portfolio for each bank in our sample, which we then use to compute time-varying shares of each industry in each bank's lending portfolio.

As a last step, we examine how firm outcomes change for core and non-core borrowers, across specialized and non-specialized lenders, following covenant violations. We conduct this analysis at the firm-quarter level, by aggregating the expanded loan data for each firm-quarter. Then, we combine the firm-quarter level panel data with covenant violations extracted from firms' 10-Q and 10-K SEC filings in EDGAR. Regulation S-X compels firms to report any breach of covenant which has not been cured in the notes of the financial statements (Roberts & Sufi, 2009). In particular, we use data from Griffin et al. (2018), who extract violations from SEC filings using textual analysis from 1997 to 2019.[12,13] This approach allows us to follow covenant violations and their consequences even if there is an amendment in the covenant-mandated threshold, which is not always reported in Dealscan.

We rely on bank-firm relationships in Dealscan to connect the covenant violation data with firms' lead lenders. Although matching violations to lenders is clear-cut when a firm has a single lead lender in a given quarter, we make the following assumption to link violations to lenders

10. Section 3.1 illustrates how we construct bank specialization in detail.
11. To track loan amendments, we exploit the information present in the "facilityamendment" table in the legacy version of Dealscan, in WRDS. One potential caveat is that renegotiated/amended loans could appear as new loans in DealScan; if loan renegotiations are not identically and independently distributed across bank-firm pairs, this could imply an imperfect measurement of a bank's lending activity. To partially address this issue, we perform our analysis by dropping from our sample all the loans that have a description such as "This loan amends and restates..." in the various "comment" fields available in Dealscan. All the results of the paper are robust to not dropping these loans.
12. Nini et al. (2012) initially extracted violations from firms' SEC filings through a text-search algorithm over the period of 1997-2008.
13. We are grateful to Greg Nini for sharing the most updated data on covenant violations.

when firms have multiple lead lenders. Specifically, for multi-lead firms in a single quarter, we consider the firm's main lead lender the bank with the highest outstanding loan to the firm, among all the firm's lead lenders, in that quarter.[14] Then, if there are multiple lead lenders with the same loan exposure, we consider the main lead lender the bank that has the longest relationship with the firm. If there are still ties, then we break it by considering the lead lender the bank with the highest overall outstanding loans in the given quarter. Nevertheless, we show that our results remain robust if we focus only on single-lead bank firms in each quarter.

3 Measure and Evidence of Bank Specialization

In this section, we describe how we measure bank specialization and then provide illustrative evidence of specialization in the US syndicated loan market.

3.1 Measure of Bank Specialization

Main measure of bank specialization. We employ the same approach in Blickle et al. (2023), which is similar to the measure adopted by Paravisini et al. (2023). We measure a bank's specialization in an industry computing that industry's share in the bank's total lending portfolio. The logic is that, if a bank has a lending advantage towards an industry, that will result in a large portfolio concentration in that industry by revealed preferences. However, an industry's share in the bank's lending portfolio depends also on industry size. For example, manufacturing firms receive more loans than construction firms, on average. In this case, the weight of the manufacturing industry in a fully diversified bank's portfolio is higher than the weight of the construction industry. That is, a share of an industry in a fully diversified bank's portfolio would be in line with the share of the industry in the entire lending market. For this reason, we need to account for the degree to which lending to a specific industry by a bank differs from a fully diversified bank's lending activity. Hence, we measure bank specialization as the ratio of the share of an industry in the bank's lending portfolio relative to the share of an industry in the entire lending market:

14. As a benchmark, we split the loan amount equally among lead lenders. This results in multiple lead lenders with the same loan exposure unless the firm has another outstanding loan with one of these multiple lead lenders.

$$Specialization_{i,b,t} = \frac{S_{i,b,t}}{S_{i,t}} \tag{1}$$

$$\text{where } S_{i,b,t} = \frac{AmountLent_{i,b,t}}{\sum_{i=1}^{I} AmountLent_{i,b,t}} \text{ and } S_{i,t} = \frac{AmountLent_{i,t}}{\sum_{i=1}^{I} AmountLent_{i,t}}$$

where $S_{i,b,t}$ denotes the share of outstanding credit issued to industry i in bank b's total lending portfolio at time t, and $S_{i,t}$ is the share of credit issued to sector i by all banks at time t. Specialization is the degree to which a bank concentrates its lending into an industry, *relative* to a perfectly diversified bank. For example, if market-wide lending to an industry accounts for 3%, while a bank lends 6% of its total portfolio to the same industry, that bank is specialized in that industry by a factor of two.

As a baseline, we average both $S_{i,b,t}$ and $S_{i,t}$ over a rolling window of 12 quarters (3 years).[15] We take this average so that we put less weight on industries whose shares are sporadically larger (or smaller) in banks' portfolios and/or the entire lending market. For example, a high industry share might be simply the result of a single large loan at a time of relatively low lending activity in that industry. Using average shares, we ensure that our specialization measure is not affected by such large deviations.[16]

Herfindahl-Hirschman Index. To obtain descriptive evidence on the relevance of bank specialization, we also employ the Herfindahl-Hirschman Index (*HHI*), commonly used to measure the degree of market concentration. Specifically, we use it to characterize the level of concentration of the market portfolio and of the average bank, with respect to the different industries in the economy. The *HHI* of the commercial lending portfolio of a given bank is

15. As a benchmark, we choose 12 quarters as this length ensures a good balance between capturing persistence and avoiding that our measure simply mimics the origination of new loans—the average maturity of a loan in DealScan is around 4 years. The choice of 12-quarter rolling window length, performed for similar reasons, can also be found in Paravisini et al. (2023). Notwithstanding this, in Section 5.4, we show that our results are robust when we measure specialization using rolling windows of different lengths.

16. Despite using banks' average portfolio shares, such large deviations can still lead to large right-tails, which can distort our estimations. We address this concern by showing that our results are robust to defining specialization as the distance between the industry's share in the bank's total lending portfolio and the industry's share in the entire lending market. We discuss these results in Section 5.4.

defined as follows:

$$HHI_{b,t} = \sum_{i=1}^{I} S_{i,b,t}^2 \tag{2}$$

$HHI_{b,t}$ reaches its maximum – which is equal to 1 – in presence of a perfectly concentrated portfolio, i.e. $S_{i,b,t} = 1$ for only one industry i, and 0 for all the others, and its minimum – equal to $1/I$ in presence of a perfectly diversified portfolio, i.e. $S_{i,b,t} = 1/I \ \forall i \in I$.[17]

We can then compute the *HHI* for the average bank by simply taking a weighted average of the *HHI* of all banks, in which the weights are represented by a bank's share of total credit:

$$\overline{HHI}_t = \sum_{b=1}^{B} \frac{AmountLent_{b,t}}{AmountLent_t} \left(\sum_{i=1}^{I} S_{i,b,t}^2 \right) \tag{3}$$

Similarly, we can define the *HHI* for the market portfolio. If we think of all the credit exposures of all the banks, summed together at a given time, as the "market" portfolio for the syndicated loan market at that time, then we can define the *HHI* for the "market" portfolio as follows:

$$HHI_{M,t} = \sum_{i=1}^{I} S_{i,t}^2 \tag{4}$$

Why using relative portfolio shares is important. Looking at *relative* portfolio shares captures the intuitive and theory-grounded idea (Boyd & Prescott, 1986) that the portfolio of a specialized bank should not be representative of the portfolio of the population. To help understand this approach and highlight its advantages over measures that capture the overall concentration of the loan portfolio, such as the *HHI*, Figure 1 presents some simple examples involving two banks and an economy with only two sectors. In panel (a), neither bank is specialized, as each bank's balance sheet is split in half between the two sectors and the pattern

17. We define portfolio shares as decimal values between 0 and 1, i.e. they are not in percentage terms. Therefore, the HHI is bounded between 0 and 1. In other applications in which percentage terms are used, the HHI varies between 0 and 10000.

is equal across banks. Panel (c) is similar to the first case. Although one bank is larger and the other smaller, and they are both mostly exposed to Sector A, the pattern of exposure is the same. Thus, large exposures to Sector A might simply reflect a higher credit demand from Sector A relative to Sector B, and we cannot detect evidence that one particular bank is specialized.

In panel (b), instead, we have an example of specialization. In this case, Bank 1 is specialized in Sector A, and Bank 2 is specialized in Sector B. Each bank may lend to both sectors – and they do – but each of them is abnormally exposed to one sector within its portfolio and relative to the sector's share in the whole lending market, indicating a bank-level pattern that is coherent with comparative advantage in lending towards that sector. This does not depend simply on the amount of credit that goes from each bank to each sector, but rather depends on the sector's share in the bank's lending portfolio. In panel (d), Bank 2 is specialized in Sector B even though it provides less credit to Sector B relative to Bank 1.

3.2 Evidence of Bank Specialization

Since a bank's portfolio share towards a given industry is a proxy to capture comparative advantage in lending towards specific types of projects in the economy, we use the TFIC (Hoberg & Phillips, 2010, 2016) to define what an industry is. The TFIC adapts annually on the base of each firm's actual core operation. Specifically, the TFIC uses textual data to track the products (types of projects) that characterize each firm's core business activity. Then, it classifies firms as belonging to a specific cluster (industry) based on the similarity of the firm's core activity. Different from a static NAICS or SIC industry definition, the TFIC follows the evolution of the firm's core business over time by taking into account the evolution of the product market as well as the creation of new product markets, and thus it is closer in spirit to what we aim to capture.

We employ the 25-industry version of the TFIC, as this ensures a good balance between the number of firms present in DealScan in each industry and sufficient precision in the characterization of the different sets of projects in the economy. We apply the methodology described in the previous subsection and compute the two measures of specialization for all the banks in the sample of syndicated loans granted over 1987-2016.

To understand patterns of industry specialization in the syndicated loan market, we start

looking at the measure of loan portfolio diversification. In Figure 2, we plot the *HHI* of the commercial lending portfolio for the average bank computed for each quarter as in Equation (3), and the same measure computed for the market portfolio as in Equation (4). A larger value of *HHI* implies a larger concentration of exposure. Comparing the average *HHI* of the market portfolio (~ 0.07) and that of the average bank (~ 0.105) over time, we see that the average bank is significantly more concentrated than the market. This implies that not every bank is lending to every industry in the same way, providing suggestive evidence of specialization in lending.

Second, we look at specialization by industry. Specifically, we want to understand how common are abnormally large loan portfolio shares in each industry in our sample. Figure 3 shows, at four different moments in time, the box-and-whisker plots of the distribution of bank portfolio shares towards each industry i (i.e., $S_{i,b,t}$). We can see that across time most industries' loan share distributions are skewed to the right and almost every industry displays at least one bank that is a right-tail outlier (a blue dot, in the plot). Moreover, specialization is persistent. In Figure 4, we plot the autocorrelation of the relative lending portfolio shares, $Specialization_{i,b,t}$, defined in Equation (1). We can see that the autocorrelation between the relative share for bank b towards industry i at year t and at year $t+10$ is still 55%. That is, if a bank concentrates its lending towards specific industries, the bank is very likely to keep doing the same in the future.

Overall, the evidence we presented in this section points to bank specialization in lending as a defining feature of the US syndicated loan market.

4 Empirical Strategy and Sample Characteristics

To link bank specialization to information advantages and to real effects on borrowing firms, we conduct two classes of analyses. First, we examine specialized banks' ex-ante screening abilities by looking at how they set covenants at loan origination. Then, we examine how specialized banks monitor their borrowers by tracking firm outcomes after covenant violations.

4.1 Bank Specialization and the Strictness of Loan Covenants

Our first goal is to understand whether specialization is associated with information advantages in lending to specific industries of the economy. We therefore need an empirical proxy to capture the notion of information advantage when a bank is lending to firms in a given industry. To achieve this, we build upon the theoretical work by Gârleanu and Zwiebel (2009), and consider the covenant structure embedded in a loan contract as capturing the information "distance" between a bank and a firm. The more restrictive the contract – in terms of what the firm can or cannot do in order not to trigger a technical default by violating a covenant – the less information a bank has about a borrower, according to the theory. Thus, by looking at the strictness of loan covenants at loan inception, we can directly assess whether specialized banks are closer to their borrowers in terms of information.

To assess systematic differences in covenant strictness at loan origination between core and non-core borrowers, the ideal setting would involve observing the same bank lending to multiple firms that are identical in everything except their industry of operation. This requires random assignment in the choice of firms' industry of operation, the choice of banks' specialization, as well as the matching between banks and firms. However, this may not always be the case. For example, it may be that specialized banks focus on serving overall less risky customers that require less tight covenant supervision ex-ante, beyond any information advantage. Or it may be that specialized banks face patterns of risk in the rest of their portfolio that allow them to be more lenient with their customers.

To investigate the effect of bank specialization on covenant strictness by taking into account the concerns outlined above, we estimate the following specification:

$$\begin{aligned} Y_{l,f(i),b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot Specialization_{b,i,t-1} \\ + \gamma_F \cdot Firm\ Controls_{f,t} + \gamma_L \cdot Loan\ Controls_{l,f,b,t} + \varepsilon_{l,f,b,t} \end{aligned} \tag{5}$$

where $Y_{l,f(i),b,t}$ stands for covenant strictness of loan l, originated in quarter t, by bank b, to firm f, operating in industry i.[18] We rely on the measure of covenant strictness developed and made available by Demerjian and Owens (2016), which is based on the measure developed in

18. In further tests, we will also use other loan characteristics (e.g., spread, amount, etc.) as dependent variables.

Murfin (2012).[19] Specifically, Demerjian and Owens (2016) define covenant strictness as the *ex-ante* probability of violating at least one *financial* covenant during the lifetime of the loan, ranging from 0 to 100. This measure is characterized by four properties, all valid on an "all else equal" basis. First, it increases in the number of covenants; second, for a fixed number of covenants, it decreases in the initial slack of a covenant, defined as the distance between the level of the covenant threshold and the starting level of the corresponding financial ratio; third, it increases in the volatility of the ratios targeted by covenants; fourth, it decreases in the correlation between covenants—intuitively, since even a single covenant's violation can trigger a technical default, contracting on independent financial ratios increases the probability of violation.[20]

To reduce the endogeneity concerns outlined above, we estimate Equation (5) using a granular set of fixed effects. First, we use bank×year-quarter fixed effects ($\alpha_{b,t}$), inducing a within-bank-time comparison. Specifically, we compare loans arranged by the *same bank* in the *same year and quarter*, to borrowers within industries in which the bank is specialized versus borrowers in other industries in which the bank is not specialized. Bank-time fixed effects, however, do not fully account for borrower selection problems highlighted at the beginning of this section. Even after absorbing all time-varying bank-specific factors, it may be the case that within each bank's borrower pool, core borrowers are systematically different from non-core borrowers. To address this, we include industry×time fixed effects ($\alpha_{i,t}$), to capture all time-varying observed and unobserved industry heterogeneity, and firm fixed effects (α_f), to account for all firm-specific, observable, and unobservable characteristics that are fixed over time.[21]

$Specialization_{b,i,t-1}$ is our main variable of interest, the ratio of industry i's share in bank b's lending portfolio (averaged over 12 quarters), relative to industry i's share in the entire lending market (averaged over 12 quarters), at $t-1$ (defined and commented in Equation (1)). The coefficient of interest, β, captures how covenant strictness varies for contemporaneous loans arranged to sectors in which the bank' pre-set concentration is twice that of the market.

19. The measure developed by Demerjian and Owens (2016) can be downloaded on Edward L. Owens' personal website https://sites.google.com/site/edowensphd/researchdata. We thank the authors for making the measure available.
20. For further details, we refer to Murfin (2012) and Demerjian and Owens (2016).
21. Ideally, we would rather have a within bank-time and within firm-time specification. Unfortunately, as we work on a sample of very large loans, we do not see many firms doing multiple deals in the same year-quarter. This makes the adoption of such a strategy infeasible.

In order to further limit sources of bias, we account for a wide variety of observable, time-varying borrower and loan characteristics. At the *firm-level*, we include separate intercepts for each S&P long-term issuer credit rating (with the omitted dummy variable capturing unrated firms), the expected default probability (EDF) based on the Merton model of credit risk (Merton, 1974) and computed implementing the "naive" approach proposed by Bharath and Shumway (2008), as well as the log of total assets, debt to tangible net worth ratio, current ratio, the ratio of property, plant and equipment to assets, interest coverage ratio, and market-to-book ratio. These controls account for repayment risk (especially for non-rated firms), size, leverage, liquidity, the ability to provide collateral, profitability, and investment opportunities.[22] At the *loan-level*, we include the log of maturity, the log of the loan amount, all-in spread drawn, the fraction of revolving credit over the total package amount, separate intercepts for different loan purposes, and the log of the number of syndicate participants, accounting for the trade-off that might exist between different loan characteristics and covenants (e.g. Bradley & Roberts, 2015).[23]

Finally, to ensure that our standard errors account properly for repeated observation by firms and banks, we double-cluster standard errors at the bank and firm levels.

4.2 Bank Specialization and Real Effects

In addition to exploring specialized banks' screening capabilities at loan origination, we also investigate whether specialized banks' monitoring leads to different real effects for their core borrowers. Checking real effects is important as their presence ensures that the phenomenon we study is of ultimate economic importance, and not just a matter of hypothetical control rights allocation without actual real impact. Moreover, evidence of better performance of core borrowers after moments of stress would shed further light on the plausibility of information advantage as a driver of specialization. Indeed, banks with an information advantage should be able to better manage moments of crisis, with positive returns for their borrowers.

To examine whether bank specialization has real effects, we focus on violations of financial

22. Similar controls are used in similar studies focusing on the determinants of loan covenant strictness, such as Murfin (2012) or Prilmeier (2017).

23. We also test that systematic differences in these characteristics do not contrast our main result and its interpretation, using some of these loan-level variables as left-hand variables.

covenants. Covenant violations constitute “technical defaults" allowing creditors the right to demand immediate repayment of principal. However, creditors rarely execute such threat, but they rather use it to gain bargaining power in renegotiations that frequently follow violations, i.e., covenant violations transfer control rights from borrowers to creditors (Chava & Roberts, 2008). The empirical literature has already shown that creditors' intervention *(monitoring)* following violations has material effects on firm outcomes (Chava & Roberts, 2008; Falato & Liang, 2016; Ferreira et al., 2018; Nini et al., 2012; Roberts & Sufi, 2009). Hence, by looking at differences in firm outcomes before and after a violation, we can link the effectiveness of banks' monitoring to their specialization.

Covenant violations help us identify the impact of specialization on firms, as violations constitute “jumps” in control rights' allocation. Thus, if firms' observables and unobservables do not suddenly change in the proximity of control rights' reallocation, then we should be able to attribute sudden changes in borrowers' outcomes to banks' intervention. As our goal is to trace differences in firms' outcomes to banks' specialization, we must focus on the *interaction* between specialization and covenant violation. For this purpose, we need to also ensure that what we observe is not the spurious effect of the interaction between other firm characteristics and specialization, on top and above the violation of covenants. Moreover, we must also ensure that we account for the potential fundamental differences between core and non-core borrowers. Even then, we may still obtain a biased estimate, as we have shown that covenants from specialized banks to core borrowers are slacker. Nonetheless, greater slackness implies that the missteps that led to violations were more notable, making the violations by core borrowers worse. For this reason, the intervention by specialized banks might be harsher when their core borrowers violate ex-ante less strict covenants. Therefore, the bias we face is against finding evidence of core-borrowers' better performance after violations. Such bias actually bolsters the economic significance of a positive finding.

Building on Nini et al. (2012), we estimate the following regression model at the firm-quarter level, adapting it so to mitigate the concerns outlined above:

$$
\begin{aligned}
Y_{f,t+4} - Y_{f,t} = {} & \theta_1 Specialization_{b,i,t} \times Violation_{f,t} \\
& + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} \\
& + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}
\end{aligned} \tag{6}
$$

where the dependent variable is the difference in firm *f*'s outcomes from *t* to *t+4*. We use investment (capital expenditures, scaled by tangible fixed assets) as our main outcome variable, as it is an all-mark of real effects following creditors' control. We also look at the effect on firms' operating performance and default risk. We define our first variable of interest, $Specialization_{i,b,t-1}$, as before. Then, $Violation_{f,t}$ equals to 1 if firm f violated a financial covenant at year-quarter t, and to 0 otherwise. In line with Nini et al. (2012), we focus on new covenant violations, i.e. violations by a firm that has not violated any covenant in the previous four quarters in any of its syndicated credit relationships. Focusing on new violations allows us to attribute changes in firm policies to the bank's intervention characterized by its level of specialization. Otherwise, our results could be contaminated by other recent violations that may involve different banks with different levels of specialization.

To control for time-varying observable firm factors that may drive the impact of violations, we add the same firm-level controls (denoted as $X_{f,t}$) as Equation Equation (5), plus the yearly changes in firm tangibility and in the logarithm of assets, following Nini et al. (2012). Additionally, we include the interactions between firm-level controls and bank specialization, assuaging the concern that our results could be simply due to some unobserved correlation between firm outcomes and the interplay of specialization with the characteristics of their borrowers (Chodorow-Reich & Falato, 2022). We also include industry×year-quarter ($\alpha_{i,t}$) and bank×year-quarter fixed effects ($\alpha_{b,t}$) to control for all time-varying industry and bank heterogeneity. As before, the latter leads to a within-bank comparison across borrowers. Fiscal quarter fixed effects ($\eta_{fiscal\ t}$) are also included because firm outcomes may follow seasonal patterns with respect to fiscal quarters. As we use four-quarter differences in firms' outcomes as dependent variables, firm fixed effects are differenced out of the specification. We double-cluster standard errors at the firm and bank levels.

The coefficient of interest is the interaction coefficient, θ_1, measuring the difference in outcomes after a violation between specialized banks' core and non-core borrowers.

4.3 Sample Characteristics

All variables, except the measures of covenant strictness and of expected default probability which are naturally bounded between 0 and 100, are winsorized at the 1st and 99th percentile.

Table 1 reports summary statistics for the samples we use in our empirical analysis. In particular, we distinguish three samples. The first one, *matched sample*, is the full DealScan-Compustat matched sample obtained from the sample selection procedure described in Section 2. The second one, *strictness sample*, is the subsample of loans for which both the All-In Drawn Spread and covenant strictness measure (developed by Demerjian and Owens (2016)) are non-missing. We examine the relationship between bank specialization and covenant strictness at loan origination using this subsample. The third one, *violation sample*, is a sample of firms' balance sheet information from Compustat at the firm-quarter level, which we use to investigate differences in the effects of covenant violations.

The top panel of Table 1 reports information on the characteristics of loan-level variables in our samples. The strictness sample includes 11,698 distinct loans. On average, a loan agreement contains more than two financial covenants and displays a level of strictness such that the borrower has a 36% probability to violate at least one covenant as well as an All-In-Drawn Spread of 188 basis points. The average loan package has a maturity of almost 4 years, amounts to $570 million, and the average syndicate size (number of lenders) is 9. These statistics are similar to the larger *matched sample*, which displays on average a smaller number of covenants, a larger average loan amount, and a slightly smaller number of syndicate members.

The mid panel of Table 1 reports information on the borrowers in our samples. The *strictness sample* includes 11,241 firm-quarter observations for 3,634 unique firms. These are large, public firms, which average $900 million in total assets. About 50% of them do not have a long-term issuer credit rating, and for those that have a rating, the average rating is BBB-/BB+.[24] Over our sample period (1996-2016), they enter, on average, into 9 syndicated loan agreements.

24. Rating is a categorical variable. We assign value 1 to AAA ratings, 2 to AA, and so on. The largest value is 9, assigned to "D" or "SD" indicating default in the Capital IQ Long-Term Issuer Credit Rating.

Overall, there are no major differences between the *strictness* and the *matched samples*.

Table 1, following the information on the borrowers, reports information on the lenders in our samples. The *strictness sample* includes 2,104 bank-quarter observations for 95 banks. The average bank is large, with $250 billion in total assets, a deposit-to-asset ratio of 60% and a book equity capital amounting to 7%.

Turning to our main explanatory variable, we observe that an average bank's portfolio concentration in a given industry is 1.6 times as large as the entire market-wide concentration in the same industry. Lastly, the bottom section displays the information on firm outcomes for the *violation sample*.

5 Results

5.1 Bank Specialization and Loan Covenant Strictness

We first look at how specialized banks write covenants at loan origination. Table 2 reports the results from the estimation of Equation (5) using covenant strictness as outcome. Column (1) includes bank×year-quarter, industry×year-quarter, and firm fixed effects. Column (2) additionally adds firm controls. Column (3) further controls for the syndicate and other loan characteristics except for loan price. Finally, column (4) also controls for price *(all-in-drawn spread)*, since there might be a trade-off between the strictness of covenants and the cost of credit, i.e., stricter contracts might be associated with lower costs and vice versa (Bradley & Roberts, 2015).

We notice that, in each column, the point estimate on the specialization variable is negative and statistically significant at the 1% confidence level, with a magnitude that remains identical across specifications. This indicates that banks specializing in lending towards a given industry write less strict contracts when entering loan agreements with firms in that industry. In particular, if a bank's portfolio concentration in an industry is twice that of the market, covenants to core borrowers are 4.7 pp looser than covenants on peer loans to non-core borrowers. This estimate is economically significant, as it amounts to 13% of the empirical mean of the distribution of covenant strictness in our sample (see Table 1, first line).

To further dispel the concern that our result on strictness could be undone by other loan characteristics due to trade-off between different loan terms, we also analyse how bank specialization affects the other loan terms. We estimate Equation (5) using various contract terms as dependent variables, and report the results in Table 3. Columns (1)-(4) show the estimates for four important price terms: the loan spread over LIBOR, the all-in spread drawn, the all-in spread undrawn, and the measure of the total cost of borrowing developed by Berg, Saunders, and Steffen (2016). The estimated effects of specialization on all price terms except the spread undrawn are negative and statistically significant.

Columns (5) and (6), instead, display the estimates of two non-price terms: the log of maturity and the log of loan amount. The impact of specialization on these two outcomes is positive, with only the effect on the loan amount being marginally significant. Overall, in accordance with Blickle et al. (2023), our results indicate that credit from specialized banks to their core borrowers is cheaper, and possibly more abundant.

The negative, economically and statistically significant relationship between specialization and covenant strictness suggests less information asymmetry (or "distance") at loan origination between a bank specialized in lending towards a given industry and firms in that industry. This is in line with the theoretical framework developed by Gârleanu and Zwiebel (2009) and signifies greater ex-ante knowledge of core borrowers by specialized banks during the initial screening phase of the lending relationship. The evidence of cheaper and larger credit from specialized banks to their core borrowers, further supports this interpretation and suggests that specialized banks not only leave more leeway to their core borrowers, but they appear not to see this as a risk for which they must be properly compensated. In conclusion, the evidence on contract terms at loan origination strongly aligns with explanations of bank specialization based on the existence of information advantages.

5.2 Bank Specialization and Real Effects

Thus far, our analysis has shown that banks write less strict covenants to borrowers in industries in which they are specialized. This suggests that industry-specific knowledge allows banks to screen borrowers more effectively, sparing on the costly tool of creditor intervention

by writing covenant clauses expected to become active less often. In this section, we investigate whether specialized banks also monitor their borrowers more effectively following covenant violations (i.e., when they obtain control rights) using their information advantage, and ultimately help them improve outcomes. Indeed, even if looser covenants may imply a cost-saving on intervention, if we were to discover that specialized banks' interventions were more disruptive, that would call our evidence in favour of information advantage into question.[25]

The effect on Investment. As a first pass, in Figure 5, we inspect whether the new (unique in four quarters) violation of a covenant has a different effect on investment for core borrowers of specialized banks relative to other borrowers. For graphical purposes, we define specialized banks as those that are in the fourth quartile of the 12-quarter averaged portfolio share distribution in a given industry. We plot in red the investment growth of core customers of specialized banks, while in dashed blue the investment growth of all non-core customers. We can see that the difference in investment levels between the two groups starts to increase and grows over time after a covenant violation, whereas it was negligible before. Specifically, investment levels decrease in the first quarter of the violation for both groups, but the decrease is clearly stronger for non-core borrowers. After the first quarter, investment levels start to increase for both groups, but the recovery is more dramatic for core borrowers.

Our unconditional evidence indicates that core borrowers of specialized banks experience smaller declines in investment following covenant violations. Nonetheless, due to the concerns expressed in Section 4.2, we now turn to our regression analysis. We also stress again that the differences in the reaction of firms' outcomes to violations may be biased below by the fact that covenants from specialized banks to core borrowers are laxer. Thus, core customers' violation could be "worse", warranting tougher interventions. That we consistently find the opposite, makes our results only more striking.

Table 4 presents the results from the estimation of Equation (6) using the four-quarter differences in investment as the dependent variable. Column (1) reports the estimates obtained only adding fixed effects, and omitting our coefficient of interest, the interaction between the violation and specialization measures. The point estimate on the violation dummy is negative and significant at the 5% confidence level, indicating that violating firms experience investment

25. Murfin (2012) documents a similar trade-off between screening and monitoring.

cuts following covenant violations. This is consistent with the evidence provided by Chava and Roberts (2008), who argue that banks obtaining control rights force more conservative policies on violating firms, leading to a reduction in investment.

Column (2) illustrates the results with the interaction term. The coefficient of *Violation* × *Specialization* is positive and significant at the 1% confidence level. Then, in the further columns, we add firm controls as well as their interactions with our *specialization* measure. The point estimate on the interaction term remains positive and significant in each column, with almost no change in the magnitude. Our estimates indicate that the investment of specialized banks' core borrowers declines less than that of non-core borrowers after a covenant violation. Based on our most restrictive specification in column (6), covenant violation within the same bank induces a cut in investments equal to 67 basis points, amounting to 20% of the standard deviation of the investment growth in our sample (see descriptives in Table 1). Nonetheless, such negative impact decreases by about 30% for firms in industries where the bank is twice as specialized as the entire market.

The effect on other outcomes. In addition to investment, we also examine the effect of bank specialization on firms' performance outcomes. Indeed, we want to make sure that the less severe intervention we document cannot be possibly related to harm to the firm in the future. That is, we want to be sure that specialized banks are actually better at monitoring, not just more lenient.

To elucidate this, in columns (1) and (2) of Table 5, we first look at the effect on accounting-based measures of performance: the ratio of operating cash flow to sales and the natural log of sales. The point estimates on the interaction term are positive and significant for both outcomes. In column (3), we then look at the impact on the firm's expected default probability, computed based on the approach by Bharath and Shumway (2008) and that accounts for market performance, providing third-party validation for banks' interventions. The coefficient of the interaction term is negative and significant. Numerically, these results imply that core borrowers of a bank that is twice as specialized in one industry experience a 30% smaller drop in sales, a 20% smaller increase in the expected default probability, and an improvement in operating cash flow over sales (while there is no significant baseline breach impact on that same variable, i.e., the stand-alone coefficient of the violation dummy is negative but not significant) in the four

quarters after violation, with respect to non-core borrowers of the same bank. Taken together, these results suggest that bank specialization has a positive impact on firms' performance.

Overall, the results indicate that, following a covenant violation, core borrowers of specialized banks on average invest more and perform better than non-core borrowers. Such evidence suggests that specialized banks better help borrowers improve outcomes when they obtain control rights. This evidence strongly aligns with an information advantage of specialized banks, which allows them not only to rely less on strict accounting covenants in loan drafting, but also to better monitor their borrowers, leading to real effects for borrowing firms.

5.3 Assessing Alternative Explanations

In this section, we test whether the results presented in Tables 2 and 4 might be explained by other reasons than information advantages of specialized banks. In particular, these results might be explained by three other economic mechanisms: (i) insurance incentives stemming from a high industry market share; (ii) local knowledge spillovers implied by geographical, rather than industrial, specialization; (iii) the presence of borrower-specific knowledge (i.e., relationship lending).

High Industry Market Share

First, banks that are specialized in lending towards a given industry might also provide a relatively large share of credit to that industry, i.e. not only the *relative* concentration is high, but also the *absolute* credit provided. This would point to at least two other potential explanations for our results. On the one hand, if specialization is driven by an industry-specific information advantage, it may itself result in a higher market share. Banks could offer favourable credit terms to crowd out other lenders from a given industry (as in Ioannidou & Ongena, 2010), thereby increasing both their industry market share and their industry portfolio share. If this is the case, the observed effect on contract terms should be driven by the bank's industry market share and not by specialization.

On the other hand, banks with a high market share might have incentives to offer better contract terms to borrowers for reasons unrelated to an information advantage. Specifically,

Giannetti and Saidi (2019) show that banks with a high market share in an industry are more likely to internalize negative spillovers and possible systemic effects of tougher credit conditions in that industry in periods of distress. For analogous reasons, banks might have incentives to write less strict contracts to avoid triggering covenant violations that might be costly for borrowers operating in industries where they have a high market share.

To address these concerns, we estimate Equation (5) with the variable $Market\ Share_{b,i,t}$, defined as the fraction of credit that bank b provides to industry i relative to the total credit supplied to the industry by all banks in quarter t, averaged over 12 quarters as our baseline measure of specialization. As shown in column (1) of Table 6, the estimated coefficient for industry *market share* on covenant strictness is positive and statistically significant at the 1% confidence level, which is consistent with the evidence provided by Gorostiaga (2022). Moreover, controlling for industry market share increases the estimated effect of specialization on covenant strictness by about 55%, indicating that disentangling specialization from raw market power is important for the design of covenants at loan origination.

Additionally, we also run Equation (6) with *industry market share* and its interaction with the violation dummy. As illustrated in column (1) of Table 7, the point estimates on these variables are not significant, suggesting that market power does not have an effect on bank monitoring following violations. At the same time, the coefficient of *violation*×*specialization* is essentially the same as our baseline result (see column (6) of Table 4).

Geographical Proximity

Second, the literature points to the role of geographic distance as an important proxy for the degree of asymmetric information between borrowers and lenders. Loans have been shown to feature more favourable terms when borrowers are geographically closer to lenders (Agarwal & Hauswald, 2010; Degryse & Ongena, 2005), even in the presence of large corporations (Hollander & Verriest, 2016).

We are thus concerned that a bank is specialized in an industry because of lending to specific locations that feature business concentration in that industry and that are geographically close to the bank's headquarters. This geographical proximity between banks and firms in specific industries might in turn explain our results. If this is the case, we would still interpret our

results in light of the information advantage of these banks. However, this advantage would not stem from an industry-specific expertise, but from the acquisition of soft information based on geographical proximity.

To address this issue, we estimate Equations (5) and (6) with a dummy variable, $Same\ State_{f,b,t}$, which is equal to 1 if bank b and firm f are headquartered in the same state in quarter t, and to 0 otherwise.[26] The results are presented in columns (2) of Tables (6) and (7) for the covenant *strictness* and *violation* analyses, respectively. In these tables, the point estimates on the *same state* dummy as well as its interaction with the violation dummy are not significant, while our estimated coefficients of interest remain significant. This signifies that our results arise from banks' industrial, rather than their geographical, specialization.

Relationship Lending

Third, one could argue that the industry-specific information advantage could originate from an information advantage that is borrower-specific. This would be consistent with widespread "relationship lending" (Boot, 2000). For example, Bharath, Dahiya, Saunders, and Srinivasan (2011) and Prilmeier (2017) specifically show that relationship lending matters for the determination of covenants and other contract terms in syndicated loan agreements.

To explore the role that borrower-specific information might have on our results, we define two measures, also employed by Bharath et al. (2011) and Prilmeier (2017). The first one, $Rel.\ Length_{f,b,t}$, denotes the length of a relationship. It is defined as the time elapsed between period t and the first interaction between firm f and bank b in DealScan. The second one, $Rel.\ Intensity\ (Amt)_{f,b,t}$, captures the intensity of a relationship. It is defined as the fraction of credit that firm f obtained from bank b over the total amount of credit firm f received over the 3 years prior to a loan at time t.

We estimate Equations (5) and (6) by interacting these two measures with our main variables of interest. Tables (6) and (7), in columns (3) and (4), report the results from these regressions. Across all specifications, the point estimates on our main variables are virtually unchanged and remain statistically significant, validating the hypothesis that banks have an information

26. We use the historical data on firm and bank locations collected from the SEC filings by Bai, Fairhurst, and Serfling (2020) and Gao, Leung, and Qiu (2021), and supplement them with Compustat header information when missing.

advantage that stems from industry-specific expertise and not only from borrower-specific information.

To further ensure that our results are not driven by relationship lending, we follow Paravisini et al. (2023) and exploit bank mergers. The rationale behind this approach is that a bank's soft information on firms, associated with relationship lending, cannot be easily transmitted to an acquiring bank (Stein, 2002). Hence, we analyse whether the lending advantages of the two banks preceding the merger are maintained and transmitted to the entire bank after the merger.

We conduct an event study analysis in which we look at five years before and five years after each merger. For this analysis, we calculate the combined measure of specialization by using the maximum of merging banks' specialization in the quarter before the merger. Column (1) of Table 8 replicates our baseline estimation shown in Equation (5). In line with our baseline result, the estimated effect of specialization on covenant strictness is negative and strongly significant. In column (2), we interact the combined specialization measure with the *merger* dummy which is equal to 1 for the post-merging period, and to 0 otherwise. The point estimate on the interaction term is not significant, implying that the initial specialization of the banks is transmitted to the merged entity. This suggests that the bank's lending advantage studied here, namely specialization, is different from banks' firm-specific soft information.

In conclusion, we see that an explanation based only on relationship lending does not rationalize the information advantage stemming from bank industrial specialization.

5.4 Robustness Checks

The results presented so far stand to a series of robustness checks.

Covenant-lite contracts. One concern would be that our results are confounded by the post-financial crisis period, in which the share of leveraged, covenant-light (i.e., covenants with weaker enforcement) loans increased dramatically and the coverage of financial covenants offered by Dealscan appears to have decreased in quality (Bräuning, Ivashina, & Ozdagli, 2022). To investigate this, we run Equations (5) and (6) by interacting our main variables of interest with the *covenant-lite period* dummy which is equal to 1 for the period of 2008-2016, and to 0 otherwise. As displayed in Table A2 (A3), the point estimates on the double (triple) interaction

terms are not statistically significant at any conventional levels, suggesting that our results are not driven by the period when covenant-light contracts became popular.

Using different rolling windows to measure specialization. Our results remain unchanged if we re-calculate bank specialization by averaging industry portfolio shares over 1, 2, 4, or 5 years, instead of 3 years. As seen in Table A4 and Table A5, the effect of the specialization variable on covenant strictness as well as on investment after a covenant violation is very similar in both economic magnitude and statistical significance across specialization measures calculated using rolling windows of different lengths.

Constructing loan shares. We illustrate that our results are robust when we attribute loan shares to lead arrangers by using different loan samples or different methods. In Tables A6 and A7, we present the results of re-estimating Equations (5) and (6) using a measure of specialization calculated by: in columns (1), all loans, without dropping loan contracts that are likely to be restatements of existing loans; in columns (2), only loans originated from 1996 onward; in columns (3), excluding term loans B, as these are most likely to be sold to institutional investors; in columns (4), by attributing loan shares to lead arrangers using the approach by Chodorow-Reich (2014); in columns (5), by attributing loan shares to lead arrangers using the method by Doerr and Schaz (2021); and in columns (6), by attributing loan shares to lead arrangers using the approach by De Haas and Van Horen (2013). In all cases, the estimates are very similar to the baseline results, both in economic magnitude and statistical significance.

Different measure of specialization. One further concern is that our measure of specialization leads to large right-tails and thus distorts our estimations. To address this, we employ "excess" specialization, from Blickle et al. (2023), obtained by the difference between the bank's portfolio concentration in a given industry and the entire market's concentration in the same industry (i.e., the excess concentration from the ideal share that would result from a perfectly diversified portfolio). More formally, we define this measure as:

$$\textit{Excess Specialization}_{i,b,t} = S_{i,b,t} - S_{i,t}$$

This measure results in less extreme right-tails compared to our *relative (baseline)* specializa-

tion measure.[27] To use a reasonable variation, we consider a change of the *excess specialization* variable by 10%. This can, e.g., result from looking at the differences in the strictness of contracts written by a bank that has a portfolio concentration twice as large as the entire market's concentration in a given industry, while that industry absorbs 10% of total market credit at that point in time. Tables A8 and A9 respectively show that such variation (i) correlates with covenants that are around 4.6% looser at origination and (ii) leads to around 7% smaller decline in investment after a covenant violation for core borrowers, in line with our baseline results.

Focusing on firms that violated a covenant before. Regarding our *violation* analysis, one concern would be that violators and non-violators might have inherent differences and thus might invalidate the comparison. To address this, we focus only on firms that violated a covenant at least once during our sample period (as in Chava & Roberts, 2008). Nevertheless, as presented in Table A10, our results are very close to our baseline estimates in Table 4.

Results with single-bank firms. To conduct our *violation* analysis, we link covenant violations (extracted from firms' SEC filings) to firms' lead lenders by relying on bank-firm relationships in Dealscan. As a benchmark, we make certain assumptions to match violations to lenders when the firm has multiple lead lenders in a given quarter (see Section 2 for details). In Table A11, we show that our results hold without those assumptions, when we focus only on firms with a single lead lender.

6 Conclusion

In this paper, we provide evidence that banks specialize in lending towards specific industries even in a credit market for large borrowers, such as the U.S. syndicated loan market. We show that loan contracts between borrowers in an industry and banks specialized in lending towards that industry display less restrictive covenants, with no other unfavourable terms, at loan inception.

Then, we investigate how specialized banks intervene in firm choices when they obtain

27. To give an example, assume that Bank A (Bank B) lends 10% (6%) of its total portfolio to Industry A (Industry B), while market-wide lending to Industry A (Industry B) accounts for 5% (1%). According to our baseline (relative) measure of bank specialization, Banks A and B are specialized in Industries A and B by factors of 2 and 5, respectively. However, both banks' excess specialization is equal (5%) even though the ideal shares for these industries stemming from diversified portfolios are different.

control rights after covenant violations. We observe that core borrowers of specialized banks invest more and perform better than non-core borrowers after breaching a covenant. This points to the fact that, first, specialized banks have a lighter hand with core borrowers, and at the same time, such hand is discerning, leading to improvements in firm outcomes.

We look at our results in light of financial contracting theory and interpret the restrictiveness of the covenant structure as the degree of information asymmetry between a borrower and a lender (Gârleanu & Zwiebel, 2009). Thus, we take stock of two messages from our analysis. First, evidence from contract design at loan origination, as well as from the ex-post effects of contract design, aligns with an information-advantage explanation of bank specialization. Moreover, evidence from the effect of covenant violations suggests that bank specialization may have real effects for borrowing firms.

References

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

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

Bai, J. J., Fairhurst, D., & Serfling, M. (2020). Employment Protection, Investment, and Firm Growth. *Review of Financial Studies*, *33*(2), 644–688.

Beck, T., De Jonghe, O., & Mulier, K. (2022). Bank Sectoral Concentration and Risk: Evidence from a Worldwide Sample of Banks. *Journal of Money, Credit and Banking*, *54*(6), 1705-1739.

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

Berger, A. N., & DeYoung, R. (2001). The Effects of Geographic Expansion on Bank Efficiency. *Journal of Financial Services Research*, *19*(2-3), 163–184.

Berger, P. G., Minnis, M., & Sutherland, A. (2017). Commercial lending concentration and bank expertise: Evidence from borrower financial statements. *Journal of Accounting and Economics*, *64*(2-3), 253–277.

Berlin, M., & Mester, L. J. (1992). Debt Covenants and Renegotiation. *Journal of Financial Intermediation*, *2*(2), 95–133.

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

Bharath, S. T., & Shumway, T. (2008). Forecasting Default with the Merton Distance to Default Model. *Review of Financial Studies*, *21*(3), 1339–1369.

Billett, M. T., King, T.-H. D., & Mauer, D. C. (2007). Growth Opportunities and the Choice of Leverage, Debt Maturity, and Covenants. *Journal of Finance*, *62*(2), 697–730.

Blickle, K., Parlatore, C., & Saunders, A. (2023). Specialization in banking. *NBER Working Paper No 31077*.

Boot, A. W. A. (2000). Relationship Banking: What Do We Know? *Journal of Financial Intermediation*, *9*(1), 7–25.

Boyd, J. H., & Prescott, E. C. (1986). Financial Intermediary-Coalitions. *Journal of Economic Theory*, *38*(2), 211–232.

Bradley, M., & Roberts, M. R. (2015). The Structure and Pricing of Corporate Debt Covenants. *Quarterly Journal of Finance*, *05*(02), 1550001.

Bräuning, F., Ivashina, V., & Ozdagli, A. K. (2022). High-Yield Debt Covenants and Their Real Effects. *NBER Working Paper No 29888*.

Carey, M., Post, M., & Sharpe, S. A. (1998). Does Corporate Lending by Banks and Finance Companies Differ? Evidence on Specialization in Private Debt Contracting. *Journal of Finance*, *53*(3), 845–878.

Casado, A., & Martinez-Miera, D. (2022). Local lending specialization and monetary policy.

Chakraborty, I., Goldstein, I., & MacKinlay, A. (2018). Housing Price Booms and Crowding-Out Effects in Bank Lending. *Review of Financial Studies*, *31*(7), 2806–2853.

Chava, S., & Roberts, M. R. (2008). How Does Financing Impact Investment? The Role of Debt Covenants. *Journal of Finance*, *63*(5), 2085–2121.

Chodorow-Reich, G. (2014). The Employment Effects of Credit Market Disruptions: Firm-Level Evidence from the 2008–9 Financial Crisis. *Quarterly Journal of Economics*, *129*(1), 1–59.

Chodorow-Reich, G., & Falato, A. (2022). The Loan Covenant Channel: How Bank Health Transmits to the Real Economy. *Journal of Finance*, *77*(1), 85–128.

Degryse, H., & Ongena, S. (2005). Distance, Lending Relationships, and Competition. *Journal of Finance*, *60*(1), 231–266.

De Haas, R., & Van Horen, N. (2013). Running for the exit? International bank lending during a financial crisis. *Review of Financial Studies*, *26*(1), 244–285.

De Jonghe, O., Dewachter, H., Mulier, K., Ongena, S., & Schepens, G. (2020). Some Borrowers Are More Equal than Others: Bank Funding Shocks and Credit Reallocation. *Review of Finance*, *24*(1), 1–43.

Demerjian, P. R., & Owens, E. L. (2016). Measuring the Probability of Financial Covenant Violation in Private Debt Contracts. *Journal of Accounting and Economics*, *61*(2-3), 433–447.

Demiroglu, C., & James, C. M. (2010). The Information Content of Bank Loan Covenants.

Review of Financial Studies, *23*(10), 3700–3737.

Di, W., & Pattison, N. (2023). Industry specialization and small business lending. *Journal of Banking & Finance*, *149*, 106797.

Diamond, D. W. (1984). Financial Intermediation and Delegated Monitoring. *Review of Economic Studies*, *51*(3), 393–414.

Doerr, S., & Schaz, P. (2021). Geographic diversification and bank lending during crises. *Journal of Financial Economics*, *140*(3), 768–788.

Duquerroy, A., Mazet-Sonilhac, C., Mésonnier, J.-S., & Paravisini, D. (2022). Bank Local Specialization. *Banque de France Working Paper No. 865*.

Falato, A., & Liang, N. (2016). Do Creditor Rights Increase Employment Risk? Evidence from Loan Covenants. *Journal of Finance*, *71*(6), 2545-2590.

Ferreira, D., Ferreira, M. A., & Mariano, B. (2018). Creditor Control Rights and Board Independence. *Journal of Finance*, *73*(5), 2385–2423.

Gao, M., Leung, H., & Qiu, B. (2021). Organization Capital and Executive Performance Incentives. *Journal of Banking & Finance*, *123*, 106017.

Gârleanu, N., & Zwiebel, J. (2009). Design and Renegotiation of Debt Covenants. *Review of Financial Studies*, *22*(2), 749–781.

Giannetti, M., & Saidi, F. (2019). Shock Propagation and Banking Structure. *Review of Financial Studies*, *32*(7), 2499–2540.

Gopal, M. (2021). How Collateral Affects Small Business Lending: The Role of Lender Specialization. *U.S. Census Bureau Center for Economic Studies Working Paper 21-22*.

Gorostiaga, J. (2022). It's Not You, It's Them: Industry Spillovers and Loan Portfolio Optimization.

Griffin, T., Nini, G., & Smith, D. C. (2018). Losing Control: The 20-Year Decline in Loan Covenant Restrictions. *SSRN Electronic Journal*.

Hoberg, G., & Phillips, G. (2010). Product Market Synergies and Competition in Mergers and Acquisitions: A Text-Based Analysis. *Review of Financial Studies*, *23*(10), 3773–3811.

Hoberg, G., & Phillips, G. (2016). Text-Based Network Industries and Endogenous Product Differentiation. *Journal of Political Economy*, *124*(5), 1423–1465.

Hollander, S., & Verriest, A. (2016). Bridging the Gap: The Design of Bank Loan Contracts and

Distance. *Journal of Financial Economics*, *119*(2), 399–419.

Houston, J., James, C., & Marcus, D. (1997). Capital market frictions and the role of internal capital markets in banking. *Journal of Financial Economics*, *46*(2), 135–164.

Hubbard, R. G., Kuttner, K. N., & Palia, D. N. (2002). Are There Bank Effects in Borrowers' Costs of Funds? Evidence from a Matched Sample of Borrowers and Banks. *Journal of Business*, *75*(4), 559–581.

Ioannidou, V., & Ongena, S. (2010). "Time for a Change": Loan Conditions and Bank Behavior when Firms Switch Banks. *Journal of Finance*, *65*(5), 1847–1877.

Ivashina, V. (2009). Asymmetric Information Effects on Loan Spreads. *Journal of Financial Economics*, *92*(2), 300–319.

Jiang, S., & Li, J. Y. (2022). He Who Lends Knows. *Journal of Banking & Finance*, *138*, 106412.

Merton, R. C. (1974). On the Pricing of Corporate Debt: The Risk Structure of Interest Rates. *Journal of Finance*, *29*(2), 449–470.

Murfin, J. (2012). The Supply-Side Determinants of Loan Contract Strictness. *Journal of Finance*, *67*(5), 1565–1601.

Nini, G., Smith, D. C., & Sufi, A. (2012). Creditor control rights, corporate governance, and firm value. *Review of Financial Studies*, *25*(6), 1713-1761.

Paravisini, D., Rappoport, V., & Schnabl, P. (2023). Specialization in Bank Lending: Evidence from Exporting Firms. *Journal of Finance (Forthcoming)*.

Petersen, M. A., & Rajan, R. G. (1995). The Effect of Credit Market Competition on Lending Relationships. *Quarterly Journal of Economics*, *110*(2), 407–443.

Prilmeier, R. (2017). Why Do Loans Contain Covenants? Evidence from Lending Relationships. *Journal of Financial Economics*, *123*(3), 558–579.

Roberts, M. R., & Sufi, A. (2009). Control rights and capital structure: An empirical investigation. *Journal of Finance*, *64*(4), 1657-1695.

Santos, J. A. C., & Winton, A. (2019). Bank Capital, Borrower Power, and Loan Rates. *Review of Financial Studies*, *32*(11), 4501–4541.

Schwert, M. (2018). Bank Capital and Lending Relationships. *Journal of Finance*, *73*(2), 787–830.

Sharpe, S. A. (1990). Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized

Model of Customer Relationships. *Journal of Finance*, *45*(4), 1069–1087.

Smith, C. W., & Warner, J. B. (1979). On Financial Contracting: An Analysis of Bond Covenants. *Journal of Financial Economics*, *7*(2), 117–161.

Stein, J. C. (2002). Information Production and Capital Allocation: Decentralized versus Hierarchical Firms. *Journal of Finance*, *57*(5), 1891–1921.

Tables

Table 1. Descriptive Statistics

This table reports the descriptive statistics for the full *matched* Dealscan-Compustat sample at origination obtained after applying the selection criteria described in Section 2, for the *strictness* sample, which further restricts the sample to observations with non-missing covenant strictness and all-in drawn spread, as well as for the *covenant violation* sample. All variables are described in Table A1.

	Matched Sample			Strictness Sample		
	Mean	Std. Dev.	Obs.	Mean	Std. Dev.	Obs.
Loan variables						
Covenant Strictness	35.82	41.18	12,140	35.80	41.16	11,698
N. Covenants	2.46	1.13	14,503	2.47	1.14	11,698
All-In Spread Drawn	190.87	128.35	22,773	188.17	118.43	11,698
All-In Spread Undrawn	30.26	19.09	16,642	31.68	18.63	9,934
Spread over Libor	180.01	130.73	21,544	175.26	117.48	11,074
TCB	123.11	113.83	12,112	122.88	105.64	7,788
Loan Amount ($M)	624.04	1448.28	23,215	570.03	1203.13	11,698
Maturity (Months)	45.47	22.27	22,318	46.05	20.01	11,643
N. Lenders	8.00	8.74	23,215	9.06	9.37	11,698
Collateral	0.69	0.46	16,737	0.65	0.48	10,644
Revolver Fraction	0.74	0.38	23,215	0.79	0.34	11,698
Previus Rel.	0.69	0.46	18,216	0.70	0.46	9,140
Firm variables						
Ln(Assets)	7.02	1.92	21,450	6.80	1.83	11,241
EDF	0.06	0.17	18,322	0.06	0.17	10,164
Tangibility	0.33	0.25	21,379	0.33	0.25	11,207
Leverage	0.51	5.63	13,455	0.62	5.74	7,011
Current Ratio	1.91	1.25	20,657	1.87	1.15	10,896
Ln(1+Int. Cover. Ratio)	2.21	1.07	16,181	2.20	1.03	8,906
Market-to-Book	1.72	1.06	18,528	1.67	0.99	9,822
Rated	0.45	0.50	21,451	0.45	0.50	11,241
Rating	4.49	1.18	9,751	4.62	1.05	5,009
N. Loans	9.06	6.94	21,451	8.82	6.42	11,241
Bank variables						
Ln(Assets)	12.41	1.58	2,744	12.42	1.57	2,104
Deposits	61.94	12.89	2,083	61.36	12.70	1,656
Book Equity	7.23	2.89	2,694	7.31	2.75	2,070
Market Equity	12.00	6.51	2,525	12.45	6.52	1,953
Tier 1 Capital	9.73	2.18	1,942	9.52	2.12	1,571
Non-Performing Assets	0.65	0.53	1,759	0.63	0.50	1,431
Profitability	0.25	0.17	2,086	0.26	0.18	1,659
Bank-industry variables						
Specialization	1.61	2.45	19,798	1.62	2.60	10,097
	Covenant Violation Sample					
Firm outcome variables						
Δ Capex/PPE	-0,001	0,037	45,955			
Δ Ln(Sales)	0,053	0,227	46,189			
Δ EBITDA/Assets	-0,003	0,083	45,528			
Δ Expected Default Prob.	0,006	0,175	44,981			

Table 2. The Effect of Bank Specialization on Covenant Strictness

This table reports the estimates of the coefficients from the following regression:

$$Y_{l,f,b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot Specialization_{b,i,t-1} + \gamma_F \cdot Firm\ Controls_{f,t} + \gamma_L \cdot Loan\ Controls_{l,f,b,t} + \varepsilon_{l,f,b,t}$$

where $Y_{l,f,b,t}$ is the measure of covenant strictness for loan l contracted in year-quarter t by bank b to firm f. $Specialization_{b,i,t-1}$ is the ratio of bank b's portfolio share in industry i at quarter $t-1$ (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at quarter $t-1$ (averaged over a rolling 12-quarter window). Firm controls include those reported in the table, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. Loan controls include those reported in the table, plus separate intercepts for different loan purposes (Corporate Purposes, Working Capital, Debt Repayment, Takeover, CP Backup). All variables are described in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Covenant Strictness			
	(1)	(2)	(3)	(4)
Specialization	−4.702***	−4.638***	−4.654***	−4.682***
	(−3.67)	(−3.41)	(−3.72)	(−3.65)
Ln(Assets)		.9159	.5657	.7467
		(0.54)	(0.26)	(0.33)
EDF		15.48**	14.65**	11.7**
		(2.73)	(2.62)	(2.14)
Tangibility		−23.2**	−21.68*	−20.87*
		(−2.11)	(−2.04)	(−2.02)
Debt / Tang. Net Worth		−.144**	−.1361**	−.1326*
		(−2.23)	(−2.04)	(−2.00)
Current Ratio		−4.141***	−4.052***	−4.055***
		(−2.85)	(−2.78)	(−2.79)
Ln(1+Int. Cover. Ratio)		−14.71***	−14.56***	−14.11***
		(−9.55)	(−9.72)	(−9.64)
Market-to-Book		−2.606	−2.676	−2.534
		(−0.78)	(−0.84)	(−0.80)
Ln(Loan Maturity)			−.1809	−.587
			(−0.096)	(−0.30)
Ln(Lenders)			−.7018	−.506
			(−0.47)	(−0.33)
Ln(Loan Amount)			.8459	.8868
			(0.60)	(0.62)
Revolver Fraction			.2976	1.62
			(0.12)	(0.70)
All-In Drawn Spread				.0244***
				(2.90)
Bank-YearQtr FE	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Rating Dummies	−	✓	✓	✓
Loan Purpose Dummies	−	−	✓	✓
Adj. R^2	.513	.566	.566	.567
Obs.	3498	3498	3498	3498

Table 3. The Effect of Bank Specialization on Other Contract Terms

This table reports the estimates of the coefficients from the following regression:

$$Y_{l,f,b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot Specialization_{b,i,t-1} + \gamma_F \cdot Firm\ Controls_{f,t} + \gamma_L \cdot Loan\ Controls_{l,f,b,t} + \varepsilon_{l,f,b,t}$$

where $Loan\ Term_{l,f,b,t}$ is one of the variables reported below for loan l contracted in year-quarter t by bank b to firm f. $Specialization_{b,i,t-1}$ is the ratio of bank b's portfolio share in industry i at quarter $t-1$ (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at quarter $t-1$ (averaged over a rolling 12-quarter window). Firm controls include those reported in Table 2, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are described in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Price Terms				Non-Price Terms	
	Loan Spread	AISD	AISU	TCB	Maturity	Loan Amount
	(1)	(2)	(3)	(4)	(5)	(6)
Specialization	-7.81^{***}	-6.23^{***}	.028	-9.21^{*}	0.0087	$.026^{*}$
	(−2.98)	(−2.71)	(0.075)	(−1.92)	(0.79)	(1.66)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Rating Dummies	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓
Adj. R^2	.645	.665	.72	.617	.328	.675
Obs.	7471	7600	4903	3619	7600	7600

Table 4. Bank Specialization and Firm Investment: Analysis of Covenant Violations

This table reports the estimates of the coefficients from the following regression:

$$Y_{f,t+4} - Y_{f,t} = \theta_1 Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}$$

where the dependent variable is the difference in firm f's investment from year-quarter t to $t+4$. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter t, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of bank b's portfolio share in industry i at time t (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at time t (averaged over a rolling 12-quarter window). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Δ Investment					
	(1)	(2)	(3)	(4)	(5)	(6)
Violation	−.0035**	−.0068***	−.0076***	−.0071***	−.0073***	−.0067***
	(−2.32)	(−4.43)	(−4.95)	(−4.51)	(−4.78)	(−4.37)
Specialization	−0.000	0.0004	0.0001	0.0002	.0031**	.0019
	(−0.025)	(−0.18)	(−0.40)	(−0.64)	(2.10)	(1.23)
Violation×Specialization		.0024***	.0025***	.0024***	.0023***	.0022***
		(3.64)	(3.78)	(3.56)	(3.39)	(3.01)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓	✓	✓
Rating Dummies	–	–	✓	✓	✓	✓
Firm Controls	–	–	✓	✓	✓	✓
Diff. Firm Controls	–	–	–	✓	–	✓
Firm Controls×Spec.	–	–	–	–	✓	✓
Diff. Firm Controls×Spec.	–	–	–	–	–	✓
R^2	.108	.108	.11	.13	.111	.131
Obs.	45955	45955	45955	45955	45955	45955

Table 5. Bank Specialization and Firm Performance

This table reports the estimates of the coefficients from the following regression:

$$Y_{f,t+4} - Y_{f,t} = \theta_1 Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}$$

where the dependent variable is the change from year-quarter t to $t+4$ of the variable indicated in each column. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter t, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of bank b's portfolio share in industry i at quarter t (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at quarter t (averaged over a rolling 12-quarter window). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	ΔOper. Cash Flow / Sales	ΔLog(Sales)	ΔEDF
	(1)	(2)	(3)
Violation	-.0019	-.0387***	.0502***
	(-0.36)	(-2.73)	(5.99)
Specialization	.0049	-.0034	0.0004
	(1.29)	(-0.47)	(0.080)
Violation×Specialization	.0051*	.0109*	-.0112**
	(-1.87)	(1.69)	(-2.48)
Bank-YearQtr FE	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓
Rating Dummies	✓	✓	✓
Firm Controls (incl. Diff.)	✓	✓	✓
Firm Controls (incl. Diff.)×Spec.	✓	✓	✓
R^2	.145	.301	.495
Obs.	45528	46189	44981

Table 6. Bank Specialization and Covenant Strictness: Other Explanations

This table reports the estimates of the coefficients from the following regression:

$$Y_{l,f,b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot Specialization_{b,i,t-1} + \delta \cdot Other\ Var + \gamma_F \cdot Firm\ Controls_{f,t} + \gamma_L \cdot Loan\ Controls_{l,f,b,t} + \varepsilon_{l,f,b,t}$$

where $Y_{l,f,b,t}$ is the measure of covenant strictness for loan l contracted in year-quarter t by bank b to firm f. $Specialization_{b,i,t-1}$ is the ratio of bank b's portfolio share in industry i at quarter $t-1$ (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at quarter $t-1$ (averaged over a rolling 12-quarter window). Firm controls include those reported in Table 2, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. Loan controls include those reported in Table 2, plus separate intercepts for different loan purposes (Corporate Purposes, Working Capital, Debt Repayment, Takeover, CP Backup). All variables are described in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Covenant Strictness			
	(1)	(2)	(3)	(4)
Specialization	-7.353***	-3.432**	-4.639***	-4.667***
	(-4.63)	(-2.50)	(-3.73)	(-3.63)
Industry Market Share	44.05***			
	(3.52)			
Same State		-1.549		
		(-0.38)		
Rel. Length			-.0625	
			(-0.30)	
Rel. Intensity (Amt)				.4036
				(0.24)
Bank-YearQtr FE	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Rating Dummies	✓	✓	✓	✓
Loan Purpose Dummies	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓
Loan Controls	✓	✓	✓	✓
Adj. R^2	.567	.563	.565	.565
Obs.	3498	3012	3498	3498

Table 7. Bank Specialization and Firm Investment: Other Explanations

This table reports the estimates of the coefficients from the following regression:

$$\begin{aligned} Y_{f,t+4} - Y_{f,t} = {} & \theta_1 Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} \\ & + \theta_4 Other\ Var + \theta_5 Violation \times Other\ Var \\ & + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t} \end{aligned}$$

where the dependent variable is the difference in firm f's investment from year-quarter t to $t+4$. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter t, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of bank b's portfolio share in industry i at quarter t (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at quarter t (averaged over a rolling 12-quarter window). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	ΔInvestment			
	(1)	(2)	(3)	(4)
Violation	-.0067**	-.0067***	-.0058**	.0021
	(-2.44)	(-3.87)	(-2.05)	(0.37)
Specialization	.0019	.0021	.0019	.0019
	(1.22)	(1.25)	(1.22)	(1.22)
Violation×Specialization	.0022***	.0016*	.0022***	.0022***
	(2.95)	(1.87)	(3.01)	(3.02)
Industry Market Share	.003			
	(1.42)			
Violation×Industry Market Share	0.0001			
	(0.0076)			
Same State		-0.0008		
		(-1.17)		
Violation×Same State		-.0013		
		(-0.15)		
Rel. Length			-0.0000	
			(-0.010)	
Violation×Rel. Length			-0.0004	
			(-0.52)	
Rel. Intensity				-.0012
				(-1.35)
Violation×Rel. Intensity				-.0099
				(-1.60)
Bank-YearQtr FE	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓
Rating Dummies	✓	✓	✓	✓
Firm Controls (incl. Diff.)	✓	✓	✓	✓
Firm Controls (incl. Diff.)×Spec.	✓	✓	✓	✓
R^2	.131	.129	.131	.131
Obs.	45955	41481	45955	45955

Table 8. Bank Specialization and Covenant Strictness: Bank Mergers

This table reports the estimates of the coefficients from the following equation:

$$Y_{l,f,b,t} = \alpha_{b,merger\ t} + \alpha_{i,merger\ t} + \alpha_f + \beta_1 \cdot Specialization_{b,i,merger\ t-1} + \beta_2 \cdot Merger_{b,merger\ t} + \beta_3 \cdot Specialization_{b,i,merger\ t-1} \times Merger_{b,merger\ t} + \gamma_F \cdot Firm\ Controls_{f,t} + \gamma_L \cdot Loan\ Controls_{l,f,b,t} + \varepsilon_{l,f,b,t}$$

For this analysis, we draw from the original data 10-year intervals (5 years before and 5 years after) around the quarter of each merger. $Y_{l,f,b,t}$ is the measure of covenant strictness for loan l contracted in year-quarter t by bank b to firm f. $Specialization_{b,i,merger\ t-1}$ is the maximum specialization of the merging banks in the quarter before the merger. $Merger_{b,merger\ t}$ is equal to 1 for the post-merging period, and 0 otherwise. Firm controls include those reported in Table 2, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. Loan controls include those reported in Table 2, plus separate intercepts for different loan purposes (Corporate Purposes, Working Capital, Debt Repayment, Takeover, CP Backup). All variables are described in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

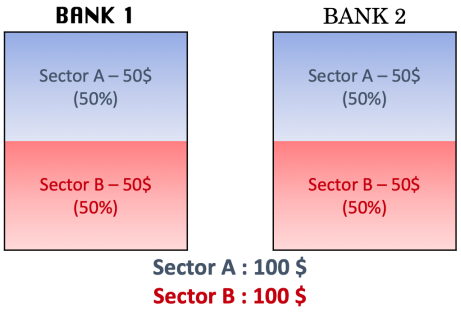
	Covenant Strictness	
	(1)	(2)
Specialization (pre-merger)	-8.714***	-10.547**
	(-3.68)	(-3.01)
Merger		-3.322
		(-0.97)
Specialization (pre-merger) x Merger		1.911
		(1.02)
Bank-MergerYearQtr FE	✓	✓
Firm FE	✓	✓
Industry- MergerYearQtr	✓	✓
Firm Controls	✓	✓
Loan Controls	✓	✓
Adj. R^2	0.558	0.558
Obs.	1,566	1,566

Figures

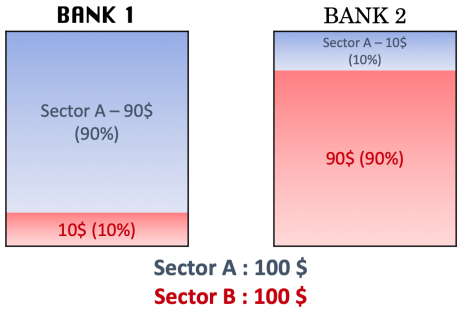
Figure 1. Simple Examples to Understand Bank Specialization at the Industry Level

This figure illustrates the notion of bank specialization in an industry according to the definition by Paravisini et al. (2023) with simple examples from two-bank, two-sector lending markets. From the top left, we can see: (a) an example of no specialized banks; (b) an example of specialized banks – Bank 1 in lending to Sector A and Bank 2 in lending to Sector B; (c) a case in which no bank is specialized because both banks allocate the same portfolio shares to both sectors; (d) a case in which both banks are specialized – Bank 1 in lending to sector A and Bank 2 in lending to sector B.

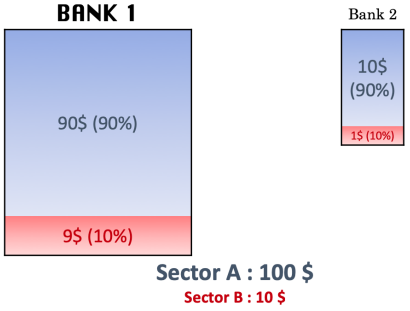
(a) Neither bank is specialized



(b) Both banks are specialized (1-A, 2-B)



(c) Neither bank is specialized



(d) Both banks are specialized (1-A, 2-B)

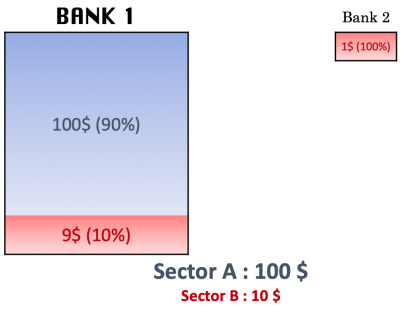


Figure 2. Comparison Between Portfolio Concentration of the Average Bank and the "Market"

This figure plots on the y-axis the *HHI* measure of loan portfolio concentration, and on the x-axis the year at which it is recorded. *HHI* is computed for the Market (blue) and Average Bank (green) portfolios over each year-quarter. A higher value of *HHI* implies that lending to sectors is more concentrated in the market/average bank's portfolio. The fact that the average bank is systematically characterized by a higher *HHI* compared to the market shows graphically that the average lender in the syndicated loan market remained overall more concentrated than the whole syndicated market over 1996-2016.

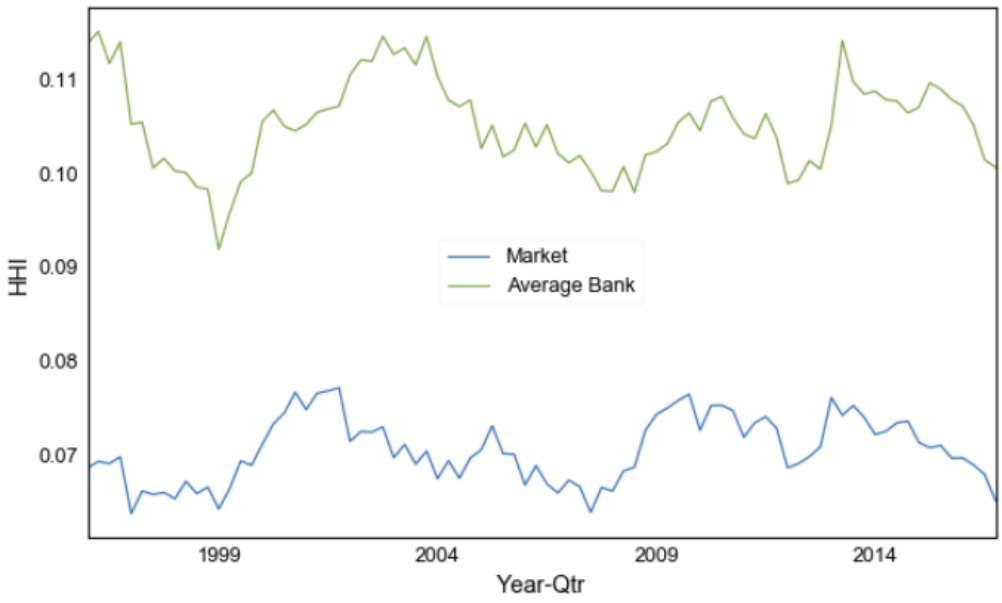


Figure 3. Specialization Is Common Across Industries and Time

This figure presents evidence of specialization in lending towards specific industries in four different moments: 2000q2, 2005q2, 2010q2, 2015q2. Each subfigure reports the box-plot graph, for each of the 25 TFIC industries, of the distribution of banks' demeaned loan portfolio shares in a given industry. Each dot represents an outlier, indicating banks specialized in that industry.

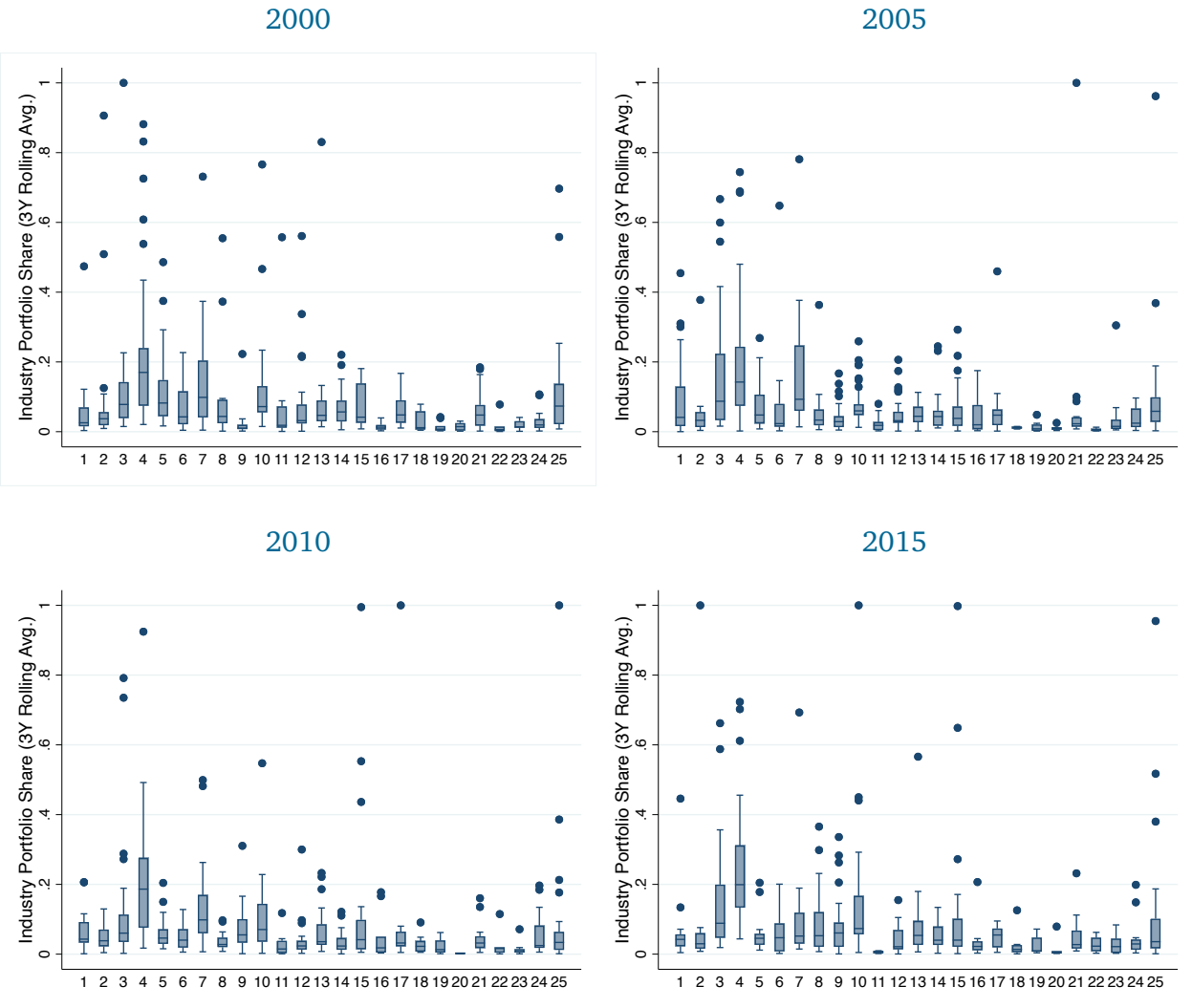


Figure 4. Specialization Is Persistent Over Time

This figure plots the *n*-year autocorrelation of the relative portfolio share, averaged at the bank-year-sector level, where *n* takes value from 1 to 10.

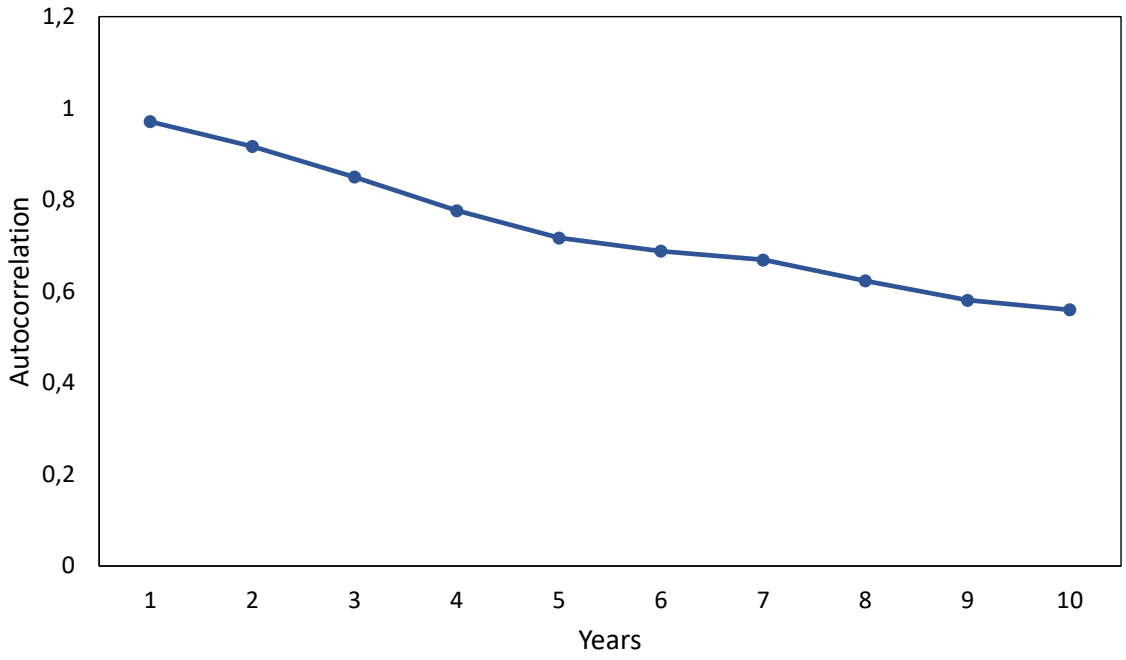
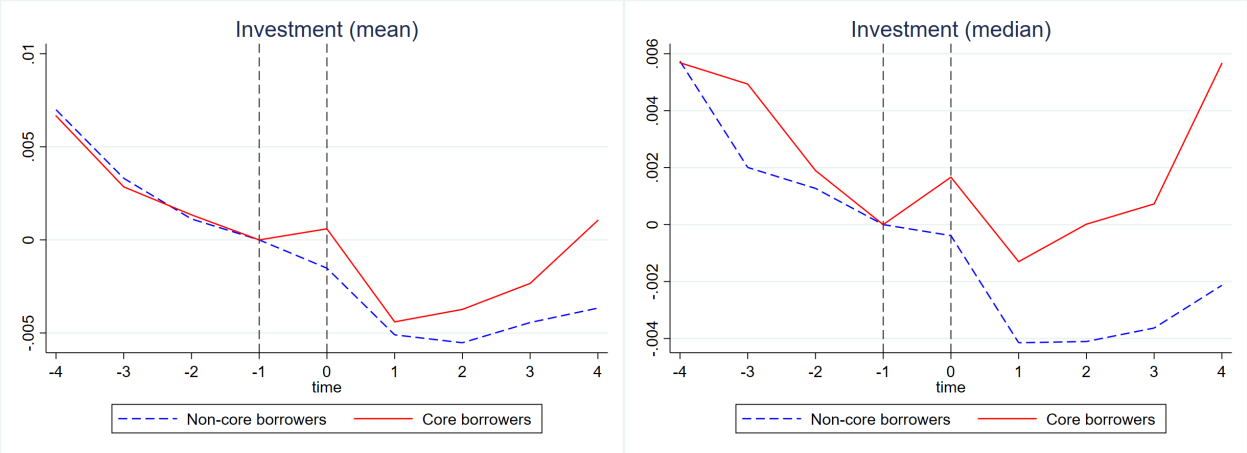


Figure 5. Violations Impact Core Customers' Investment Less

This figure plots the mean (left) and median (right) of investment four quarters before and after covenant violations, separately for core and non-core customers. For this plot, we define core customers as firms borrowing from banks whose lending share is above the 75th percentile of the lending shares' distribution in their industries. For comparability, we normalize the y-axis so the figures for core and non-core borrowers are zero in quarter *t-1*, i.e., the y-axis demonstrates the figure in a given quarter relative to the figure in quarter *t-1*.



Appendix

Table A1. Variable Definitions

Variable Name	Definition	Data Source	Unit
Specialization	Ratio of the share of an industry in the bank's lending portfolio relative to the share of an industry in the entire lending market(defined in Equation (1))	Dealscan	float
Specialization (nY)	Defined in Equation (1), obtained averaging over $4 \times n$ quarters	Dealscan	float
EDF	See Bharath and Shumway (2008), pp. 1247-48	CRSP/ Compustat	float (%)
Assets	`atq`	Compustat	USD Mil
Tangibility	`ppentq`/Assets	Compustat	float
Tangible Net Worth	`atq - intanq - ltq`	Compustat	float
Debt / Tang. Net Worth	(`dlttq` + `dlcq`)/Tang. Net Worth	Compustat	float
Current Ratio	`actq/lctq`	Compustat	float
Int. Cover. Ratio	Rolling 4-qtr sum of `oibdq`/Rolling 4-qtr sum of `xintq`	Compustat	float
Equity Market Cap	`prccq×cshoq`	Compustat	float
Book Equity	`atq - ltq + txditcq`	Compustat	float
Market to Book	(Equity Market Cap - Book Equity + Assets)/Assets	Compustat	float
Rated	Dummy variable equal to 1 if firm-quarter has a long-term issuer credit rating, 0 otherwise	Capital IQ	int (0/1)
Rating	Categorical variable equal to 1 for credit rating "AAA", to 2 for "AA", ... , to 9 for "D"/"SD" (indicating default)	Capital IQ	int
N. Loans	Number of packages per borrower over sample period	Dealscan	int
Covenant Strictness	Ex-ante probability of violating a financial covenant. See Demerjian and Owens (2016)	Dealscan	float (%)
Covenant violation	Dummy equal to 1 if the firm violated a covenant, and to 0 otherwise	SEC	int (0/1)
N. Covenants	Number of financial covenants in package	Dealscan	int
AISD (All-In Spread Drawn)	Average of each facility's `allindrawn` in package weighted by `facilityamt`	Dealscan	basis points
AISU (All-In Spread Undrawn)	Average of each facility's `allinundrawn` in package weighted by `facilityamt`	Dealscan	basis points
Spread over Libor	Average of each facility's `maxbps_libor`	Dealscan	basis

Table A1. Variable Definitions

	in package weighted by `facilityamt`		points
TCB	Total cost of borrowing (see Berg et al. 2016)	Dealscan	basis points
Loan Amount	Ln(`dealamount`)	Dealscan	USD
Maturity	Ln(average of each facility's `maturity` in package weighted by `facilityamt`)	Dealscan	months
Lenders	Ln(N. syndicate members)	Dealscan	int
Revolver Fraction	Revolver credit amount in package / `dealamount`	Dealscan	float
Rel. Intensity (Amt)	Fraction of credit that the firm obtained from the bank over the total amount of credit the firm received in the last 3 years	Dealscan	float
Rel. Length	Time elapsed since the first interaction between the firm and the bank	Dealscan	years
Market Share	Fraction of credit that the bank provides to the industry relative to the total credit supplied to the industry by all banks	Dealscan	float
Same State	Dummy variable equal to 1 if the bank and the firm are headquartered in the same state, and to 0 otherwise	Compustat/ SEC	int (0/1)
Bank Assets	`atq`	Compustat	USD Mil
Deposits	(`dptcq`/`atq`)×100	Compustat	float (%)
Book Equity	(`ceqq`/`atq`)×100	Compustat	float (%)
Market Equity	(`prccq`×`cshoq`)/(`atq` − `ceqq` + `prccq`×`cshoq`)	Compustat	float
Tier 1 Capital	`capr1q`	Compustat	float
Non-Performing Assets	(`npatq`/`atq`)×100	Compustat	float (%)
Profitability	(`niq`/`atq`)×100	Compustat	float (%)

Table A2. Bank Specialization and Covenants: Heterogeneity over Time

This table reports the estimates of the coefficients from the following regression:

$$Y_{l,f,b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot Specialization_{b,i,t-1} + \delta \cdot Specialization_{b,i,t-1} \times Covenant\text{-}lite\ period_t + \gamma \cdot X_{f,b,t} + \varepsilon_{l,f,b,t}$$

where $Y_{l,f,b,t}$ is the measure of covenant strictness for loan l contracted in year-quarter t by bank b to firm f. $Specialization_{b,i,t-1}$ is the ratio of bank b's portfolio share in industry i at quarter $t-1$ (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at quarter $t-1$ (averaged over a rolling 12-quarter window). *Covenant-lite period*$_t$ is a dummy equal to 1 for the period of 2008-2016, and to 0 otherwise. $X_{f,b,t}$ is a vector of firm-level and loan-level controls, which consists of all those included in Table 2, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings, and separate intercepts for different loan purposes (Corporate Purposes, Working Capital, Debt Repayment, Takeover, CP Backup). t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Covenant Strictness			
	(1)	(2)	(3)	(4)
Specialization	−5.967***	−5.728***	−5.836***	−5.768***
	(−3.28)	(−3.22)	(−3.38)	(−3.31)
Specialization × Post 2008	3.696	3.175	3.444	3.166
	(1.36)	(1.31)	(1.41)	(1.32)
Bank-YearQtr FE	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Rating Dummies	–	✓	✓	✓
Loan Purpose Dummies	–	–	✓	✓
Firm Controls	–	✓	✓	✓
Loan Controls	–	–	✓	–
Loan Controls (including AISD)	–	–	–	✓
Adj. R^2	.513	.566	.566	.567
Obs.	3498	3498	3498	3498

Table A3. Bank Specialization and Firm Investment: Heterogeneity over Time

This table reports the estimates of the coefficients from the following regression:

$$\begin{aligned} Y_{f,t+4} - Y_{f,t} = {} & \theta_1 Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} \\ & + \theta_4 Violation_{f,t} \times \textit{Covenant-lite period}_t + \theta_5 Specialization_{f,t} \times \textit{Covenant-lite period}_t \\ & + \theta_5 Violation_{f,t} \times Specialization_{f,t} \times \textit{Covenant-lite period}_t \\ & + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t} \end{aligned}$$

where the dependent variable is the difference in firm *f*'s investment from year-quarter *t* to *t+4*. $Violation_{f,t}$ is equal to 1 if firm *f* violated a financial covenant at year-quarter *t*, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of the bank's portfolio share in industry *i* at time *t* (averaged over a rolling 12-quarter window) relative to the market-wide share of credit to industry *i* at time *t* (averaged over a rolling 12-quarter window). $Covenant\text{-}lite\ period_t$ is a dummy equal to 1 for the period of 2008-2016, and to 0 otherwise. $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. *t* statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	ΔInvestment					
	(1)	(2)	(3)	(4)	(5)	(6)
Violation	-.0033	-.007***	-.0075***	-.0073***	-.0072***	-.0069***
	(-1.49)	(-3.04)	(-3.32)	(-3.33)	(-3.08)	(-3.09)
Violation×Post 2008	-0.0005	.0014	0.0008	.0016	0.0001	0.001
	(-0.11)	(0.24)	(0.14)	(0.28)	(0.021)	(0.17)
Specialization	-0.00001	0.0005	0.0005	0.0004	.003*	.0017
	(-0.026)	(1.45)	(1.26)	(1.25)	(1.84)	(1.03)
Violation×Specialization		.0025***	.0025***	.0024***	.0023***	.0022***
		(3.33)	(3.38)	(3.27)	(2.95)	(2.73)
Specialization×Post 2008		-.001**	-.001**	-.001***	-0.0008*	-0.001**
		(-2.63)	(-2.61)	(-2.89)	(-1.93)	(-2.21)
Violation×Specialization×Post 2008		-.001	-0.0008	-0.0009	-0.0002	-0.0004
		(-0.51)	(-0.40)	(-0.44)	(-0.076)	(-0.18)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓	✓	✓
Rating Dummies	-	-	✓	✓	✓	✓
Firm Controls	-	-	✓	✓	✓	✓
Diff. Firm Controls	-	-	-	✓	-	✓
Firm Controls * Spec.	-	-	-	-	✓	✓
Diff. Firm Controls * Spec.	-	-	-	-	-	✓
Adj. R^2	.108	.108	.11	.13	.111	.131
Obs.	45955	45955	45955	45955	45955	45955

Table A4. Bank Specialization and Covenant Strictness: Alternative Time Windows to Compute Specialization

This table reports the estimates of the coefficients on the *Specialization* variable—built on the basis of portfolio shares averaged over different time windows—from the following regression:

$$Y_{l,f,b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot \beta \cdot Specialization\ (nY)_{b,i,t-1} + \gamma_F \cdot Firm\ Controls_{f,t} + \gamma_L \cdot Loan\ Controls_{l,f,b,t} + \varepsilon_{l,f,b,t}$$

where $Y_{l,f,b,t}$ is the measure of covenant strictness as for loan l contracted in year-quarter t by bank b to firm f. $Specialization_{b,i,t-1}$ is the ratio of bank b's portfolio share in industry i at quarter t (averaged a rolling $4 \times n$-quarter window) relative to the market-wide share of credit to industry i at quarter $t-1$ (averaged over a rolling $4 \times n$-quarter window). Firm controls include those reported in Table 2, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. Loan controls include those reported in Table 2, plus separate intercepts for different loan purposes (Corporate Purposes, Working Capital, Debt Repayment, Takeover, CP Backup). All variables are described in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Covenant Strictness				
	(1)	(2)	(3)	(4)	(5)
Specialization (1Y)	−4.062***				
	(−3.40)				
Specialization (2Y)		−4.739***			
		(−4.25)			
Specialization			−4.654***		
			(−3.72)		
Specialization (4Y)				−4.367***	
				(−3.20)	
Specialization (5Y)					−3.785***
					(−2.76)
Bank-YearQtr FE	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓
Rating Dummies	✓	✓	✓	✓	✓
Loan Purpose Dummies	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓
Loan Controls	✓	✓	✓	✓	✓
Adj. R^2	.567	.567	.566	.557	.566
Obs.	3615	3551	3498	3390	3247

Table A5. Bank Specialization and Firm Investment: Alternative Time Windows

This table reports the estimates of the coefficients on the *Specialization* variable—built on the basis of portfolio shares averaged over different time windows—from the following regression:

$$Y_{f,t+4} - Y_{f,t} = \theta_1 Excess\ Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Excess\ Specialization(nY)_{b,i,t} + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Excess\ Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}$$

where the dependent variable is the difference in firm f's investment from year-quarter t to $t+4$. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter t, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of bank b's portfolio share in industry i at time t (averaged a rolling $4 \times n$-quarter window) relative to the market-wide share of credit to industry i at time t (averaged over a rolling $4 \times n$-quarter window). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	ΔInvestment				
	(1)	(2)	(3)	(4)	(5)
Violation	-.0067***	-.0068***	-.0067***	-.0074***	-.0063***
	(-3.96)	(-4.50)	(-4.37)	(-5.04)	(-3.80)
Specialization (1Y)	.0018*				
	(1.67)				
Violation×Specialization (1Y)	.0022***				
	(3.19)				
Specialization (2Y)		.0022			
		(1.59)			
Violation× Specialization (2Y)		.0019***			
		(2.69)			
Specialization			.0019		
			(1.23)		
Violation× Specialization			.0022***		
			(3.01)		
Specialization (4Y)				.0015	
				(0.89)	
Violation×Specialization (4Y)				.0022***	
				(3.07)	
Specialization (5Y)					.0012
					(0.73)
Violation×Specialization (5Y)					.0017**
					(2.12)
Bank-YearQtr FE	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓	✓
Rating Dummies	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓
Diff. Firm Controls	✓	✓	✓	✓	✓
Firm Controls×Spec.	✓	✓	✓	✓	✓
Diff. Firm Controls×Spec.	✓	✓	✓	✓	✓
Adj. R^2	.134	.133	.131	.13	.129
Obs.	47765	46870	45955	44880	43724

Table A6. Bank Specialization and Covenant Strictness: Alternative Assumptions for the Computation of Specialization Measure

This table reports the estimates of the coefficients from the following regression:

$$Y_{l,f,b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot Excess\ Specialization_{b,i,t-1} + \gamma_F \cdot Firm\ Controls_{f,t} + \gamma_L \cdot Loan\ Controls_{l,f,b,t} + \varepsilon_{l,f,b,t}$$

where $Y_{l,f,b,t}$ is the measure of covenant strictness for loan l contracted in year-quarter t by bank b to firm f. $Specialization_{b,i,t-1}$ is the ratio of bank b's portfolio share in industry i at time $t-1$ (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at time $t-1$ (averaged over a rolling 12-quarter window). Specialization is calculated using: in columns (1), all loans, without dropping loan contracts that are likely to be restatements of existing loans; in columns (2), only loans originated from 1996 onward; in columns (3), excluding term loans B; in columns (4), by attributing loan shares to lead arrangers as in Chodorow-Reich (2014); in columns (5), by attributing loan shares to lead arrangers as in Doerr and Schaz (2021); and in columns (6), by attributing loan shares to lead arrangers as in De Haas and Van Horen (2013). Firm controls include those reported in Table 2, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. Loan controls include those reported in Table 2, plus separate intercepts for different loan purposes (Corporate Purposes, Working Capital, Debt Repayment, Takeover, CP Backup). All variables are described in Table A1 t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Starting Samples			Loan Share Attribution Methods		
	Amend/Restate	From 1996	No Term Loans B	Chodorow-Reich (2014)	Doerr & Schaz (2021)	De Haas & Van Horen (2013)
	(1)	(2)	(3)	(4)	(5)	(6)
Specialization	-5.11***	-4.66***	-4.27***	-3.63**	-3.39**	-4.48***
	(-4.02)	(-3.72)	(-3.58)	(-2.66)	(-2.48)	(-3.40)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓	✓	✓
Rating Dummies	✓	✓	✓	✓	✓	✓
Loan Purpose Dummies	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓
Loan Controls	✓	✓	✓	✓	✓	✓
Adj. R^2	.567	.569	.566	.565	.564	.566
Obs.	3506	3491	3493	3498	3498	3498

Table A7. Bank Specialization and Firm Investment: Alternative Assumptions for the Computation of Specialization Measure

This table reports the estimates of the coefficients from the following regression:

$$Y_{f,t+4} - Y_{f,t} = \theta_1 Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}$$

where the dependent variable is the difference in firm f's investment from year-quarter t to $t+4$. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter t, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of bank b's portfolio share in industry i at time t (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at time t (averaged over a rolling 12-quarter window). Specialization is calculated using: in columns (1), all loans, without dropping loan contracts that are likely to be restatements of existing loans; in columns (2), only loans originated from 1996 onward; in columns (3), excluding term loans B; in columns (4), by attributing loan shares to lead arrangers as in Chodorow-Reich (2014); in columns (5), by attributing loan shares to lead arrangers as in Doerr and Schaz (2021); and in columns (6), by attributing loan shares to lead arrangers as in De Haas and Van Horen (2013). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Starting Samples			Loan Share Attribution Methods		
	Amend/Restate	From 1996	No Term Loans B	Chodorow-Reich (2014)	Doerr & Schaz (2021)	De Haas & Van Horen (2013)
	(1)	(2)	(3)	(4)	(5)	(6)
Violation	-.0063***	-.0067***	-.0068***	-.0074***	-.0075***	-.0068***
	(-3.87)	(-4.37)	(-4.31)	(-4.96)	(-5.13)	(-4.41)
Specialization	.0017	.0019	.0019	.0018	.0017	.0015
	(1.30)	(1.23)	(1.22)	(1.17)	(1.10)	(1.11)
Violation × Specialization	.0021**	.0022***	.0023***	.0027***	.0028***	.0022***
	(2.61)	(3.01)	(2.86)	(3.30)	(3.30)	(3.04)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓	✓	✓
Rating Dummies	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓
Diff. Firm Controls	✓	✓	✓	✓	✓	✓
Firm Controls * Spec.	✓	✓	✓	✓	✓	✓
Diff. Firm Controls * Spec.	✓	✓	✓	✓	✓	✓
Adj. R^2	.065	.064	.063	.064	.064	.064
Obs.	46243	45951	45849	45955	45955	45955

Table A8. Bank Specialization and Covenant Strictness: Alternative Specialization Measure

This table reports the estimates of the coefficients from the following regression:

$$Y_{l,f,b,t} = \alpha_{b,t} + \alpha_{i,t} + \alpha_f + \beta \cdot \textit{Excess Specialization}_{b,i,t-1} + \gamma_F \cdot \textit{Firm Controls}_{f,t} + \gamma_L \cdot \textit{Loan Controls}_{l,f,b,t} + \varepsilon_{l,f,b,t}$$

where $Y_{l,f,b,t}$ is the measure of covenant strictnes for loan l contracted in year-quarter t by bank b to firm f. $\textit{Specialization}_{b,i,t-1}$ is the difference between the bank b's portfolio share in industry i at time $t-1$ (averaged a rolling 12-quarter window) and the market-wide share of credit to industry i at time $t-1$ (averaged over a rolling 12-quarter window). Firm controls include those reported in Table 2, plus separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. Loan controls include those reported in Table 2, plus separate intercepts for different loan purposes (Corporate Purposes, Working Capital, Debt Repayment, Takeover, CP Backup). All variables are described in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	Covenant Strictness			
	(1)	(2)	(3)	(4)
Excess Specialization	−4.187*	−4.563*	−4.468**	−4.66**
	(−1.84)	(−2.02)	(−2.05)	(−2.12)
Bank-YearQtr FE	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓
Firm FE	✓	✓	✓	✓
Rating Dummies	–	✓	✓	✓
Loan Purpose Dummies	–	–	✓	✓
Firm Controls	–	✓	✓	✓
Loan Controls	–	–	✓	–
Loan Controls (including AISD)	–	–	–	✓
Adj. R^2	.511	.565	.564	.565
Obs.	3498	3498	3498	3498

Table A9. Bank Specialization and Firm Investment: Alternative Specialization Measure

This table reports the estimates of the coefficients from the following regression:

$$Y_{f,t+4} - Y_{f,t} = \theta_1 Excess\ Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Excess\ Specialization_{b,i,t} + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Excess\ Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}$$

where the dependent variable is the difference in firm f's investment from year-quarter t to $t+4$. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter t, and to 0 otherwise. $Specialization_{b,i,t}$ is the difference between bank b's portfolio share in industry i at time t (averaged a rolling 12-quarter window) and the market-wide share of credit to industry i at time t (averaged over a rolling 12-quarter window). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. t statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	ΔInvestment					
	(1)	(2)	(3)	(4)	(5)	(6)
Violation	−.0034**	−.0041***	−.0048***	−.0044***	−.0046***	−.0043***
	(−2.31)	(−2.75)	(−3.21)	(−2.93)	(−3.07)	(−2.83)
Excess Specialization	.00002	.00001	0.000002	−.00002	.00062	.00037
	(0.47)	(0.34)	(0.044)	(−0.44)	(1.66)	(0.99)
Violation×Excess Specialization		.00042***	.0004***	.0004***	.00038**	.00032*
		(2.89)	(2.93)	(2.93)	(2.28)	(1.83)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓	✓	✓
Rating Dummies	–	–	✓	✓	✓	✓
Firm Controls	–	–	✓	✓	✓	✓
Diff. Firm Controls	–	–	–	✓	–	✓
Firm Controls×Spec.	–	–	–	–	✓	✓
Diff. Firm Controls×Spec.	–	–	–	–	–	✓
R^2	.108	.108	.11	.129	.111	.131
Obs.	45955	45955	45955	45955	45955	45955

Table A10. Bank Specialization and Firm Investment: Only Firms in Violation at Least Once

This table reports the estimates of the coefficients from the following regression only by using firms that have violated a covenant:

$$Y_{f,t+4} - Y_{f,t} = \theta_1 Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}$$

where the dependent variable is the difference in firm *f*'s investment from year-quarter *t* to *t+4*. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter *t*, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of bank *b*'s portfolio share in industry i at time t (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at time t (averaged over a rolling 12-quarter window). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. *t* statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	ΔInvestment					
	(1)	(2)	(3)	(4)	(5)	(6)
Violation	−.0035**	−.0066***	−.0071***	−.0063***	−.0071***	−.0063***
	(−2.30)	(−3.88)	(−4.35)	(−3.89)	(−4.35)	(−4.07)
Specialization	0.0004	0.0003	0.0004	0.0003	.0018	0.0006
	(1.00)	(0.81)	(0.85)	(0.93)	(1.18)	(0.31)
Violation×Specialization		.0022***	.0023***	.0021***	.0024***	.0021***
		(4.02)	(4.19)	(3.78)	(4.27)	(3.51)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓	✓	✓
Rating Dummies	—	—	✓	✓	✓	✓
Firm Controls	—	—	✓	✓	✓	✓
Diff. Firm Controls	—	—	—	✓	—	✓
Firm Controls×Spec.	—	—	—	—	✓	✓
Diff. Firm Controls×Spec.	—	—	—	—	—	✓
R^2	.171	.171	.173	.193	.174	.195
Obs.	19353	19353	19353	19353	19353	19353

Table A11. Bank Specialization and Firm Investment: Only Single-Bank Lenders

This table reports the estimates of the coefficients from the following regression only by using firms that have a single lender in each quarter:

$$Y_{f,t+4} - Y_{f,t} = \theta_1 Specialization_{b,i,t} \times Violation_{f,t} + \theta_2 Violation_{f,t} + \theta_3 Specialization_{b,i,t} + \Phi_1 X_{f,t} + \Phi_2 X_{f,t} \times Specialization_{b,i,t} + \alpha_{i,t} + \alpha_{b,t} + \eta_{fiscal\ t} + \varepsilon_{f,t}$$

where the dependent variable is the difference in firm *f*'s investment from year-quarter *t* to *t+4*. $Violation_{f,t}$ is equal to 1 if firm f violated a financial covenant at year-quarter *t*, and to 0 otherwise. $Specialization_{b,i,t}$ is the ratio of bank *b*'s portfolio share in industry i at time t (averaged a rolling 12-quarter window) relative to the market-wide share of credit to industry i at time t (averaged over a rolling 12-quarter window). $X_{f,t}$ is a vector of firm-level controls consisting of all those included in Table 2, plus the lagged 4-quarter difference in Log(Assets) and Tangibility, as well as separate intercepts for Capital IQ S&P Long Term Issuer Credit Ratings. All variables are defined in Table A1. *t* statistics (in parentheses) are obtained from two-way clustering at the bank and firm level. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

	ΔInvestment					
	(1)	(2)	(3)	(4)	(5)	(6)
Violation	-.0038**	-.0076***	-.0083***	-.0076***	-.008***	-.0072***
	(-2.23)	(-4.28)	(-4.61)	(-4.17)	(-4.41)	(-4.11)
Specialization	0.00004	0.000004	-0.00001	-0.0001	.0041**	.0024
	(0.14)	(0.015)	(-0.24)	(-0.36)	(2.53)	(1.49)
Violation×Specialization		.0028***	.0028***	.0027***	.0027***	.0024***
		(5.81)	(5.85)	(5.24)	(5.37)	(4.35)
Bank-YearQtr FE	✓	✓	✓	✓	✓	✓
Industry-YearQtr FE	✓	✓	✓	✓	✓	✓
Fiscal Qtr FE	✓	✓	✓	✓	✓	✓
Rating Dummies	-	-	✓	✓	✓	✓
Firm Controls	-	-	✓	✓	✓	✓
Diff. Firm Controls	-	-	-	✓	-	✓
Firm Controls * Spec.	-	-	-	-	✓	✓
Diff. Firm Controls * Spec.	-	-	-	-	-	✓
R^2	.12	.12	.122	.142	.122	.143
Obs.	36928	36928	36928	36928	36928	36928