

Boards as Contracting Intermediaries: Evidence from Board-Interlocking Firms in the Credit Market

August 2026

Abstract

This paper examines the role of corporate boards as contracting intermediaries in credit markets. While prior research emphasizes directors' monitoring and advisory functions, their potential to facilitate financing remains largely unexplored. We study this mechanism through board interlocking, focusing on cases in which a director simultaneously serves on the boards of two firms, one of which already maintains a lending relationship with a bank. In such settings, the common director may reduce contracting frictions by providing informal assurance through reputational linkages between the two firms or by facilitating the exchange of soft information from prior lending interactions. We find that when a firm is connected to a bank through an interlocking firm, the probability of forming a new lending relationship increases significantly. A counterfactual exercise suggests that aggregate lending to unconnected firm–bank pairs during the 2007–2008 financial crisis would have been 47.9% higher if those pairs had been connected. Instrumental-variable and quasi-natural-experiment analyses support a causal interpretation. The effects are strongest for informationally opaque firms and during credit market disruptions, extending to favorable loan pricing and real outcomes such as employment and investment. Overall, our findings highlight a novel channel through which interlocking directors can facilitate financial contracting, effectively serving as informal guarantors or information providers.

JEL Classifications: G21, G32, G34

Keywords: Role of Board, Board Interlocking, Financial Intermediation, Loan Contracting

1 Introduction

How effective are board members in firm financing? The existing literature thoroughly examines the board’s role in *advising* management on approaches to optimize shareholder wealth, *monitoring* management to ensure it serves shareholders’ best interests, and *assessing* managers’ ability to enhance shareholder value.¹ While more recent studies on corporate boards have increasingly sought to understand at a more granular level what individual directors actually do to create value for their firms, director involvement in financing activities remains relatively unexplored.² Our paper seeks to fill this gap by examining how directors can serve as *contracting intermediaries* in credit markets, exploiting the unique empirical setting of board interlocking.

In this paper, we propose that a director can serve as a middleman between her firm (“focal firm”, henceforth) and a bank.³ Yet, a key challenge to study this role is that the director’s direct involvement or efforts to facilitate the loan process between the focal firm and the bank are unobservable. Therefore, we focus on a unique setting in which she holds another directorship in a third firm (“interlocking firm”, henceforth) that already has a loan relationship with the bank.

A new loan process between the focal firm and the bank would face less friction from adverse selection and moral hazard, holding other factors (e.g., credit history, collateral, and creditworthiness) constant. This reduction in friction arises from the existing loan with the interlocking firm, as adverse credit events at the focal firm can generate reputational spillovers through the common director and adversely affect the interlocking firm’s future lending relationship with the bank—for instance, through tighter credit standards or reduced credit availability. In this context, the interlocking firm can act as an informal guarantee for the focal firm, with the common director serving as an informal guarantor (i.e., guarantor channel). Alternatively, the common director may reduce contracting costs by facilitating information exchange between the focal firm and the bank, drawing on her previous experience from contracting with the bank in the interlocking firm (i.e., information provider channel).

¹See [Adams, Hermalin, and Weisbach \(2010\)](#) for a comprehensive survey of the literature on the monitoring and advising roles of boards. More recently, [Hermalin and Weisbach \(2014\)](#) and [Denis, Denis, and Walker \(2015\)](#) examine boards’ role in assessing CEOs.

²Although directors are not typically involved in firms’ day-to-day financing decisions, major syndicated credit facilities can involve formal board authorization. For example, Best Buy’s March 2002 credit agreement with US Bank (featured in Figure 1) required a secretary’s certificate confirming that its Board of Directors had adopted resolutions authorizing the loan documents and the borrowings thereunder.

³The resource-dependence view of boards suggests that directors can leverage personal resources, including professional networks and experience, in performing their roles. Consistent with this view, [Engelberg, Gao, and Parsons \(2012\)](#) show that interpersonal connections between board members and banks (e.g., shared educational or employment backgrounds) influence lending decisions. Our setting differs in that the same director serves at two firms, one of which already has a lending relationship with the bank.

As both an informal guarantor and/or information provider, the director can serve as an intermediary for the focal firm-bank pair, especially when the pair is connected through a third firm that is board-interlocking with the focal firm and currently has a loan relationship with the bank (“connected”, henceforth).

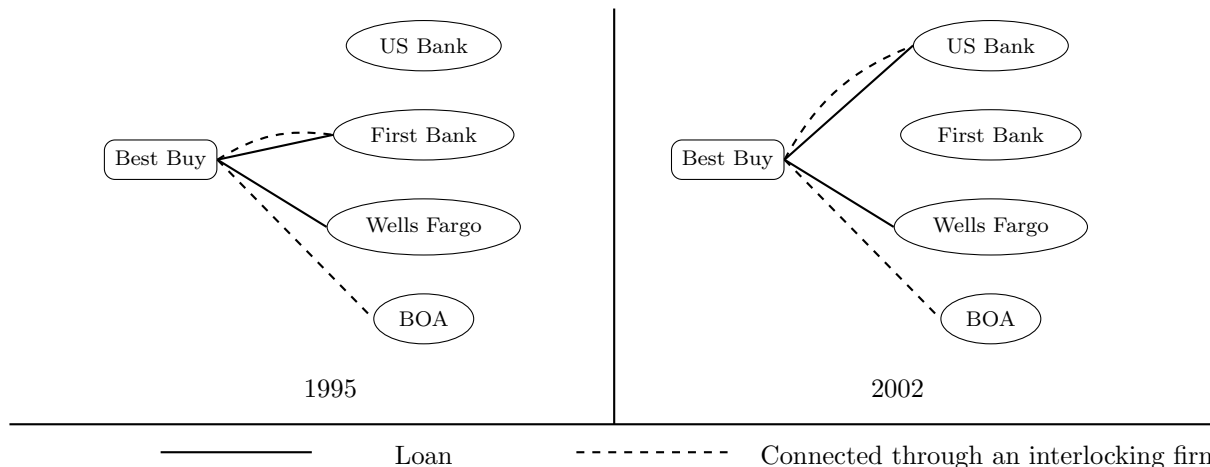


Figure 1. Illustration of the Empirical Setting. This figure illustrates the empirical setting, displaying the relationships between a focal firm (Best Buy) and four banks (US Bank, First Bank, Wells Fargo, and Bank of America) in 1995 and 2002. The solid line indicates that Best Buy and the bank had a syndicated loan relationship. The dashed line indicates that there is a third firm that was board-interlocking with Best Buy and had a loan from the bank (i.e., *Connected*). In 1995, Best Buy and a third firm (Pentair) shared a common director (Dick Schulze), and the third firm had loans from both First Bank and BOA, resulting in *Connected* between Best Buy and both First Bank and BOA. In 2002, Best Buy and a third firm (Infogroup) shared a common director (Elliot Kaplan), and the third firm had a loan from US Bank, resulting in *Connected* between Best Buy and US Bank. In addition, Best Buy and a third firm (Shopko Stores) shared a common director (Jack Eugster), and the third firm had a loan from BOA, resulting in *Connected* between Best Buy and BOA.

Figure 1 illustrates our empirical setting using Best Buy as the focal firm. In 1995, Best Buy was neither connected to nor borrowing from US Bank. By 2002, however, Best Buy had become connected to US Bank through Infogroup, with which it shared a common director. Infogroup maintained an outstanding loan relationship with US Bank from July 1999 to June 2004, and Best Buy subsequently established a loan relationship with US Bank in March 2002. In contrast, Best Buy was connected to First Bank through another interlocking firm and had a loan relationship with First Bank in 1995, but by 2002 both the connection and the lending relationship had disappeared.

Building on this anecdotal example, this article investigates whether there is a systematic correlation between a firm-bank pair’s status of being connected (through an interlocking firm) and the likelihood of forming a loan relationship. Importantly, we focus on within-pair variations in both the connection status and the loan relationship, using firm-bank pair fixed effects and controls. In Figure 1, the pairs of Best Buy–Wells Fargo and Best Buy–BOA do not show any within-pair time-series changes. In contrast, the pairs of Best Buy–US Bank

and Best Buy–First Bank exhibit within-pair time-series variations in both the connection status and the loan relationship, which we aim to capture in our empirical setting.

The advantages of using board interlocking as a laboratory are multifaceted: (i) A natural alternative for exploring the contracting intermediary role of the board is to examine variation in board structure or characteristics within a firm that affect the board’s ability to facilitate financing. Ideally, one would focus on each board member’s ability or skill to intermediate financing, but such variation is difficult to observe or quantify. Therefore, we focus on a different margin—board interlocking—where the variation is easily identifiable from the director sets of each firm pair. (ii) The connection between a firm and a bank through a third firm is less likely to be shaped endogenously or strategically by either the firm or the bank, compared to the variation in board composition or characteristics within a firm. (iii) Finally, as the attention on board interlocking increases, investigating the outcomes of such interlocks between two firms is interesting in its own right.⁴

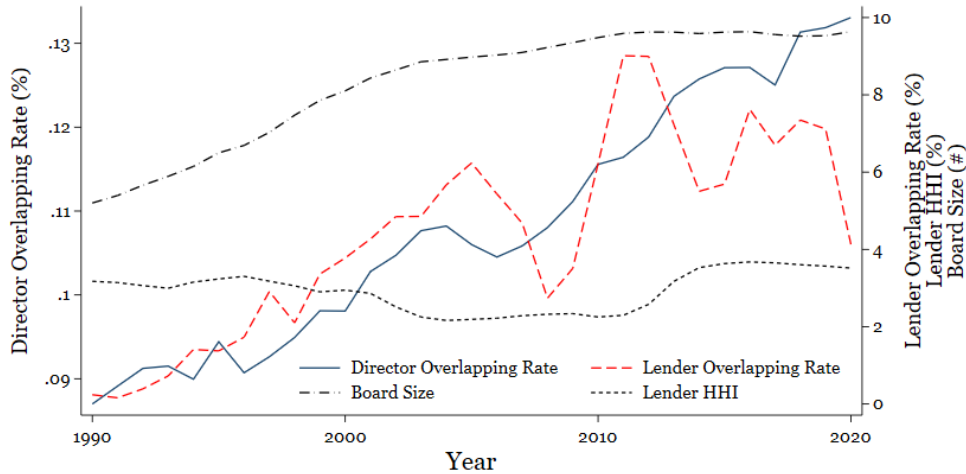


Figure 2. U.S. Trend. This figure plots the time trends of the director overlap rate and lender overlap rate among firm pairs in our sample from 1990 to 2020. It also shows the size of corporate boards and the lender Herfindahl–Hirschman Index (HHI) in the syndicated loan market for the same period. See Section 3 for a detailed description of sample construction.

⁴The recent enforcements by the Federal Trade Commission (FTC) and the Department of Justice (DOJ) reflect growing attention to interlocking directorates. Both agencies have recently prioritized the enforcement of Section 8 of the Clayton Act, which prohibits an individual or entity from simultaneously serving as a director or board-appointed officer at two competing corporations, subject to certain exceptions and conditions. Consistent with the DOJ’s increased efforts to break up interlocking directorates (<https://www.justice.gov/opa/speech/assistant-attorney-general-jonathan-kanter-delivers-opening-remarks-2022-spring-enforcers>), the department announced that seven directors resigned from the boards of five companies in response to concerns raised by the Antitrust Division’s investigation of potential Section 8 violations in 2022. Prior to this, the DOJ rarely investigated or enforced the federal ban on interlocking directorates. The FTC also announced its first enforcement action under Section 8 in over 40 years, following its policy statement in 2022 (https://www.ftc.gov/system/files/ftc_gov/pdf/P221202Section5PolicyStatement.pdf).

The first stylized fact presented in our paper, based on data from syndicated loan market participants among public U.S. firms between 1990 and 2020, is that both lender overlap and director overlap between firm pairs exhibit an evolving trend, as shown in Figure 2. Lender overlap rates exhibit more pronounced fluctuations, especially after the 2008 financial crisis. This observed comovement is, however, only suggestive. Additionally, corporate board size has increased over time, from approximately 5 to 9 members on average, which may partly explain the rising trend in director overlap rates. Meanwhile, the lender Herfindahl–Hirschman Index (HHI) in the syndicated loan market remains relatively stable, suggesting that the upward trend in lender overlap rates is not a mechanical artifact of shifts in lender concentration.

We also present in Section 4 that the lender overlapping rates of a borrower pair increase (decrease) shortly after the initiation (termination) of their board interlocking. In addition, when focusing on new entrants to the loan market, the lender overlapping rates are higher for firm pairs that are board-interlocked than for randomly matched firm pairs. These dynamics provide initial evidence that board interlocking may influence loan contracting behavior.

For a sharper analysis of the contracting intermediary effect, we run a lender choice model in multivariate settings, similar to previous studies (e.g., [Bharath et al., 2007](#); [Hellmann, Lindsey, and Puri, 2008](#); [Karolyi, 2018](#)). More specifically, we construct loan–firm–bank triad observations by matching the (counterfactual) top 50 lenders in the syndicated loan market to each of the loan facilities that are actually made. The results show that the probability of a firm–bank pair matching for a loan significantly increases when they are connected through a board-interlocking firm, holding other factors constant. The effects are also economically significant: the probability increases by about 26% (from the unconditional probability of 0.02) when they are connected, compared to when they are not. Also, the results remain robust across alternative specifications, including different matching schemes (top 25, top 100, or all active lenders), high-dimensional fixed effects (firm–bank pair, firm–year, and bank–year levels), and alternative clustering methods.

We next conduct placebo tests to shed light on the informal guarantor and information provider channels, which are not mutually exclusive. We pay closer attention to the timing of board interlocking and lending relationships by constructing placebo-connection variables that capture non-contemporaneous links between firms and banks (i.e., links where the board overlap or lending relationship occurred in the past but not contemporaneously). We find little evidence that such past connections affect lender choice. Instead, the effect is concentrated in contemporaneous connections (i.e., when both the board overlap and lending relationship are simultaneously present). This pattern is more consistent with the reputational-assurance mechanism underlying the informal guarantor channel, although it does not rule out information provision through the currently shared director.

Importantly, the lender choice model involves two primary sources of endogeneity: the matching process between directors and firms, and the matching process between firms and banks. For example, the director selection of a firm, pursuing certain policies, may render its status of board interlocking endogenous to its lender choice. Also, it is possible that a lender may prefer to lend to a firm because its directors hold multiple directorships and are perceived to have greater ability. Although firm–bank pair fixed effects account for certain unobserved factors, we reinforce the identification by triangulating the analysis with two complementary strategies: an instrumental variable (IV) approach and a quasi-natural experiment.

First, we introduce the average busyness of potential directors (i.e., directors whose firms are currently borrowing from the bank but who do not work for the focal firm, and could thus potentially join the focal firm as an interlocking director) as an IV. This IV strategy is based on the rationale that the marginal increase in workload and time cost for an additional directorship appointment is greater for busy directors (i.e., those with more than one directorship) than for those with only one position. For a given focal firm–bank pair, if the potential directors are too busy with their current directorships, the pair is less likely to become connected through an interlocking firm. This is a plausible instrument because neither the focal firm nor the bank can govern other directors’ employment choices or appointments at other firms. To wit, this supports our identifying assumption that assignment to a pool of busy potential directors is effectively random across firm–bank pairs, generating variation in the ex ante likelihood of the pairs becoming connected through an interlocking director.

The IV estimations confirm our prior that the likelihood of a firm–bank pair being connected decreases significantly when the pair is quasi-randomly assigned to a set of busy potential directors, thereby satisfying the relevance requirement. In turn, this instrumented decline in connection likelihood translates into a lower probability of the pair forming a loan relationship, consistent with the main results.

We then focus on credit market disruptions during the 2007–2008 financial crisis, when financing frictions were particularly severe. This setting allows us to examine whether the board’s contracting intermediary role helps alleviate such frictions. First, the results indicate that the baseline effect amplifies more than sixfold during the crisis period. Moreover, a partial equilibrium counterfactual exercise assessing the economic magnitude of the intermediation effect suggests that aggregate loans for unconnected firm–bank pairs would have increased by 47.9% during the crisis if those pairs had been connected.

In particular, as a quasi-natural experiment, we extend the approach of Almeida et al. (2012) and subsequent studies (e.g., Benmelech, Frydman, and Papanikolaou, 2019; Costello, 2020; Granja and Moreira, 2023) to a *triple-difference* setting. Prior studies show that firms with a large share of debt maturing at the onset of the crisis were forced to refinance and

consequently faced severe financial constraints. Importantly, even among these financially constrained firms, preexisting connections with banks through an interlocking firm could have mitigated the impact of the shock. If such connections reduce contractual frictions, connected firm–bank pairs should have been more likely than unconnected pairs to initiate lending relationships during the crisis period—a pattern confirmed by the results. Because a firm’s exposure to the crisis, determined by prescheduled debt maturities, is unlikely to be systematically correlated with its preexisting connection status across multiple banks (which generates the third layer of difference), the results support a causal interpretation of our findings.⁵

To identify which firms experience a more pronounced contracting-intermediary effect, we exploit cross-sectional heterogeneity in borrower characteristics. Classic theories of financial intermediation (e.g., [Leland and Pyle, 1977](#); [Diamond, 1984](#); [Ramakrishnan and Thakor, 1984](#)) predict that banks’ informational advantage is most valuable when borrowers are opaque or financially constrained. Consistent with this view, we find that the board-generated connection is especially beneficial for firms that are new entrants to the syndicated loan market, unrated, small, or young—those for whom informational frictions are most severe. These results suggest that the interlock operates as a relational conduit through which banks’ informational advantage is *activated* for otherwise disadvantaged borrowers, effectively extending the reach of traditional intermediation.

For the intensive margin, we examine whether the pricing of a loan between a firm–bank pair is influenced by their connection status. The results show that while the connection status may not significantly reduce loan spreads for average firms, informationally opaque firms, especially during credit market freezes, benefit from the connections at both the intensive and extensive margins.

Finally, we examine whether the contracting benefits of interlocking directors extend beyond financing outcomes to real firm decisions. Using firm-level regressions linking connection intensity (i.e., the average exposure of a firm to lenders) to subsequent employment and investment, we find that more intensely connected firms expand both employment and capital expenditures more than less connected firms. The effects are economically significant:

⁵Notably, establishing causality is challenging because we observe only originated loans—not borrower loan applications and lender proposals—implying that our tests may capture ex post equilibrium outcomes. An ideal experiment to establish causality would use exogenous variation in factors or events that lead to the appointment of a director capable of interlocking two firms, one of which already has a loan relationship with the focal bank, and then examine their effects on borrower loan applications, lender proposals, and subsequent loan formation. However, identifying a “good” variation is challenging because the appointment of such a director is likely an endogenous decision, often correlated with unobservable characteristics within the firm. Still, together with the model’s robustness to granular firm–bank pair fixed effects, the IV approach and quasi-natural experiment help mitigate endogeneity concerns.

a one-standard-deviation increase in connection intensity raises employment by about 1.7% for credit market incumbents and nearly 9% for entrants. The impact on investment is also stronger during financial crises, suggesting that interlocking directors help firms translate financing advantages into real economic outcomes when credit frictions tighten.

This study extends the literature on institutional relationship lending (e.g., [Petersen and Rajan, 1994](#); [Berger and Udell, 1995](#); [Hellmann, Lindsey, and Puri, 2008](#); [Bharath et al., 2011](#)) or personal relationship lending (e.g., [Engelberg, Gao, and Parsons, 2012](#); [Drexler and Schoar, 2014](#); [Haselmann, Schoenherr, and Vig, 2018](#); [Karolyi, 2018](#); [Khan et al., 2019](#); [Herpfer, 2021](#); [Anderson et al., 2023](#); [Even-Tov et al., 2024](#)) by highlighting an overlooked dimension: the interdependence of lending decisions across multiple borrowers during the same contracting period. Our focus is on lending relationships formed through board interlocks with a third firm (encompassing both personal and institutional connections), which constitute first-order links between borrowers facilitated by *shared* personnel, arguably a stronger form of connection than ties formed through broader personal networks.

Our paper also contributes to the board interlocking literature. On the one hand, prior studies find that board interlocks are valuable for firms in improving performance, profitability, and governance (e.g., [Perry and Peyer, 2005](#); [Nguyen and Nielsen, 2010](#); [Masulis and Mobbs, 2011](#); [Barzuza and Curtis, 2017](#); [Faia, Mayer, and Pezone, 2021](#); [Zhang, 2021](#); [Geng et al., 2022](#); [Gopalan, Li, and Zaldokas, 2024](#); [Poberejsky, 2024](#); [Barone, Schivardi, and Sette, 2025](#)). On the other hand, other studies suggest that interlocks may harm firm value and governance (e.g., [Yermack, 1996](#); [Hallock, 1997](#); [Fich and White, 2005](#); [Fich and Shivdasani, 2006](#); [Güner, Malmendier, and Tate, 2008](#); [Hauser, 2018](#)). Although the evidence is mixed, the general consensus is that interlocking directors are significant conduits of information and firm policy (e.g., [Bouwman, 2011](#); [Intintoli, Kahle, and Zhao, 2018](#); [Burt, Hrdlicka, and Harford, 2020](#); [Begley, Haslag, and Weagley, 2024](#); [Chen et al., 2024](#); [Cabezón and Hoberg, 2026](#)). Building on this consensus, our paper suggests that board interlocks can link contracting practices across firms.

Last but not least, our study contributes to the extensive literature on the roles of corporate boards ([Adams, Hermalin, and Weisbach, 2010](#)). While much of this literature focuses on monitoring, advising, and assessing, more recent work seeks to understand what individual directors actually do to create value for their firms. We contribute to this literature by documenting how directors can serve as contracting intermediaries in financial markets, highlighting a novel channel through which directors can facilitate firms' access to external finance.

2 On the Roles of Common Directors

Two non-mutually exclusive channels are proposed, highlighting the role of the common director as a contracting intermediary between the focal firm and the lender, though through different mechanisms. While complementary to a director’s standard advising role within her firm, her contribution to financial contracting is distinct, as the process involves not only her firm but also the lender, who is not obligated to abide by the advice of the borrower’s director. Importantly, this role does not require the common director’s direct participation in the day-to-day loan application or negotiation process; rather, it operates through reputational and informational linkages across the two firms. Furthermore, although related to the monitoring role, contracting intermediation is based on the lender’s expectation of ex-post monitoring of the common director (which arises due to the presence of the interlocking firm) and therefore precedes it. The following outlines our hypothesis, focusing on the informal guarantor and information provider channels, and describes our simple model, which is detailed in the Internet Appendix I.

Informal guarantor channel: When borrowers are more informed about their own risk profile than lenders, loan outcomes can be inefficient in equilibrium, i.e., adverse selection problems may arise. However, if a focal firm is about to contract with a lender and its interlocking firm already has an active loan relationship with the same lender, the interlocking firm can serve as an “informal guarantee” for the focal firm (and vice versa).⁶ If one firm defaults (or even attempts to strategically default) on its loan, the resulting reputational spillover through the common director can adversely affect the other firm’s future lending relationship with the bank, potentially leading to tighter terms or reduced credit availability.⁷ ⁸ This arrangement effectively creates a risk-pooling mechanism that is feasible only for firm pairs connected through and supervised by the same agent (i.e., a common director), but not for unconnected firm pairs.⁹ As a result, this mechanism can help restore efficiency

⁶This mechanism is feasible under U.S. governance and banking regulation because it operates as an informational and reputational assurance rather than a contractual guarantee. See Internet Appendix II for the institutional background establishing its legal permissibility.

⁷Consistent with such reputational spillovers in credit markets, [Haw et al. \(2021\)](#) find that firms face higher loan costs following bankruptcy filings by board-interlocking firms and provide evidence that this effect reflects lenders’ reassessment of the common director’s monitoring and advising abilities. More broadly, prior studies document adverse reputational consequences associated with lawsuits or other negative events at firms connected through shared directors ([Srinivasan, 2005](#); [Fich and Shivdasani, 2007](#); [Dou, 2017](#); [Gow, Wahid, and Yu, 2018](#)). Our research differs from these studies by (i) focusing on loans provided by the *same* lender, which allows us to examine the underexplored role of common directors, and (ii) emphasizing ex-ante loan contracting (i.e., loan origination and structuring) that factors in the probability of potential ex-post credit events and the resulting changes in perceptions of the borrower’s or director’s abilities.

⁸Any adjustment in future lending terms would formally be justified by borrower-level risk factors or market conditions, while reputational deterioration conveyed through the interlock operates informally.

⁹From the lender’s perspective, once the focal firm is included in its loan portfolio, the reputational linkage

and mitigate the adverse selection problem. Consequently, a common director expects more favorable loan pricing or terms when the focal firm borrows from a connected lender rather than an unconnected one and, therefore, advises the focal firm accordingly.

Moreover, lenders' imperfect information about borrowers' effort levels in their investments can result in inefficiencies, leading to effort levels lower than the efficient level—where marginal benefit equals marginal cost—because borrowers do not fully internalize the cost of investment failure. In other words, moral hazard problems may arise. However, due to the implicit cross-firm liability created by this reputational linkage, a lender expects their common director to demonstrate greater commitment to ensuring the solvency of the focal firm if the interlocking firm has an active loan relationship with the same lender. This expectation is based on an ex-ante commitment to monitoring, in contrast to the ex-post monitoring that has been the primary focus of previous literature on the board's monitoring role. Furthermore, because the likelihood of ex-post moral hazard is lower, the lender itself may anticipate a reduced need for intensive monitoring efforts. As a result, loan pricing and terms may also be more favorable.

Information provider channel: the common director can help reduce the lender's cost of searching and evaluating new borrowers with whom the lender has prior borrowing experience in the interlocking firm (i.e., relationship-based lending in another firm). Moreover, the common director can streamline the focal borrower's process of finding a new lender, thus reducing the focal firm's lender search costs as well.¹⁰ Furthermore, the shared past loan experience can smooth communication between the common director and the loan officer, enhancing the overall information exchange during the loan contracting period. Additionally, the common director can provide the lender with more relevant and lender-specific private information (i.e., soft information) about the focal firm, reducing the focal firm's information preparation costs. The director's prior experience with the lender through the interlocking firm can further facilitate the approval process by helping the focal firm navigate the lender's screening and approval procedures.¹¹ On the other hand, the lender can also better evaluate the precision of information of the focal firm conveyed by the common director, by experiencing

operates in both directions: adverse credit events at either firm may affect the other firm's future lending relationship with the bank.

¹⁰Lender search costs can arise both from identifying suitable lenders and from screening potential lenders. Anecdotal evidence illustrates how directors can facilitate the former: Sunflower Bank reports that its relationship with Solea Energy began when a Solea board member introduced the firm's leadership to the bank's commercial banking team. The relationship subsequently developed into customized credit arrangements and syndicated lending (<https://www.sunflowerbank.com/about-us/client-stories/solea-energy>). The latter can also include the cost of screening lenders that may leak information to other (rival) firms during lending relationships (e.g., Acharya and Johnson, 2007; Massa and Rehman, 2008; Ivashina and Sun, 2011).

¹¹This mechanism does not imply that the director provides the lender with additional private information about the interlocking firm to facilitate the focal firm's loan.

and learning from the synchronicity between information and observed firm quality within the interlocking firm (i.e., cross-learning). Therefore, the lender can obtain information advantage over other lenders.

However, the prediction on loan pricing or terms is not straightforward a priori from this information provider channel; on the one hand, with the information advantage, the lender may be able to better sort the borrowers on quality, and which does not necessarily induce more favorable terms for the focal firm’s loans, all else being equal. However, the proprietary lending opportunity enabled by the lender’s informational advantage (through the common director) could instead generate rents that can be shared with the borrower through more favorable loan terms.¹²

In addition, while some empirical predictions from both the informal guarantor channel and information provider channel may align, there are notable differences between them, particularly in terms of *loan origination timing*. The guarantor channel is strictly contingent upon *concurrent* loans in the interlocking firm, whereas the information provider channel extends beyond the current period, encompassing all the *past* loans between the interlocking firm and the lender. Furthermore, the guarantor channel, unlike the information provider channel, has implications on a board-interlocking firm when the other firm causes covenant violations or credit events. Thus, the empirical prediction of the two channels differs over the course of the loan as well as at the initiation.

While our hypothesis above predicts lender concentration among board-interlocking firms through the guarantor and/or information provider channels, countervailing forces may arise. To wit, when a lender extends a board-interlocking loan, it could potentially elevate concentration in its portfolio. This credit concentration arises due to the interconnectedness of board-interlocking firms, wherein they may share correlated economics or risks through the transfer of information or policy by the common director (e.g., [Bouwman, 2011](#)). As a result of this increased concentration risk, the lender may refrain from extending such loans.

It is also possible that the common director may encounter a concentration of capital from the same lender in both firms. In such a scenario, the lender would hold excessive private information, which could allow it to extract rents from the two borrowers. For instance, the lender could capitalize on greater information asymmetry between other lenders and

¹²Alternatively, the lender might offer lower interest rates on the focal firm’s loan to induce the common director to increase the lender’s chance of winning the focal firm’s loan business in the first place. This mechanism is related to banks’ incentives to offer favorable terms to secure additional banking business (e.g., [Fang, Ivashina, and Lerner, 2013](#); [Kang, Williams, and Wittenberg-Moerman, 2021](#)). In our setting, however, the additional lending opportunity arises across different borrowers connected through the same director rather than from cross-selling multiple financial services to the same borrower.

the borrowers, effectively locking in the borrowers within the credit market.¹³ Additionally, the concentration of capital may expose the common directors to higher risks of reputation damage or job loss, as they may be blamed for any adverse events in the loans.¹⁴

These countervailing forces can result in a *lower* incidence of board-interlocking loans and *stricter* pricing of such loans, contrary to the predictions of our contracting intermediary hypothesis. This suggests that the lender would exercise caution in extending such loans due to concerns about increased portfolio concentration and the potential risks associated with holding concentrated capital in the interlocking firms. On balance, it is an empirical question whether a loan relationship is more likely to be formed for a firm-bank pair when they are connected through an interlocking firm.

3 Data

We utilize data from BoardEx, which provides detailed information on directors’ employment history, positions, dates of death, and network sizes. Besides, our analysis focuses on the syndicated loan market because (i) other financing sources involve dispersed investors, making it challenging to generalize or pinpoint the board-financier effect in those contexts; (ii) syndicated loans are one of the major sources of debt financing; and (iii) DealScan offers comprehensive information on contractual terms, including loan spreads, covenants, and other participants within syndicates.

From the initial Thomson Reuters DealScan data on U.S. loan facilities, we follow the screening procedure outlined in previous literature (e.g., [Jiang, Li, and Shao, 2010](#); [Darmouni, 2020](#); [Chen et al., 2022](#)). Specifically, we (i) exclude facilities classified as bankers’ acceptances, bonds, bridge loans, leases, floating rate notes, standby letters of credit, step payment leases, guidance lines, traded letters of credit, multi-option facilities, and undisclosed loans; (ii) include only facilities denominated in USD; and (iii) retain facilities that use LIBOR as the base rate, excluding those with missing all-in-drawn spreads, negative all-in-drawn spreads, or spreads exceeding 1,000 basis points. From the resulting set of facilities, borrower GVKEYs are identified using the DealScan–Compustat link table of [Chava and Roberts \(2008\)](#). Lender GVKEYs are sourced from the DealScan Lender Link Table ([Schwert, 2018](#)).

To obtain borrower characteristics, we use firm–year observations from the CRSP–Compustat

¹³Banks can get information monopoly during the lending process (e.g., [Greenbaum, Kanatas, and Venezia, 1989](#); [Sharpe, 1990](#); [Rajan, 1992](#); [Schenone, 2010](#)). However, banks, as common lenders, may instead help reduce information asymmetry *among* borrowers, potentially facilitating knowledge transfer and assisting borrowers in other markets ([Frattaroli and Herpfer, 2023](#); [Giacomini, Kumar, and Naranjo, 2024](#)).

¹⁴[Gao, Kleiner, and Pacelli \(2020\)](#) show that individual bankers also face disciplinary actions after credit events in their loan portfolios.

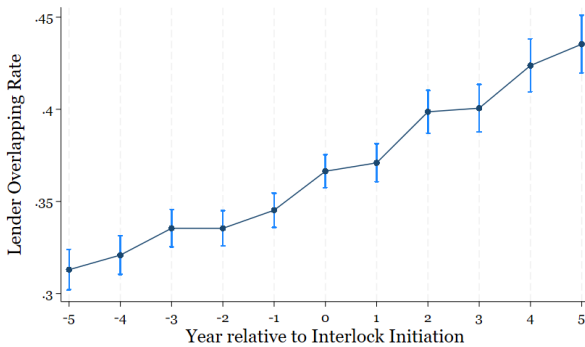
Merged (CCM) Database, excluding financial firms (SIC 6000–6999) and utilities (SIC 4900–4999). Firm–year observations without board information from BoardEx or insufficient firm data to compute borrower variables are excluded. The resulting CCM-BoardEx sample is then merged with the DealScan sample described earlier. The intersection of the datasets spans 1990–2020.

[Insert [Table 1](#) here]

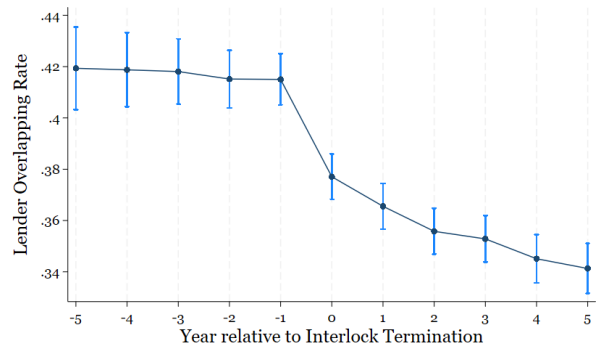
Table 1 presents summary statistics of our sample. Panels A and B show the characteristics of firms and banks, respectively. Panel C focuses on firm-bank pair characteristics, indicating that approximately 27.4% of the pairs are connected through a board-interlocking firm. Panel D reveals that the loans associated with connected firm-bank pairs have lower spreads, larger sizes, longer maturities, fewer covenants, and are less secured compared to loans for unconnected firm-bank pairs. This implies that the connections may lead to more favorable loan contract terms.

4 Initial Evidence

We first present the unconditional rates of lender overlap among board-interlocked borrowers. Specifically, we examine how many firm pairs share a common lender around the initiation or termination of their board interlocks.



(a) Figure 3.A



(b) Figure 3.B

Figure 3. Lender Overlapping Rates around Initiations or Terminations of Interlocking. These figures present lender overlapping rates around initiations or terminations of board-interlocking between borrower pairs. Figure 3.A (3.B) shows the lender overlapping rates around initiations (terminations).

First, Figure 3.A tracks all outstanding loans over an 11-year window for firm pairs that initiate a board interlock at $t = 0$. The figure shows that approximately 36.6% of these pairs share at least one common lender at the inception of the interlock ($t = 0$). There is an immediate increase in the overlap rate relative to the pre-interlock period, and over time, the

prevalence of lender commonality continues to rise. By $t = 5$, about 43.5% of the pairs share a common lender. Next, Figure 3.B tracks all outstanding loans over an 11-year window for firm pairs that terminate a board interlock at $t = 0$. The overlap rate remains around 42% in the pre-termination period, followed by an immediate drop to 37.7% at $t = 0$. The downward trend persists through $t = 5$. Overall, these time-series patterns suggest that board interlocks are linked to lender commonality.

In addition, we test whether newly borrowing firms (entrants to the syndicated loan market) are more likely to borrow from lenders that have previously lent to their interlocking firms. Focusing on first-time borrowers mitigates concerns that the observed overlap simply reflects common lenders shaping board interlocks. Internet Appendix Table A2 reports the actual incidence of such borrowing in Row (1) and placebo rates in Rows (2)–(4), based on random pairings by year, by year–MSA, and by year–SIC2, each averaged over 100 simulations. The substantially higher actual rate in Row (1) relative to the placebos indicates that entrants disproportionately borrow from lenders with prior exposure to their interlocking firms.

The above evidence on lender overlap also suggests that firms embedded in more interlocks access a larger pool of lenders overall. To explore this implication, we examine how the scope of loan relationships varies with the number of outside directorships.

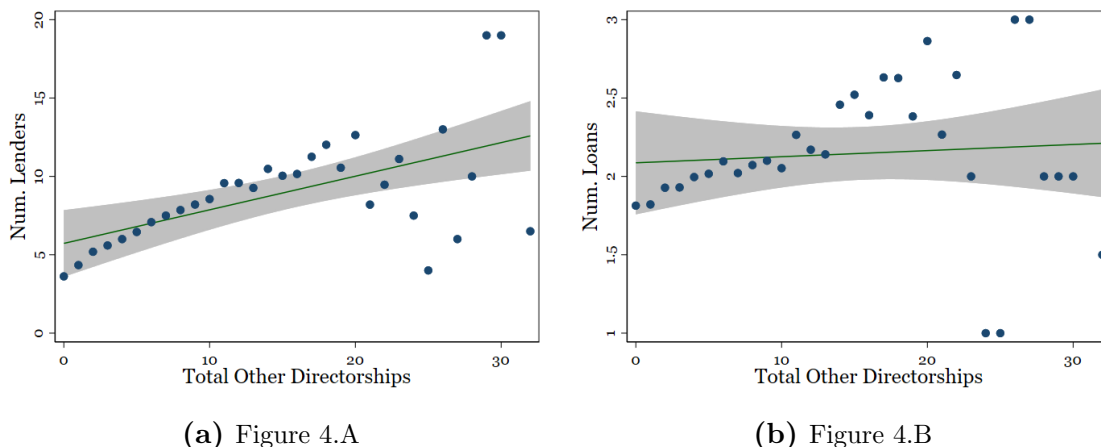


Figure 4. Aggregate Trend. These bin scatterplot figures show the average number of lenders and loans outstanding for firms, binned by the total number of directorships their directors hold in other firms.

Figure 4.A plots the average number of distinct lenders in outstanding loans against the total number of outside directorships held by the focal firm’s directors, revealing an upward trend. Figure 4.B shows a mild but similar trend, plotting the average number of outstanding loans.

5 Main Results

5.1 Lender choice model

5.1.1 Baseline model

Motivated by the initial evidence, our main analysis focuses on loan matching while accounting for various factors that may influence loan contracting. Similar to the lender choice models in previous studies (e.g., [Bharath et al., 2007](#); [Hellmann, Lindsey, and Puri, 2008](#); [Karolyi, 2018](#)), we run the following model using loan-firm-bank triad observations, which we construct by matching the top 50 (counterfactual) lenders to each of the loan facilities that are actually made:¹⁵

$$\begin{aligned} Lender_{l,f,b,t} = & \beta_0 + \beta_1 Connected_{l,f,b,t} + \beta_2 X_{f,b,t} + \beta_3 Y_{b,t} + \beta_4 Z_{f,t} + Loan\ Type\ FE_l \\ & + Loan\ Purpose\ FE_l + Firm\ FE_f + Bank\ FE_b + Year\ FE_t + \epsilon_{l,f,b,t}, \end{aligned} \quad (1)$$

where l , f , b , and t index loan facility, firm, bank, and year, respectively. $Lender_{l,f,b,t}$ represents an indicator variable for bank b being chosen as the actual lead lender of facility l , which is the loan for firm f in year t .¹⁶ $Connected_{l,f,b,t}$ is an indicator variable equal to 1 if, at the time facility l is originated in year t , firm f and bank b are linked through another firm that both (i) shares a board interlock with firm f and (ii) is currently borrowing from bank b . $X_{f,b,t}$ represents firm-bank pair-level controls (i.e., prior lending relationship, same location indicator, bank's portfolio in borrower's SIC-2 industry) that can influence the matching probability of the firm-bank pair.¹⁷ $Y_{b,t}$ represents bank controls (i.e., the number of borrowers, portfolio size in the quarter of loan origination, and a top-10 lender indicator based on syndicated loan market share) as proxies for banks' lending capacity. $Z_{f,t}$ represents firm controls (i.e., leverage, size, Zscore, S&P rating dummy, board interlocking dummy, board size) as proxies for firm quality and board characteristics.¹⁸ The detailed definition of

¹⁵If the actual lender is among the top 50 lenders, the other 49 lenders are matched.

¹⁶Our main analysis focuses on lead arrangers rather than other syndicate participants because lead arrangers actively originate loans, whereas participants are passive investors. The results remain qualitatively similar but weaker when non-lead participants are used in the sample. Section 6 provides further details and results.

¹⁷Past studies find that geographic proximity of lenders to borrowers affect lending decisions (e.g., [Degryse and Ongena, 2005](#); [Agarwal and Hauswald, 2010](#); [Bellucci, Borisov, and Zazzaro, 2013](#); [Hollander and Verriest, 2016](#)).

¹⁸Board interlocking is a necessary condition for a firm to be classified as *Connected* with a bank. The board-interlocking dummy controls for the average effect of having interlocked directors. For example, the value of such directors may differ between firms that primarily require advising and those that require monitoring ([Field, Lowry, and Mkrtchyan, 2013](#)), potentially influencing lender choices. Firms with interlocks may also differ in borrowing capacity relative to those without, independent of any intermediary role. We therefore include this control to isolate the intermediary effect from the pure board-interlocking effect.

variables is provided in Internet Appendix Table A1. The standard errors are clustered at the loan package level (i.e., deal level) because the facilities (and choice of lenders) are not independent to each other within the same deal.¹⁹

[Insert Table 2 here]

Table 2 shows the estimates for Equation (1). In Column 1, the coefficient of $Connected_{l,f,b,t}$ indicates that the probability of a firm-bank pair matching for a loan significantly increases when the firm’s board-interlocking firm has a current loan relationship with the bank, holding other factors constant. The results are also economically significant; specifically, the unconditional probability of a lender being chosen by a borrower is 0.02 (i.e., unconditional mean of $Lender_{l,f,b,t}$, wherein one bank is chosen from a pool of 50 potential lenders). However, when connected to the lender through another firm, the probability increases by about 26% (i.e., 0.0052 increase) in Column 1’s specification. The effects remain significant when $Lender_{l,f,b,t}$ and $Connected_{l,f,b,t}$ are replaced by their continuous proxies (i.e., loan amount) in Column 2, 3, and 4.²⁰ For example, the results in Column 4 indicate that the loan amount extended by the chosen lender to the focal firm increases with the loan amount the same lender had previously extended to the interlocking firm. This finding is consistent with the notion that the effect amplifies when there is a greater loan stake involved, and thus when the common director’s intermediary role is plausibly greater.²¹

5.1.2 Model sensitivity

The baseline results in Table 2 are obtained by matching each loan facility to the top 50 lenders. However, the estimates may be sensitive to the choice of the counterfactual lender set. To test robustness, we match each loan facility to the top 25, top 100, or all active lenders (as identified in the DealScan sample each year).

Conditional on board-interlocking firms, 205,355 (48.59%) firm-bank pairs are classified as *Connected*, while 217,255 (51.41%) are not, indicating that the presence of board interlocks alone does not necessarily translate into a higher likelihood of connection between a firm and a bank.

¹⁹The results are also robust to clustering at different levels (e.g., firm, bank, or facility level). Internet Appendix Figure A1 presents the estimates under various clustering schemes.

²⁰More precisely, $Lender(Amount)_{l,f,b,t}$ denotes the participation amount of bank b in facility l . It takes a value of 0 if bank b is not selected as the actual lender for facility l . $Connected(Amount)_{l,f,b,t}$ represents the loan size provided by bank b to the board-interlocking firm of firm f . If there are multiple board-interlocking firms, we use the size of the largest loan among those provided to these firms. It takes a value of 0 if firm f and bank b are not *Connected*. Within the matched firm-bank pairs that are connected (i.e., loan-firm-bank triad observations where $Connected_{l,f,b,t} = 1$ and $Lender_{l,f,b,t} = 1$), $Lender(Amount)_{l,f,b,t}$ also increases with $Connected(Amount)_{l,f,b,t}$ (coefficient: 0.0139; standard error: 0.0081), indicating that the effects manifest at the intensive margin as well.

²¹Notably, the positive coefficients of *Prior Relationship*, *Industry Specialization*, and *Same MSA* are consistent with the results from prior studies about relationship lending (e.g., Bharath et al., 2007).

[Insert Table 3 here]

Table 3 Panel A shows that the estimates are robust to these alternative matching schemes, and the economic significance also persists. In Column 2, *Connected* increases the matching probability by 19% (i.e., 0.0076 increase) from the unconditional probability of 0.04.

Next, we examine whether the baseline results are robust to high-dimensional fixed effects (FE). In Table 3 Panel B, Columns 1 and 2 include firm-year FE and bank-year FE to control for credit demand effect and credit supply effect, respectively (Khwaja and Mian, 2008). The results are qualitatively similar to those in Table 2. However, the inclusion of firm-year FE and bank-year FE subsumes year-level firm controls (e.g., *Size*) and year-level bank controls (e.g., *Portfolio Size*), which generate meaningful variation for the follow-up tests.

Importantly, any unobserved, private connection between borrower and lender (other than through their interlocking firm) could confound the relationships. Alternatively, any segmentation in the loan market (i.e., segmented borrower sets among lenders) could mechanically drive the results. Firm-bank pair FE controls for such unobservable confounding factors, allowing us to use the time-series variations in $Connected_{l,f,b,t}$ and $Lender_{l,f,b,t}$ within the same firm-bank pairs. Even though the granular firm-bank pair FE may reduce the power of panel data estimators (Zhou, 2001; Breuer and DeHaan, 2024), Column 3 shows a statistically significant coefficient of *Connected*, with a higher R-squared (adjusted R-squared) value of 0.3223 (0.2245).

Building on this evidence, we adopt the top 50 matching scheme, balancing computational efficiency with the matching quality of counterfactual lenders, throughout this paper. We also use firm-bank pair FE (along with year FE, loan type FE, and loan purpose FE), balancing test power with the ability to isolate effects from unobserved confounding factors. The results throughout this paper are robust to different combinations of matching and FE specifications.

Next, we exploit differences in the timing of board interlocks and lending relationships to shed light on the informal guarantor and information provider channels. To do so, we introduce two placebo-connection variables that vary the linking timings of firms and banks: (i) *Placebo-Connected 1* is an indicator for when the firm shares a director with another firm that has ever borrowed from the lender within the past 5 years, but not currently, and (ii) *Placebo-Connected 2* is an indicator for when the firm has another firm that is currently borrowing from the same lender but has shared a director only in the past 5 years, not currently. Figure 5 compares *Connected*, *Placebo-Connected 1*, and *Placebo-Connected 2*. Among firm-bank observations, 7.4% are *Placebo-Connected 1* and 10.4% are *Placebo-Connected 2*.

Table 3 Panel C presents the regression results when these placebo-connection variables are additionally included. The information provider channel predicts a positive coefficient

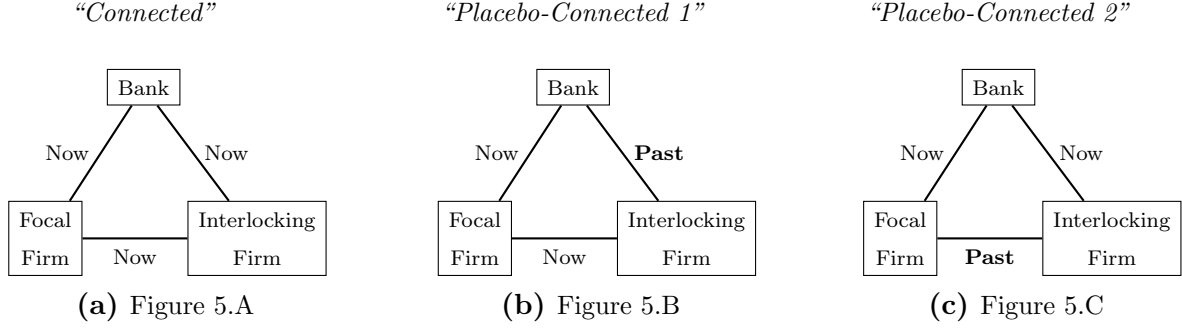


Figure 5. Connected vs. Placebo-connected. These figures describe and compare the constructions of the variables *Connected*, *Placebo-Connected 1*, and *Placebo-Connected 2*.

of *Placebo-Connected 1* (as well as *Connected*), because the common director remains present in both firms and has prior lending experience with the lender that may facilitate information provision.²² However, the insignificant coefficient on *Placebo-Connected 1* provides little evidence that prior lending experience continues to affect lender choice after the interlocking firm’s relationship with the bank ends. Likewise, the insignificant coefficient on *Placebo-Connected 2* suggests that past connections do not affect lender choice once the common director is no longer shared.²³ These results also alleviate concerns that persistent borrower similarities arising from past director sharing drive our baseline findings.

The concentration of the effect in contemporaneous connections is more consistent with the reputational-assurance mechanism underlying the informal guarantor channel. However, because the information provider channel can also operate through the current lending relationship (captured by *Connected*), the results do not cleanly separate the two channels or rule out information provision.

5.2 Identification

The lender choice model shows that a firm–bank pair being connected through an interlocking firm is positively associated with the likelihood of the pair entering into a loan relationship; however, the model carries largely two primary sources of endogeneity, as *Connected* for a firm–bank pair is the interaction between the existence of another firm, which is board-interlocked with the focal firm, and its concurrent borrowing from the bank.²⁴

²²This case is similar to the effect of personal relationships provided by new executives with loan experience in their former firms, identified in Karolyi (2018).

²³A joint F -test rejects the null hypothesis that *Connected*, *Placebo-Connected 1*, and *Placebo-Connected 2* have equal effects in Column 3 ($F=4.07$, $p=0.0171$).

²⁴However, it is also plausible that endogeneity in the lender choice model rather could lead to *downward* bias in the OLS coefficient of $Connected_{i,f,b,t}$. For example, regulatory pressure or firm effort to increase financial experts on the board (“omitted variable”) may lead to hiring of a banker from a particular bank, which could then influence the firm’s decision to choose the bank as lender. In turn, such appointments, due

First, the matching process between directors and firms, as well as the directors’ employment decisions across multiple firms, are not random. Although it is unlikely that the focal firm and interlocking firm hire the same director solely to establish a loan with the chosen bank, it is still plausible that two firms pursuing similar financial policies (e.g., borrowing from major banks during adverse credit market conditions) that have elected the same director (with expertise in these policies) may *mechanically* exhibit a higher likelihood of borrowing from the same lender.²⁵

Second, the loan matching between a lender and a borrower may not be random; for example, the lender might have preferred to lend to the interlocking firm because its director holds multiple positions and seemingly has greater ability. In turn, the lender may also prefer to lend to the focal firm because of the director’s abilities.

While firm–bank pair FE helps control for such unobservable factors to some extent, we further strengthen our identification by triangulating the evidence through two complementary strategies: an instrumental variable (IV) approach and a quasi-natural experiment, to address potential endogeneity concerns.

5.2.1 IV estimation approach

We introduce an IV, building on the rationale that the marginal increase in workload and time costs associated with an additional directorship appointment is greater for busy directors (i.e., directors with more than one directorship) than for those with only one position. Moreover, firms may discourage their busy directors from taking on additional directorships. Hauser (2018) reports that 64.4% and 21.3% of directors in the S&P 1500 companies hold one and two board seats, respectively. Only 14.3% of the directors hold three or more board seats, supporting this rationale.

For a given focal firm–bank pair, we identify the director pool consisting of all current borrowers of the bank and determine the proportion of directors within this pool who currently hold multiple directorships, but not in the focal firm. These directors may therefore be less able or willing to take on an additional directorship in the focal firm, resulting in a lower likelihood of the focal firm being *Connected* to the bank through a board-interlocking firm. Let $B_{b,t}$ and $D_{i,t}$ denote the set of current borrowers of bank b and the set of directors serving firm i at time t , respectively. Then, $D_{f,b,t} = \bigcup_{i \in B_{b,t} \setminus \{f\}} D_{i,t}$ represents the set of directors of bank b ’s other current borrowers, excluding the focal firm f . The instrument is then defined

to the limit on the number of total board seats, might reduce the likelihood of hiring a director from a third firm, which naturally reduces the incidence of board-interlocking and thus $Connected_{i,f,b,t}$.

²⁵Relatedly, common directors or director networks can be a route for propagation of firm policies and practices (e.g., Bouwman, 2011; Fernandes et al., 2013; Foroughi et al., 2022; Cabezón and Hoberg, 2026). Section 6 further explores the implications of this firm similarity within our context.

as:

$$Busy(Potential) Directors_{f,b,t} = \frac{|\{d \in D_{f,b,t} : |\{i : d \in D_{i,t}\}| \geq 2\}|}{|D_{f,b,t}|}. \quad (2)$$

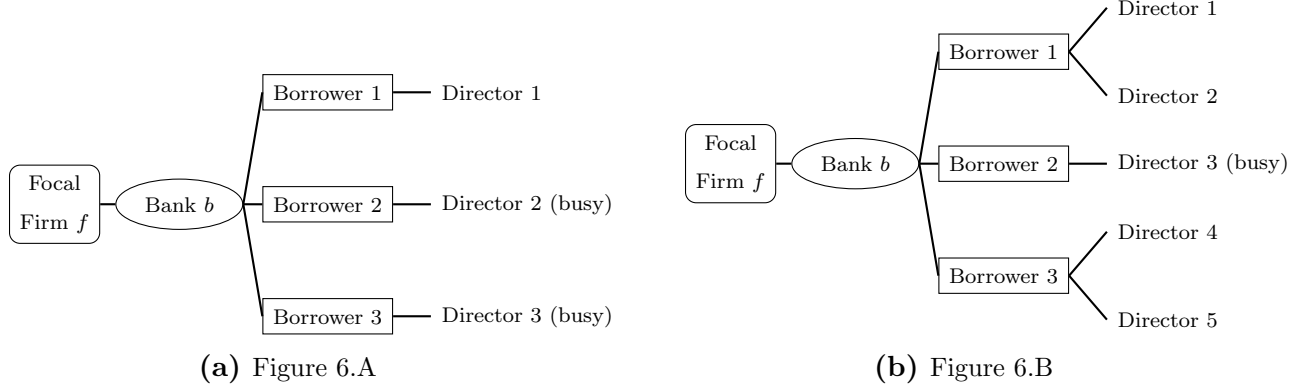


Figure 6. IV Illustration. These figures show the construction of the instrument, *Busy (Potential) Directors*. Figure 6.A and Figure 6.B represent the cases of high *Busy (Potential) Directors* and low *Busy (Potential) Directors*, respectively.

Figure 6 illustrates our identification strategy. In Panel A, bank b has three current borrowers, each represented by one director. Two of these directors (Directors 2 and 3) also serve on boards of other firms, making them busy, whereas Director 1 holds only one directorship. Accordingly, *Busy (Potential) Directors* $_{f,b,t}$ for the focal firm–bank pair equals $2/3$. In Panel B, only one of the three directors (Director 2) is busy, while the other two are not, yielding *Busy (Potential) Directors* $_{f,b,t} = 1/5$.

The focal firm–bank pair in Panel A is therefore less likely to be *Connected*, as a larger proportion of directors are already committed to other boards, reducing their capacity to assume an additional seat on the focal firm’s board. In contrast, the pair in Panel B exhibits a higher likelihood of being *Connected*, given the greater availability of directors for potential interlocks. Consistent with this reasoning, we expect *Connected* $_{l,f,b,t}$ to be negatively associated with *Busy (Potential) Directors* $_{f,b,t}$.²⁶

In addition, *Busy (Potential) Directors* $_{f,b,t}$ is a plausible instrument for the following reasons: (i) The number of directorships held by directors in the current borrowers of the bank (other than in the focal firm) is unlikely to be governed by the bank. While it might be possible for the bank to direct some borrowers to limit the outside directorships of their directors, it is unlikely that the bank can exert comprehensive control over the career decisions of the many directors across its current borrower pool. Likewise, it is unlikely that the focal firm governs the director appointments of other borrowers of the bank. In sum,

²⁶For simplicity, the figure holds constant the number of current borrowers (three). In practice, a bank with more current borrowers has a larger director pool, which increases the denominator of *Busy (Potential) Directors* $_{f,b,t}$ and thus strengthens the negative relationship with *Connected* $_{l,f,b,t}$.

*Busy (Potential) Directors*_{*l,f,b,t*} is unlikely to be a policy variable for either the focal firm *f* and the bank *b*. (ii) The firm–bank FE isolate the variations in the instrument within the same firm–bank pairs, which are unlikely to be chosen by either the firm and the bank. Put differently, any cross-sectional differences in the instruments between two firm–bank pairs, though unlikely, that arise from their attempts to optimize the instrument, are subsumed by the firm–bank fixed effects. Taken together, these points support our identifying assumption that the assignment of a firm–bank pair to a set of busy or unbusy potential directors is quasi-random.

[Insert Table 4 here]

$$\begin{aligned} \text{Connected}_{l,f,b,t} = & \beta_0 + \beta_1 \text{Busy (Potential) Directors}_{f,b,t} + \beta_2 X_{f,b,t} + \beta_3 Y_{b,t} + \beta_4 Z_{f,t} \\ & + \text{Loan Type FE}_l + \text{Loan Purpose FE}_l + \text{Firm-Bank FE}_{f,b} \\ & + \text{Year FE}_t + u_{l,f,b,t}. \end{aligned} \quad (3)$$

$$\begin{aligned} \text{Lender}_{l,f,b,t} = & \beta_0 + \beta_1 \widehat{\text{Connected}}_{l,f,b,t} + \beta_2 X_{f,b,t} + \beta_3 Y_{b,t} + \beta_4 Z_{f,t} + \text{Loan Type FE}_l \\ & + \text{Loan Purpose FE}_l + \text{Firm-Bank FE}_{f,b} + \text{Year FE}_t + \epsilon_{l,f,b,t}. \end{aligned} \quad (4)$$

Table 4 Panel A replicates the baseline tests, replacing the OLS models with 2SLS models. Columns 1 and 2 report the first-stage and second-stage results, respectively, of Equation (3) and (4). Column 1 shows that the probability of a firm–bank pair’s being connected significantly decreases with *Busy (Potential) Directors*, consistent with the prior that it is a relevant instrument.²⁷ Also, the large *F*-statistics of 467.3 supports that *Busy (Potential) Directors* is a valid instrument, regarding the weak IV problem. In Column 2, the coefficient of instrumented *Connected* is statistically significant, consistent with the OLS results. Further, a one standard deviation increase in the predicted *Connected* (0.2593) is associated with a 0.0204 increase in the probability of a bank being chosen by a borrower. Columns 3, 5, and 7 (4, 6, and 8) present the first-stage (second-stage) results in the 2SLS

²⁷When the instrument is well designed, we should expect a stronger effect for focal firms that face greater frictions in inviting *Busy (Potential) Directors* onto their boards. Specifically, focal firms with larger boards or those that already include busy directors should exhibit a more pronounced effect. Following this prediction, Internet Appendix Table A2, Panel A, reruns the first stage separately for large- versus small-board firms, as well as for firms with busy directors versus those with fewer busy directors, similar to the split-sample first-stage approach of Acharya et al. (2024). Another potential concern is that *Busy (Potential) Directors* may *overidentify* the potential director pool, since it includes all other current borrowers of the bank. However, some of these directors are unlikely ever to join the focal firm because the travel time or legal constraints would make serving on both boards infeasible. To address this, we further restrict the pool to directors from geographically proximate firms and from sectorally distant industries, who face fewer constraints in accepting an additional directorship. Internet Appendix Table A2, Panel B shows that the results remain robust when the potential pool is limited to directors from firms located within the average interlocking-pair distance (786.3 miles) and operating in a different SIC-2 industry. All these results support the plausibility of our instrument.

variations for Columns 2, 3, and 4 of Table 2, respectively, showing consistent results.²⁸

However, unobservable factors that drive endogenous matching may threaten the identification assumption if they correlate with the instrument and thereby violate the exclusion restriction. To address this concern, we re-estimate the 2SLS models within subsets of firm–bank pairs that are least likely to be affected by endogenous matching. Specifically, we focus on sufficiently old and established connections—those formed through directors appointed well in the past or through loans involving interlocking firms issued long before the focal firm–bank pair’s loan (i.e., “old” *Connected* pairs). More concretely, we retain a *Connected* firm–bank pair only if the common directors have served on both the focal and interlocking firms for more than three years, or if the interlocking firm’s loans were issued at least three years before the focal firm’s loan. These subsets help isolate connections that are plausibly less influenced by endogenous matching among firms, directors, or banks. Table 4, Panels B and C, present the results from these subsamples, which remain consistent with our main findings. Overall, the effect of *Connected* remains robust within subsamples that are least plausibly subject to endogenous matching.

In addition, we examine other potential channels that could undermine the exclusion restriction. The most intuitive alternative channel is the lender’s preference or lending technologies, which could incidentally result in concentrated lending to borrowers with busy boards. To address this concern, Internet Appendix Table A2 Panel B, in its Columns 1 and 2, examines whether *Busy (Potential) Directors* correlates with focal firms’ busy board status (the number and proportion of busy directors, respectively) and finds no systematic correlation. Alternatively, it is possible that a bank with *Busy (Potential) Directors* provides more lending to those other borrowers, thereby mechanically limiting the loan resources available to the focal firm.²⁹ To assess this possibility, Internet Appendix Table A2 Panel B, Columns 3 and 4, presents regressions of the relative loan amounts to the focal firm compared to other borrowers with nonbusy or busy boards and finds insignificant coefficients for *Busy*

²⁸The reported IV estimates of *Connected* are larger than the OLS estimate ($=0.0011$), consistent with OLS being downward biased due to omitted variables (see footnote 24) and/or reflecting a deviation between the local average treatment effect (LATE) from IV estimation and the average treatment effect (ATE) from OLS. In our setting, the LATE captures the effect among complier firm–bank pairs, that is, pairs that become connected only when the director pool includes fewer busy directors. Such firms may be constrained in hiring busy directors—for example, because of higher governance standards—while their boards face pressure to exert effort, including in contracting intermediation. Complier banks, in turn, may be especially willing to lend to these firms given their governance standards, much as they lend to firms with fewer busy directors. Consequently, complier firm–bank pairs are markedly more likely than the average pair to form relationships, illustrating why the LATE may diverge from the ATE in our context.

²⁹However, this scenario is also far from likely because *Busy (Potential) Directors* is defined at the firm–bank level, and a bank typically has multiple borrower firms at the same point in time. A focal firm is then defined as one of the other current borrowers of another focal firm, suggesting that an imbalance in the bank’s loan supply among its borrowers in this scenario is unlikely.

(*Potential*) *Directors*. While this falsification test cannot provide formal evidence on whether our instrument satisfies the exclusion restriction, it increases confidence that the instrument is uncorrelated with *Lender*, except through *Connected*.

5.2.2 Quasi-natural experiment: financial crisis

This section investigates when the contracting intermediary role of board is particularly realized, with a focus on the 2007-8 financial crisis as a plausibly exogenous shock.

Observational evidence. During the crisis, there was a sharp decrease in the credit supply from banks (Ivashina and Scharfstein, 2010; Santos, 2011; Almeida et al., 2012; Chodorow-Reich, 2014). Banks thus had to selectively distribute credit due to liquidity shortages, increased uncertainty, and information asymmetries. In this context, firm boards could facilitate intermediation between their firms and banks through reputational assurance, risk pooling, and improved transmission of private information. Accordingly, we predict that the intermediary effect was more pronounced during the loan supply shortage period from July 2007 to August 2008.³⁰

[Insert Table 5 here]

Using a *Financial Crisis* indicator, Table 5 Column 1 shows that the sensitivity of *Lender* to *Connected* is greater during the financial crisis period. More specifically, the effect of being *Connected* amplifies by roughly sixfold during the crisis, highlighting the significant role of boards as financial intermediaries, particularly during periods of credit market disruption.

It is also possible that selective matching between firm-bank pairs attenuates the effect of *Connected* during the crisis. For example, firms and banks may be more likely to match for a loan if they have transacted previously, seeking safety during the period. To test this possibility, we interact pair-level characteristics (i.e., *Prior Relationship*, *Industry Specialization*, and *Same MSA*) with *Financial Crisis*. In Table 5, Column 2, the coefficient of *Connected* $\times$ *Financial Crisis* remains similar even after controlling for these interactions, suggesting that the effect of contracting intermediation through boards may outweigh the effect of institutional relationships between firms and banks during credit market disruptions.

As an auxiliary test, we also use an alternative continuous measure of credit conditions: aggregate bank lending standards from the Federal Reserve Board’s Senior Loan Officer Survey on Bank Lending.³¹ The survey provides quarterly net percentages of domestic bank respondents reporting tightening standards for commercial and industrial loans to large and

³⁰Ivashina and Scharfstein (2010) show that new bank loans to large firms dropped by 79% between the second quarter of 2007 and the fourth quarter of 2008.

³¹<https://fred.stlouisfed.org/series/DRTSCILM>

middle-market firms since 1990. This index thus captures changes in bank lending standards and loan supply (e.g., Lown and Morgan, 2006; Leary, 2009; Bassett et al., 2014; Chava, Gallmeyer, and Park, 2015; Becker and Ivashina, 2014). Table 5 Columns 3 and 4 replace *Financial Crisis* with *Credit Tightness* (%) and show similar results. Compared to the least tightened period (-25% in April–June 1993), during the most tightened period (83.6% in July–September 2008), the probability of matching increases by 0.0033 ($= 0.00003 \times (83.6 - (-25))$) for *Connected* pairs, ceteris paribus. This increase is about three times the effect of connection status alone (0.0011), highlighting the greater role of connections during tight credit periods.

As another continuous measure, we use the excess bond premium (*EBP* (%)) proposed by Gilchrist and Zakrajšek (2012).³² It is estimated as the average difference between corporate credit spreads and the spreads implied by the default risk of individual issuers (i.e., fundamental credit risk factor), serving as a proxy for economy-wide credit supply. In addition, we employ the Chicago Fed’s National Financial Conditions Index (*NFCI*) to capture conditions in broader capital markets as well as credit markets.³³ The index aggregates 105 risk, credit, and leverage indicators spanning money, equity, and debt markets, as well as traditional and shadow banking. Higher values indicate tighter external financing conditions. We use the adjusted *NFCI*, which isolates the component of financial conditions orthogonal to prevailing economic conditions. Columns 5 through 8 in Table 5 again show similar results when *EBP* (%) and *NFCI* are applied.³⁴

Figure 7 displays the dynamic coefficients over time, highlighting the heightened sensitivity of *Lender* to *Connected* during the tightened periods of 1998, 2000–2002, and 2007–2009 (indicated by the shaded areas). In contrast, the insignificant coefficients during less tightened periods suggest that the effect is similar to that observed during other normal periods.

To further explore the aggregate implications of *Connected*, we conduct a simple counterfactual exercise, similar to those in Chodorow-Reich (2014), Acharya et al. (2018), and Acharya et al. (2024). For each unconnected firm–bank pair, we estimate their counterfactual loan matching rate if they had been connected. First, we estimate

$$\widetilde{Lender}_{i,f,b,t} = \widehat{Lender}_{i,f,b,t} + \beta \times [1(Connected_{i,f,b,t} = 1) - 1(Connected_{i,f,b,t} = 0)], \quad (5)$$

³²https://www.federalreserve.gov/econres/notes/feds-notes/ebp_csv.csv

³³<https://www.chicagofed.org/research/data/nfci/current-data>

³⁴The coefficient on *Financial Crisis* is negative, consistent with a sharp contraction in loan supply during 2007–2008, when banks curtailed new lending. In contrast, the coefficients on *Credit Tightness* (%), *EBP* (%), and *NFCI* are positive, though modest, reflecting periods when firms sought new bank relationships amid tighter market or non-bank funding conditions. Thus, while the crisis dummy captures a supply-driven collapse, the continuous measures may also reflect demand substitution during normal credit cycles.

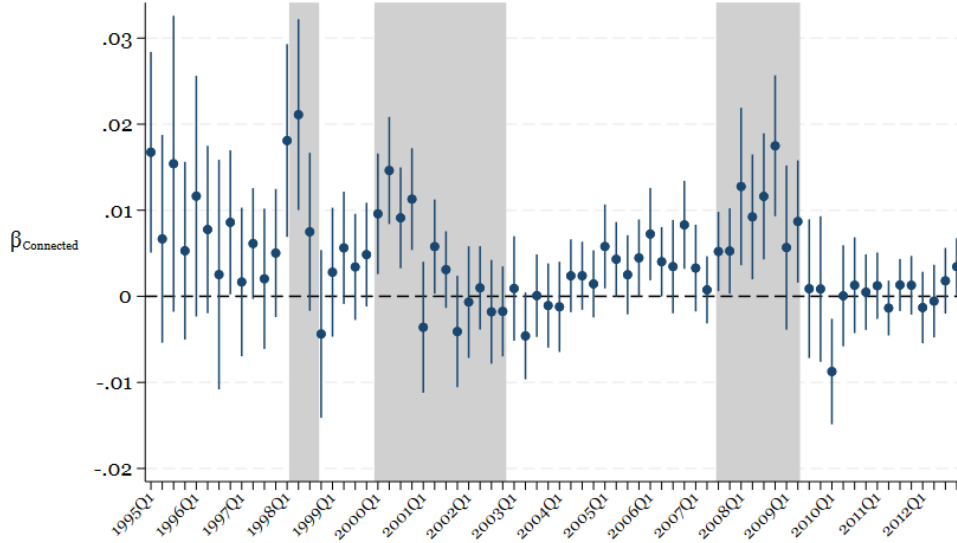


Figure 7. Credit Market Disruptions. This figure displays the dynamic coefficients obtained from the specification of Table 9 Column 1, replacing *Financial Crisis* with year-quarter dummies around the crisis periods. It shows the coefficient estimates and 95% confidence intervals for *Connected* interacted with the year-quarter dummies. The shaded areas represent the periods of highest credit tightness, where *Credit Tightness* (%) exceeds 20%.

where $\widehat{Lender}_{l,f,b,t}$ is the fitted value and β is the coefficient from Table 5 Column 1's regression. $\widetilde{Lender}_{l,f,b,t}$ represents the counterfactual loan matching rate for an unconnected firm f -bank b pair, assuming they had been connected. The gain from hypothetical connections is then given by

$$\frac{\sum_{\substack{l,f,b,t \\ Connected_{l,f,b,t}=0}} [\widetilde{Lender}_{l,f,b,t} - \widehat{Lender}_{l,f,b,t}]}{\sum_{\substack{l,f,b,t \\ Connected_{l,f,b,t}=0}} \widehat{Lender}_{l,f,b,t}}, \quad (6)$$

which is the fraction of the counterfactual increase in loans relative to the total sample loans for unconnected pairs. This aggregation assumes that the overall increase in loan matching equals the sum of the pair-level increases in loan matching, under a partial equilibrium setting.³⁵ The estimation shows that the coefficient of 0.0010 for *Connected* translates to approximately 1,390 additional loans, representing 6.83% increase from the total 20,362 loans actually made for unconnected pairs during normal times. More importantly, the coefficient of 0.0060 of *Connected* $\times$ *Financial Crisis* translates to an increase of 296 loans, which is equivalent to 47.9% increase from the total 618 loans made during the crisis period. Therefore, the aggregate gain from hypothetical connections is more than seven times greater during the crisis.

³⁵Another implicit assumption of this estimation is that connected firm-bank pairs did not shift their loan matching function, especially during the crisis.

Quasi-experimental evidence. Notably, the above results do not establish causal evidence, as other factors concurrent with the disruption periods may confound the relationship. For instance, borrowers in unconnected pairs may have faced lower liquidity demand during these periods compared with others—an effect unrelated to our proposed mechanism yet capable of driving the observed results. Moreover, the disruptions themselves may have led to firm failures, which in turn could have influenced both the likelihood of board interlocking among surviving firms and the lending behavior of banks exposed to those firms. Such dynamics can generate a spurious association between *Connected* and *Lender* during the disruption periods.

We address this challenge using the approach of Almeida et al. (2012) and subsequent studies (e.g. Benmelech, Frydman, and Papanikolaou, 2019; Costello, 2020; Granja and Moreira, 2023). This approach exploits variation in the fraction of long-term debt that was contractually scheduled to mature at the onset of the financial crisis. Firms with a large share of debt maturing at that time had a greater need to refinance precisely when bank credit supply contracted sharply, making them particularly exposed to the aggregate credit shortage. Prior evidence from these studies confirms that the crisis represented a *relevant* shock for such firms. Importantly, even among these financially constrained firms, preexisting connections with banks through an interlocking firm could have mitigated the impact of the shock. If such connections reduce contractual frictions, then connected firm–bank pairs should have been more likely to initiate loan relationships than non-connected pairs during the crisis period.

We first restrict connections to those established prior to July 2007 to ensure that they reflect preexisting relationships. This restriction eliminates connections formed after the onset of the crisis, which could otherwise introduce confounding variation in *Connected* and *Lender*.

Next, following Costello (2020) and Granja and Moreira (2023), we define the sample of treated and control firms based on their debt maturity structure. For each firm, we compute the total amount of loans initiated before July 2006 that were scheduled to mature between July 2007 and August 2008, scaled by the firm’s total outstanding loan amounts as of July 2007. This ratio captures the firm’s exposure to the shock. Requiring loans to have at least one year to maturity ensures that firms are not mechanically sorted on their access to short-versus long-term debt. We then classify firms as treated or control depending on whether this ratio exceeds a given threshold (e.g., 20%).

On the other hand, the key identifying assumption in our setting is that the maturity date of long-term debt is orthogonal to firm–bank characteristics that drive changes in lending relationships around the crisis. A potential concern is that a firm–bank pair with a history

of frequent, short-term transactions would naturally have loans maturing during the initial crisis period and, consistent with past practice, initiate new loans at the same time. This scenario would violate the identifying assumption. To mitigate this concern, we compute the amount-weighted average maturity of all loans initiated before 2006 (requiring at least three such loans) for each firm–bank pair, and exclude pairs with an average maturity below the sample median. Our results remain similar when this restriction is not imposed.

In the final step, we classify a firm as $Treated_f$ if it satisfies the above condition and has more than 20% of its debt maturing during the initial crisis period (Almeida et al., 2012; Costello, 2020). Firms that satisfy the condition but have less than 20% of their debt maturing during this period are classified as control firms. $Post_t$ is an indicator equal to one for loans initiated between July 2007 and December 2008, and zero for loans initiated between January 2006 and June 2007, covering 12 quarters around July 2007. Using $Treated_f$ and $Post_t$, we estimate the following triple-difference specification:

$$\begin{aligned} Lender_{l,f,b,t} = & \beta_0 + \beta_1(Connected_{l,f,b,t} \times Treated_f \times Post_t) + \beta_2(Treated_f \times Post_t) \\ & + \beta_3(Connected_{l,f,b,t} \times Post_t) + \beta_4(Connected_{l,f,b,t} \times Treated_f) \\ & + \beta_5 Connected_{l,f,b,t} + \beta_6 Post_t + \beta_7 X_{f,b,t} + \beta_8 Y_{b,t} + \beta_9 Z_{f,t} + Loan\ Type\ FE_l \\ & + Loan\ Purpose\ FE_l + Firm-Bank\ FE_{f,b} + Year\ FE_t + \epsilon_{l,f,b,t}, \end{aligned} \quad (7)$$

where l , f , b , and t index loan facility, firm, bank, and facility start date, respectively. $Treated_f$ is subsumed by the firm–bank FE. The variable of interest, $Connected_{l,f,b,t} \times Treated_f \times Post_t$, allows the effect of $Treated_f \times Post_t$ (i.e., exposure to the credit supply shock) to vary with the preexisting connection status of firm–bank pairs. In this specification, β_1 captures whether the relative effect of high refinancing needs on loan matching during the credit supply contraction differs between *Connected* and non-*Connected* firm–bank pairs. Given the three layers of differencing, this identification is robust to systematic differences between treated and control borrowers that are common across all banks, as well as to systematic differences between *Connected* and non-*Connected* pairs that are common across both treated and control firms, during the sharp contraction in credit supply.

[Insert Table 6 here]

Table 6, Column 1 reports the estimation results of Equation (7). The coefficient on $Treated_f \times Post_t$ controls for differences in changes to loan relationship status between financially constrained firms and unconstrained firms in the post period relative to the pre period. Its coefficient is negative but statistically insignificant. In contrast, the significantly positive coefficient on $Connected \times Treated \times Post$ indicates that firms benefit from their

connections with banks through interlocking firms, even when facing a shortage of credit supply. For sensitivity analyses, we vary the treatment threshold from the baseline 20%. In Columns 2 and 3, we use the sample median (14.1%) and a higher cutoff (25%), respectively, and the results remain similar.

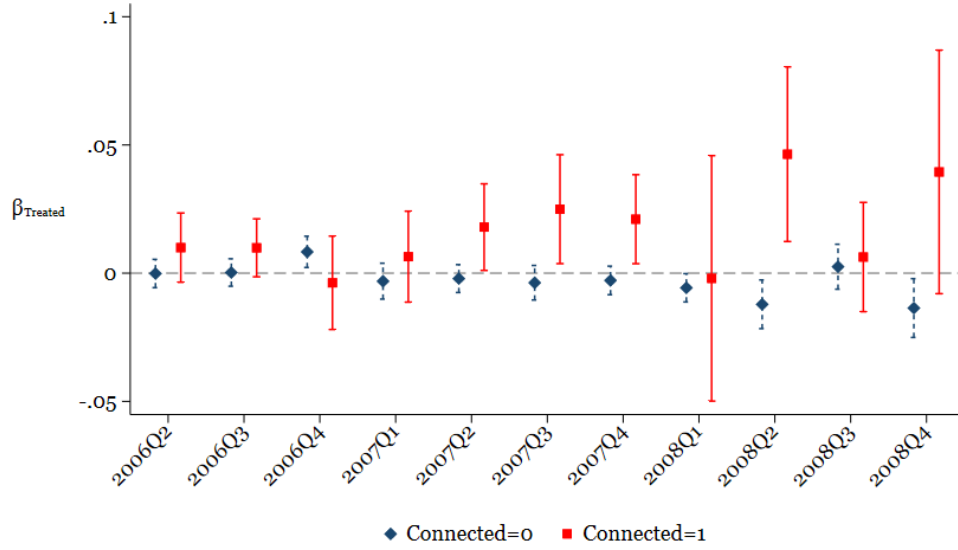


Figure 8. Dynamic Effect around Financial Crisis. This figure plots the dynamic coefficients from Equation (7), where $Post$ is replaced with year-quarter dummies around the 2007–08 financial crisis. Red (blue) dots and solid (dashed) lines show the point estimates and 90% confidence intervals of $Treated$ for *Connected* (non-*Connected*) firm–bank pairs, respectively. The crisis is identified as beginning in 2007Q3, and 2006Q1 serves as the baseline year-quarter.

Figure 8 plots the dynamic treatment effects for treated firms relative to control firms, using 2006Q1 as the reference quarter, separately for *Connected* and non-*Connected* pairs. The trends in loan matching are indistinguishable up to 2007Q2 (the pre-shock period), providing reassurance that loan matching prior to the shock is unrelated to connection status and supporting the absence of strong pre-trends. However, in the post-shock period, the trends in loan matching diverge sharply between *Connected* and non-*Connected* pairs: beginning in 2008Q1, non-*Connected* pairs exhibit significantly lower matching relative to their pre-shock level, consistent with a reduction in bank credit supply. Crucially, after the onset of the crisis, the matching rates for *Connected* pairs never fall below those for non-*Connected* pairs, with the gap becoming statistically significant immediately thereafter.

While the significantly higher loan matching rates observed for firm–bank pairs whose firms are treated—non-*Connected* pairs in 2006Q4 and *Connected* pairs in 2007Q2—may reflect anticipatory behavior by treated firms and thus pose a potential threat to the difference-in-differences effect (i.e., $Treated_f \times Post_t$), our triple-difference design supports a causal inference of the main findings. This is because a firm’s exposure to the crisis,

determined by prescheduled debt maturities, is unlikely to be systematically correlated with its preexisting connection status across multiple banks, which generates the third layer of difference.

Next, we conduct additional robustness tests in Panel B of Table 6. In Column 1, we restrict the *Connected* group to firm–bank pairs whose connection status lasted until at least July 2007, thereby ensuring that the connections were in place at the onset of the crisis. In Column 2, we include other firm–bank relationship variables interacted with $Treated_f \times Post_t$. These additional controls mitigate concerns that the results could be driven by pre-shock differences in geographic proximity, industry specialization, or prior lending relationships across pairs with different connection status, which may have led them to respond differently to the crisis. The main triple-interaction term remains significant. Finally, in Column 3, we replace *Connected* with *Connected (Amount)* and obtain similar results.

While establishing causality is challenging because we observe only originated loans—not loan applications—implying that our tests capture ex post equilibrium outcomes, the quasi-natural experiment, combined with within–firm–bank estimators and the IV approach, lends support to a causal interpretation of the findings.

5.3 Cross sectional tests

This section explores which firms experience a more pronounced contracting intermediary role of a common director, using cross-sectional variation in the focal firm’s characteristics. Specifically, we predict that the effect of *Connected* is greater for borrowers who are informationally opaque and have had limited exposure to the credit market, as greater information frictions increase the potential value of common director intermediation in the contracting process.³⁶ To examine this, we consider several measures of informational opacity, such as being new entrants to the syndicated loan market, unrated (i.e., bank-dependent), small, or young (e.g., [Lin and Paravisini, 2013](#); [Chodorow-Reich, 2014](#); [Schwert, 2018](#)).

[Insert [Table 7](#) here]

To test this, Table 7 includes the interactions between *Connected* and the firm variables. The effect of *Connected* remains significant in all Columns, consistent with the baseline results. More importantly, the results show that the effect of *Connected* is more pronounced among firms that are new entrants, unrated, small, or young, aligning with our prediction

³⁶Consistent with this mechanism, [Flanagan \(2025\)](#) shows that banks earn higher risk-adjusted returns when lending to informationally opaque or financially constrained borrowers, indicating that the marginal value of intermediation is larger for such firms. Our setting suggests that a director-based connection allows banks to access this value by facilitating contracting through relational intermediation.

based on the contracting intermediary hypothesis. In terms of economic significance, the matching probability increases by about five times for *Connected* pairs when the focal firm is an entrant. The connection benefit is also substantially lower for rated firms than for unrated firms, as the coefficient on *Connected* $\times$ *Rated* offsets about 71% of the effect of *Connected*. Moreover, a firm at the 20th percentile in size has a 0.0017 higher probability (an 8.5% increase from the unconditional probability of 0.02) than a firm at the 80th percentile in size, assuming both are *Connected* and all else is equal. Likewise, a firm with an age of 5 has a 0.003 higher probability (a 15% increase from the unconditional probability) than a firm with an age of 20, holding other factors constant.³⁷

In unreported results, we further include these double interaction terms, additionally interacted with firm-bank relationship variables (i.e., *Prior Relationship*, *Industry Specialization*, *Same MSA*), to examine whether these triple interaction terms offset the effects of the double interaction terms. The results indicate that none of the 12 ($= 4 \times 3$) triple interaction terms are statistically significant, whereas the original double interaction terms remain consistent with the results reported in Table 7. These findings suggest that informationally opaque firms benefit from connections, and these benefits are not significantly diminished by the reduced information asymmetry provided through relationship lending.

5.4 Loan pricing

This section examines whether a firm-bank pair’s connection can also affect their contracting at a different margin: loan pricing. The informal guarantor channel predicts that the loan spread is likely to be lower for a firm-bank pair that is *Connected* compared to a pair that is not. However, the information provider channel offers mixed predictions regarding loan pricing, as a lender may be able to better sort borrowers by quality using their information advantage, which does not necessarily lead to more favorable terms for its *Connected* borrowers. On the other hand, the proprietary cross-selling opportunity (facilitated by the common director) could generate rent, which may be factored into better loan terms.

[Insert [Table 8](#) here]

To investigate this, Table 8 focuses on facilities that represent actual firm-bank pairs (i.e., excluding all firm-counterfactual bank pairs). We maintain the same specification as before

³⁷Internet Appendix Figure A2 illustrates the effect of *Connected* alongside firm-level variables. Figures A2.A and A2.B show that the effect of *Connected* is particularly pronounced for entrants and for unrated firms, respectively. Figures A2.C and A2.D further indicate that the effect declines monotonically across quintiles of firm size and firm age. For large and established firms, the effect is negligible.

but replace the dependent variable, *Lender*, with the all-in-drawn spread (*AIDS*).³⁸

Controlling for other loan characteristics, the results in Column (1) show that the coefficients on the control variables are consistent with prior findings (e.g., [Lim, Minton, and Weisbach, 2014](#)). More importantly, the coefficient on *Connected* is negative but statistically insignificant, indicating that loan spreads do not differ systematically between *Connected* and non-*Connected* firm–bank pairs. This suggests that loan pricing is likely determined objectively based on borrower fundamentals rather than connections per se.

We next examine whether the sensitivity of loan pricing to *Connected* varies with firm characteristics and credit market conditions. The results in Columns (3), (5), and (6) indicate that unrated or young firms, as well as firms borrowing during the financial crisis, receive lower loan spreads when they are *Connected*. In sum, although connections may not reduce spreads for the average borrower, opaque firms—particularly during credit market freezes—appear to benefit from lower loan costs, suggesting that the advantages of connection are also realized along the intensive margin.

5.5 Real Effects

This section examines whether the contracting benefits of interlocking directors scale beyond financing outcomes. If connected firms not only obtain loans more easily but also at lower cost—thereby improving their financial capacity—an important question is whether these advantages also extend to real effects. In particular, we analyze firm-level outcomes related to employment and investment and estimate the following regressions:

$$y_{f,i,m,t+1} = \beta_0 + \beta_1 \text{Connection Intensity}_{f,t} + \beta_2 Z_{f,t} + \text{Firm FE}_f + \text{Industry FE}_i + \text{MSA FE}_m + \text{Year FE}_t + u_{f,i,m,t+1}. \quad (8)$$

where f , i , m , and t index firms, industries, MSAs, and years, respectively. The dependent variable $y_{f,i,m,t+1}$ is either *Employment* (the log number of employees) or *Investment* (the log of capital expenditures) for firm f , operating in industry i and MSA m , measured in year $t + 1$. The regressions include firm–year controls (*Market Leverage*, *Size*, *Zscore*, *Rated*, *Board Interlocking*, and *Board Size*), as well as firm, industry, MSA, and year fixed effects to absorb unobserved heterogeneity at each level. Firm fixed effects are not fully

³⁸Because loan terms—including spread—are jointly determined, we also account for other contractual features. Internet Appendix Figure A3 compares loan terms (amount, spread, maturity, covenants, and whether secured) between *Connected* and non-*Connected* firm–bank pairs, focusing on new borrowers. The figures show that loans to *Connected* pairs are characterized by larger amounts, lower spreads, longer maturities, fewer covenants, and a lower likelihood of being secured, providing preliminary evidence that connections may facilitate more favorable loan terms for borrowers.

nested within industry or MSA fixed effects because firms may relocate geographically or be reclassified into different industries over time; the results are similar or stronger when only firm fixed effects are used. The main explanatory variable, *Connection Intensity* $_{f,t}$, is defined as the mean of *Connected* $_{l,f,b,t}$ across all potential lender matches for firm f in year t , capturing firm-level exposure to connected lenders and the extent to which a firm can tap into connection-based financing.³⁹

A caveat to this analysis is that we cannot fully rule out the possibility that firms with stronger employment or investment opportunities strategically appoint directors who can link them to banks through interlocking firms. Although such endogenous board appointments are difficult to eliminate empirically (Hermalin and Weisbach, 1988, 1998; Adams, Hermalin, and Weisbach, 2010), the evidence still implies that the board-interlock channel is the mechanism through which these firms translate opportunities into realized real policies.

[Insert Table 9 here]

With this caveat in mind, we interpret the results in Table 9. Columns (1)–(4) show that *Connection Intensity* is associated with higher *Employment*, with the effect being more pronounced for opaque firms. Economically, Column (1) implies that a one-standard-deviation increase in *Connection Intensity* (0.2322) raises *Employment* by 1.68% for incumbent firms. For the average firm in our sample (23,554 employees), this corresponds to roughly 400 additional workers. For entrants, the combined effect of the main and interaction terms implies an 8.84% increase in *Employment*, or approximately 2,080 additional workers for the average firm. Columns (6), (7), and (9) show similar results for *Investment*. In addition, Column (10) indicates that the effect of *Connection Intensity* on *Investment* is amplified during financial crises.⁴⁰

6 Additional Analysis

We provide additional results in the Internet Appendix IV. In summary, the findings are as follows. (i) Focal firm–bank pairs connected through interlocking firms operating in the same industry or region are significantly more likely to form loan relationships than those connected through interlocking firms in different industries or regions, although the latter still exhibit a higher likelihood than unconnected pairs. These results provide evidence

³⁹The results are similar when either the count of *Connected* values or the mean of *Connected (Amount)* values is used as the connection intensity measure.

⁴⁰Unreported results show that a firm’s connections with banks through industry specialization and geographic proximity also increase *Investment*. The effect of *Connection Intensity* remains robust to including these alternative channels.

inconsistent with the credit-concentration-based countervailing channel. (ii) Similarity in *Size*, *Leverage*, or *Zscore* between focal and interlocking firms does not have an incremental effect conditional on the pair being *Connected*, but it is associated with similar loan spreads. This suggests that while screening is not directly affected by such similarity, banks may benchmark a focal firm’s loan spread against that of its interlocking firms with comparable characteristics. (iii) Connected firm–bank pairs are significantly more likely to form loan relationships when the interlocking directors have served the focal firm for a longer period or are more experienced (i.e., age 70 or older), consistent with the notion that experienced directors—who are better positioned to engage in the lending process—are more influential. (iv) Director “styles” (captured by director fixed effects) significantly explain variation in matching incidence, suggesting that some directors exploit connections more effectively than others. Nonetheless, these effects account for considerably less variation than firm-, bank-, or firm–bank-specific factors. (v) Finally, syndicate structure and lender concentration do not differ significantly between loans to connected and unconnected firm–bank pairs.

7 Conclusion

This paper examines the role of boards as contracting intermediaries in syndicated lending. We show that a firm is more likely to borrow from a bank when the two are linked through a director who already sits on another firm with an established lending relationship with that bank. The results are robust to alternative specifications, and IV and quasi-natural experiment tests indicate that the effects persist after addressing endogenous matching.

We further find that (i) the guarantor channel appears weakly dominant over the information-provider channel, (ii) the intermediary effect is stronger for new entrants, unrated, small, or young firms and during credit market freezes, (iii) pricing benefits accrue primarily to these constrained borrowers, and (iv) such board-enabled connections extend to real outcomes, increasing employment and investment.

A limitation of the study is that directors’ direct involvement in the contracting process is unobservable; richer private data may uncover these mechanisms more precisely. More broadly, while board interlocking may expand credit access, it may also segment credit markets, raising general-equilibrium implications for future research.

Overall, the paper highlights a novel function of corporate boards and contributes to the growing literature on the consequences of board interlocks, an issue of rising policy relevance as reflected in heightened FTC and DOJ scrutiny.

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Table 1: Summary Statistics

Summary statistics are reported for the base sample of 2,168,853 facility-firm-bank triad observations used in our analysis. Panel A reports the firm characteristics for 15,536 firm-year observations. Panel B reports the bank characteristics for 2,622 bank-year observations. Panel C reports the firm-bank pair characteristics for 748,290 firm-bank-year observations. Panel D reports the loan characteristics for 44,803 facilities, categorized into two groups: (i) firm-bank pairs that are not connected through a board-interlocking firm and (ii) firm-bank pairs that are connected through a board-interlocking firm. The symbol ***, **, and * denote statistical significance for two-tailed *t*-tests at the 1%, 5%, and 10% levels, respectively.

Panel A: Firm characteristics						
	N	Mean	Std. Dev.	25th	Median	75th
Market Leverage	15,536	0.266	0.211	0.104	0.220	0.385
Size	15,536	7.249	1.877	6.007	7.217	8.476
Zscore	15,536	1.677	1.744	0.933	1.696	2.467
Rated	15,536	0.431	0.495	0.000	0.000	1.000
Board Interlocking	15,536	0.560	0.496	0.000	1.000	1.000
Board Size	15,536	2.340	0.453	2.079	2.303	2.485
Panel B: Bank characteristics						
	N	Mean	Std. Dev.	25th	Median	75th
Num Borrowers	2,622	2.297	1.234	1.099	2.197	3.178
Portfolio Size	2,622	22.576	2.613	21.243	23.076	24.551
Top 10	2,622	0.118	0.323	0.000	0.000	0.000
Panel C: Firm-bank characteristics						
	N	Mean	Std. Dev.	25th	Median	75th
Prior Relationship	748,290	0.057	1.943	0.000	0.000	0.000
Industry Specialization	748,290	0.026	0.064	0.000	0.001	0.027
Same MSA	748,290	0.028	0.164	0.000	0.000	0.000
Connected	748,290	0.274	0.446	0.000	0.000	1.000
Connected (Amount)	748,290	5.634	9.245	0.000	0.000	17.103
Lender	748,290	0.022	0.127	0.000	0.000	0.000
Lender (Amount)	748,290	0.412	2.407	0.000	0.000	0.000
Busy (Potential) Directors	748,290	0.406	0.066	0.367	0.400	0.441
Panel D: Facility characteristics						
	Connected = 0		Connected = 1		Diff (t-stat)	
	Mean	Std. Dev.	Mean	Std. Dev.		
AIDS	5.197	0.654	4.921	0.759	0.276***	(41.402)
Facility Size	19.037	1.505	19.886	1.262	-0.849***	(-64.188)
Maturity	3.892	0.535	3.861	0.566	0.031***	(5.987)
Covenant	0.699	0.636	0.583	0.569	0.116***	(20.252)
Secured	0.606	0.489	0.437	0.496	0.169***	(36.346)
N	20,980		23,823			

Table 2: Baseline Effects

This table shows the results of OLS regressions from Equation (1), examining the effect of firm-bank pair's *Connected* status on their loan status. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	Lender (1)	Lender (Amount) (2)	Lender (3)	Lender (Amount) (4)
<i>Main variables:</i>				
Connected	0.0052*** (0.0003)	0.1009*** (0.0061)		
Connected (Amount)			0.0003*** (0.0000)	0.0055*** (0.0003)
<i>Borrower-lender pair variables:</i>				
Prior Relationship	0.0031*** (0.0008)	0.0585*** (0.0143)	0.0031*** (0.0008)	0.0584*** (0.0143)
Industry Specialization	0.0647*** (0.0027)	1.4009*** (0.0556)	0.0647*** (0.0027)	1.4001*** (0.0555)
Same MSA	0.0230*** (0.0010)	0.4379*** (0.0195)	0.0230*** (0.0010)	0.4372*** (0.0195)
<i>Lender variables:</i>				
Num Borrowers	0.0142*** (0.0003)	0.2575*** (0.0048)	0.0142*** (0.0003)	0.2569*** (0.0048)
Portfolio Size	-0.0007*** (0.0001)	-0.0092*** (0.0018)	-0.0007*** (0.0001)	-0.0092*** (0.0018)
Top 10	0.0088*** (0.0006)	0.1658*** (0.0119)	0.0086*** (0.0006)	0.1637*** (0.0119)
<i>Borrower variables:</i>				
Market Leverage	0.0007* (0.0004)	0.0156** (0.0078)	0.0006* (0.0004)	0.0149* (0.0078)
Size	-0.0001 (0.0001)	0.0016 (0.0015)	-0.0001 (0.0001)	0.0015 (0.0015)
Zscore	0.0001 (0.0001)	0.0028** (0.0012)	0.0001 (0.0001)	0.0027** (0.0012)
Rated	-0.0005*** (0.0001)	-0.0103*** (0.0029)	-0.0005*** (0.0001)	-0.0103*** (0.0029)
Board Interlocking	-0.0006** (0.0003)	-0.0139*** (0.0053)	-0.0008*** (0.0003)	-0.0184*** (0.0054)
Board Size	-0.0006*** (0.0002)	-0.0132*** (0.0046)	-0.0007*** (0.0002)	-0.0138*** (0.0046)
Observations	2,168,853	2,168,853	2,168,853	2,168,853
R-squared	0.0801	0.0775	0.0801	0.0775
Loan Type FE	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y
Firm, Bank, and Year FE	Y	Y	Y	Y

Table 3: Alternative Models

This table shows the results of OLS regressions from Equation (1), under alternative specifications. Panel A shows the results when top 25, top 100, or all active lenders (as identified in DealScan sample each year) are matched to each of the loan facilities. Panel B show the results when alternative fixed effects are included. Panel C shows the results including the additional variables, *Placebo-Connected 1* and *Placebo-Connected 2*. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Alternative counterfactual lenders			
	Lender		
	Top 25	Top 100	All Active Lenders
	(1)	(2)	(3)
Connected	0.0076*** (0.0006)	0.0043*** (0.0002)	0.0042*** (0.0002)
Observations	1,102,953	3,914,716	5,576,728
R-squared	0.0506	0.0556	0.0558
Controls	Y	Y	Y
Loan Type FE	Y	Y	Y
Loan Purpose FE	Y	Y	Y
Firm, Bank, and Year FE	Y	Y	Y
Panel B: Alternative fixed effects			
	Lender		
	(1)	(2)	(3)
Connected	0.0052*** (0.0004)	0.0047*** (0.0003)	0.0011*** (0.0004)
Observations	2,168,853	2,168,853	2,168,853
R-squared	0.0806	0.1457	0.3223
Controls	Y	Y	Y
Loan Type FE	Y	Y	Y
Loan Purpose FE	Y	Y	Y
Firm FE	N	Y	N
Bank FE	Y	N	N
Year FE	N	N	Y
Firm-Year FE	Y	N	N
Bank-Year FE	N	Y	N
Firm-Bank FE	N	N	Y
Panel C: Placebo connection			
	Lender		
	(1)	(2)	(3)
Placebo-Connected 1	-0.0003 (0.0005)		0.0003 (0.0005)
Placebo-Connected 2		-0.0006 (0.0004)	-0.0001 (0.0004)
Connected			0.0012*** (0.0004)
Observations	2,168,853	2,168,853	2,168,853
R-squared	0.3223	0.3223	0.3223
Controls	Y	Y	Y
Loan Type FE	Y	Y	Y
Loan Purpose FE	Y	Y	Y
Year FE	Y	Y	Y
Firm-Bank FE	Y	Y	Y

Table 4: IV Approach

This table shows the results of 2SLS regressions, using *Busy Directors* as the instrument for *Connected*, revisiting the OLS regressions in Table 2. Columns 1, 3, 5, and 7 (2, 4, 6, and 8) present the first-stage (second-stage) in the 2SLS variations for Columns 1, 2, 3, and 4 of Table 2, respectively. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Full sample								
	Lender		Lender (Amount)		Lender		Lender (Amount)	
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\widehat{\text{Connected}}$		0.0786*** (0.0117)		1.4344*** (0.2215)				
$\widehat{\text{Connected (Amount)}}$						0.0033*** (0.0005)		0.0595*** (0.0091)
Busy (Potential) Directors	-0.4120*** (0.0191)		-0.4120*** (0.0191)		-9.9233*** (0.3946)		-9.9233*** (0.3946)	
Observations	2,164,496	2,164,496	2,164,496	2,164,496	2,164,496	2,164,496	2,164,496	2,164,496
F Statistics	467.3		467.3		632.3		632.3	
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y	Y	Y	Y	Y
Panel B: Subsample								
	Lender							
	Long-tenure interlocks (≥ 3 -year board overlap)				Long-standing interlocking loans (≥ 3 -year lead)			
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\widehat{\text{Connected}}$		0.1171*** (0.0363)				0.0395*** (0.0114)		
$\widehat{\text{Connected (Amount)}}$				0.0048*** (0.0015)				0.0018*** (0.0005)
Busy (Potential) Directors	-0.1742*** (0.0171)		-4.2439*** (0.3571)		-0.3936*** (0.0159)		-8.6642*** (0.3329)	
Observations	1,203,883	1,203,883	1,203,883	1,203,883	1,679,682	1,679,682	1,679,682	1,679,682
F Statistics	103.4		141.2		614.0		677.2	
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 5: Credit Market Disruptions

This table shows the results of OLS regressions using *Financial Crisis*, *Credit Tightness* (%), or *EBP* (%) and their interactions with *Connected*. *Financial Crisis* is an indicator variable representing the period from July 2007 to August 2008. *Credit Tightness* (%) represents the quarterly net percentages of domestic bank respondents tightening standards for commercial and industrial loans to large and middle-market firms, as reported in the Federal Reserve Board's Senior Loan Officer Survey. *EBP* (%) is the excess bond premium, calculated as the average difference between corporate credit spreads and the spreads implied by the default risk of individual issuers. *NFCI* is the weighted average of 105 financial activity measures, including risk, credit, and leverage indicators, capturing national financial conditions. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Credit Market Condition =	Lender							
	Financial Crisis		Credit Tightness (%)		EBP (%)		NFCI	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Connected	0.0010** (0.0004)	0.0010** (0.0004)	0.0011*** (0.0004)	0.0011*** (0.0004)	0.0011*** (0.0004)	0.0011*** (0.0004)	0.0023*** (0.0004)	0.0022*** (0.0004)
Connected × Credit Market Condition	0.0060*** (0.0015)	0.0059*** (0.0015)	0.0000** (0.0000)	0.0000* (0.0000)	0.0012*** (0.0005)	0.0012** (0.0005)	0.0027*** (0.0005)	0.0027*** (0.0005)
Credit Market Condition	-0.0017** (0.0008)	-0.0020** (0.0008)	0.0000** (0.0000)	0.0000** (0.0000)	0.0007*** (0.0002)	0.0004 (0.0003)	0.0014*** (0.0003)	0.0012*** (0.0003)
Prior Relationship × Credit Market Condition		-0.0006 (0.0007)		-0.0000 (0.0000)		-0.0003 (0.0004)		-0.0003 (0.0005)
Industry Specialization × Credit Market Condition		0.0131 (0.0136)		0.0001 (0.0001)		0.0076* (0.0044)		0.0087* (0.0049)
Same MSA × Credit Market Condition		0.0018 (0.0050)		0.0001 (0.0000)		0.0022 (0.0016)		0.0006 (0.0020)
Observations	2,168,853	2,168,853	2,168,853	2,168,853	2,168,853	2,168,853	2,168,853	2,168,853
R-squared	0.3223	0.3223	0.3223	0.3223	0.3223	0.3223	0.3223	0.3223
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y	Y	Y	Y	Y

Table 6: Quasi-natural Experiment

This table shows the results of OLS regressions for Equation (5). Panel A shows the baseline results. In Columns 1, 2, and 3, $Treated_f$ is defined as an indicator equal to 1 if firm f has more than 20%, sample median (=14.1%), and 25% of its debt maturing between July 2007 and August 2008. $Post_t$ is defined as an indicator equal to 1 if the loan is issued from July 2007 to December 2008. Panel B shows the robustness results. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Baseline			
Fraction of loans maturing during the crisis:	Lender		
	$\geq 20\%$	$\geq \text{median}$	$\geq 25\%$
	(1)	(2)	(3)
Connected $\times$ Treated $\times$ Post	0.0153** (0.0067)	0.0132** (0.0055)	0.0137* (0.0075)
Treated $\times$ Post	-0.0030 (0.0021)	-0.0022 (0.0020)	-0.0027 (0.0023)
Connected $\times$ Post	-0.0005 (0.0022)	-0.0009 (0.0024)	-0.0001 (0.0022)
Connected $\times$ Treated	-0.0073 (0.0069)	-0.0132* (0.0076)	-0.0012 (0.0062)
Post	0.0002 (0.0011)	0.0003 (0.0011)	0.0001 (0.0011)
Connected	-0.0059** (0.0028)	-0.0044* (0.0027)	-0.0067** (0.0028)
Observations	164,874	164,874	164,874
R-squared	0.6127	0.6127	0.6127
Controls	Y	Y	Y
Loan Type FE	Y	Y	Y
Loan Purpose FE	Y	Y	Y
Year FE	Y	Y	Y
Firm-Bank FE	Y	Y	Y
Panel B: Robustness			
	Lender		
	“Clean” Connected Status	Other relationship controls	Alternative Connected variable
	(1)	(2)	(3)
Connected $\times$ Treated $\times$ Post	0.0161** (0.0072)	0.0141** (0.0069)	
Same MSA $\times$ Treated $\times$ Post		-0.0131 (0.0124)	
Industry Specialization $\times$ Treated $\times$ Post		0.1068*** (0.0388)	
Prior Relationship $\times$ Treated $\times$ Post		-0.0300*** (0.0033)	
Connected (Amount) $\times$ Treated $\times$ Post			0.0008** (0.0003)
Observations	159,866	128,633	164,874
R-squared	0.6163	0.5842	0.6127
Controls	Y	Y	Y
Loan Type FE	Y	Y	Y
Loan Purpose FE	Y	Y	Y
Year FE	Y	Y	Y
Firm-Bank FE	Y	Y	Y

Table 7: Cross-sectional Tests

This table shows the results of OLS regressions using borrower characteristics and their interactions with *Connected*. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	Lender				
	(1)	(2)	(3)	(4)	(5)
Connected	0.0011*** (0.0004)	0.0021*** (0.0006)	0.0084*** (0.0017)	0.0041*** (0.0008)	0.0089*** (0.0018)
Connected $\times$ Entrant	0.0044** (0.0020)				0.0031 (0.0020)
Connected $\times$ Rated		-0.0015** (0.0007)			-0.0009 (0.0007)
Connected $\times$ Size			-0.0009*** (0.0002)		-0.0006*** (0.0002)
Connected $\times$ Age				-0.0002*** (0.0000)	-0.0001*** (0.0000)
Observations	2,168,853	2,168,853	2,168,853	2,168,853	2,168,853
R-squared	0.3223	0.3223	0.3223	0.3223	0.3223
Controls	Y	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y	Y

Table 8: Loan Pricing

This table shows the results of OLS regressions of *AIDS* (i.e., all-in-drawn spread) on *Connected*. Additional controls include the facility loan size, maturity, the number of financial or net worth covenants, and an indicator for whether the loan is secured. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	AIDS					
	(1)	(2)	(3)	(4)	(5)	(6)
Connected	-0.0152 (0.0110)	-0.0156 (0.0110)	-0.0350*** (0.0135)	0.0558 (0.0480)	-0.1033*** (0.0198)	-0.0128 (0.0110)
Connected $\times$ Entrant		0.0166 (0.0406)				
Connected $\times$ Rated			0.0339** (0.0159)			
Connected $\times$ Size				-0.0087 (0.0059)		
Connected $\times$ Age					0.0055*** (0.0010)	
Connected $\times$ Financial Crisis						-0.0940** (0.0466)
Facility Size	-0.0609*** (0.0040)	-0.0608*** (0.0040)	-0.0608*** (0.0040)	-0.0609*** (0.0040)	-0.0607*** (0.0040)	-0.0608*** (0.0040)
Maturity	-0.0138 (0.0108)	-0.0139 (0.0108)	-0.0138 (0.0108)	-0.0140 (0.0108)	-0.0143 (0.0108)	-0.0138 (0.0108)
Covenant	0.0085 (0.0083)	0.0085 (0.0083)	0.0084 (0.0083)	0.0083 (0.0083)	0.0084 (0.0083)	0.0090 (0.0083)
Secured	0.1704*** (0.0118)	0.1704*** (0.0119)	0.1701*** (0.0118)	0.1702*** (0.0118)	0.1711*** (0.0119)	0.1692*** (0.0118)
Observations	44,081	44,081	44,081	44,081	44,081	44,081
R-squared	0.9126	0.9126	0.9126	0.9126	0.9128	0.9128
Controls	Y	Y	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y	Y	Y

Table 9: Employment and Investment

This table shows the results of OLS regressions of *AIDS* (i.e., all-in-drawn spread) on *Connected*. Additional controls include the facility loan size, maturity, the number of financial or net worth covenants, and an indicator for whether the loan is secured. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	Employment					Investment				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Connection Intensity	0.0720*	0.1677***	0.4546***	0.5451***	0.0750**	0.0870*	0.1646***	0.3771**	0.3628***	0.0768
Connection Intensity $\times$ Entrant	(0.0382)	(0.0518)	(0.1624)	(0.0691)	(0.0382)	(0.0475)	(0.0611)	(0.1824)	(0.0832)	(0.0477)
Connection Intensity $\times$ Rated	0.2931***					0.2901**				
	(0.0947)					(0.1239)				
		-0.1704***					-0.1377*			
		(0.0594)					(0.0764)			
Connection Intensity $\times$ Size			-0.0473**					-0.0358		
			(0.0204)					(0.0221)		
Connection Intensity $\times$ Age				-0.0326***					-0.0191***	
				(0.0041)					(0.0049)	
Connection Intensity $\times$ Financial Crisis					-0.0128					0.2774**
					(0.0717)					(0.1079)
Observations	14,511	14,511	14,511	14,511	14,511	14,552	14,552	14,552	14,552	14,552
R-squared	0.9680	0.9680	0.9680	0.9685	0.9680	0.9493	0.9493	0.9493	0.9495	0.9493
Firm Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
MSA FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Internet Appendix

“Boards as Contracting Intermediaries:
Evidence from Board-Interlocking Firms in the Credit Market”

August 2026

Abstract

This Internet Appendix presents our simple model, institutional background, Figures A1 through A3, and Tables A1 through A7 as supporting information.

Appendix I: Simple Model

Guarantor Channel (Adverse Selection)

We first develop a stylized one-period model à la [Ghatak and Guinnane \(1999\)](#), [Van Tassel \(1999\)](#), [De Aghion and Gollier \(2000\)](#), and [Laffont and N'Guessan \(2000\)](#). This family of models explains how the reduction of the adverse selection problem in group lending schemes helps mitigate the issue of safe borrowers being driven out of the credit market when banks are imperfectly informed about borrowers' risk levels. While group lending models typically emphasize social sanctions or borrower monitoring as enforcement mechanisms, our focus is on the ability of common directors to advise and monitor their board-interlocking firms.

We characterize the loan negotiation between a bank, the focal firm (F), and the interlocking firm (I) as a contracting problem involving the bank's loan officer and the common director of both F and I. To align with our empirical setting, we also assume that F and I have been exogenously paired through the common director prior to the loan contract negotiation.

The loan officer is risk-neutral and competitive, in the sense that firms invite multiple banks to submit proposals for arranging syndicated loans. She incurs a funding cost ρ (>0), when providing a loan. If her borrower defaults on repayment r and repays 0 (due to limited liability), she bears a cost c , which represents the audit cost or personal career cost.

Both F and I are also risk-neutral and can be either a safe (S) type with probability π or a risky (R) type with probability $1-\pi$ for a given π ($\in (0,1)$). The common director observes the types of F and I, but the loan officer has no information about them. An S-firm obtains h per unit of capital at the end of the period, while an R-firm obtains H with probability p ($\in (0,1)$) and 0 otherwise. The investments of both types have the same expected return, i.e., $pH = h$, and are socially efficient, i.e., $pH = h > \rho$. Without loss of generality, firms' opportunity cost of labor is assumed to be 0.

No interlock case: We first consider the benchmark equilibrium of firms without a board interlock. Suppose the loan officer anticipates that only S-firms will apply for a loan. She will then charge

$$r = \rho \tag{1}$$

as the break-even rate. However, this rate also satisfies the participation constraint of R-firms, since $pH > \rho$, and thus cannot be the equilibrium rate. Now suppose the loan officer assumes that only R-firms will apply for a loan. She then sets a break-even rate r such that $pr - (1-p)c$

= ρ . Thus, she charges

$$r = \frac{\rho + (1-p)c}{p} \quad (2)$$

This rate generates an equilibrium in which only R-firms apply if

$$h \leq \frac{\rho + (1-p)c}{p} \leq H \quad (3)$$

Lastly, suppose the loan officer anticipates that both S- and R-firms will apply for a loan. She will then sets a break-even rate r such that $\pi r + (1-\pi)[pr - (1-p)c] = \rho$. That is, she will charge

$$r = \frac{\rho + (1-\pi)(1-p)c}{\pi + (1-\pi)p} \quad (4)$$

This rate is consistent with an equilibrium if

$$h \geq \frac{\rho + (1-\pi)(1-p)c}{\pi + (1-\pi)p} \quad (5)$$

since S-firms participate, and because $H > h$, R-firms also participate. Taken together, the set of equilibria shows that (i) there is no equilibrium with only S-firms applying, (ii) there is an equilibrium with only R-firms applying, depending on sufficiently low h and sufficiently high H , and (iii) there is an equilibrium with both S- and R-firms applying for sufficiently high h . Moreover, the equilibrium rates in (2) and (4) are both higher than the equilibrium rate in (1), which would have been available to S-firms had there been no R-firms. Overall, the presence of R-firms can trigger a higher equilibrium interest rate that drives S-firms out of the credit market, even though their investments are socially efficient.

Interlock case: we next consider the contracting between the loan officer and firm F when its board-interlocked firm I has already obtained a loan from the same loan officer. We assume that I did not have another board-interlocked firm and was thus charged the pooling rate r_I given in (4). I's type has not been revealed by the loan officer—since I's loan is currently active and matures after F's loan originates—but it is known to the common director. Importantly, we introduce an “implicit joint liability” scheme between F and I as follows: if one firm defaults on its repayment, the other firm pays some penalties in the form of the net present values of lost consumption due to reputational damage, tightened credit standards in the next loan, or unavailability of refinancing in the future. This joint liability is informal rather than contractual. In reduced form, we assume that the other firm will pay a fraction ($\alpha \in (0,1)$) of the defaulting firm's repayment, plus c , which represents the cost

borne by the loan officer for loan failure. The loan officer's problem is

$$\begin{aligned} & \pi^2(r_F + r_I) + \pi(1 - \pi)[p(r_F + r_I) + (1 - p)(r_F + \alpha r_I)] + \pi(1 - \pi)[p(r_F + r_I) + (1 - p)(r_I + \alpha r_F)] \\ & + (1 - \pi)^2[p^2(r_F + r_I) + p(1 - p)(r_F + \alpha r_I) + p(1 - p)(r_I + \alpha r_F) + (1 - p)^2(-2c)] = 2\rho \end{aligned} \quad (6)$$

where the terms on the left-hand side represent the payoffs, respectively, when (i) both F and I are S, (ii) F is S and I is R, (iii) F is R and I is S, and (iv) both F and I are R. Equivalently,

$$r_F = \frac{2[\rho + (1 - \pi)^2(1 - p)^2c]}{[\pi + p(1 - \pi)][\pi + (1 - \pi)p + (1 + \alpha)(1 - \pi)(1 - p)]} - r_I \quad (7)$$

Meanwhile, the common director knows the types of F and I and advises F's contracting decision accordingly. Since the participation constraints of R-firms are always satisfied when S-firms participate (as in the benchmark case), we consider the case when F is of type S and its participation constraints.

If I is of type S, F participates if and only if $h \geq r_F$ as given in (7). Since the first ratio term in the right-hand side of (7) is strictly lower than $2r_I$ for any $\alpha > 0$, the critical value of h for F to participate is lower than r_I , which is the rate in the benchmark case. Thus, the adverse selection problem is mitigated in this case.

If I is of type R, the participation constraint of F is

$$p(h - r_F) + (1 - p)(h - r_F - \alpha r_I - c) \geq 0 \quad (8)$$

To rephrase, F participates if and only if $h \geq r_F + (1 - p)(\alpha r_I + c)$. Therefore, the adverse selection problem can be mitigated if there exists a parameter value for α such that the critical value $r_F + (1 - p)(\alpha r_I + c)$ of h is strictly lower the pooling benchmark rate, r_I . Substituting r_F from (7) into this condition, this equates to

$$\frac{2[\rho + (1 - \pi)^2(1 - p)^2c]}{[\pi + p(1 - \pi)][\pi + (1 - \pi)p + (1 + \alpha)(1 - \pi)(1 - p)]} - r_I + (1 - p)(\alpha r_I + c) < r_I \quad (9)$$

Substituting r_I from (4) into above,

$$\begin{aligned} & (1 - \pi)(1 - p)[\rho + (1 - \pi)(1 - p)c] \alpha^2 \\ & + \left((2\pi - 1)\rho + c(1 - \pi)[(\pi + (1 - \pi)p)(3 - p) - (1 + p)] \right) \alpha \\ & + c(\pi + (1 - \pi)p)(2\pi - 1) < 0 \end{aligned} \quad (10)$$

Because (10) defines a convex quadratic function in α , an equilibrium value exists whenever the inequality holds for some $\alpha \in (0,1)$. Since the left-hand side is continuous in α and typically takes a non-positive value for moderate parameter values—such as when $\pi < \frac{1}{2}$ or when the default cost c and project success probability p are within plausible ranges—there exists an interior solution that satisfies (10). In this equilibrium, a greater fraction of S-type firms participate relative to the benchmark case.

Guarantor Channel (Moral Hazard)

We next develop a simple one-period model in the spirit of [Stiglitz \(1990\)](#), [Varian \(1990\)](#), [Banerjee, Besley, and Guinnane \(1994\)](#), [Besley and Coate \(1995\)](#), and [De Aghion \(1999\)](#). These models emphasize the cross-monitoring among borrowers under a group lending scheme, leading to a reduction in the moral hazard problem.

We build upon a similar setting to the adverse selection model, but now we endogenize p ($\in (0,1)$) and characterize it as the monitoring effort of the common director, which determines the probability of project success. Both F and I are of R types and obtain H with probability p_F and p_I , respectively, which are unknown to the loan officer. Additionally, the common director bears the costs of monitoring as $\gamma p_F^2/2$ and $\gamma p_I^2/2$ for the two firms.

No interlock case: we first consider the benchmark equilibrium p and r when firms do not have a board interlock with other firms. For a given r , a firm maximizes $p(H-r) - \frac{1}{2}\gamma p^2$ and chooses

$$p = \frac{H - r}{\gamma} \quad (11)$$

which is lower than the socially efficient level $p = \frac{H}{\gamma}$. The loan officer has a break-even rate r such that $pr + (1-p)(-c) = \rho$, which is

$$r = \frac{\rho + (1-p)c}{p} \quad (12)$$

Substituting (12) into (11), we obtain the following quadratic equation in p

$$\gamma p^2 - (H + c)p + \rho = 0 \quad (13)$$

Therefore, the firm will choose an equilibrium monitoring level

$$p = \frac{H + c + \sqrt{(H + c)^2 - 4\gamma\rho}}{2\gamma} \quad (14)$$

since the loan office breaks even, and the firm is strictly better off with the higher value between the two possible roots.

Interlock case: we again assume that firm I has already entered into a loan relationship with the loan officer, having chosen p_I in (14) and been charged r_I in (12) accordingly. F is partially liable for I's default, as described in the above adverse selection model. Given r_F , r_I , and p_I , F maximizes $p_F p_I (H - r_F) + p_F (1 - p_I) (H - \alpha r_I - c) - \frac{1}{2} \gamma p_F^2$ by choosing

$$p_F = \frac{p_I (H - r_F) + (1 - p_I) (H - \alpha r_I - c)}{\gamma} \quad (15)$$

The loan officer sets a break-even rate r_F such that $p_F p_I (r_F + r_I) + p_F (1 - p_I) (r_F + \alpha r_I) + p_I (1 - p_F) (r_I + \alpha r_F) + (1 - p_F) (1 - p_I) (-2c) = 2\rho$. Thus,

$$r_F = \frac{2\rho + 2c(1 - p_F)(1 - p_I) - r_I[p_I + \alpha p_F(1 - p_I)]}{p_F + \alpha p_I(1 - p_F)} \quad (16)$$

Substituting r_I from (12), and r_F from (16) into (15), we obtain a quadratic equation:

$$\begin{aligned} & \gamma (1 - \alpha p_I) p_F^2 \\ & + \left[\gamma \alpha p_I - p_I \left(H(1 - \alpha p_I) + (1 - p_I) \left(2c + \alpha \frac{\rho + (1 - p_I)c}{p_I} \right) \right) \right. \\ & \quad \left. - (1 - p_I) \left(H - \alpha \frac{\rho + (1 - p_I)c}{p_I} - c \right) (1 - \alpha p_I) \right] p_F \\ & - \left[p_I \left(\alpha p_I H - 2\rho - 2c(1 - p_I) + (\rho + (1 - p_I)c) \right) \right. \\ & \quad \left. + (1 - p_I) \left(H - \alpha \frac{\rho + (1 - p_I)c}{p_I} - c \right) \alpha p_I \right] = 0 \end{aligned} \quad (17)$$

In equilibrium, F exerts greater monitoring effort than I (i.e., beyond the benchmark level) if there exists a value of α such that the equilibrium solution for p_F from (17) exceeds the benchmark p_I in (14). Rather than deriving the closed-form solution for $p_F(\alpha)$, we illustrate the mechanism numerically. Fixing reasonable primitives $(H, c, \gamma, \rho) = (6, 0.2, 5, 1.5)$, (14) and (12) yield $p_I = 0.9105$ and $r_I = 1.667$. Solving (17) shows that $p_F = 0.8936$ when $\alpha = 0$, $p_F = 0.9108$ when $\alpha = 0.53$, and $p_F = 0.9175$ when $\alpha = 0.88$. This pattern demonstrates that, for plausible parameter values, an interior level of joint-liability intensity α exists such that $p_F > p_I$, implying that joint guarantees can induce stronger monitoring incentives for F relative to the benchmark case.

Information-Provider Channel

A common director can serve as an information bridge between the focal firm F , the interlocking firm I , and the loan officer. Because the officer can reuse knowledge from prior lending relationships—such as familiarity with disclosure practices, management style, and documentation standards—the perceived uncertainty about the borrower’s quality declines. This reuse of soft information effectively *lowers* the officer’s funding and screening cost, ρ . On the borrower’s side, the director’s prior lending experience enables firm F to prepare and present information more efficiently, drawing on established loan documentation and communication practices from firm I . These efficiencies reduce redundant paperwork and coordination costs, thereby *increasing* the project’s effective net return (h or H) without altering its underlying technology. These parameter shifts generate comparative-static effects that mitigate both the adverse-selection and moral-hazard problems discussed above.

More specifically, under adverse selection, the bank begins with more reliable information about the borrower, improving credit assessment and lowering the rate required to lend. Under moral hazard, the director’s prior lending experience helps firm F anticipate the bank’s expectations and maintain compliance, reducing reporting delays or misunderstandings. In reduced form, these improvements can be viewed as a downward shift in the effective funding and screening cost and an upward shift in the firm’s net payoff. In the broader framework, this information-provider channel complements the guarantor channel: while the latter reduces perceived risk through partial loss sharing, the former lowers informational frictions by improving procedural efficiency and communication between the interlocking firm, the focal firm, and the lender.

Appendix II: Institutional Background

Fiduciary Duties and Corporate Governance Standards

Directors have fiduciary duties of care and loyalty, requiring them to act in the best interest of the corporation and its shareholders. In the context of financing, this means ensuring that lending arrangements and financial decisions are made prudently and transparently. The Securities and Exchange Commission (SEC) mandates disclosures of interlocking relationships, particularly when they may influence financial decisions or pose conflicts of interest, under Regulation S-K, Item 407 of the Exchange Act.¹ Notably, Item 407(e)(4) requires disclosure of compensation-related interlocks specifically, while interlocks that operate through financing channels or reputational spillovers fall outside its scope; these non-compensation interlocks must be disclosed but are not substantively restricted so long as they do not involve competing firms or material self-dealing.

Additionally, the Delaware General Corporation Law (DGCL § 144) provides a procedural safe harbor for transactions involving potential conflicts of interest, permitting interlocks when properly disclosed and approved.² The Federal Trade Commission (FTC) and the Department of Justice (DOJ) have recently increased enforcement efforts under Section 8 of the Clayton Act, requiring directors to resign from interlocking positions in competing firms to prevent anticompetitive conduct.^{3 4 5} While interlocks between non-competing firms remain legally permitted, companies must disclose these relationships in proxy statements, ensuring transparency and regulatory accountability.

Directors and Officers (D&O) Liability Insurance

D&O liability insurance may materially affect directors' willingness to engage in relational governance and informational intermediation. These policies shield directors from personal

¹<https://www.ecfr.gov/current/title-17/part-229/section-229.407>

²<https://delcode.delaware.gov/title8/c001/sc04/index.html>

³For example, in April 2024 two Warner Bros. Discovery directors resigned following DOJ concerns over simultaneous service with Charter Communications (video distribution competitors): <https://www.justice.gov/archives/opa/pr/two-warner-bros-discovery-directors-resign-after-justice-department-expresses-antitrust>

⁴In December 2024, Tencent relinquished its unilateral appointment rights and removed two directors from Epic Games due to Section 8 concerns given Tencent's existing ownership of competitor Riot Games: <https://www.justice.gov/archives/opa/pr/tencent-removes-two-directors-epic-games-and-relinquishes-its-right-unilaterally-appoint>

⁵In September 2025, the FTC secured resignations in a separate enforcement action involving interlocks that created governance-side information-sharing risks between competing entities: <https://www.ftc.gov/news-events/news/press-releases/2025/09/three-directors-resign-sevita-board-directors-response-ftcs-ongoing-enforcement-efforts-against>

liability for fiduciary-duty claims when they act in good faith and on an informed basis, consistent with the procedural standard articulated by the Business Judgment Rule. In *Smith v. Van Gorkom* (1985), the Delaware Supreme Court held that directors lose the protection of the Business Judgment Rule only when they act without adequate information or deliberation.⁶ Accordingly, when directors satisfy process-based safeguards and avoid self-dealing, D&O insurance substantially limits their litigation exposure. This legal structure lowers the private cost of engagement and facilitates directors' reliance on accumulated expertise, reputational capital, and multi-board experience when advising on or indirectly influencing financial contracting.

Informal Intermediation and Legal Gray Zones

The governance framework in the United States creates meaningful scope for “soft” or relational intermediation without triggering fiduciary breach, so long as no confidential information is transferred and no self-dealing occurs. SEC oversight of director conduct is largely procedural and disclosure-based: the Division of Corporation Finance selectively reviews public-company filings to monitor and enhance compliance with disclosure and accounting requirements, concentrating on critical disclosures or those that appear materially deficient in explanation or clarity.⁷ ⁸ By contrast, substantive intervention on interlocks typically arises only when overlaps threaten competition among *competitors*—the focus of Section 8 enforcement by the DOJ Antitrust Division.⁹ As a result, cross-board informational spillovers among *non-competing* firms—such as reputational signals, governance impressions, or qualitative assessments—generally fall outside substantive antitrust scrutiny and are handled, if at all, through ordinary disclosure controls. This creates a legally permissible channel through which directors may facilitate credibility transmission between borrowers and lenders, even in the absence of explicit contractual obligations.

Bank-Side Communication and Information Use

On the lending side, federal banking regulation treats the receipt and use of qualitative signals as a permissible component of underwriting, provided they are incorporated within a safety-and-soundness framework. U.S. banking supervision gives lenders discretion to

⁶<https://law.justia.com/cases/delaware/supreme-court/1985/488-a-2d-858-4.html>

⁷<https://www.sec.gov/about/divisions-offices/division-corporation-finance/filing-review-process-corp-fin>

⁸<https://www.sec.gov/resources-small-businesses/capital-raising-building-blocks/sec-filing-review-process>

⁹<https://www.justice.gov/archives/opa/pr/justice-department-s-ongoing-section-8-enforcement-prevents>

supplement quantitative analysis with qualitative judgment when assessing credit risk. The OCC’s *Comptroller’s Handbook: Rating Credit Risk* instructs examiners to “incorporate all relevant factors in a credit rating”, rather than relying solely on predetermined indicators.¹⁰ Related guidance in the OCC’s *Loan Portfolio Management* booklet emphasizes that “a bank’s first defense against excessive credit risk is the initial credit-granting process — sound underwriting standards, an efficient, balanced approval process, and a competent lending staff”.¹¹ Regulation B of the Equal Credit Opportunity Act similarly permits creditors to consider any information in underwriting so long as it is not used in a discriminatory manner (12 C.F.R. § 1002.6).¹² Consistent with this approach, the 2020 *Interagency Guidance on Credit Risk Review Systems* states that effective review “considers any information available” that bears on repayment capacity.¹³

At the same time, the Bank Holding Company Act’s anti-tying rule (12 U.S.C. § 1972) restricts coercive conditioning of credit on the purchase of additional products or services, but it does not prohibit banks from drawing inferences from relationship-based or reputational signals, because these are informational rather than transactional inputs.^{14 15} This structure therefore accommodates the informal guarantor channel relevant to this study: the bank interprets the presence of a connected director as a credibility signal or implicit assurance, but does not require any contractual guarantee or bundled obligation. Because the signal is informational rather than transactional, the relationship falls outside the scope of tying restrictions and remains legally permissible.

¹⁰<https://www.occ.treas.gov/publications-and-resources/publications/comptrollers-handbook/files/rating-credit-risk/pub-ch-rating-credit-risk.pdf>

¹¹<https://www.occ.treas.gov/publications-and-resources/publications/comptrollers-handbook/files/loan-portfolio-management/pub-ch-loan-portfolio-mgmt.pdf>

¹²<https://www.ecfr.gov/current/title-12/part-1002>

¹³<https://www.fdic.gov/news/press-releases/2020/pr20058b.pdf>

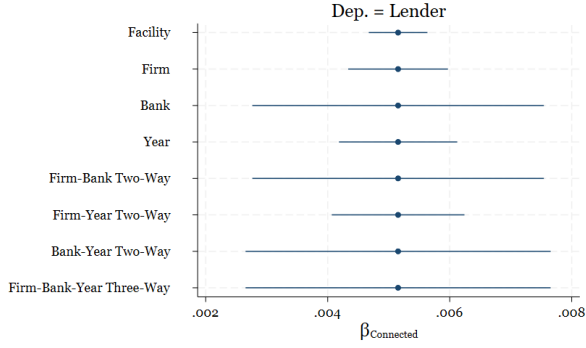
¹⁴<https://www.law.cornell.edu/uscode/text/12/1972>

¹⁵<https://www.occ.treas.gov/news-issuances/bulletins/1995/bulletin-1995-20.html>

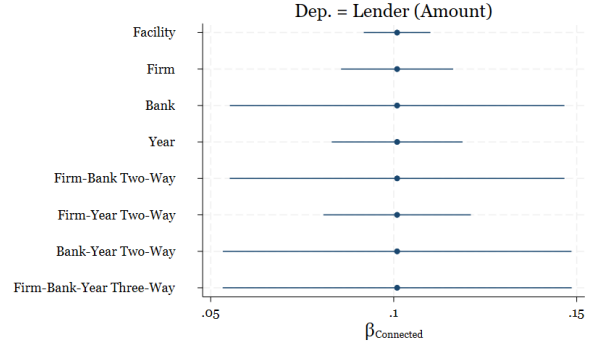
Appendix III: Additional Figures

Figure A1: Alternative Clustering of Standard Errors

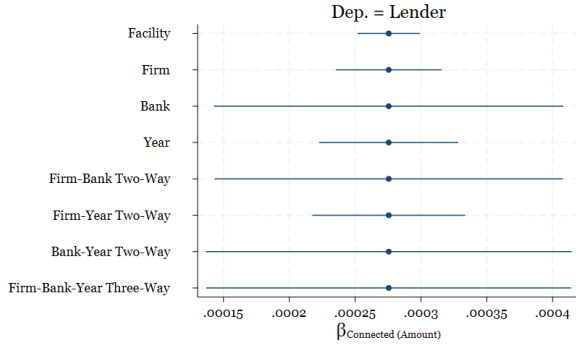
These figures replicate Table 2's regressions, under alternative clustering schemes. Figure A1.A, Figure A1.B, Figure A1.C, and Figure A1.D report the coefficient estimates and 95% confidence intervals for Column 1, 2, 3, and 4 of Table 2, respectively.



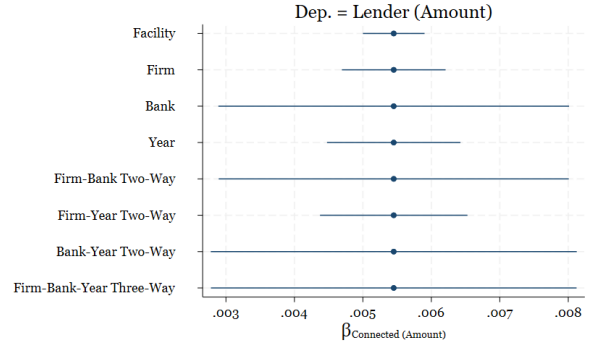
(a) Figure A1.A



(b) Figure A1.B



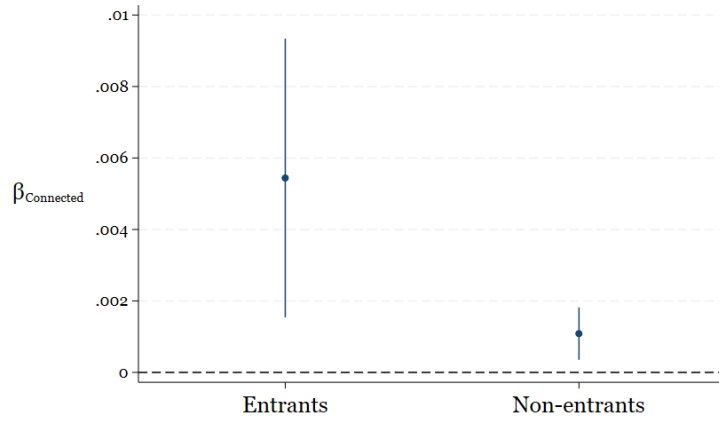
(c) Figure A1.C



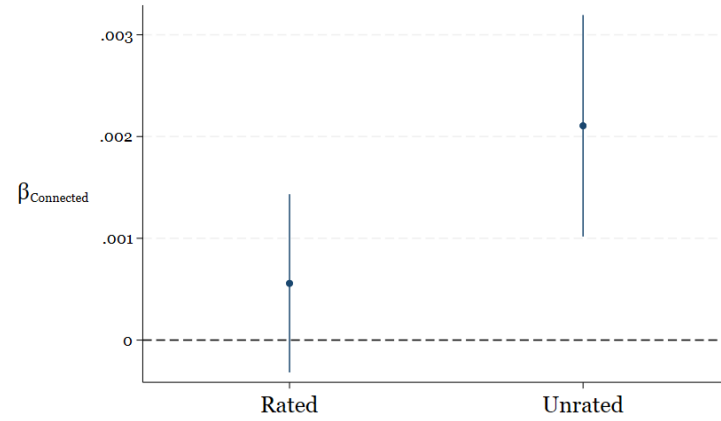
(d) Figure A1.D

Figure A2: Cross-sectional Tests

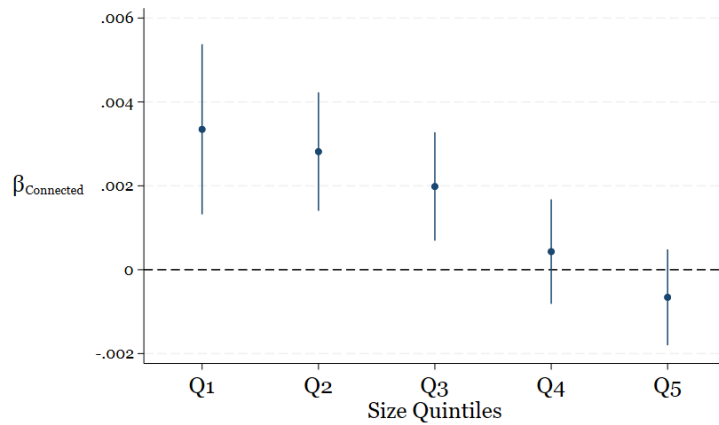
These figures display the coefficient estimates for *Connected* across variable categories or quintiles. Figures A2.A, A2.B, A2.C, and A2.D display the coefficient estimates and 95% confidence intervals for *Connected* interacted with the *Entrant* dummy, *Rated* dummy, *Size* quintile dummies, and *Age* dummies, respectively.



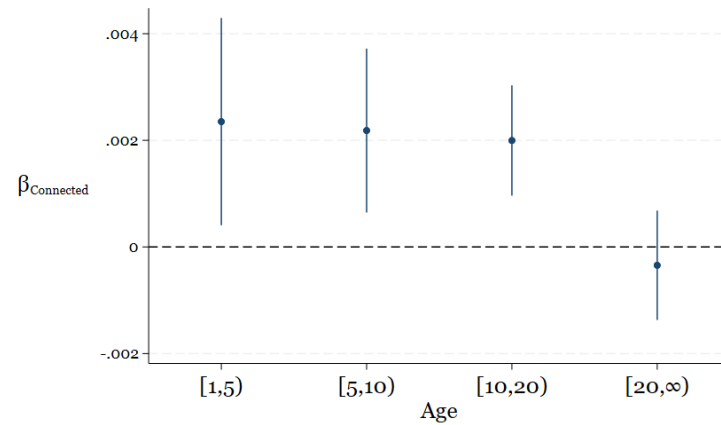
(a) Figure A2.A



(b) Figure A2.B



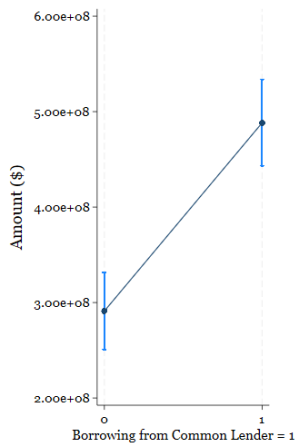
(c) Figure A2.C



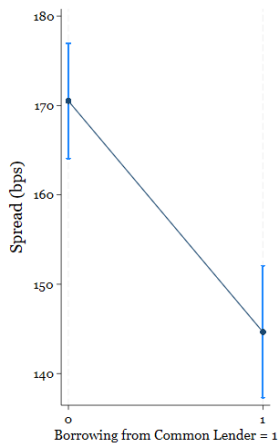
(d) Figure A2.D

Figure A3: Loan Terms from Common Lenders vs. Non-Common Lenders

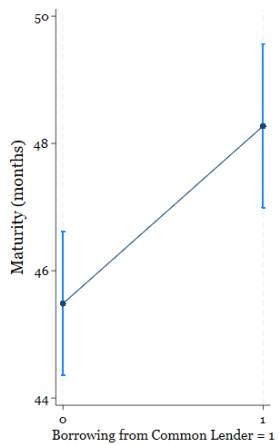
These figures compare the terms of loans provided by lenders to borrowers who are connected through an interlocking firm vs. those that not. Figure A3.A, Figure A3.B, Figure A3.C, Figure A3.D, and Figure A3.E show the differences in loan amount, loan spread, maturity, the number of covenants, and secured indicator, respectively.



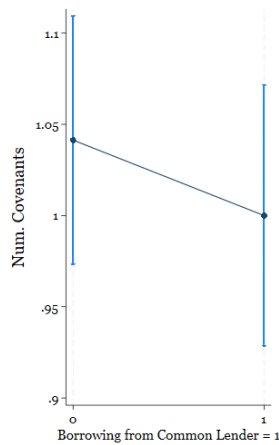
(a) Figure A3.A



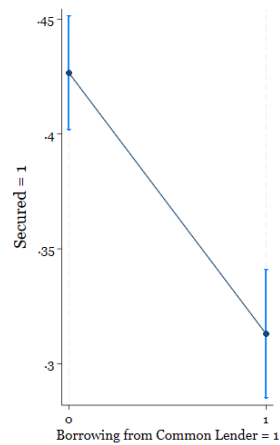
(b) Figure A3.B



(c) Figure A3.C



(d) Figure A3.D



(e) Figure A3.E

Appendix IV: Additional Tables

IV.1: Variable Definitions

Table A1: Variable Definitions

Variable	Definition
$AIDS_{l,t}$	The log of all-in-drawn spread of facility l
$Board\ Interlocking_{f,t}$	An indicator equal to 1 if firm f has a board-interlocking firm
$Board\ Size_{f,t}$	The log of 1 plus the number of directors of firm f
$Busy\ (Potential)\ Directors_{f,b,t}$	The ratio of directors who are not affiliated with firm f but are directors of other current borrowers of bank b , to the total number of directors of other current borrowers of bank b
$Connected_{l,f,b}$	An indicator equal to 1 if, at the time facility l is originated, there exists another firm that is both board-interlocked with firm f and borrowing from bank b .
$Connected\ (Amount)_{f,b,t}$	The log size of facility provided by bank b in year t to a firm board-interlocking with firm f in year t
$Connected\ (SameInd)_{f,b,t}$	An indicator equal to 1 if firm f and its board-interlocking firm (also borrowing from bank b) are in the same SIC industry
$Connected\ (SameRegion)_{f,b,t}$	An indicator equal to 1 if firm f and its board-interlocking firm (also borrowing from bank b) are in the same MSA
$Connected\ (SupplyChain)_{f,b,t}$	An indicator equal to 1 if firm f and its board-interlocking firm (also borrowing from bank b) are in the customer-supplier relationship
$Covenant_{l,t}$	The log of 1 plus the number of financial and net worth covenants
$Credit\ Tightness\ (\%)_t$	Quarterly net percentages of domestic bank respondents reporting tightening standards for commercial and industrial loans to large and middle-market firms, available from the Federal Reserve Board's Senior Loan Officer Survey on Bank Lending (https://www.federalreserve.gov/econres/notes/feds-notes/ebp_csv.csv)
$EBP\ (\%)_t$	Average difference between corporate credit spreads and the spreads implied by the default risk of individual issuers (https://www.federalreserve.gov/econres/notes/feds-notes/ebp_csv.csv)
$Entrant_{f,t}$	An indicator equal to 1 if firm f has its first syndicated loan in year t
$Facility\ Size_{l,t}$	The log size of facility l
$Financial\ Crisis_{l,t}$	An indicator equal to 1 if the start date of facility l is between July 2007 and August 2008
$Industry\ Specialization_{f,b,t}$	The ratio of the loan amount provided by bank b to firms sharing the same SIC-2 code as firm f , to the total loan amount provided by bank b
$Lender_{l,f,b,t}$	An indicator equal to 1 if bank b is chosen as the actual lead lender of facility l provided to firm f

Table A1 (Continued)

Variable	Definition
$Lender\ (Amount)_{l,f,b,t}$	The log of bank b 's participation in facility l , conditional on $Lender_{l,f,b,t} = 1$, and 0 otherwise
$Market\ Leverage_{f,t}$	$(DLTT+DLC)/(DLTT+DLC+CSHO*PRCC_F)$
$Maturity_{l,t}$	The log maturity of facility l
$Num\ Borrowers_{b,t}$	The log of 1 plus the number of borrowers that have loan outstanding from bank b in year t
$Placebo-Connected\ 1_{l,f,b,t}$	An indicator equal to 1 if firm f has a board-interlocking firm in year t , who has borrowed from bank b in year $t-5$ to $t-1$
$Placebo-Connected\ 2_{l,f,b,t}$	An indicator equal to 1 if firm f has had a board-interlocking firm in year $t-5$ to $t-1$, who borrows from bank b in year t
$Portfolio\ Size_{b,t}$	The log of 1 plus the total loan amount provided by bank b
$Prior\ Relationship_{f,b,t}$	The ratio of the loan amount provided by bank b to firm f to the total loan amount provided to firm f in the past five years
$Rated_{f,t}$	An indicator equal to 1 if firm f has S&P credit rating
$Same\ MSA_{f,b,t}$	An indicator equal to 1 if firm f and bank b are in the same MSA
$Secured_{l,t}$	An indicator equal to 1 if facility l is secured
$Size_{f,t}$	The log of $CSHO*PRCC_F$ of firm f
$Top\ 10_{b,t}$	An indicator equal to 1 if bank b ranks among the top 10 in syndicated loan market share in year t
$Zscore_{f,t}$	$(1.2*WCAP+1.4*RE+3.3*PI+0.999*SALE)/AT$

IV.2: Lender Overlapping Rates

Table A2: Lender Overlapping Rates for Board-interlocking Pairs and Random Pairs

This table reports the incidence with which newly borrowing firms (entrants to the syndicated loan market) borrow from lenders that have previously lent to their interlocking firms. Row (1) presents the actual overlap rate between focal entrants and their interlocking firms' lenders. Rows (2)–(4) report placebo overlap rates based on 100 simulations of random pairings: Row (2) matches each entrant to a randomly selected non-interlocking firm in the same year; Row (3) restricts the random match to the same year and Metropolitan Statistical Area (MSA); and Row (4) restricts the match to the same year and SIC-2 industry. The symbols ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively, based on two-tailed t -tests.

	(1) Mean	(2) t-stat (Difference from Row (1))
(1) Lender overlapping between newly borrowing firms and interlocking firms in the sample	40.8%	N/A
(2) Lender overlapping between newly borrowing firms and random firms in the same year (simulated for 100 times)	19.0%	-416.97***
(3) Lender overlapping between newly borrowing firms and random firms in the same year-MSA (simulated for 100 times)	11.6%	-564.32***
(4) Lender overlapping between newly borrowing firms and random firms in the same year-industry (simulated for 100 times)	12.3%	-577.05***

IV.3: IV Validity

Table A3 reports evidence supporting the validity of the IV, *Busy (Potential) Director*. In Panel A, we split the sample by whether the focal firm’s board size (≥ 9 members) and number of busy directors (≥ 3 members) are above or below the sample medians, and estimate the first-stage regression in each subsample. The results show that firms with larger boards or more busy directors—those facing greater frictions in inviting *Busy (Potential) Directors*—exhibit a stronger first-stage effect, supporting the IV’s validity. In Panel B, we restrict the potential director pool to nearby and sectorally distinct firms to account for practical constraints on additional board appointments.¹⁶ Formally, we redefine the potential borrower and director sets as $B'_{b,t} = \{i \in B_{b,t} \setminus \{f\} : \text{Dist}(i, f) \leq 786.3 \text{ miles and SIC2}(i) \neq \text{SIC2}(f)\}$ and $D'_{f,b,t} = \bigcup_{i \in B'_{b,t}} D_{i,t}$. We then recompute the instrument using $D'_{f,b,t}$ in place of $D_{f,b,t}$. This alternative IV produces similar results. In Panel C, we examine the association between our IV and two sets of measures: (i) the focal firm’s busy-board status and (ii) its relative loan amounts compared with other borrowers. Across both sets of measures, we find no systematic correlation with the IV, suggesting that lenders’ preferences or lending technologies are unlikely to drive concentrated lending to firms with busy boards.

¹⁶Donelson, Hutzler, and Rhodes (2024) document that board interlocks occur among only 6.2% of competitors in 2004 and 9.7% in 2021.

Table A3: IV Validity

This table shows the results of OLS regression of loan size per other current borrowers on *Busy (Potential) Directors*. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: 1st stage split				
	Connected			
	Board size		Busy board	
	$\geq$ median	$<$ median	$\geq$ median	$<$ median
	(1)	(2)	(3)	(4)
Busy (Potential) Director	-0.4565*** (0.0272)	-0.3246*** (0.0282)	-0.4503*** (0.0287)	-0.2790*** (0.0197)
Observations	1,363,918	800,578	1,364,588	799,908
R-squared	0.8679	0.8241	0.9830	0.8052
Controls	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y

(Continued)

Panel B: Alternative IV								
	Lender		Lender (Amount)		Lender		Lender (Amount)	
	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage	1st Stage	2nd Stage
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\widehat{\text{Connected}}$		0.1272*** (0.0436)		2.3292*** (0.8155)				
$\widehat{\text{Connected (Amount)}}$						0.0047*** (0.0015)		0.0866*** (0.0283)
Busy (Potential) Directors	-0.0553*** (0.0113)		-0.0553*** (0.0113)		-1.4876*** (0.2338)		-1.4876*** (0.2338)	
Observations	2,142,260	2,142,260	2,142,260	2,142,260	2,142,260	2,142,260	2,142,260	2,142,260
<i>F</i> Statistics	24.14		24.14		40.50		40.50	
Controls	Y	Y	Y	Y	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y	Y	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y	Y	Y	Y	Y

Panel C: 2nd stage falsification tests

	Number of Busy Directors	Busy Director Proportion	Loan Amount (relative to Other Nonbusy Borrowers)	Loan Amount (relative to Other Busy Borrowers)
	(1)	(2)	(3)	(4)
Busy (Potential) Director	0.0033 (0.0143)	-0.0012 (0.0066)	-0.0182 (0.0131)	-0.0523 (0.0579)
Observations	2,164,496	2,164,496	2,164,352	2,163,450
R-squared	0.8679	0.8241	0.9830	0.8052
Controls	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y

IV.4: Other Economic Connections

While the contracting-intermediary channel is supported theoretically and empirically, we also test a countervailing mechanism: lenders may hesitate to lend to board-interlocking firms if the relationship increases credit concentration risk. If the focal and interlocking firms are exposed to the same geographic or sectoral shocks, the interlock could reduce diversification rather than improve screening or monitoring.

We therefore decompose connection status along three dimensions of potential concentration: (i) same vs. different MSA, (ii) same vs. different industry, and (iii) presence vs. absence of a supply-chain link. The results in Table A4 show no moderation from supply-chain proximity (Column 3), and the effect of connection is stronger, not weaker, when firms share the same region or industry (Columns 1 and 2). These findings are inconsistent with a credit-concentration-based countervailing channel.

Table A4: Other Economic Connections

This table shows the results of OLS regressions with additional variables, *Connected (Same Region)*, *Connected (Same Ind)*, and *Connected (Supply Chain)*. *Connected (Same Region)* is an indicator variable that denotes whether the focal firm is located in the same MSA as another borrower of the bank. *Connected (Same Ind)* is an indicator variable that denotes whether the focal firm operates in the same SIC-2 industry as another borrower of the bank. *Connected (Supply Chain)* is an indicator variable that denotes whether the focal firm is either a supplier to or a customer of another borrower of the bank, as identified from the Compustat Segment file. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

	Lender		
	(1)	(2)	(3)
Connected (Same Region)	0.0034*** (0.0009)		
Connected (Different Region)	0.0008** (0.0004)		
Connected (Same Ind)		0.0029*** (0.0010)	
Connected (Different Ind)		0.0010** (0.0004)	
Connected (Supply Chain)			0.0142 (0.0128)
Connected (Non-Supply Chain)			0.0011*** (0.0004)
Observations	2,168,853	2,168,853	2,168,853
R-squared	0.3223	0.3223	0.3223
F-test for equality (<i>p</i> -value)	7.80 (0.0052)	3.37 (0.0665)	1.03 (0.3091)
Controls	Y	Y	Y
Loan Type FE	Y	Y	Y
Loan Purpose FE	Y	Y	Y
Year FE	Y	Y	Y
Firm-Bank FE	Y	Y	Y

IV.5: Difference between Focal Firm and Interlocking Firm

This section examines whether financial similarity between focal firms and their interlocking firms affects loan matching or pricing. In Panel A of Table A5, we classify pairs as “similar” when the focal firm’s size, leverage, or Z-score is within 75–125% of the interlocking firm’s value. Although magnitudes differ, F-tests show no statistically significant differences in the connection effect between similar and dissimilar pairs. Panel B then relates the distance in AIDS between the two firms to the distance in their financial characteristics. We find that loan spread differences shrink as firms become more financially similar, with consistent results using both raw and log absolute differences.

Overall, financial similarity does not affect whether a loan is formed once a connection exists, but it does affect pricing, consistent with banks benchmarking spreads against the interlocking firm.

Table A5: Difference between Focal Firm and Interlocking Firm

This table shows the results of OLS regressions with additional variables. In Panel A and B, *Connected* is decomposed into connection status variables based on the difference of focal firms and interlocking firms in terms of size, market leverage, and Zscore. In Panel C, distance variables between focal firms and interlocking firms in terms of (raw, not log of) AIDS, size, market leverage, and Zscore are used. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Lender choice			
	Lender		
	(1)	(2)	(3)
Connected (similar-size interlocking firm)	0.0016** (0.0008)		
Connected (different-size interlocking firm)	0.0011*** (0.0004)		
Connected (similar-leverage interlocking firm)		0.0006 (0.0006)	
Connected (different-leverage interlocking firm)		0.0013*** (0.0004)	
Connected (similar-Zscore interlocking firm)			0.0008 (0.0006)
Connected (different-Zscore interlocking firm)			0.0012*** (0.0004)
Observations	2,168,853	2,168,853	2,168,853
R-squared	0.3223	0.3223	0.3223
F-test for equality (<i>p</i> -value)	0.44 (0.5065)	1.23 (0.2670)	0.50 (0.4786)
Controls	Y	Y	Y
Loan Type FE	Y	Y	Y
Loan Purpose FE	Y	Y	Y
Year FE	Y	Y	Y
Firm-Bank FE	Y	Y	Y

(Continued)

Panel B: Distance between focal firm and interlocking firm				
	Distance (AIDS)			
	(1)	(2)	(3)	(4)
Distance (Size)	7.6995** (3.3671)			6.2189* (3.4237)
Distance (Mkt.Lev)		44.0891*** (16.7869)		31.4318* (18.2395)
Distance (Zscore)			5.9683* (3.1937)	5.1615 (3.2495)
Observations	22,874	22,845	21,655	21,629
R-squared	0.8570	0.8580	0.8574	0.8588
Controls	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y
Firm Pair FE	Y	Y	Y	Y

IV.6: Director Characteristics

Even though a director’s direct involvement in the loan contracting process is not observable, it is worth exploring whether directors who are better positioned to influence financing decisions or facilitate contracting exhibit a stronger intermediary effect.¹⁷ As indirect proxies for a director’s ability and influence in facilitating financial contracting, we consider the director’s position, tenure, and experience.

In Panel A of Table A6, Column 1, compare cases where a firm-bank pair is connected through an interlocking director who is an executive member of the firm versus cases where the pair is connected through a non-executive director. While a connection through an executive director appears to be more significant than that through a non-executive director, their effects are not significantly different as shown from the F test for equality. Likewise, the effects of connections through financial and non-financial directors are not significantly different in Column 2. In contrast, Columns 3 and 4 show that connections through directors with longer tenure or greater experience contribute significantly more to the matching probability. These results are consistent with directors who have greater firm-specific influence or experience being more effective in facilitating lending relationships.

In Panel B of Table A6, we examine whether heterogeneity in directors’ personal “styles” helps explain variation in the probability that connected firms and banks form loan matches, following [Bertrand and Schoar \(2003\)](#). Restricting attention to connected firm-bank pairs (i.e., *Connected* = 1), we estimate how much unexplained variation in matching incidence (*Lender*) can be attributed to director fixed effects. The adjusted R-squared remains nearly unchanged when year effects are added, but rises markedly when firm, bank, or firm-bank fixed effects and control variables are included, indicating that institutional and transactional characteristics account for much of the observed variation. Nevertheless, the joint significance tests consistently reject the null that all director fixed effects equal zero (F -statistics ≈ 2 , $p < 0.001$), implying systematic differences across directors in the extent to which they exploit existing connections. While the joint F -tests provide statistical evidence of director-specific heterogeneity, their interpretation should be viewed with caution: as [Wooldridge \(2010\)](#) notes, F -tests for large sets of individual effects rely on restrictive assumptions about the error structure, and their significance may be overstated in the presence of clustering or heteroskedasticity. Overall, the evidence suggests that director “style” matters statistically, though its explanatory contribution is modest compared with firm- or bank-level factors.

¹⁷Relatedly, [Gao, Kleiner, and Pacelli \(2020\)](#) and [Herpfer \(2021\)](#) identify the loan officers who signed the loan contracts by parsing the signature pages from 10-K exhibits. While the method is novel, it may not effectively identify directors involved in our context, given our focus on directors. For instance, loan contracts are occasionally signed by treasurers, who are not C-suite executives. Additional data would enable a more detailed investigation, potentially enhancing the external validity of the contracting intermediary effect of boards, extending beyond the scope of board interlocks.

Table A6: Director Characteristics

This table shows the results using director-level variables. In Panel A, *Connected* is decomposed based on the characteristics of common directors. In Panel B, joint significance F test on director FE is reported across different specifications. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Director characteristics				
	Lender			
	(1)	(2)	(3)	(4)
Connected (through executive directors)	0.0019*** (0.0007)			
Connected (through non-executive directors)	0.0010** (0.0004)			
Connected (through financial directors)		-0.0017 (0.0050)		
Connected (through non-financial directors)		0.0011*** (0.0004)		
Connected (through long-tenure directors)			0.0031*** (0.0009)	
Connected (through short-tenure directors)			0.0010*** (0.0004)	
Connected (through experienced directors)				0.0016*** (0.0004)
Connected (through inexperienced directors)				0.0005 (0.0005)
Observations	2,168,853	2,168,853	2,168,853	2,168,853
R-squared	0.3223	0.3223	0.3223	0.3223
F-test for equality (<i>p</i> -value)	1.54 (0.2152)	0.33 (0.5667)	6.64 (0.0100)	3.37 (0.0664)
Controls	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y
Panel B: Director FE				
	F tests on Director FE	N	R-squared	Adj. R-squared
(1) None	2.337*** (<.0001, 5,735)	671,960	0.019	0.011
(2) Year FE	2.311*** (<.0001, 5,734)	671,960	0.019	0.011
(3) Year FE, Firm FE	1.972*** (<.0001, 5,732)	671,949	0.069	0.061
(4) Year FE, Firm FE, Bank FE	1.970*** (<.0001, 5,519)	671,925	0.073	0.062
(5) Year FE, Firm FE, Bank FE, Controls	1.923*** (<.0001, 5,519)	671,925	0.082	0.071
(6) Year FE, Firm-Bank FE, Controls	1.671*** (<.0001, 4,953)	659,283	0.275	0.190

IV.7: Syndicate Structure

This section explores how connections shape loan syndicate structures. At a broader level, the entire syndication process involves two layers of contracting intermediation: (i) intermediation by directors between firms and lead arrangers (as argued in this paper) and (ii) intermediation by lead arrangers in inviting syndicate participants. On one hand, lead arrangers may want to retain larger shares of loans to focal firms when they are connected to them, as the common directors can act as guarantors or information providers through the interlocking firms. On the other hand, it is also plausible that syndicate participants may allow lead arrangers to retain a smaller share, as the lead arrangers' ability to misrepresent the quality of the focal firms and their role in monitoring the firms diminishes due to the existence of the interlocking firms. In other words, the reduced adverse selection and moral hazard between focal firms and lead arrangers may lead to reduced adverse selection and moral hazard between lead arrangers and participants. To explore these dynamics empirically, we investigate whether syndicate concentration is affected by the connection status.

Panel A of Table A7 regresses the lead arranger share, (log) number of participants, and the HHI of lender shares on *Connected* within the sample of matched firm-bank pairs. The results show insignificant coefficients for *Connected* in all columns, implying that the connection status has a neutral effect on syndicate concentration.

Next, we examine whether the connection status of non-lead syndicate participants also affects their loan participation. Specifically, we replace the lead arrangers with non-lead syndicate members within the same loans and replicate the baseline tests. Table A7, Panel B, shows similar but weaker effects of *Connected* for non-lead syndicate participants. Altogether, the results suggest that the information problem between the lead banks and syndicate participants could attenuate the effect of the connection status of those participants with the borrowers.

Table A7: Syndicate Structure

This table shows the results of OLS regressions of syndicate structure variables on *Connected*. In Panel A, the share of lead lenders' loan amounts (*Lead Lender Share (%)*), the number of syndicate participants (*Num Participants*), and the HHI of loan amounts within syndicates (*HHI of Lender Shares*) are regressed on *Connected*. In Panel B, the regressions revisit the baseline effects with using *Connected* status of non-lead syndicate members and their loan status. Standard errors are clustered at loan package level, and are reported in parentheses. The symbol ***, **, and * denote statistical significance at the 1%, 5%, and 10%, respectively.

Panel A: Syndicate concentration				
	Lead Lender Share (%)	Num Participants	HHI of Lender Shares	
	(1)	(2)	(3)	
Connected	0.2725 (0.3378)	-0.0086 (0.0071)	0.0074 (0.0158)	
Observations	44,081	44,081	13,147	
R-squared	0.7771	0.8340	0.9165	
Controls	Y	Y	Y	
Loan Type FE	Y	Y	Y	
Loan Purpose FE	Y	Y	Y	
Year FE	Y	Y	Y	
Firm-Bank FE	Y	Y	Y	
Panel B: Non-lead syndicate members				
	Lender	Lender (Amount)	Lender	Lender (Amount)
	(1)	(2)	(3)	(4)
Connected	0.0004 (0.0003)	0.0085 (0.0055)		
Connected (Amount)			0.0000* (0.0000)	0.0005* (0.0003)
Observations	4,145,074	4,145,074	4,145,074	4,145,074
R-squared	0.2014	0.1922	0.2014	0.1922
Controls	Y	Y	Y	Y
Loan Type FE	Y	Y	Y	Y
Loan Purpose FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm-Bank FE	Y	Y	Y	Y

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