# Banking on Bailouts*

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**Abstract**

Banks have a significant funding-cost advantage if their liabilities are protected by bailout guarantees. We construct a corporate finance-style model showing that banks can exploit this funding-cost advantage by just intermediating funds between investors and ultimate borrowers, thereby earning the spread between their reduced funding rate and the competitive market rate. This mechanism leads to a crowding-out of direct market finance and real effects for bank borrowers at the intensive margin: banks protected by bailout guarantees induce their borrowers to leverage excessively, to overinvest, and to conduct inferior high-risk projects. We confirm our model predictions using U.S. panel data, exploiting exogenous changes in banks' political connections, which causes variation in bailout expectations. At the bank level, we find that higher bailout probabilities are associated with more wholesale debt funding and lending. Controlling for loan demand, we confirm this effect on bank lending at the bank-firm level and find evidence on loan pricing consistent with a shift towards riskier borrower real investments. Finally, at the firm level, we find that firms linked to banks that experience an expansion in their bailout guarantees show an increase in their leverage, higher investment levels with indications of overinvestment, and lower productivity.

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# 1 Introduction

Mark Twain's aphorism, "history doesn't repeat itself, but it often rhymes," seems strikingly fitting when considering government support policies aimed at mitigating the negative externalities of bank failures. Although the specific measures vary, time and again, regulators offer government support to struggling banks, as evidenced by recent cases involving Silicon Valley Bank and Credit Suisse. Such bailouts continue to occur despite previous assurances from authorities that "this time is different" and bailouts are rendered obsolete due to the implementation of stress tests, the enforcement of more stringent capital and liquidity requirements, along with the introduction of novel resolution mechanisms such as bail-in provisions and living wills. Nevertheless, bailouts remain a constant feature in the banking landscape, and it appears that government guarantees for banks are now more extensive than ever before.

The existing literature has established that public bailout guarantees incentivize banks to engage in riskier behavior at the extensive margin, which includes investment in high-risk assets and extending credit to riskier borrowers (e.g., Gropp et al., 2014). Our paper advances this understanding by showing that bailout guarantees can also adversely affect banks' optimal loan contract design, inducing them to leverage up and to engage in risk-shifting at the intensive margin, which leads to inefficient investment behavior among borrowers.

Specifically, we first show theoretically that banks can capitalize on the funding-cost advantage arising from their bailout guarantees by simply intermediating more funds between investors and ultimate borrowers, thus profiting from the spread between their reduced funding rate and the competitive market rate. This profit opportunity incentivizes banks to implement loan contracts that encourage their borrowers to take on excessive leverage and to overinvest, crowding out firms' market financing. The resulting elevated debt level on the banks' part together with their bailout guarantees further incentivizes them to implement loan contract designs that nudge borrowers towards inefficient high-risk projects.

We confirm our model predictions using U.S. panel data, exploiting exogenous changes in banks' political connections, which causes variation in banks' bailout expectations. At the bank-level, we find that higher bailout probabilities are associated with more wholesale debt funding, more lending in general, and more corporate lending in particular. Controlling for loan demand, we confirm this effect on bank lending at the bank-firm

level and find evidence on loan pricing consistent with borrowers shifting towards riskier real investments. Finally, at the firm-level, we find that firms linked to banks that experience an expansion in their bailout guarantees show an increase in their leverage, higher investment levels with indications of overinvestment, and lower productivity.

Our findings hold significant policy relevance. The interventions in the case of Credit Suisse and various U.S. banks during the 2023 banking crisis, combined with the ongoing debates in Europe and the U.S. over the potential widening of their respective deposit insurance programs, indicate an unprecedented expansion in government guarantees for financial institutions. Our analysis shows that this expansion may impede economic growth since such guarantees can lead to overindebtedness and inefficient investment behavior among borrowers and ultimately, a "zombification" of the economy.

**Model preview.** We analyze the interplay between bailout guarantees, bank finance, and market finance within a corporate finance framework, building on Holmstrom and Tirole (1997) and Diamond (1991). In particular, we consider an economy with two dates and four different risk-neutral parties: a firm, a bank, a public authority (represented by public officials), and competitive household investors (henceforth called investors for simplicity).[1]

In the first period, the firm can choose to invest either in an efficient real project or in an inefficient high-risk one (henceforth called the efficient and the inefficient project, respectively), which both have decreasing returns to scale and two possible return states in the second period: success and failure. The efficient project has a positive net return when the investment size is not too large, while the inefficient project always has a negative net return. Although the inefficient project has a higher failure probability, it yields a higher return in case of success, which creates a moral hazard problem for the firm.

In addition to its equity endowment, the firm can raise external funds for its real investment, either directly from investors (i.e., market funding) or indirectly from the bank that, in turn, raises funds from investors (i.e., bank funding). The investors provide a perfectly elastic amount of funds whenever their expected investment return is at least equal to their cost of capital. If the firm borrows from the bank, the bank can monitor the firm and enforce the implementation of the efficient project, thereby resolving the

[1] In Section 4.1, we show that our main results also hold when the economy consists of numerous nonidentical firms.

firm's moral hazard problem. The loan contract between the bank and the firm is a standard debt contract, which stipulates the loan and repayment amount. The bank has the bargaining power vis-à-vis investors and the firm.[2]

Finally, when the bank fails in the second period, the public officials representing the public authority have to decide whether to rescue the bank. For this decision, they have to weigh the costs of raising distortionary taxes to bail out the bank vs. the negative externalities of letting the bank default. Since these negative externalities are uncertain ex-ante, all parties expect in the first period that the bank is rescued with a positive probability in case it fails in the second period.

**Model results preview.** We first consider the case where the bank monitors the firm and enforces the implementation of the efficient project. With a bailout possibility, the bank's marginal funding costs are lower than the investors' cost of capital. Consequently, the bank can capitalize on this lending spread by simply channeling more funds from investors to the firm. This additional profit source incentivizes the bank to offer the firm a loan contract with an excessively large loan volume, thereby crowding out the firm's market financing. This loan contract induces the firm to implement an inefficiently high leverage and investment level.

We then characterize the bank's optimal loan contract when it wants to induce the firm to invest in the inefficient project and the conditions under which the bank prefers to induce the firm to implement the inefficient versus the efficient project. Our results show that if the bank's bailout probability is sufficiently high, the bank waives monitoring and incentivizes the firm to implement the inefficient instead of the efficient project. In particular, a switch by the firm from the efficient to the inefficient project has two opposing effects on the bank's expected profit: an income-reducing and a cost-saving effect.

First, the switch to the inefficient project decreases the bank's expected loan income since the loan repayment is linked to the firm's project net return, which is lower for the inefficient project. Second, the project switch increases the bank's default probability and thus decreases the probability that the bank has to honor its debt repayment obligations. While the increased default probability also increases the bank's funding rate, it does so only to a limited extent due to the bailout guarantee, which reduces the sensitivity of the bank's funding rate with respect to its default probability. Overall, the switch to

[2]We show in Section 4.2 that our main results are robust to shifting the bargaining power to the firm.

the inefficient project thus decreases the bank's *expected* funding costs. Hence, the bank prefers financing the inefficient project whenever its bailout probability is high enough such that the cost-saving effect dominates the income-reducing effect.

Finally, we find that the effect of an increase in the bank's bailout possibility on its loan pricing is ambiguous. If the bank promotes the implementation of the efficient borrower project, its loan spreads decrease since the bank's marginal funding costs are lower. However, the firm's potential switch from the efficient to the inefficient project tends to increase the loan spread since the inefficient project is more risky and has a higher nominal return conditional on success.

We consider two extensions to our main model. First, we consider the case where the economy consists of an infinite number of independent firms. This setting allows the bank to hedge against idiosyncratic firm risk. As a result, the bank's financial situation depends mainly on the state of the whole economy, which can be either good or bad. The main results of our baseline model also hold in this extension: the bank still has an incentive to induce its borrowers to leverage higher, to overinvest, and to choose inferior high-risk projects when its bailout probability is sufficiently high. Moreover, our results show that increasing the bank's equity capitalization can reduce the bank's risk-shifting incentives at the intensive margin. Second, we show that shifting the bargaining power from the bank to the firm does not affect our main results qualitatively.

**Empirical analysis and results.** Empirically, it is challenging to analyze changes in banks' lending behavior in response to a variation in their bailout guarantees. First, expectations about banks' bailout probabilities are not observable. Second, a bank's likelihood of being bailed out in case of distress is influenced by its lending behavior and portfolio risk, leading to endogeneity concerns.

To identify measurable variations in banks' expected bailout guarantee coverage that are independent of their lending behavior, we build on recent literature that explores the influence of political connections on bank bailout decisions and employ banks' geographic-based political representation as a proxy for bailout expectations (Duchin and Sosyura, 2014; Kostovetsky, 2015). This approach allows us to establish a source of exogenous variation in the perception about banks' bailout likelihoods, which are not directly influenced by their lending activities.

Specifically, we conjecture that the presence of a senator from the state in which a bank is headquartered in the U.S. Senate Committee on Banking, Housing, and Urban

Affairs (BHUA Senate committee) increases the expectations regarding the probability that the bank obtains government assistance during times of financial turmoil. Over the past few decades, the BHUA Senate committee has played a pivotal role in shaping bailout decisions made by U.S. authorities. Importantly, for our analysis, the composition of the BHUA Senate committee exhibits a dispersed distribution across various states, resulting in substantial exogenous variation over time. We substantiate the conjecture that banks with representation in the BHUA Senate committee indeed have a higher likelihood of receiving public assistance by showing that these banks were more likely to receive bailout funds during the 2007–2008 financial crisis.

To quantify the shifts in banks' anticipated bailout guarantee coverage, we employ a bank-specific time-varying binary variable, denoted as $GG$, which takes a value of one if a bank's headquarter state has at least one senator serving on the BHUA Senate committee in a given year. We measure a borrower's indirect exposure to its banks' bailout guarantee coverage with the weighted sum of its lenders' $GG$ and denote this variable *Indirect GG*.

To track changes in the banks' funding and lending behavior, we use both aggregated data from the BHC Call Report Database, provided by the Federal Reserve System, and granular data from the U.S. syndicated loan market. Using the aggregate Call Report data, we look at banks' funding and lending policies at the bank-level. Leveraging on the granularity of syndicated loan data, we then analyze changes in bank lending behavior at the bank-firm level and analyze the resulting real effects at the firm-level. Our final sample consists of 99 unique banks and 5560 unique borrowers and spans the years 1996 to 2016.

Specifically, at the bank-level, we find that a higher bailout guarantee coverage is associated with an increase in wholesale funding as well as enhanced growth in total lending and corporate lending. For this analysis, we employ time and bank fixed effects to absorb time-invariant bank characteristics and common shocks. A $GG$ equal to one implies an additional 6.2pp growth in wholesale funding, which represents 32.2% of the average within-bank standard deviation (SD) of the wholesale funding growth. Similarly, a $GG$ equal to one is associated with an additional 2.3pp growth in total lending and a 3.1pp increase in corporate lending, which represents 27.2% and 27.4% of the respective average within-bank SD.

In a next step, we exploit the granularity of our syndicated loan data to verify the stimulating effects of an increase in bailout coverage on corporate lending at the bank-

firm level while controlling for demand factors, as well as to test its implications on banks' loan pricing. For this analysis, we employ bank fixed effects and firm-time fixed effects to absorb time-invariant bank characteristics and common shocks. Importantly, these fixed effects also allow us to rule out that our estimates are biased by state-level shocks (affecting firm borrowing behavior) induced by changes in the U.S. Congress committee composition (or factors that lead to changes in the composition) but that are unrelated to changes in banks' bailout likelihood.

Altogether, banks display a lending behavior at the bank-firm level consistent with the bank-level evidence. Specifically, gaining bailout guarantee coverage is associated with an additional 2.1pp growth in loan volume, which represents 8.0% of the average within-bank SD. Moreover, we find a non-negative correlation between an increase in a bank's bailout guarantee coverage and the loan spreads offered to its borrowers. This result supports the notion that banks, in response to an extended bailout guarantee coverage, are incentivized to steer their borrowers towards undertaking inefficient high-risk projects, as we should observe a decrease in loan spreads for the same or lower risk levels.

In a final step, we analyze the indirect knock-on effects of bailout guarantees on the financial and real outcomes of bank borrowers. For this analysis, we aggregate the syndicated loan market data to the firm-year level and run regressions including firm, industry-time, and state-time fixed effects to absorb time-invariant firm characteristics and common shocks at the industry-state level. Consistent with our model predictions, we find that a one SD higher *Indirect GG* (i.e., a higher indirect bailout guarantee coverage) is associated with a 1.8pp higher debt funding growth and a 1.1 higher leverage ratio, which represents 3.2% and 3.5% of the average within-firm SD for the respective distribution.

Our results suggest that this additional liquidity induces borrowers to increase their investment level: borrowers with a one SD higher *Indirect GG* show a 0.43 higher investment over assets ratio and a 0.15 higher capital expenditures ratio, which represents 3.2% and 4.2% of the average within-firm SD for the respective investment measures. This elevated investment activity appears to be overinvestment, estimated as the difference between a borrower's actual and expected investment. Finally, we find a reduction in firms' productivity when their banks experience an increase in their government guarantee coverage: a one SD higher *Indirect GG* is associated with a 0.70pp lower productivity (measured as 1/3*log(sales)*-2/3*log(employees)*-1/3*log(PP&E)*), which represents 4.2% of the average within-firm SD. This evidence is also consistent with overinvestment and

investments in inefficient projects.

Overall, our empirical results confirm that a greater bailout guarantee coverage leads to more intermediated credit and, in turn, efficiency losses due to overinvestment and worse project selection. This interpretation is also consistent with the findings of Cournède and Denk (2015), who show that periods of more intermediated credit are associated with larger implicit bank debt guarantees, stronger credit issuance by banks compared to other intermediaries, a lower credit quality, and slower economic growth. Similarly, Denk et al. (2015) find that situations where bank credit reaches levels that reduce economic growth are more prevalent in OECD countries with greater bailout guarantees.

**Related literature.** Our paper adds to the literature on the effects of bailout guarantees on bank lending behavior and, more generally, risk-taking. Generally, government guarantees aim to prevent bank runs (e.g., Diamond and Dybvig, 1983) and to avoid the social cost of bank failures (e.g., Gorton and Huang, 2004). Such guarantees, however, lead to the well-known risk-shifting problem, as first shown in the seminal work by Kareken and Wallace (1978) and Merton (1977).

More recent theoretical work mostly focuses on the systemic risk aspects of bailout guarantees. Diamond and Rajan (2002) distinguishes between well-targeted bailouts (which can be beneficial) and poorly-targeted bailouts that can lead to a systemic crisis. Relately, Bianchi (2016) shows that non-targeted and systemic bailouts are preferred to targeted ones since the latter exacerbate banks' moral hazard. Farhi and Tirole (2012) demonstrates that bailouts generate incentives to correlate risks, resulting in financial fragility. Davila and Walther (2019) finds that large banks leverage more than small banks because they internalize that their decisions affect bailout policies. Allen et al. (2018) shows that, although guarantees can distort bank behavior, they increase welfare because they induce banks to improve liquidity provision. Keister (2016) finds that commitment to a no-bailout policy induces banks to become excessively illiquid.

Various papers have also empirically investigated the effect of government guarantees on banks' risk-taking decisions. Brandao-Marques et al. (2013), Dam and Koetter (2012), and Gropp et al. (2014) provide evidence showing that government guarantees are associated with more bank risk-taking. Gropp et al. (2011) documents that government guarantees undermine competition in the banking sector, which increases risk-taking also by non-guaranteed banks. Nier and Baumann (2006) finds that government safety nets result in lower capital buffers. Gropp et al. (2019) extends these findings by showing that

the removal increases allocative efficiency as low-quality borrowers are relatively more likely to lose funding from banks that loose their guarantee. As a result, these firms have lower sales growth, lower employment growth, invest less, and improve their profitability.

The existing literature thus mainly focuses on the effect of bailout guarantees on the banks' risk-taking behavior at the extensive margin, that is, their portfolio and capital structure choices. We highlight that bailout guarantees create risk-shifting incentives for banks also at the intensive margin, distorting their loan contracting behavior. This leads to knock-on real effects for their borrowers, that is, higher firm leverage, overinvestment, and inefficient project selection.

# 2 Model Setup

We build on the frameworks of Holmstrom and Tirole (1997) and Diamond (1991) to analyze the impact of bailout guarantees on: (1) the loan contract design between a bank and a borrower, (2) the bank's monitoring incentives, and (3) the resulting investment behavior of the borrower.

We consider an economy that consists of two dates, $t = \{0, 1\}$. This economy is populated by several risk-neutral parties that all have a cost of capital equal to $R$: a firm seeking financing, a bank that provides loans and performs monitoring, a public authority (represented by public officials) that may bailout the bank, and numerous competitive household investors (referred to as "investors" hereafter).

Investors provide a perfectly elastic amount of funds to the bank and/or the firm whenever their expected return is greater than or equal to their cost of capital, $R$. Since investors are competitive, we assume they have no bargaining power vis-à-vis the firm or the bank.

**Firm characteristics.** The firm has an equity endowment $e > 0$. The firm can be interpreted as a representative firm for numerous identical firms. In an extension in Section 4.1, we consider the case where the economy consists of multiple independent firms, showing that this extension does not affect our results qualitatively. If the firm wants to implement an investment level $i > e$, it can raise external funds directly from investors (i.e., market finance) and/or indirectly from the bank (i.e., bank finance), which, in turn, can raise funds from investors.

The firm can invest in two different scalable real projects in $t = 0$: an efficient project and an inefficient high-risk project. Both projects have two possible outcome states: success or failure. For simplicity, we assume that both projects yield zero when they fail. The efficient project succeeds with probability $p_H$ in $t = 1$, then yielding the return $f(i)$, where $f(i)$ is a decreasing return-to-scale technology with $f'(i) > 0$, $f''(i) < 0$, and $f(0) = f'(\infty) = 0$. The efficient project's marginal expected return is higher than the cost of capital even if the firm invests its entire initial equity endowment $e$:

**Assumption 1.** $p_H f'(e) > R$.

Hence, there is a benefit of raising outside funds if the firm implements the efficient project.

The inefficient high-risk project (hereafter, for brevity, called "inefficient project") succeeds with probability $p_L$, in which case it yields the return $\delta f(i)$ with $\delta > 1$ and $p_L < p_H$. The inefficient project always generates a negative net return, irrespective of the investment level:

**Assumption 2.** $p_L \delta f'(0) < R$.

Hence, the efficient project is more likely to succeed than the inefficient project, but yields a lower return when successful, which creates a moral hazard problem for the firm. Without monitoring, the firm implements the efficient project only if its incentive compatibility (IC) constraint is satisfied:

$$p_H \left[ f(i) - R_O \right] \geq p_L \left[ \delta f(i) - R_O \right], \quad \text{[Firm IC]} \tag{1}$$

where $R_O$ represents the gross nominal return the firm promises to outside funding providers (the bank and/or investors) in the event of success. The left-hand side (LHS) and the right-hand side (RHS) of Condition (1) represent the firm's expected residual return from investing in the efficient and the inefficient project, respectively. This moral-hazard-induced condition imposes the following upper bound for the amount the firm can pledge to outside funding providers without monitoring:

$$R_O \leq \frac{p_H - p_L \delta}{\Delta p} f(i) \equiv \overline{R} < f(i), \tag{2}$$

where $\Delta p \equiv p_H - p_L$.

**Bank characteristics.** The bank can resolve the firm's moral hazard problem through monitoring.[3] If the firm seeks to borrow from the bank, the bank can offer a loan contract that specifies a pair of contract elements $\{B, b\}$, where $b$ denotes the loan volume at $t = 0$ and $B$ the gross loan repayment at $t = 1$. The bank is protected by limited liability and has full bargaining power vis-à-vis the firm.[4] To clearly convey the intuition of the model, we assume in our baseline setup that the bank has no initial capital endowment. We relax this assumption in Section 4.1, where we consider positive bank equity capital.

When the bank fails at $t = 1$, the officials representing the public authority have to decide whether to bail out the bank (i.e., settle the bank's debt). We follow Eisert and Eufinger (2019) and assume that, when making this decision, the public officials trade off the perceived costs of transferring funds from the public to the private sector (e.g., deadweight costs originating from taxation; see Ballard et al., 1985 and Feldstein, 1999) and the perceived social costs of the bank's failure (e.g., Freixas, 1999).

In particular, we assume that the perceived costs of transferring funds from the public to the private sector are $\chi$ times the transferred funds. The perceived social costs of the bank's failure are given by the fraction $\kappa$ of its debt size. These costs can be interpreted as fire sale costs due to rapid asset liquidation, legal expenditures resulting from breaking a loan originator-borrower relationship, or costs associated with the resulting credit crunch (e.g., Acharya and Yorulmazer, 2007).

Because the costs arising from the bank's failure are driven by factors that are revealed only in times of distress (such as the availability of outside investors, asset liquidity, and lending relationships with the non-financial sector), we assume that at $t = 0$, only the distribution of $\kappa$ is known. Specifically, we assume that $\kappa = \overline{\kappa} \times u$, where $\overline{\kappa}$ is a scaling factor and $u$ is drawn from the uniform distribution $\mathcal{U}(0, 1)$. The scaling factor $\overline{\kappa}$ allows us to model that the perceived social costs associated with the bank's default depend on the relationship between the deciding public officials and the bank. For example, a public official from Nevada might perceive the social costs associated with a default of a bank from Nevada as higher than a public official from Maine, given that the resulting credit crunch mainly affects the official's constituency in its home state, Nevada.

[3] When providing a loan, the bank can monitor the firm and enforce the implementation of its efficient project. For convenience, we assume that monitoring is costless for the bank, which rules out that the bank waives monitoring (potentially inducing the firm to invest in the inefficient project) just to save monitoring costs.

[4] In an extension in Section 4.2, we show that shifting the bargaining power to the firm does not affect our results qualitatively.

Therefore, at $t = 1$, the public authority bails out the bank if, and only if

$$\chi b \quad \leq \quad \kappa b. \tag{3}$$

As a result, the bank's ex-ante bailout probability at $t = 0$ conditional on its default at $t = 1$ is equal to

$$\alpha = 1 - \chi/\overline{\kappa}, \tag{4}$$

which increases with the extent $\overline{\kappa}$ of the bank's political connections to the public officials deciding upon the bailout.

To ensure that the bank's debtholders prefer the success state over the failure state, irrespective of the bank's likelihood of being bailed out, we impose the following restriction:

**Assumption 3.** $P > (1 - P)(1 - \chi/\overline{\kappa}) = (1 - P)\alpha$ holds for $P \in \{p_H, p_L\}$,

where $P$ denotes the bank's success probability.[5]

To borrow from investors, the bank must promise a nominal interest rate of $D$ that yields an expected return of at least $R$. With bailout probability $\alpha$, the participation constraint (PC) for investors becomes:

$$PD + (1 - P)\alpha D \geq R, \quad \text{[Investor PC Bank]} \tag{5}$$

The LHS of PC (5) is the investors' expected marginal return when lending to the bank, while the RHS represents their cost of capital. The bank's repayment probability is $P = p_H$ if the firm implements the efficient project and $P = p_L$ if it implements the inefficient project. Since the bank has the bargaining power vis-à-vis investors, PC (5) has to be binding in the optimum. Solving the PC (5) for the bank's expected "marginal funding cost", $PD$, yields:

$$c(P) \equiv PD = \frac{PR}{P + (1 - P)\alpha}. \tag{6}$$

To understand why $c(P)$ is the bank's marginal funding cost, note that the bank stays

[5]Since the bank lends to a single firm in our baseline model, the success probability for both the firm and the bank is equal to $P$. This is not the case anymore in Section 4.1, where we consider a setting with multiple non-identical borrowers.

solvent with likelihood $P$, in which case it has to repay its debt interest rate $D$. Naturally, $c(P) < R$ if $\alpha > 0$ and the bank's marginal funding costs decrease with its bailout likelihood:

$$\frac{\partial c(P)}{\partial \alpha} = -\frac{P(1-P)R}{(P+(1-P)\alpha)^2} < 0. \tag{7}$$

With the loan contract $\{B, b\}$, the bank's expected profit is thus given by

$$\Pi^B(B, b, P) \equiv P(B - bD) = PB - bc(P).$$

If the firm's project succeeds and it repays its bank loan, which happens with probability $P$, the bank's profit is $B - bD$. If the firm fails, the bank earns zero profit due to limited liability.

**Market finance benchmark.** As a benchmark, we first consider the case in which the firm relies solely on market finance. Let $R_{inv}$ denote the gross repayment that the firm promises to investors at $t = 1$. According to Condition (2), the firm implements the efficient project if and only if $R_{inv} \leq \overline{R}$.[6] The firm's optimization problem thus becomes:

$$\max_{i, R_{inv}} p_H [f(i) - R_{inv}] - eR, \tag{8}$$

s.t.

$$R_{inv} \leq \overline{R}, \quad \text{[Firm IC]} \tag{9}$$

$$p_H R_{inv} \geq (i - e)R. \quad \text{[Investor PC Firm]} \tag{10}$$

The efficient project succeeds with probability $p_H$, in which case the firm receives the residual project return (i.e., $f(i) - R_{inv}$) at $t = 1$. Investors are willing to finance the firm only if their expected return (LHS of PC 10) is greater than or equal to their cost of capital (RHS of PC 10).

Since the firm has the bargaining power vis-à-vis investors, PC (10) must be binding in the optimum. Plugging this condition into Eq. (8) and simplifying yields for the firm's optimization problem:

$$\max_{i, R_{inv}} p_H f(i) - iR, \text{ s.t. } R_{inv} \leq \overline{R}, \tag{11}$$

[6] Investing in the inefficient project cannot simultaneously satisfy the break-even conditions of both the firm and investors due to its negative net return.

which corresponds to maximizing the efficient project's net return subject to the Firm IC (9). If IC (9) is not binding, the first-order condition (FOC) for the firm is simply

$$f'(i^*)p_H = R, \tag{12}$$

where $i^*$ is the optimal *unconstrained* efficient investment level. Eq. (12) implies that the optimal unconstrained investment level should equate the efficient project's marginal expected return, $f'(i)p_H$, to the cost of capital, $R$.

If Firm IC (9) is binding, jointly solving IC (9) and the Investor PC (10) yields the following condition for the firm's optimal *constrained* investment level, $\bar{i}$:

$$\frac{(\bar{i}-e)R}{p_H} = \frac{p_H - p_L\delta}{\Delta p} f(\bar{i}). \tag{13}$$

If the firm relies solely on market finance, its maximum expected profit is thus given by

$$p_H f(i^M) - i^M R, \tag{14}$$

where $i^M = \min\left\{i^*, \bar{i}\right\}$.

# 3 Optimal Bank Contract

In this section, we analyze the bank's optimal loan contracting and monitoring decision. We first determine the bank's optimal contracts for two cases: (i) the bank monitors the firm and induces it to implement the efficient project; (ii) the bank waives monitoring and induces the firm to invest in the inefficient project. Then, we analyze whether and when it can be optimal for the bank to induce the firm to invest in the efficient or inefficient project, respectively.

**Efficient project implementation.** If the firm borrows from the bank with monitoring and subsequently invests in the efficient project, the firm's maximum expected profit becomes

$$\max_{i \geq b+e} p_H \left[f(i) - R_{inv} - B\right] - eR. \tag{15}$$

If the firm chooses $i = b + e$, it does not need to borrow additional funds from investors, while for $i > b+e$, it needs to raise $i-b-e$ from investors. Since the firm's moral hazard

problem is resolved by bank monitoring, investors are willing to lend to the firm if

$$p_H R_{inv} \geq (i - b - e)R, \quad \text{[Investor PC Firm]}$$

which is binding in the optimum, implying $R_{inv} = (i - b - e)R/p_H$. The following lemma states the firm's optimal investment decision.

**Lemma 1.** *If the firm accepts the loan contract $\{B, b\}$ and the bank monitors the firm and induces it to implement the efficient project, the firm chooses $i = \max\{i^*, b + e\}$.*

*Proof.* See the Appendix.

The intuition for this lemma is straightforward. The efficient investment level $i^*$ maximizes the efficient project's return. If the loan and the firm's equity endowment together are insufficient to reach $i^*$, the firm optimally borrows $i^* - b - e$ from investors and then implements $i^*$. If the sum of the loan and firm equity (i.e., $b+e$) already exceed $i^*$, the firm's optimal strategy is to invest these funds into the efficient project without raising additional funds from investors.

If the firm rejects the loan contract, its expected profit is given by Eq. (14). Hence, the firm accepts the loan contract $\{B, b\}$ only when it satisfies:

$$p_H \left[ f(i) - \frac{(i - b - e)R}{p_H} - B \right] - eR \geq p_H f(i^M) - i^M R. \tag{16}$$

That is, the firm's expected profit from bank finance (i.e., the LHS of Ineq. 16) must be greater than or equal to its expected profit when solely relying on market finance. Consequently, the bank's optimization problem becomes:

$$\max_{B,b \geq 0} \Pi^B(B, b, p_H) = p_H B - bc(p_H) \tag{17}$$

$$\text{s.t. } \Pi^B(B, b, p_H) \geq 0 \text{ and Condition (16).}$$

The following proposition characterizes the bank's optimal loan contract when the firm implements the efficient project, denoted as $\{B_H, b_H\}$.

**Proposition 1.** *If the bank monitors the firm and induces it to implement the efficient project, the optimal contract, $\{B_H, b_H\}$, is given by the solution of the following system of equations*

$$p_H f'(b_H + e) = c(p_H) \tag{18}$$

$$p_H B_H = p_H f(b_H + e) - eR - \left(p_H f(i^M) - i^M R\right). \tag{19}$$

*The bank's maximum expected profit from lending is given by*

$$\hat{\Pi}_H^B \equiv \Delta N\left(b_H + e\right) + b_H\left(R - c\left(p_H\right)\right) > 0, \tag{20}$$

*where* $\Delta N\left(\cdot\right)$ *is a function defined as:*

$$\Delta N\left(x\right) \equiv p_H f(x) - xR - \left(p_H f(i^M) - i^M R\right). \tag{21}$$

*With bank finance, the firm's investment level is* $i_H \equiv b_H + e > i^*$ *and thus higher than the efficient level.*

*Proof.* See the Appendix.

The bank's expected profit in Eq. (20) depends on two determinants. First, with bank finance, the firm's investment level changes from $i^M$ to $i_H$, so the attainable net return of the firm's project changes by $\Delta N\left(i_H\right)$, which the bank absorbs through the loan arrangement.[7] Note that function $\Delta N\left(i\right)$ is maximized when $i = i^*$ and decreases with $i$ for $i > i^*$.

Second, the bailout possibility lowers the bank's marginal funding costs $c\left(p_H\right)$ below the firm's costs of borrowing directly from investors, $R$. This allows the bank to realize a return simply by channeling funds from investors to the firm, thereby earning the lending spread $R - c\left(p_H\right)$ for each loan unit.

The bank's optimal loan contract thus strikes a balance between these two profit determinants: (i) the change in the firm's expected project return (which is maximized at $i^*$) and (ii) the return the bank can garner from exploiting the lending spread $R - c\left(p_H\right)$. Due to the second determinant, the bank offers the firm a loan contract with an inefficiently large loan volume that crowds out market finance and induces the firm to overinvest (i.e., $i_H > i^*$) such that the marginal return of the firm's project equals the bank's marginal funding costs (i.e., $p_H f'(i_H) = c\left(p_H\right)$).

The extent of this investment inefficiency is positively associated with the bank's lending spread $R - c\left(p_H\right)$, which increases with the bank's bailout probability. The following corollary summarizes this result.

[7] Since bank monitoring can enforce the implementation of the efficient project, there is no moral-hazard-induced upper bound for $i_H$.

**Corollary 1.** *If the bank monitors the firm and induces it to implement the efficient project, the firm's investment level, $i_H$, is negatively associated with $c(p_H)$ and satisfies:*

$$\lim_{c(p_H)\to R} i_H = i^* \text{ and } \lim_{c(p_H)\to R} \hat{\Pi}_H^B = \Delta N\left(i^*\right).$$

*The extent of the firm's investment inefficiency (i.e., the wedge between $i_H$ and $i^*$) and the firm's leverage (defined as $i/e$) both increase with the bank's bailout probability $\alpha$. The bank's nominal lending rate (i.e., $B_H/b_H$) decreases with $\alpha$.*

*Proof.* See the Appendix.

A higher bailout probability leads the bank to implement a loan contract that is associated with a more severe borrower overinvestment and, in turn, a reduction in the net return of the firm's efficient project. Consequently, the bank must offer the firm a lower nominal lending rate, $B_H/b_H$, to ensure that the firm still accepts the loan contract.

**Inefficient project implementation.** Next, we characterize the bank's optimal loan contract when it wants to induce the firm to invest in the inefficient project.

**Proposition 2.** *If the firm implements the inefficient project, it does not borrow from investors. The bank's maximum expected profit is then given by*

$$\hat{\Pi}_L^B \equiv \Pi_L^B\left(b_L\right), \tag{22}$$

*where $\Pi_L^B(\cdot)$ is a function defined as*

$$\Pi_L^B\left(x\right) \equiv p_L \delta f(x+e) - p_H f(i^M) + \left(i^M - e\right) R - c\left(p_L\right) x,$$

*and $b_L$ is the unique solution of*

$$p_L \delta f'(b_L + e) = c\left(p_L\right). \tag{23}$$

*The bank's maximum expected profit, $\hat{\Pi}_L^B$, can be non-negative if $\alpha > 0$. The corresponding investment level of the firm is $i_L \equiv b_L + e$ and the bank's optimal loan contract is $\{B_L, b_L\}$, where $B_L$ solves*

$$p_L[\delta f(b_L + e) - B_L] - eR = p_H f(i^M) - i^M R.$$

*Proof.* See the Appendix.

The intuition underlying Proposition 2 is again straightforward. Without a bailout possibility (i.e., if $\alpha = 0$), the implementation of the inefficient project implies that there exists no loan contract that can provide non-negative expected returns to both the firm and the bank since the inefficient project has a negative net return. The presence of a bailout guarantee (i.e., $\alpha > 0$), however, reduces the bank's marginal funding costs to $c(p_L)$ ($< R$). If the bailout subsidy is sufficiently large and, in turn, $c(p_L)$ sufficiently low, the bank is able to offer a loan contract that ensures non-negative expected returns for both the firm and the bank even when the inefficient project is implemented.

The bank's expected profit solely originates from exploiting the lending spread $R - c(p_L)$ in the inefficient project case. Hence, the bank's optimal loan volume balances the expected marginal project return, $p_L \delta f'(i_L)$, and the bank's corresponding marginal funding costs, $c(p_L)$, as shown in Eq. (23).

**Comparing efficient vs. inefficient project implementation.** Finally, we analyze the conditions under which the bank prefers to induce the firm to implement the inefficient or the efficient project, respectively.

**Proposition 3.** *If the following inequality holds:*

$$\underbrace{\frac{\alpha R(p_H - p_L)}{(p_H + (1-p_H)\alpha)(p_L + (1-p_L)\alpha)}}_{=c(p_H)-c(p_L)} > (p_H - p_L\delta)\, f'(0), \tag{24}$$

*it is optimal for the bank to waive monitoring and offer the contract $\{B_L, b_L\}$ (given in Proposition 2) when the bank's liabilities are sufficiently large (i.e., when $e$ is sufficiently small). The firm implements the inefficient project after accepting the contract. It holds that $b_L > b_H$ and $i_L > i_H$ when the bank waives monitoring and offer the contract $\{B_L, b_L\}$.*

*Proof.* See the Appendix.

The intuition for this result is as follows. Waiving monitoring and inducing the firm to invest in the inefficient instead of the efficient project has two opposing effects on the bank's expected profit: an *income-reducing* and a *cost-saving* effect.

(a) *Income-reducing effect.* For any given firm investment level, inducing the firm to invest in the inefficient instead of the efficient project reduces its expected loan

repayment to the bank since this repayment is linked to the expected value of the firm's project, which is lower for the inefficient project.

(b) *Cost-saving effect.* With a bailout guarantee (i.e., $\alpha > 0$), the bank can reduce its marginal funding costs by inducing the firm to implement the inefficient instead of the efficient project since $c(p_L) < c(p_H)$, which follows from the derivative of $c(P)$ (see Eq. 6) with respect to $P$:

$$\frac{\partial c(P)}{\partial P} = \frac{\alpha R}{(P + (1-P)\alpha)^2} > 0. \tag{25}$$

Specifically, the switch to the inefficient project increases the bank's default probability and thus decreases the likelihood that the bank has to honor its debt repayment obligations. While the higher bank default probability leads investors to demand a higher nominal interest $D$, the bailout possibility dampens this adjustment. Consequently, a lower success probability (i.e., a lower $P$) implies lower marginal funding costs for the bank (i.e., a lower $c(P) = PD$).

Condition (24) shows that when the cost-saving effect associated with the inefficient project implementation is sufficiently large compared to its income-reducing effect, the bank will induce the firm to invest in the inefficient project.

Moreover, Proposition 3 shows that when the bank induces the implementation of the inefficient project, the overinvestment inefficiency on the firm side is even more severe than in the efficient project case (i.e., $i_L > i_H > i^*$). The reason is that the bank has the incentive to exploit the inefficient project's cost-saving effect using a larger loan volume. To understand this, note that a necessary condition for the inefficient project's cost-saving effect to dominate its income-reducing effect (and thus a necessary condition for the bank to prefer the inefficient project) is that there exists an $i$ such that

$$p_L \delta f'(i) - c(p_L) \geq p_H f'(i) - c(p_H), \tag{26}$$

where $p_H f'(i)$ and $p_L \delta f'(i)$ are the marginal returns of the efficient and inefficient project, respectively.[8] Note that Condition (26) implies that the inefficient project has a higher marginal return-cost ratio than the efficient project (i.e., $p_L \delta / c(p_L) > p_H / c(p_H)$), which

[8] If there exists no $i$ satisfying Condition (26), the efficient project always has a higher marginal return net of marginal funding costs than the inefficient project, implying that the bank must prefer to induce the implementation of the efficient project.

implies $b_L > b_H$ and $i_L > i_H$.

In a last step, we analyze the effect of a change in the bank's bailout guarantee on its decision of whether to induce the firm to implement the inefficient vs. efficient project. Taking the cross partial derivatives of $c(P)$ with respect to $P$ and $\alpha$ shows that, with Assumption 3, the cost-saving effect of the inefficient project (i.e., the spread between $c(p_H)$ and $c(p_L)$) increases with the bailout probability $\alpha$:

$$\frac{\partial^2 c(P)}{\partial P \partial \alpha} = \frac{R(P-(1-P)\alpha)}{(P+(1-P)\alpha)^3} > 0. \tag{27}$$

Given that the inefficient project implementation is associated with a higher default probability than the efficient project implementation, an increase in the bailout probability lowers the bank's marginal funding costs relatively more in the inefficient than in the efficient project case. Consequently, a higher bailout probability makes it more likely that the bank induces the firm to invest in the inefficient project. We formalize this result in the following proposition.

**Proposition 4.** *If there exists an $\alpha$ for which the bank prefers the inefficient project implementation on the firm side, then there exists an $\hat{\alpha}$ with $\hat{\alpha} \in (0,1]$ for which the bank induces the firm to invest in the inefficient project (resp. efficient project) whenever $\alpha \geq \hat{\alpha}$ (resp. $\alpha < \hat{\alpha}$).*

*Proof.* See the Appendix.

**Corollary 2.** *If the bank waives monitoring and induces the firm to implement the inefficient project, the bank's nominal lending rate, $B_L/b_L$ decreases with $\alpha$. In this case, the firm's investment level, $i_L$, and leverage, $i_L/e$, are negatively associated with $c(p_L)$ (i.e., they both increase with the bailout probability $\alpha$).*

*Proof.* See the Appendix.

This intuition of this corollary is the same as that underlying Corollary 1. Note that $B_L/b_L > B_H/b_H$ holds for a broad range of parameters since the inefficient project is more risky and has a higher nominal return conditional on success.[9] As a result, the effect of an increase in $\alpha$ on the bank's nominal loan interest rate (i.e., $B/b$) is ambiguous: On the one hand, $B_H/b_H$ and $B_L/b_L$ both decrease with $\alpha$; on the other hand, the firm's

[9] In Section 4.2, we show that $B_L/b_L > B_H/b_H$ always holds if the firm has the bargaining power.

potential switch from the efficient to the inefficient project tends to increase the interest rate.

Based on our model and its underlying mechanisms, we derive the following empirical predictions, which we bring to the data in Section 5.

**Bank funding:** An expansion in bailout guarantee coverage prompts banks to raise their debt funding, in particular in debt instruments that are not already covered by explicit government guarantees, such as deposit insurance schemes.

**Bank lending:** An extended bailout coverage prompts banks to elevate their lending activities, including corporate lending. This results in higher loan volumes for their borrowers. Additionally, banks may incentivize their borrowers to undertake riskier projects. The effect of an increase in a bank's bailout coverage on its loan pricing is ambiguous. If the bank promotes the implementation of efficient borrower projects, its average loan spreads should decrease. Conversely, if it pushes for inefficient, high-risk projects, the spreads tend to rise.

**Firm funding and investment behavior:** Firms associated with banks benefiting from increased bailout guarantee coverage tend to boost their bank borrowing. Consequently, this results in an uptick in their leverage ratios. These firms then channel this additional debt funding into expanding their investments. This surge in investment leads to overinvestment, which, in turn, results in diminished firm productivity. Moreover, these firms are more likely to implement inefficient projects, further reducing firm productivity.

# 4 Extensions

In the section, we provide two extensions to our baseline model. First, we analyze the case in which there are multiple nonidentical firms and the bank has a positive equity endowment. Second, we consider the case where bargaining power is shifted from the bank to the firm.

## 4.1 Multiple Firms and Bank Equity

Next, we show that main results derived in our main analysis also hold when (i) the economy consists of numerous nonidentical firms (of mass 1), instead of a single representative

firm; and (ii) the bank has a positive equity endowment (denoted as $e_b$). We assume that the marginal costs of bank equity are equal to the capital costs of investors $R$.

We assume that the success probability of each firm's projects depends on an economy-wide state of nature, which is realized at $t = 1$. The state of the economy at $t = 1$ can be good or bad, which occurs with probability $p$ and $1 - p$, respectively. In the good state, firms' efficient projects succeed with probability $\overline{p}_H$, while inefficient projects succeed with probability $\overline{p}_L < \overline{p}_H$. In the bad state, efficient projects succeed with probability $\underline{p}_H \leq \overline{p}_H$, while inefficient projects always fail. This assumption captures the key intuition that efficient projects dominate inefficient projects in terms of their success probability in both states of the world. For a given state, the return distributions of the firms' projects are independent.

The likelihood of each state is publicly known at $t = 0$. Hence, from an ex-ante perspective, an efficient project succeeds with the probability

$$p_H \equiv p\overline{p}_H + (1-p)\,\underline{p}_H,$$

while an inefficient project succeeds with probability

$$p_L \equiv p\overline{p}_L.$$

Hence, as in our baseline model, we have $p_H > p_L\delta$. Moreover, to accommodate a risk shifting possibility, we assume that, conditional on the realization of the economy-wide good state of nature, an inefficient project has a higher expected value than an efficient project, that is, $\overline{p}_L\delta > \overline{p}_H$ (which corresponds to $\delta > 1$ in our main analysis from Section 2).

We assume that the bank can offer two separate loan contracts at $t = 0$: one (referred to as the "efficient project contract") for firms that the bank monitors and for which it wants to implement the efficient project, and one (referred to as the "inefficient project contract") for firms for which the bank waives monitoring and wants to implement the inefficient project. In the following, we denote the bank's efficient project contract as $\{B^{\uparrow}, b^{\uparrow}\}$, and the "inefficient project contract" as $\{B^{\downarrow}, b^{\downarrow}\}$. The choice variable $w$ denotes the fraction of firms for which the bank implements $\{B^{\uparrow}, b^{\uparrow}\}$; thus, $(1 - w)$ represents the share of firms for which the bank implements $\{B^{\downarrow}, b^{\downarrow}\}$. Accordingly, the size of the bank's total loan provision is given by $b_w \equiv wb^{\uparrow} + (1-w)\,b^{\downarrow}$. If $b_w > e_b$, the bank needs

to raise $b_w - e_b$ units of external funding to provide loans. If $e_b \geq b_w$, the bank finances its loans solely with equity; we assume that excess bank equity does not generate cost of capital for the bank.

In our analysis, we focus on the (realistic) case in which the bank's equity endowment $e_b$ is insufficient to meet the funding demand of firms, that is, $e_b \in (0, i^* - e)$ such that the bank equity alone cannot support firms' efficient investment level.[10]

As in the baseline model, the bank is protected by a bailout possibility (represented by $\alpha$). To keep the analysis tractable, we focus on the case with $\alpha = 1$ throughout this extension, which implies that household investors lending to the bank are always fully repaid (by either the bank or the bailout).

We have to distinguish between two possible cases: (i) the *"fully solvent case"* and (ii) the *"partially solvent case"*. In the fully solvent case, the bank has sufficient equity to stay solvent in both states of nature. In the partially solvent case, the bank alone can fully repay investors only in the good state of nature and becomes insolvent in the bad state.

We proceed as follows. First, we solve for the bank's optimal contract in the fully solvent case. Second, we analyze the partially solvent case with efficient project implementation and investigate the bank's solvency preferences (i.e., being fully solvent vs. only partially solvent). Finally, we determine whether it would be optimal for the bank to waive monitoring and induce the implementation of inefficient projects.

**Fully solvent case.** When the bank is fully solvent, inducing firms to implement inefficient projects does not reduce the bank's expected funding costs because the bank itself always repays $R$ to investors for each borrowed unit, while the bailout does not have a chance to work. Given that the inefficient project is inferior to the efficient project from an expected return perspective, it is thus strictly optimal for the bank to monitor all firms and implement only the efficient project contract in the fully solvent case, implying the following lemma:

**Lemma 2.** *In the fully solvent case, the bank always chooses $w = 1$ and monitors all firms.*

*Proof.* See the Appendix.

[10] This assumption does not ensure $b_w > e_b$. In Corollary 3, we show that the bank may choose $b_w = 0$, which must be smaller than $e_b$; however, firms raise market funding to achieve the efficient investment level.

The following proposition summarizes the resulting bank's optimal contract in the fully solvent case.

**Proposition 5.** *In the fully solvent case, the bank's optimal loan contract,* $\{B_{full}, b_{full}\}$*, is given by*

$$B_{full} = \frac{\Delta N\left(i^*\right) + b_{full}R}{p_H} \text{ and } b_{full} \in \left[0, i^* - e\right].$$

*Each firm will invest* $i^*$ *in its efficient project after accepting the contract. The bank's maximum expected profit from lending is* $\hat{\Pi}_{full} \equiv \Delta N\left(i^*\right)$*. The contract* $\{B_{full}, b_{full}\}$ *sustains the fully solvent case if and only if*

$$\underline{p}_H B_{full} - \left(b_{full} - e_b\right) R \geq 0. \tag{28}$$

*Proof.* See the Appendix.

By monitoring firms and inducing them to invest $i^*$, the bank generates a project value change of $\Delta N\left(i^*\right)$.[11] The bank extracts this value change through the loan contract. To implement the investment level $i^*$, the bank's optimal loan volume, $b_{full}$, can take any value equal to or smaller than $i^* - e$ (see Lemma 1). The bank then adjusts the optimal loan repayment $B_{full}$ such that firms accept the loan contract.

In the bad state, the share $\underline{p}_H$ of firms succeeds. Hence, the bank receives $\underline{p}_H B_{full}$ and is fully solvent only if $\underline{p}_H B_{full}$ is greater than or equal to the repayment promised by the bank to investors: $\left(b_{full} - e_b\right) R$, implying Condition (28).

The following corollary shows that the fully solvent case and the corresponding net profit $\hat{\Pi}_{full}$ are always attainable for the bank when it chooses a sufficiently small loan volume.

**Corollary 3.** *By choosing* $b_{full} = 0$ *and* $B_{full} = \Delta N\left(i^*\right)/p_H$*, the bank is fully solvent and earns the net profit* $\hat{\Pi}_{full}$*.*

*Proof.* See the Appendix.

**Partially solvent case with compulsory monitoring.** Next, we consider the partially solvent case. As in our main model, we first consider the case in which the bank monitors firms and enforces the implementation of efficient projects.

[11] The project value change is zero if the firm can invest $i^*$ simply through market-based finance.

In the partially solvent case with $\alpha = 1$, investors lending to the bank will always be fully repaid due to the existence of the bailout. Hence, the nominal return investors require from the bank is $R$. The bank's optimization problem (with monitoring and efficient project implementation) in the partially solvent case is given by:

$$\max_{B^{\uparrow},b^{\uparrow}\geq 0} p\left[\overline{p}_H B^{\uparrow} - \left(b^{\uparrow} - e_b\right) R\right] - e_b R. \tag{29}$$

$$s.t.$$

$$\underbrace{p_H\left(f\left(i\right) - \frac{R\left(i - b^{\uparrow} - e\right)}{p_H} - B^{\uparrow}\right)}_{i=\max\left\{b^{\uparrow}+e,i^*\right\}} \geq p_H f\left(i^M\right) - R\left(i^M - e\right), \tag{30}$$

where Condition (30) represents the firms' PC. The intuition of Eq. (29) is as follows. In the good state of the world, which happens with probability $p$, the bank receives the firms' loan repayment (i.e., $\overline{p}_H B^{\uparrow}$) net of its own debt repayment (i.e., $\left(b^{\uparrow} - e_b\right) R$). The bank defaults and makes no profit in the bad state. In addition, the bank incurs the costs of its equity capital $e_b R$.

In the partially solvent case, the bank cares only about its debt repayment in the good state (i.e., when the bank remains solvent, which happens with probability $p$). Hence, from the bank's perspective, its marginal funding costs become

$$c_p \equiv pR < R, \tag{31}$$

and are thus lower than in the fully solvent case.

The optimal strategy of the bank then depends on the relation between $c_p$ and the expected interest income of the bank for the case in which it would charge firms an interest rate that makes them indifferent between bank and market financing. In particular, when raising funds from investors, firms have to promise a (nominal) interest rate of

$$R_n \equiv \frac{R}{p_H}.$$

Since the bank survives only in the good state of nature, its expected value derived from a promised payment by a firm of $R_n$ is equal to $p\overline{p}_H R_n$. It can be easily shown that $c_p < p\overline{p}_H R_n$, so the bank can exploit the spread between $c_p$ and $p\overline{p}_H R_n$ simply by intermediating more funds. As in Proposition 1, the bank's optimal loan contract thus

balances the value it can extract from firms' project value change (which is maximized when the investment level is $i^*$) and the profit from the lending spread $p\overline{p}_H R_n - c_p$. Consequently, the optimal bank contract induces firms to overinvest (i.e., choose $i > i^*$) such that the marginal project return (from the bank's perspective), $p\overline{p}_H f'(i)$, equals the bank's marginal funding costs $c_p$. These results are summarized in the following proposition.

**Proposition 6.** *If the bank is partially solvent and monitors all firms (i.e., $w = 1$), its optimal contract, denoted by $\{B_H^{part}, b_H^{part}\}$, is given by the solution of the following two equations:*

$$\begin{cases} p\overline{p}_H f'\left(b_H^{part} + e\right) = c_p \\ p_H B_H^{part} = p_H f\left(b_H^{part} + e\right) - eR - \left(p_H f\left(i^M\right) - Ri^M\right) \end{cases}$$

*Each firm will invest $i_H^{part} \equiv b_H^{part} + e > i^*$ in its efficient project after accepting the loan contract. The bank's corresponding maximum expected profit is*

$$\begin{aligned} \hat{\Pi}_H^{part} &\equiv \frac{p\overline{p}_H}{p_H}\Delta N\left(b_H^{part} + e\right) + b_H^{part}\left(p\overline{p}_H R_n - c_p\right) \\ &- (1-p)\, e_b R. \end{aligned} \tag{32}$$

*The contract $\{B_H^{part}, b_H^{part}\}$ sustains the partially solvent case if and only if*

$$\underline{p}_H B_H^{part} - \left(b_H^{part} - e_b\right) R < 0. \tag{33}$$

*Proof.* See the Appendix.

Condition (33) comes from the solvency threshold in the bad state, in which $\underline{p}_H$ firms succeed, and the bank thus receives $\underline{p}_H B_H^{part}$. Accordingly, the bank is partially solvent only if this amount is smaller than its own debt repayment to investors.

When Condition (33) holds, the bank has to decide whether to implement the fully or partially solvent case by offering the corresponding optimal loan contract: $\{B_{full}, b_{full}\}$ or $\{B_H^{part}, b_H^{part}\}$, respectively.[12] The following proposition shows that the bank may optimally choose to implement the partially solvent case due to the bailout.

[12]When Condition (33) does not hold, the bank's optimal contract for the partially solvent case does not have an inner solution. Therefore, the bank must prefer to be fully solvent and earn $\hat{\Pi}_{full}$.

**Proposition 7.** *If the following inequality holds:*

$$p\overline{p}_H R_n - c_p > \frac{(p_H - p\overline{p}_H)\,\Delta N\,(i^*)}{p_H i^*},$$

*it is optimal for the bank to implement the partially solvent case by offering the loan contract* $\{B_H^{part}, b_H^{part}\}$ *when the bank's liabilities are sufficiently large (i.e., when* $e$ *and* $e_b$ *are sufficiently small). As* $e_b$ *decreases, the bank's preference for the partially solvent case becomes stronger.*

*Proof.* See the Appendix.

The mechanisms underlying Proposition 7 are driven by a cost-saving and an income-reducing effect, and thus similar to the intuition of Proposition 3. First, being partially instead of fully solvent increases the bank's default probability, in turn decreasing its marginal funding costs from $R$ to $c_p$ (cost-saving effect). Second, even though some borrowers are repaying their loans in the bad state, the bank – being partially solvent – does not benefit from loan repayments (i.e., makes no profit) in the bad state because its income in this state is entirely seized by investors and hence cannot contribute to its lending profit (income-reducing effect). When the cost-saving effect derived from the bailout possibility and an increased probability of default dominate this income-reducing effect, the bank is incentivized to implement the partially solvent case.

Proposition 7 also shows that a higher bank equity makes the partially solvent case less attractive to the bank. The intuition is straightforward. With a higher equity level, the bank raises less debt for any given loan size. Therefore, the cost-saving effect derived from the bailout is lower. As a result, a lower $e_b$ will move the bank's preference toward the partially solvent case.

**Partially solvent case without compulsory monitoring.** Next, we consider the case in which the bank can waive monitoring and investigate whether it can be optimal for the bank to induce firms to implement inefficient projects.

The following lemma shows that it is never strictly optimal for the bank to let some borrowers implement efficient projects, while others implement inefficient projects.

**Lemma 3.** *For the partially solvent case it holds that:*

*(i) If some* $w < 1$ *is optimal for the bank, then* $w = 0$ *is also optimal.*

*(ii) Whenever the bank chooses $w = 0$ and makes a positive expected profit, its optimal loan contract, denoted by $\{B_L^{part}, b_L^{part}\}$, is given by the unique solution of the following system of equations:*

$$\begin{cases} p\overline{p}_L \delta f'\left(b_L^{part} + e\right) = c_p, \\ p_L \delta f\left(b_L^{part} + e\right) = p_L B_L^{part} + eR + p_H f\left(i^M\right) - Ri^M. \end{cases}$$

*Each firm will invest $i_L^{part} \equiv b_L^{part} + e > i^*$ in its inefficient project after accepting the loan contract. The bank's corresponding expected profit is given by*

$$\begin{aligned} \hat{\Pi}_L^{part} &\equiv p_L \delta f\left(b_L^{part} + e\right) - pRb_L^{part} - eR \\ &- \left(p_H f\left(i^M\right) - Ri^M\right) - R\left(1-p\right)e_b. \end{aligned} \tag{34}$$

*Proof.* See the Appendix.

In the partial solvent case, the bank might prefer the implementation of inefficient projects because they have a higher expected return conditional on the realization of the good state (i.e., $\overline{p}_L \delta > \overline{p}_H$), that is, the state in which the bank is solvent.

If the loan contract $\{B^{\downarrow}, b^{\downarrow}\}$, which induces firms to implement the inefficient project, generates a higher expected return for the bank than the efficient project loan contract $\{B^{\uparrow}, b^{\uparrow}\}$, the bank optimally induces all firms to implement the inefficient project (i.e., chooses $w = 0$). Therefore, it is never strictly optimal for the bank to offer some firms the inefficient project contract and others the efficient project contract. Consequently, we can focus our analysis on the two remaining cases: (i) the bank monitors all firms and enforces the implementation of efficient projects, and (ii) the bank waives monitoring and induces all firms to implement inefficient projects.

Comparing the bank's expected profits for the fully solvent case, the partially solvent case with monitoring and the implementation of efficient projects, as well as the partially solvent case in which inefficient projects are implemented yields the following proposition.

**Proposition 8.** *If the following inequalities hold:*

$$\underbrace{p_L \delta - p\overline{p}_H}_{p(\overline{p}_L \delta - \overline{p}_H)} > \left(1 - \frac{p\overline{p}_H}{p_H}\right) \frac{\left(p_H f\left(i^M\right) - i^M R\right)}{f\left(i_L^{part}\right)}, \tag{35}$$

$$\left(1-p\right)R > \left(p_H - p_L \delta\right) f'\left(0\right), \tag{36}$$

*it is optimal for the bank to waive monitoring (i.e., choose $w = 0$) and offer the loan contract $\{B_L^{part}, b_L^{part}\}$ when the bank's liabilities are sufficiently large (i.e., when $e$ and $e_b$ are sufficiently small). As $e_b$ increases, $\hat{\Pi}_L^{part} - \hat{\Pi}_{full}$ will decrease, which implies that the bank's preference for the implementation of inefficient projects becomes weaker, while its preference for the fully solvent case becomes stronger.*

*Proof.* See the Appendix.

Inducing borrowers to invest in their inefficient instead of their efficient project has opposing effects on the bank's expected profit in the partially solvent case.

Implementing inefficient projects yields a higher expected project return conditional on the realization of the good state of the world (the state in which the bank is solvent). While efficient projects also yield cash flows in the bad state, the bank does not benefit from loan repayments in this state since it is insolvent, and investors seize the entire loan repayments. However, positive cash flows from efficient projects in the bad state dampen the downside risk for firms. Consequently, to incentivize a firm to invest in its inefficient project, the bank needs to compensate it by adjusting the firm's nominal borrowing interest rate downwards. The bank prefers the implementation of inefficient projects if their return advantage in the good state outweighs their disadvantage in the bad state. When Condition (35) holds the first effect dominates.

Condition (36) states that the bank prefers to waive monitoring (which induces the partially solvent case) over staying fully solvent when the cost-saving effect of being only partially solvent is sufficiently large. Finally, a higher bank equity level shifts the bank's preference toward the fully solvent case because the bank then needs to raise less debt from investors, implying a lower cost-saving effect generated by the bailout.

**Corollary 4.** *The following relation holds: $i_L^{part} > i_H^{part} > i^*$.*

*Proof.* See the Appendix.

The relation $i_H^{part} > i^*$ has been explained below Proposition 6. The relation $i_L^{part} > i_H^{part}$ holds because, in the partially solvent case, the bank values only the good state, in which inefficient projects have higher expected returns than efficient ones.

## 4.2 Role of Bargaining Power

In this section, we check the robustness of our results for the case where the firm has bargaining power vis-à-vis the bank. In addition, we assume that the firm can decide whether monitoring is needed when borrowing from the bank. All the other setups in Section 2 still apply here. The following proposition shows that our main results are robust to shifting the bargaining power to the firm.

**Proposition 9.** *If the firm has bargaining power vis-à-vis the bank when negotiating the loan contract, it holds that:*

*(i) When the firm implements the efficient project, its investment level will be $i_H$, and the bank's loan volume will be $b_H$, with $i_H$ and $b_H$ given in Proposition 1. The firm's promised loan repayment, denoted by $B_H^F$, is given by*

$$B_H^F = \frac{b_H c\left(p_H\right)}{p_H}.$$

*Hence, the nominal loan interest rate, $B_H^F/b_H$, increases with $c\left(p_H\right)$. In this case, the firm's maximum profit is*

$$\hat{\Pi}_H^F \equiv p_H f(e + b_H) - b_H c\left(p_H\right) - eR.$$

*(ii) If Condition (24) holds, the firm optimally implements the inefficient project if its liabilities are sufficiently large (i.e., when $e$ is sufficiently small). When the firm implements the inefficient project, its investment level will be $i_L$, and the bank's loan volume will be $b_L$, with $i_L$ and $b_L$ given in Proposition 2. The firm's promised loan repayment, denoted by $B_L^F$, is given by*

$$B_L^F = \frac{b_L c\left(p_L\right)}{p_L}.$$

*Hence, the nominal loan interest rate, $B_L^F/b_L$, increases with $c\left(p_L\right)$. In this case, the firm's maximum profit is*

$$\hat{\Pi}_L^F \equiv p_L \delta f(e + b_L) - b_L c\left(p_L\right) - eR.$$

*Proof.* See the Appendix.

Shifting bargaining power to the firm means that the bank makes zero profit, letting the firm extract the entire project return and the value generated by the bailout possibility.

First, consider the case in which the firm implements the efficient project. Then, the bank's marginal funding cost is $c(p_H)$ ($< R$). Since the firm has bargaining power, it can raise funds through the bank and enjoy this advantageous funding cost. As a result, the firm's marginal funding cost (though bank finance) is $c(p_H)$ when it has the bargaining power. The best strategy of the firm is to invest until its marginal investment return, $p_H f'(i)$, is equal to its marginal funding cost, $c(p_H)$, leading to the optimal investment level, $i_H = b_H + e$. That is, shifting bargaining does not change the firm's investment level.

Since a higher default probability increases the value of the bailout possibility, the firm will implement the inefficient instead of the efficient project if $\alpha$ is large enough, in which case the bank waives monitoring. The reason is as outlined after Proposition 3. The trade-off between a cost-saving effect and an income-reducing effect still exists when the firm has bargaining power; the only difference is that now the firm itself enjoys the cheap funding generated by the bailout possibility. A sufficient condition for the firm to implement the inefficient project is Condition (24), meaning that the cost-saving effect dominates. In sum, shifting bargaining power to the firm does not change our main results.

# 5 Empirical Analysis

In this section, we test the model predictions developed in Section 2. Specifically, in Section 5.1, we outline the empirical setting that we exploit for our analysis and explain the data. We then test our model predictions at the bank-level, at the bank-firm level, as well as at the firm-level.

## 5.1 Data and Institutional Setting

We test our model predictions in the context of the U.S. banking system during the period 1996-2016. We obtain bank financial information from the BHC Call Report Database (Y9C-form), information about banks' activity in the syndicated loan market from LPC

Dealscan, and borrower financial information from Compustat. We employ information about the U.S. Senate committee composition to capture changes in banks' expected bailout guarantee coverage.

**Measuring changes in banks' bailout expectations.** Analyzing how banks alter their lending practices in response to changes in their expected bailout guarantee coverage and the subsequent effect on borrowers' investment behavior presents a significant empirical challenge. First, market participants' expectations about banks' bailout guarantees are inherently unobservable. Second, the degree of a bank's protection through bailout guarantees is significantly influenced by its investment activity and associated portfolio risk and, thus, endogenous.

From an econometric perspective, we thus need some observable variation in the expected bank bailout likelihood that is not correlated with banks' investment practices. To this end, we turn to recent studies on political connections and bank bailouts, leveraging changes in banks' geography-based political connections to identify arguably exogenous variation in bailout expectations (e.g., Duchin and Sosyura, 2014 and Kostovetsky, 2015).

The results of Duchin and Sosyura (2014) and Kostovetsky (2015) suggest that a bank that is headquartered in an electoral constituency of a politician who serves in an important finance committee of the U.S. Congress enjoys a higher likelihood of receiving government assistance in times of distress.[13] Specifically, we build on the geography-based political connection measure from Kostovetsky (2015), focusing on banks' links to politicians in the U.S. Senate Committee on Banking, Housing, and Urban Affairs (BHUA Senate committee), one of twenty standing committees, which exercises jurisdiction over banks and other financial institutions. This committee has been instrumental in U.S. government bailout decisions in recent decades. We substantiate the conjecture that banks with representation in the BHUA Senate committee indeed have a higher likelihood of receiving public assistance by showing in Table 11 that these banks were more likely to receive bailout funds during the 2007–2008 financial crisis through the Troubled Asset Relief Program (TARP).

The procedures that shape the composition of senate committees, coupled with the seldom occurrence of banks changing their headquarters, imply that a bank's political connection to the BHUA Senate committee is not linked to its investment behavior, except

[13]Relatedly, Dam and Koetter (2012), Duchin and Sosyura, 2012, and Blau et al. (2013) find that politically connected banks tend to be favored in accessing government rescue measures.

through the effect on bailout expectations. By leveraging this exogenous variation, we can estimate the causal effects of changes in banks' expected bailout guarantee coverage on their lending behavior and their borrowers' investment activity.

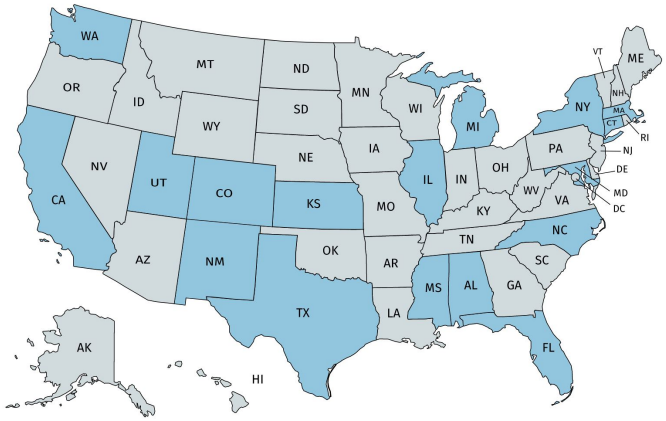
Specifically, every time a new U.S. congress convenes, senators are assigned to senate committees. These committees play a critical role in overseeing governmental operations within their assigned areas, identifying issues ripe for legislative review, collecting and evaluating information, and suggesting action plans. Though senators are formally elected to standing committees by the entire senate membership, in practice, each party conference holds significant sway in deciding which members will sit on each committee. For the committee assignments, party conferences appoint either a "committee on committees" or a steering committee. These bodies take into account factors such as seniority, areas of expertise, preferences, and prior committee assignments. Additionally, these committee assignments must comply with senate-imposed limits on the number and types of panels that any single senator can serve on or chair.

A party's share of seats on each committee is directly proportional to the number of seats it holds in the senate. Therefore, in addition to party considerations and senators' qualifications and committee preferences, changes in the ratio of Republican to Democrat senators also prompt the parties to reconfigure committee memberships. Furthermore, a senator's decision to focus on other tasks (e.g., election campaigns) or retirement can also trigger changes in committee membership.

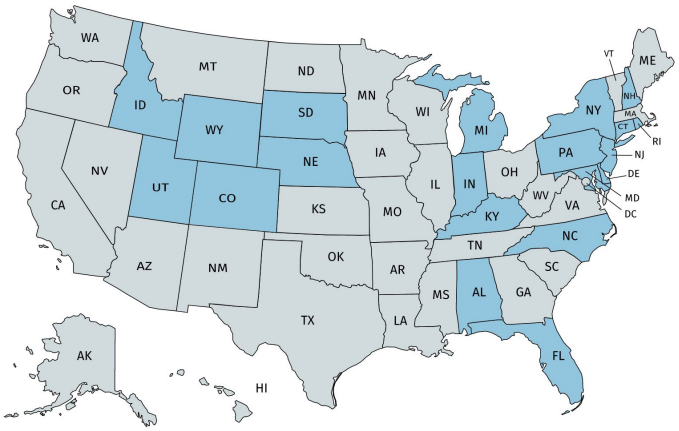
As of 2022, the BHUA Senate committee consists of 24 members, equally divided between the Democratic Party and the Republican Party. We obtain the historical membership data of the BHUA Senate committee from annual volumes of the Official Congressional Directory. Figure 1 shows that the committee's state representation is spread across various states and varies significantly over time.

We use the information about the composition of the BHUA Senate committee to construct two different proxies capturing changes in bank bailout expectations. For our bank-year level regressions, we employ the dummy variable $GG_{b,t}$ (for **G**overnment **G**uarantee), which equals one if a senator from bank $b$'s headquarter state is a member in the BHUA Senate committee in year $t$. For regressions at the bank-industry-year and bank-firm-year level, we employ $\triangle GG_{b,t}$, which can take values of $-1, 0, 1$: 0 when there is no change in $GG_{b,t}$ in year $t$, 1 if $GG_{b,t}$ switches from zero to one, and $-1$ if $GG_{b,t}$ changes from one to zero. Overall, during our sample period, 35 out of our 99 sample

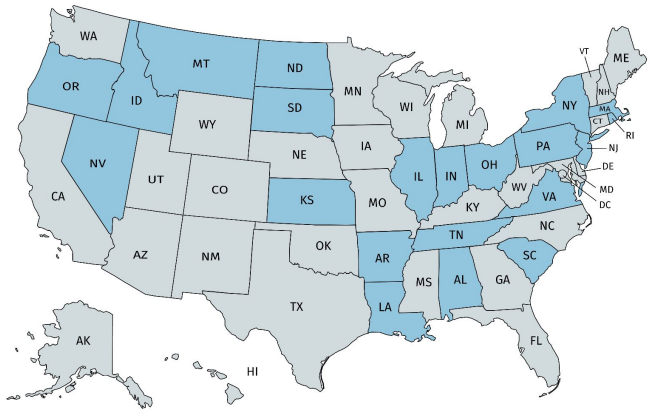
**Figure 1:** States with a senator in the BHUA Senate committee (in light blue) in 1996, 2006, and 2016.




**(a)** As of 1996




**(b)** As of 2006




**(c)** As of 2016

banks (i.e., 35.3%) experience a change in $GG_{b,t}$.

**Bank-firm lending relationships.** We obtain information about bank-firm relationships from Refinitiv's LPC DealScan, which provides comprehensive coverage of the syndicated loan market. We follow Schwert (2018) to construct loan portfolios for each bank holding company on a yearly basis focusing on loans extended to U.S. firms (excluding financial and utility firms). Consistent with the literature (e.g., Mian and Sufi, 2014), we aggregate all loans to a bank's parent. Following Ivashina, 2009, we focus our analysis on lead arranger(s) in charge of the respective loan's active management, which we identify following Chakraborty et al. (2018) based on the variables "lead arranger" and "lead arranger credit".[14] To account for the time lag between the moment a bank and a firm enter into the loan contract and the reported start date, we follow Murfin (2012) and consider the origination date of a loan package to be 90 days prior to the date reported in DealScan.

To measure the extent to which borrowers are (indirectly) linked to banks' bailout coverage, we employ the continuous variable *Indirect GG* (bound between 0 and 1) for our regressions at the firm-year level. We construct this variable by weighting the $GG$ values of a borrower's banks with the relative extent of their credit relationships. That is, for each bank-firm pair in year $t$, we first calculate firm $f$'s loan share from bank $b$ by dividing the bank's loan amount by the combined loan amount:

$$Loan\ Share_{b,f,t} = \frac{Loan\ Amount\ from\ Lead\ Arranger_{b,f,t}}{Total\ Lead\ Arranger\ Volume_{f,t}}. \tag{37}$$

We then calculate the extent to which firm $f$ is exposed to banks with varying degrees

[14] Chakraborty et al. (2018) employs the following ranking where the lender(s) with the highest ranking is (are) considered to be the respective lead arranger(s): 1) "Admin agent", 2) "Lead bank", 3) "Lead arranger", 4) "Mandated lead arranger", 5) "Mandated arranger", 6) "Arranger" or "Agent" and "yes" for lead arranger credit, 7) "Arranger" or "Agent" and "no" for lead arranger credit, 8) lender has "yes" for lead arranger credit but has a role other than the previously listed, 9) lender has "no" for lead arranger credit but has a role other than the previously listed, and 10) "Participant" or "Secondary investor". Similarly to the sample of Chakraborty et al. (2018), approximately 90% of our sample loans have a lender ranked six or higher. We exclude loans without at least one lead arranger. When the information about the share of the lead arranger(s) in a syndicated loan is missing, we deduce the lender shares by using OLS estimates obtained from deals for which we have full information. To this end, we regress the lending shares on the deal amount, the number of lead lenders and participants, and the lenders' primary role. Our results are robust to using an equal allocation of the deal amount across lenders and to allocate the full loan amount to the lead arranger(s).

of bailout guarantee coverage in year $t$ as

$$Indirect\ GG_{f,t} = \sum Loan\ Share_{b,f,t} \times GG_{b,t}. \tag{38}$$

Overall, 2,587 out of the 5,560 borrowers in our sample (i.e., 46.5%) experience at least one change in $Indirect\ GG_{f,t}$ during our sample period.

**Bank-level financial information.** We augment the data on bank-firm relationships with bank financial information and general information (e.g., on headquarter locations) from the U.S. Federal Reserve's publicly available Consolidated Financial Statements for Bank Holding Companies (FR Y-9C).[15] We condense the bank-level financial information at the year-level using year-end values and drop observations with missing or negative assets and/or equity.

Moreover, we exclude bank-year observations when a bank's assets increase by more than 50% in a single year (such a large change is likely due to a merger or a major acquisition) or if they changed their headquarter state during our sample period. Table 1 summarizes the definitions of all bank-level variables, which we all winsorize at 3%. Panel A of Table 3 presents summary statistics for all bank-level variables.

**Firm-level financial information.** We augment our dataset with firm-level accounting data and general information from Compustat. We again condense information at the year-level using year-end values and drop observations with missing or negative assets and/or equity.

Table 2 provides an overview of all firm-level variables, which we all winsorize at 1%. We compute all change variables year-over-year. Panel B of Table 3 presents summary statistics for all firm-level variables.

## 5.2 Bank Funding and Lending

We start our empirical analysis by testing how banks' funding and lending behavior are affected by changes in our bailout guarantee proxy. We conduct two sets of analyses: at the bank-level and at the bank-firm level.

**Bank-Level Analysis.** Based on our model predictions, we expect that having $GG = 1$

[15] We employ the linking file from Schwert (2018) for the matching between DealScan and the bank-level data.

**Table 1:** Variable Definitions (Bank-Level)

| Variable | Description |
|---|---|
| **Panel A: Lender Treatment and Controls** | |
| $GG_{b,t}$ | Bank $b$'s headquarter state is represented in BHUA Senate committee |
| $Size_{b,t}$ | Logarithm of total assets |
| $Leverage_{b,t}$ | Total liabilities scaled by total assets |
| $Liquidity_{b,t}$ | Cash and short-term investments over total assets |
| $ROA_{b,t}$ | Income before interests and taxes over total assets |
| $Dividends_{b,t}$ | Dividends over total assets |
| $Non\ Performing_{b,t}$ | Allowance for loan losses over total assets |
| $Sector\ Exposure_{b,i,t}$ | Lending exposure to sector $i$ over total lending volume |
| **Panel B: Lender Outcomes** | |
| $\Delta Log(WF_{b,t})$ | Change in log of bank $b$'s wholesale funding, multiplied by 100 |
| $\Delta Log(TL_{b,t})$ | Change in log of bank $b$'s total lending, multiplied by 100 |
| $\Delta Log(CI_{b,t})$ | Change in log of bank $b$'s commercial and industrial lending, multiplied by 100 |
| $\Delta Log(SL_{b,f,t})$ | Change in log of bank $b$'s syndicated loan volume to firm $f$, multiplied by 100 |
| $\Delta Log(SP_{b,f,t})$ | Change in log of bank $b$'s average all-in loan spreads to firm $f$, multiplied by 100 |

**Table 2:** Variable Definitions (Firm-Level)

| | |
|---|---|
| **Panel A: Borrower Controls** | |
| $Indirect\ GG_{f,t}$ | Firm $f$'s weighted sum of lenders' $GG$ |
| $Size_{f,t}$ | Logarithm of total assets |
| $Leverage_{f,t}$ | Total liabilities, scaled by total assets |
| $Z\text{-}score_{f,t}$ | $1.2 \times \frac{WK}{Assets} + 1.4 \times \frac{Ret.\ Earnings}{Assets} + 3.3 \times \frac{EBIT}{Assets} + \frac{Sales}{Assets} + 0.6 \times \frac{MV}{Liabilities}$ |
| $ROA_{f,t}$ | Net income, scaled by total assets |
| $Tang.\ Net\ Worth_{f,t}$ | Total assets minus liabilities and intangible assets, scaled by total assets |
| $EBITDA\ coverage_{f,t}$ | EBITDA over short-term debt and interest expenses |
| $Dividends_{f,t}$ | Total dividends, scaled by total assets |
| $Book\text{-}to\text{-}Market_{f,t}$ | Total assets over market value of equity and debt |
| **Panel B: Borrower Real and Financial Outcomes** | |
| $\triangle Log(Debt_{f,t})$ | Change in firm $f$'s log of total debt, multiplied by 100 |
| $\triangle Leverage\ Ratio_{f,t}$ | Change in firm $f$'s total debt over total assets, multiplied by 100 |
| $\triangle Capex_{f,t}$ | Change in firm $f$'s capital expenditures, scaled by total assets, multiplied by 100 |
| $\triangle Investment_{f,t}$ | Change in firm $f$'s investments, scaled by total assets, multiplied by 100 |
| $\triangle Productivity_{f,t}$ | Change in firm $f$'s log(sales) - 2/3*log(employment) - 1/3*log(PP&E), multiplied by 100 |
| $New\ Loan_{f,t}$ | Dummy variable equal to one if firm $f$ obtains a new loan in the next five years, and zero otherwise |

**Table 3:** Descriptive Statistics

| **Panel A: Lenders** | Observations | Mean | Std. Dev. | 10% | 50% | 90% |
|---|---|---|---|---|---|---|
| **Independent Variables** | | | | | | |
| $GG$ | 741 | 0.518 | 0.500 | 0.000 | 1.000 | 1.000 |
| $\triangle GG$ | 623 | -0.004 | 0.286 | 0.000 | 0.000 | 0.000 |
| Size | 741 | 18.082 | 1.202 | 17.168 | 17.543 | 19.791 |
| Leverage | 741 | 0.911 | 0.019 | 0.880 | 0.913 | 0.935 |
| ROA | 741 | 0.043 | 0.018 | 0.020 | 0.045 | 0.065 |
| Liquidity | 741 | 0.229 | 0.098 | 0.087 | 0.222 | 0.394 |
| Dividends | 741 | 0.111 | 0.066 | 0.006 | 0.114 | 0.204 |
| Non-Performing | 741 | 0.017 | 0.007 | 0.010 | 0.015 | 0.025 |
| Sector Exposure | 9,379 | 0.089 | 0.076 | 0.008 | 0.071 | 0.236 |
| **Dependent Variables** | | | | | | |
| $\triangle$log(WF) | 623 | 8.113 | 22.099 | -18.595 | 7.897 | 35.497 |
| $\triangle$log(TL) | 623 | 7.376 | 10.766 | -4.335 | 5.862 | 23.104 |
| $\triangle$log(CI) | 623 | 7.349 | 14.886 | -12.128 | 7.534 | 26.698 |
| $\triangle$log(SL) | 36,870 | 2.809 | 36.197 | -31.000 | 0.000 | 47.328 |
| $\triangle$log(SP) | 35,169 | 0.998 | 11.930 | -8.701 | 0.000 | 11.306 |
| **Panel B: Borrowers** | Observations | Mean | Std. Dev. | 10% | 50% | 90% |
| **Independent Variables** | | | | | | |
| Indirect $GG$ | 37,187 | 0.714 | 0.441 | 0.000 | 1.000 | 1.000 |
| Size | 35,086 | 6.746 | 1.920 | 4.256 | 6.720 | 9.279 |
| Leverage | 35,011 | 0.551 | 0.199 | 0.274 | 0.557 | 0.816 |
| Return on Assets | 35,054 | 0.023 | 0.111 | -0.072 | 0.039 | 0.115 |
| Z-score | 31,565 | 3.754 | 3.292 | 1.205 | 2.883 | 6.872 |
| Tang. Net Worth | 35,011 | 0.257 | 0.296 | -0.143 | 0.274 | 0.635 |
| EBITDA Coverage | 32,676 | 2.857 | 13.223 | 0.104 | 0.436 | 2.468 |
| Dividends | 34,873 | 0.011 | 0.022 | 0.000 | 0.000 | 0.031 |
| Book-to-Market | 33,009 | 0.964 | 0.537 | 0.379 | 0.876 | 1.619 |
| **Dependent Variables** | | | | | | |
| $\triangle$log(Debt) | 25,838 | 9.902 | 69.774 | -39.977 | 0.028 | 73.945 |
| $\triangle$Leverage Ratio | 27,942 | 11.004 | 42.181 | -14.111 | 0.000 | 40.675 |
| New Loan | 37,187 | 0.498 | 0.500 | 0.000 | 0.000 | 1.000 |
| $\triangle$Capex | 27,782 | 0.735 | 4.706 | -2.684 | 0.196 | 4.388 |
| $\triangle$Investment | 27,782 | 1.903 | 16.682 | -10.688 | 0.197 | 13.977 |
| Overinvestment ($OI$) | 25,442 | 3.977 | 11.179 | 0.000 | 0.000 | 10.748 |
| $\triangle$Productivity | 26,501 | 1.379 | 18.688 | -17.192 | 1.557 | 19.884 |

is associated with banks targeting a higher wholesale funding level, which should induce them to increase lending in general and business lending in particular. We employ the following specification to test these predictions:

$$y_{b,t+1} = \alpha_t + \alpha_b + \beta_1 GG_{b,t} + \delta X_{b,t} + \epsilon_{b,t}, \tag{39}$$

where we employ as outcome variable $y_{b,t+1}$ either the change in the logarithm of bank $b$'s wholesale funding (i.e., $\Delta Log(WF)_{b,t+1}$), its total lending (i.e., $\Delta Log(TL)_{b,t+1}$), or its lending to commercial and industrial business enterprises (i.e., $\Delta Log(CI)_{b,t+1}$).[16] To further test the robustness of these results, we employ dummy variables indicating whether the increase in the volume of bank $b$'s wholesale funding, total lending, and business lending, respectively, is higher than the respective median change across all banks in year $t$ as dependent variables. Accordingly, our coefficient of interest is $\beta_1$, which captures the effect of $GG$ on the banks' funding policy and lending behavior.

The vector $X_{b,t}$ includes the following set of one-period lagged bank-level control variables: size, leverage, return on assets, liquidity, dividends, and non-performing loans. Table 1 provides the detailed variable definitions. Finally, we include time and bank fixed effects to absorb time-invariant bank characteristics and common shocks.[17]

Table 4 shows the regression results for this analysis. In line with our model predictions, we find that a higher bailout guarantee coverage (i.e., $GG = 1$) is associated with banks taking on more wholesale funding. Specifically, a $GG$ equal to one implies a 6.2pp higher wholesale funding level (Column 1), which represents 32.2% of the average within-bank SD of the wholesale funding growth. Similarly, banks with $GG$ equal to one are 16.6% more likely to experience an above-median growth in their wholesale funding (Column 2).

We also find evidence consistent with the guarantee-induced higher wholesale funding level leading to more lending activity, both for banks' total lending as well as their lending to businesses: a $GG$ equal to one is associated with a 2.3pp higher growth in total lending (Column 3) and 3.1pp higher growth in lending to business enterprises (Column 5). These changes represent 27.2% and 27.4% of the average within-bank SD of total lending growth and loan growth to business enterprises, respectively. Columns (4) and (6) show that a bank with higher bailout guarantee coverage is 11.7% and 13.8%

[16] We measure a bank's wholesale funding as its assets minus its equity and deposits.

[17] We cluster standard errors at the treatment-level (i.e., at the state-level) in all regression specifications. Our results are also robust to clustering at the bank-level.

more likely to experience an above-median growth in its total lending and its lending to business enterprises, respectively.

**Table 4:** Bank-Level Analysis: Wholesale Funding and Lending Behavior

| | Wholesale Funding | | Total Lending | | Business Lending | |
|---|---|---|---|---|---|---|
| | △log | >p50% (1/0) | △log | >p50% (1/0) | △log | >p50% (1/0) |
| *GG* | 6.174** | 0.166** | 2.246*** | 0.117** | 3.120* | 0.138* |
| | (0.016) | (0.023) | (0.008) | (0.032) | (0.064) | (0.072) |
| *N* | 612 | 612 | 612 | 612 | 612 | 612 |
| $R^2$ | 0.353 | 0.161 | 0.477 | 0.274 | 0.527 | 0.260 |
| Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | | | | | | |
| Bank | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |

This table presents estimation results from Specification (39). The dependent variables are the change in wholesale funding (total assets minus total equity and deposits; Columns 1-2), total lending (all loans and leases extended by the bank; Columns 3-4), and lending to business enterprises (Columns 5-6), respectively. In Columns (1), (3), and (5), the dependent variable is the respective log volume changes, while in Columns (2), (4), and (6), it is a dummy variable equal to one when the change in the respective variable is higher than the respective median change for all banks in year $t$, and zero otherwise. The variable *GG* is a dummy variable equal to one when the bank's headquarter state is represented in BHUA Senate committee in year $t$. The regressions include the following set of one-period lagged bank-level control variables: size, leverage, return on assets, liquidity, dividends, and non-performing loans. Table 1 provides the detailed variable definitions. Standard errors are clustered at the state-level. p-values are reported in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

**Bank-firm level analysis.** Given the bank-level evidence that a higher bailout guarantee coverage incentivizes banks to increase their wholesale funding and to lend more, we next exploit the granularity of our syndicated loan data to verify that protected banks expand their corporate lending while controlling for demand factors. Moreover, we employ these data to study the effect of a change in the extent of their bailout guarantees on banks' loan pricing.

To this end, we study the changes in lending behavior at the bank-firm level in response to changes in our bailout guarantee coverage proxy ($\triangle GG$), using the following specification:

$$y_{b,f,t+1} = \alpha_b + Firm_f \times \alpha_t + \beta_1 \triangle GG_{b,t} + \delta X_{b,t} + \epsilon_{b,f,t}. \quad (40)$$

We employ four different dependent variables for this analysis. First, the change in the logarithm of bank $b$'s lending volume to firm $f$ from year $t$ to year $t+1$ (i.e., $\Delta Log(SL)_{b,i,t+1}$). Second, the change in the logarithm of the average all-in loan spreads

of bank $b$'s loans to firm $f$ from year $t$ to year $t+1$ (i.e., $\Delta Log(SP)_{b,i,t+1}$). Moreover, as alternative dependent variables, we again employ two dummy variables (for the loan volume and the loan spreads, respectively) equal to one if the respective change is higher than the median change across all bank-firm pairs in year $t$, and zero otherwise. The coefficient of interest in Specification (40) is $\beta_1$, capturing the effect of a change in $GG$ on the banks' lending behavior.

In our most stringent specification, we include bank and firm-year fixed effects, absorbing time-invariant bank characteristics and firm-specific shocks, most importantly, demand shocks. Employing firm-year fixed effects allows us to compare the changes in bank lending to a particular firm between banks that differ in treatment intensity, holding constant the time-varying loan demand at the firm-level (see Khwaja and Mian, 2008). Thereby, these fixed effects also allow us to rule out that our estimates are biased by state-level shocks (affecting firm borrowing behavior) induced by changes in the U.S. Congress committee composition (or factors that lead to changes in the composition), but that are unrelated to changes in banks' bailout likelihood.

However, employing firm-time fixed effects limits the variation that can be used for the estimation (see Degryse et al., 2019). Therefore, we also conduct the analysis using less stringent fixed effects settings, with industry-year and state-year fixed effects, as well as industry-state-year fixed effects.[18] Importantly, the latter two fixed effects still allow us to absorb state-level shocks.

Finally, we again include the following set of one-period lagged bank-level control variables: size, leverage, return on assets, liquidity, dividends, non-performing loans, and the bank's exposure to the respective firm's sector. In addition, for the specifications without firm-year fixed effects, we control for borrower quality by including the following borrower characteristics: size, leverage, Altman's Z-score, return on assets, tangible net worth, EBITDA coverage ratio, and dividends. Table 1 provides the detailed variable definitions for the bank-level variables, while Table 2 provides the definitions for the borrower-level variables.

Panel A of Table 5 present the results for the analysis related to the analysis of banks' loan volume. As predicted by our model, for both loan volume dependent variables, the estimates show that banks that experience an increase in their bailout guarantee coverage, raise their lending more relative to banks that did not experience a change in the bailout

[18]For the industry classification, we employ the Fama-French 48 industry classification.

likelihood. Interestingly, the estimated coefficients are very stable across the different fixed effects specifications.

Based on the coefficients in our most stringent specification (Columns 5 and 6), the estimates suggest that gaining (losing) bailout guarantee coverage is associated with a 2.1pp higher (lower) loan volume growth and a 1.8% higher (lower) likelihood for an above median lending volume growth. The effect equals 8.0% of the average within-bank SD of the loan volume growth.

Panel B of Table 5 displays the findings from the analysis focused on the banks' loan pricing. Although the coefficients are less stable across the different specifications in comparison to the loan volume analysis, the evidence clearly suggests a non-negative correlation (for some specifications even a significantly positive correlation) between an increase in a bank's bailout guarantee coverage and the loan spreads offered to its borrowers. This result is consistent with banks shifting towards inducing their borrowers to implement inefficient projects involving a higher risk level in response to an extended bailout guarantee coverage.

## 5.3 Real Effects

Given the evidence that a higher bailout guarantee coverage for banks affects their corporate lending, we next investigate the indirect knock-on effects of bailout guarantees on the financial and real outcomes of the banks' borrowers.

Specifically, our model predicts that firms linked to banks with expanded bailout guarantee coverage will see increased borrowing and leverage, amplify their investment activities leading to overinvestment, and experience reduced firm productivity due to this overinvestment and potential investments in less efficient projects.

**Debt funding.** We start our firm-level analysis by studying the impact on firms' debt financing, for which we employ the following specification:

$$y_{f,t+1} = \alpha_f + Industry_i \times State_s \times \alpha_t + \beta_1 Indirect\ GG_{f,t} + \delta X_{f,t} + \epsilon_{f,t}, \qquad (41)$$

where $y_{f,t+1}$ is the log change in firm $f$'s total debt (i.e., $\triangle log(Debt)_{f,t+1}$). Our coefficient of interest is $\beta_1$, which quantifies the average impact of a one SD increase in *Indirect GG* on the respective firm outcome. The metric *Indirect GG* captures the degree to which

**Table 5:** Bank-Firm Level Analysis: Corporate Lending

| Panel A: Loan Volume | △log | >p50% (1/0) | △log | >p50% (1/0) | △log | >p50% (1/0) |
|---|---|---|---|---|---|---|
| $\triangle GG$ | 2.077* | 0.025*** | 2.257*** | 0.026*** | 2.062** | 0.018** |
| | (0.065) | (0.000) | (0.008) | (0.000) | (0.029) | (0.017) |
| $N$ | 24,701 | 24,701 | 20,088 | 20,088 | 8,231 | 8,231 |
| $R^2$ | 0.088 | 0.120 | 0.270 | 0.299 | 0.488 | 0.507 |
| **Panel B: Loan Pricing** | **△log** | **>p50% (1/0)** | **△log** | **>p50% (1/0)** | **△log** | **>p50% (1/0)** |
| $\triangle GG$ | 0.273** | 0.011** | 0.124 | 0.007 | 0.584** | 0.016 |
| | (0.047) | (0.012) | (0.300) | (0.113) | (0.042) | (0.176) |
| $N$ | 23,586 | 23,586 | 18,974 | 18,974 | 7,368 | 7,368 |
| $R^2$ | 0.118 | 0.116 | 0.301 | 0.299 | 0.548 | 0.537 |
| Controls | | | | | | |
| Bank-level controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Firm-level controls | ✓ | ✓ | ✓ | ✓ | | |
| Fixed Effects | | | | | | |
| Bank | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Industry-Year | ✓ | ✓ | | | | |
| State-Year | ✓ | ✓ | | | | |
| Industry-State-Year | | | ✓ | ✓ | | |
| Firm-Year | | | | | ✓ | ✓ |

This table presents estimation results from Specification (40) for 1996-2016. The dependent variables are the change in the syndicated loan volume in Panel A and the change in the average all-in loan spreads in Panel B. In Columns (1), (3), and (5), the dependent variable is the log change, while in Columns (2), (4) and (6), it is a dummy variable equal to one when the change in the respective variable is higher than the respective median change for all banks in year $t$, and zero otherwise. The variable $GG$ is a dummy variable equal to one when the bank's headquarter state is represented in BHUA Senate committee in year $t$. $\triangle GG$ can take the values $\{-1, 0, 1\}$: 0 when there was no change in $GG_{b,t}$ in year $t$, 1 if $GG_{b,t}$ changed from zero to one, and $-1$ if $GG_{b,t}$ changed from one to zero. The regressions include the following set of one-period lagged bank-level control variables: size, leverage, return on assets, liquidity, dividends, non-performing loans, and the bank's exposure to the respective firm's sector. In Columns (1-4), the regressions additionally include the following set of one-period lagged firm-level control variables: size, leverage, Altman's Z-score, return on assets, tangible net worth, EBITDA coverage ratio, and dividends. Tables 1 and 2 provide the detailed variable definitions. Standard errors are clustered at the state-level. p-values are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

the banks connected to firm $f$ benefit from an increased bailout guarantee coverage (see Eq. 38). The vector $X_{f,t}$ includes the following one-period lagged firm control variables: size, leverage, Altman's Z-score, return on assets, tangible net worth, EBITDA coverage ratio, and dividends.

**Table 6:** Firm-Level Analysis: Debt Funding

| Panel A: Borrowing Volume | △log of Total Debt | | | | |
|---|---|---|---|---|---|
| *Indirect GG* | 1.728** | 1.709** | 1.895** | 1.864** | 1.791* |
| | (0.018) | (0.022) | (0.013) | (0.016) | (0.093) |
| $N$ | 22,629 | 22,601 | 22,536 | 22,507 | 16,613 |
| $R^2$ | 0.318 | 0.348 | 0.345 | 0.374 | 0.531 |
| Panel B: Leverage | △Leverage Ratio | | | | |
| *Indirect GG* | 0.888** | 0.874** | 0.934** | 0.952** | 1.108** |
| | (0.018) | (0.025) | (0.018) | (0.020) | (0.037) |
| $N$ | 23,084 | 23,056 | 22,990 | 22,961 | 17,044 |
| $R^2$ | 0.341 | 0.373 | 0.369 | 0.400 | 0.554 |
| Firm Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | | | | | |
| Firm | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year | ✓ | | | | |
| Industry-Year | | ✓ | | ✓ | |
| State-Year | | | ✓ | ✓ | |
| Industry-State-Year | | | | | ✓ |

This table presents estimation results from Specification (41) for 1996-2016. The dependent variable in Panel A is the change in the firms' log of total debt, and in Panel B it is the change in the firms' leverage. The variable *Indirect GG* is firm $f$'s weighted sum of lenders' *GG*, which is a dummy equal to one for lenders whose headquarter state is represented in BHUA Senate committee. The regressions include the following set of one-period lagged firm-level control variables: size, leverage, Altman's Z-score, return on assets, tangible net worth, EBITDA coverage ratio, and dividends. Table 2 provides the detailed variable definitions. Standard errors are clustered at the firm-level. p-values are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally, we employ different fixed effects settings for this analysis. In our most stringent specification, we include firm fixed effects and industry-state-year fixed effects. The firm fixed effects absorb time-invariant firm characteristics and the interaction between industry, state, and year fixed effects control for economic conditions in a specific sector-state pair. Crucially, these fixed effects interactions ensure that our estimates are not biased by any state-level factors (e.g., state-level elections) that concurrently lead to changes in the U.S. Congress committee composition and impact corporate conduct through channels other than alterations in the probability of bank bailouts.

Panel A of Table 6 presents the results for this analysis, showing that being connected to banks that experience an extension of their bailout coverage leads firms to increase their borrowing. Based on the estimates in our most stringent specification (Column 5), a one SD higher *Indirect GG* is associated with a 1.8pp higher growth in debt-based funding, which represents 3.2% of the average within-firm SD of the debt growth.

Our model predicts that banks expand their loan volumes in response to enhanced bailout guarantee coverage, crowding out other funding sources for borrowers. As a result, we expect to see that a higher *Indirect GG* value is solely associated with higher debt levels, without a proportional increase in equity finance, leading to a rise in the firms' leverage. If, instead, the leverage ratio remains constant, it indicates that firms are merely expanding their balance sheets without altering their financing mix.

To validate our model prediction, we thus next examine the impact on the change in firms' leverage ratio, defined as their total debt over total assets (i.e., $\triangle Leverage\ Ratio_{f,t+1}$). Panel B of Table 6 presents the corresponding results, showing that a one SD higher *Indirect GG* implies a 1.1 higher firm leverage (Column 5), which represents 3.5% of the average within-firm SD.

In line with this evidence, the results in Table 7 show that a one SD higher *Indirect GG* is associated with a 5.9% (i.e., $exp(0.057) - 1$) increase in the odds of getting a loan in the following five years (Column 1). We find similar results using a linear probability model with high-dimensional fixed effects (Columns 2-6).

**Total investment activity and CAPEX.** Next, we analyze if the liquidity obtained through additional borrowing from banks benefiting from a higher bailout probability is indeed leading to a higher investment level. To this end, again employing Specification 41, we test if firms that are linked to banks that experience an expansion of their bailout guarantee coverage tend to increase their general total investment activity (i.e., $\triangle Investment_{f,t+1}$) and their capital expenditures in tangible assets in particular (i.e., $\triangle CAPEX_{f,t+1}$) relative more compared to firms that are not linked to such banks. We measure firm $f$'s total investment as its capital expenditures plus R&D expenses and acquisitions, minus its sales of PP&E, depreciations and amortizations:

$$I_{f,t} = Capex_{f,t} + R\&D_{f,t} + Acquisitions_{f,t} - Sales\ of\ PP\&E_{f,t} - Dep\&Am_{f,t}. \quad (42)$$

Table 8 presents the results for this analysis. Based on the estimates of our most stringent specification in Column (5), firms with a one SD higher *Indirect GG* have a 0.43 higher

**Table 7:** Firm-Level Analysis: New Loans

| | Logit(1/0) | LPM(1/0) | | | | |
|---|---|---|---|---|---|---|
| *Indirect GG* | 0.057** | 0.009* | 0.009* | 0.008* | 0.009* | 0.014** |
| | (0.043) | (0.051) | (0.055) | (0.084) | (0.055) | (0.023) |
| $N$ | 23,178 | 28,699 | 28,677 | 28,615 | 28,593 | 22,060 |
| $R^2$ | - | 0.561 | 0.579 | 0.581 | 0.598 | 0.698 |
| p. $R^2$ | 0.391 | - | - | - | - | - |
| Firm Controls | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | | | | | | |
| Firm | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year | ✓ | ✓ | | | | |
| Industry-Year | | | ✓ | | ✓ | |
| State-Year | | | | ✓ | ✓ | |
| Industry-State-Year | | | | | | ✓ |

This table presents estimation results from Specification (41) for 1996-2016. The dependent variable is a dummy variable equal to one if the firm gets at least one new loan in the following five years. Column (1) shows the results of a logit model, while Columns (2-6) present the results of a linear probability model. The variable *Indirect GG* is firm $f$'s weighted sum of lenders' *GG*, which is a dummy equal to one for lenders whose headquarter state is represented in BHUA Senate committee. The regressions include the following set of one-period lagged firm-level control variables: size, leverage, Altman's Z-score, return on assets, tangible net worth, EBITDA coverage ratio, and dividends. Table 2 provides the detailed variable definitions. Standard errors are clustered at the firm-level. p-values are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

investment over asset ratio (Panel A), which represents between 3.2% of the SD of the within-firm distribution. Similarly, a one SD higher *Indirect GG* is associated with a 0.15 higher capital expenditures ratio (Panel B), which represents 4.2% of the SD of the within-firm distribution.

**Overinvestment.** A related prediction of our model is that having lending relationships with banks that experience an extension in their bailout guarantee coverage leads borrowers to overinvest and potentially to invest in inefficient high-risk projects.

We next formally test this prediction. To measure firm $f$'s extent of overinvestment, we follow Richardson (2006) and Anton and Lin (2020) and estimate the divergence between its actual and predicted investment levels. To this end, we first define new investment net of maintenance expenditures as follows:

$$I_{NEW,t} = \frac{I_{f,t}}{Total\ Assets_{f,t-1}}, \tag{43}$$

where $I_{f,t}$ follows the definition in Specification (42). $I_{NEW}$ can be thought as the compo-

**Table 8:** Firm-Level Analysis: Investment Activity

| Panel A | △Total Investments | | | | |
|---|---|---|---|---|---|
| *Indirect GG* | 0.319** | 0.306** | 0.361** | 0.333** | 0.435** |
| | (0.021) | (0.034) | (0.013) | (0.028) | (0.043) |
| $N$ | 22,942 | 22,915 | 22,846 | 22,818 | 16,929 |
| $R^2$ | 0.227 | 0.268 | 0.260 | 0.299 | 0.456 |
| Panel B | △CAPEX | | | | |
| *Indirect GG* | 0.097** | 0.086** | 0.103** | 0.104** | 0.149** |
| | (0.019) | (0.044) | (0.016) | (0.021) | (0.036) |
| $N$ | 22,942 | 22,915 | 22,846 | 22,818 | 16,929 |
| $R^2$ | 0.259 | 0.327 | 0.297 | 0.353 | 0.478 |
| Firm Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | | | | | |
| Firm | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year | ✓ | | | | |
| Industry-Year | | ✓ | | ✓ | |
| State-Year | | | ✓ | ✓ | |
| Industry-State-Year | | | | | ✓ |

This table presents estimation results from Specification (41) for 1996-2016. The dependent variables are the change in new investments (Panel A), defined as the sum of capital expenditures and R&D, plus acquisitions minus sales of PP&E and the change in capital expenditures (Panel B). The variable *Indirect GG* is firm $f$'s weighted sum of lenders' $GG$, which is a dummy equal to one for lenders whose headquarter state is represented in BHUA Senate committee. The regressions include the following set of one-period lagged firm-level control variables: size, leverage, Altman's Z-score, return on assets, tangible net worth, EBITDA coverage ratio, dividends, and book-to-market ratio. Table 2 provides the detailed variable definitions. Standard errors are clustered at the firm-level. p-values are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

**Table 9:** Firm-Level Analysis: Overinvestment

| | Overinvestment | | | | |
|---|---|---|---|---|---|
| *Indirect GG* | 0.192* | 0.218** | 0.232** | 0.241** | 0.372** |
| | (0.066) | (0.040) | (0.035) | (0.033) | (0.017) |
| *N* | 23,499 | 23,460 | 23,407 | 23,367 | 17,425 |
| $R^2$ | 0.300 | 0.334 | 0.331 | 0.364 | 0.509 |
| Firm Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | | | | | |
| Firm | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year | ✓ | | | | |
| Industry-Year | | ✓ | | ✓ | |
| State-Year | | | ✓ | ✓ | |
| Industry-State-Year | | | | | ✓ |

This table presents estimation results from Specification (47) for 1996-2016. The dependent variable is $OI$, equal to the difference between actual and predicted investment ($I^{\epsilon}_{new}$ defined in (46)) when this difference is positive, and zero otherwise. $OI$ is winsorized at 1%. The variable *Indirect GG* is firm $f$'s weighted sum of lenders' $GG$, which is a dummy equal to one for lenders whose headquarter state is represented in BHUA Senate committee. The regressions include the following set of one-period lagged firm-level control variables: sales growth, tangible net worth, fixed assets (PP&E scaled by assets), Altman's Z-score, operating cash flow over assets, dividends, and return on assets. Table 2 provides the detailed variable definitions. Standard errors are clustered at the firm-level. p-values are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

sition of firm's expected investment in new projects ($I^{*}_{NEW,t}$) and overinvestment ($I^{\epsilon}_{NEW,t}$):

$$I_{NEW,t} = I^{*}_{NEW,t} + I^{\epsilon}_{NEW,t}. \tag{44}$$

To decompose each factor, we first regress the actual investment expenditures ($I_{NEW}$) on a set of relevant predictors for expected investment:

$$I_{NEW,f,t+1} = \delta X_{f,t} + \alpha_t + Industry_i + State_s + \beta_1 I^{\epsilon}_{NEW,f,t}, \tag{45}$$

where the vector $X_{f,t}$ represents the following predictors of investment: firm size (logarithm of total assets), growth opportunities (book-to-market ratio), leverage, cash holdings, annual stock returns, and years since being public. We also include year, industry, and state fixed effects.

Our variable of interest at this stage is the residual, $I^{\epsilon}_{NEW,f,t}$, which captures the investment distortion measured as the difference between actual and predicted investment. Using this, we identify the magnitude of the investment distortion defining overinvestment

$(OI)$ equal to $I^{\epsilon}_{NEW,f,t}$ when this variable is positive, and zero otherwise:

$$OI_{f,t} = \begin{cases} I^{\epsilon}_{NEW,f,t}, & \text{if } I^{\epsilon}_{NEW,f,t} > 0 \\ 0, & \text{otherwise} \end{cases} \tag{46}$$

Where a higher $OI_{f,t}$ corresponds to a higher borrower overinvestment.[19]

Then, to test if indirect bailout expectations can induce borrowers to overinvest, we regress $OI$ on firm $f$'s *Indirect GG* and a set of additional control variables that could affect firm's investment level but are not included in the first stage regression:

$$OI_{f,t+1} = \beta_1 Indirect\ GG_{f,t} + \gamma W_{f,t} + \alpha_f + Industry_i \times \alpha_t + \epsilon_{f,t}, \tag{47}$$

where the vector $W_{f,t}$ includes predictors of investment not included in Specification (45): tangible net worth, sales growth, Altman's Z-score, operating cash flow over assets, fixed assets, dividends over assets, and return on assets. Our coefficient of interest is $\beta_1$, which captures the average effect of indirect $GG$ coverage on the firm's $f$ overinvestment.

Table 9 shows a positive effect of *Indirect GG* on firms' overinvestment across all fixed effects specifications. Specifically, the coefficient in Column (5) suggests that a one SD higher *Indirect GG* is associated with a 0.37 higher overinvestment, which represents 5.6% of the SD of the within-firm distribution.

**Productivity.** Finally, to provide complementary evidence consistent with borrowers overinvesting and investing into inefficient projects, we again employ Specification (41) and investigate whether *Indirect GG* is associated with a lower firm productivity (i.e., $\triangle Productivity_{f,t+1}$).

Following the literature (e.g., Caballero et al., 2008), we measure productivity based on a borrower's sales as well as employed headcount and physical capital as follows:

$$Productivity_{f,t} = log(Sales_{f,t}) - \frac{2}{3} * log(Employees_{f,t}) - \frac{1}{3} * log(PP\&E_{f,t}). \tag{48}$$

Table 10 shows that, based on the estimates in Column (5), firms with a one SD higher *Indirect GG* show a 0.7pp lower productivity, which represents 4.2% of the SD of the within-firm distribution.

[19] We winsorize $I^{\epsilon}_{NEW,f,t}$ at 1%. Our results are robust to winsorizing at the 5%, as in Anton and Lin (2020).

**Table 10:** Firm-Level Analysis: Productivity

| | △Productivity | | | | |
|---|---|---|---|---|---|
| *Indirect GG* | -0.301* | -0.363** | -0.351* | -0.380** | -0.699** |
| | (0.077) | (0.036) | (0.051) | (0.039) | (0.011) |
| *N* | 22,287 | 22,258 | 22,188 | 22,158 | 16,283 |
| $R^2$ | 0.207 | 0.284 | 0.247 | 0.313 | 0.472 |
| Firm Controls | ✓ | ✓ | ✓ | ✓ | ✓ |
| Fixed Effects | | | | | |
| Firm | ✓ | ✓ | ✓ | ✓ | ✓ |
| Year | ✓ | | | | |
| Industry-Year | | ✓ | | ✓ | |
| State-Year | | | ✓ | ✓ | |
| Industry-State-Year | | | | | ✓ |

This table presents estimation results from Specification (41) for 1996-2016. The dependent variable is the change in *Productivity* (see Eq. 48). The variable *Indirect GG* is firm $f$'s weighted sum of lenders' *GG*, which is a dummy equal to one for lenders whose headquarter state is represented in BHUA Senate committee. The regressions include the following set of one-period lagged firm-level control variables: size, leverage, Altman's Z-score, return on assets, tangible net worth, EBITDA coverage ratio, dividends, and book-to-market ratio. Table 2 provides the detailed variable definitions. Standard errors are clustered at the firm-level. p-values are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

# 6 Conclusion

The 2023 U.S. banking crisis again sparked a debate about the general desirability of implicit and explicit government guarantees for banks. Proponents of government guarantees claim that rescue measures are justified to avoid the systemic threat posed by bank failures. Critics, however, argue that government guarantees undermine market discipline and are a source of moral hazard. Our paper adds to this debate by highlighting that the moral hazard problems caused by government guarantees not only negatively affect the banks' credit allocation at the extensive margin (i.e., riskier and worse firms are financed) but that these guarantees also distort banks' loan contracting with negative real effects for borrowers at the intensive margin.

In particular, our corporate finance-style model shows that banks can exploit their government guarantees strategically by just intermediating funds between investors and ultimate borrowers. Because government guarantees substantially lower the banks' funding costs, banks can earn the spread between their reduced funding rate and the competitive market rate on each unit of intermediated funds. This mechanism gives banks an incentive to crowd out direct market finance. It also has real effects on the banks' borrow-

ers; that is, it gives banks an incentive to induce their borrowers to leverage excessively, to overinvest, and potentially to conduct inefficient high-risk projects.

We empirically validate our model predictions, leveraging exogenous shifts in U.S. banks' political affiliations to introduce variation in bailout expectations. At the bank-level, our findings indicate a positive correlation between higher bailout probabilities and an increase in both banks' wholesale debt financing and lending activities. Controlling for loan demand, we reaffirm this influence on bank lending at the bank-firm level, also uncovering loan pricing patterns that suggest a shift toward borrower real investments with heightened risk profiles. Our firm-level analysis reveals that firms connected to banks experiencing an extension in their bailout likelihood exhibit an increase in leverage and investment activity with signs of overinvestment and a decline in productivity.

Our findings carry significance for financial stability and policy, emphasizing the importance of limiting bailout guarantees by lowering bailout expectations. This becomes particularly pertinent given the current landscape of expanding government guarantees for banks: the recent bailouts of institutions such as Silicon Valley Bank and Credit Suisse and the ongoing deliberations in both the U.S. and Europe about potentially widening the scope of their respective deposit insurance schemes suggest that government guarantees for banks are now more extensive than ever before.

Policies to remedy the negative effects of government guarantees include the broad enforcement of internationally agreed capital and liquidity standards, the tightening of supervision both in micro- and macro-prudential terms, and further efforts to make resolution more effective.

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# Appendix A: Proofs

**Proof of Lemma 1.** After accepting the loan contract $\{B, b\}$, the firm chooses $i$ to maximize its profit:

$$\max_{i \geq b+e} p_H \left( f(i) - \frac{(i-b-e)R}{p_H} - R_b \right) - eR.$$

If $i \geq b+e$ is not binding, the FOC of the maximization problem is $p_H f'(i) = R$, implying $i = i^*$. The constraint $i \geq b+e$ is indeed non-binding if and only if $b \leq i^* - e$.

If $b > i^* - e$, the constraint $i \geq b+e$ must be binding, so the firm's investment is $b+e$, which is higher than $i^*$. Overall, the firm's investment level is $i = \max\{i^*, b+e\}$.

**Proof of Proposition 1.** We ignore the bank's PC, $\Pi^B(B, b, p_H) \geq 0$, for the moment and then check later, after solving the bank's maximization problem subject to the other constraints, whether this constraint holds. The bank's optimization problem (without the bank's PC) then reduces to

$$\max_{B, b \geq 0} p_H B - bc(p_H), \tag{49}$$

s.t.

$$\underbrace{p_H \left[ f(i) - \frac{(i-b-e)R}{p_H} - B \right]}_{I = \max\{I^*, q+E\}} - eR \geq p_H f(i^M) - i^M R. \tag{50}$$

Constraint (50) must be binding; otherwise, the bank can increase $B$ until the constraint is binding to raise its expected profit. Since $i = \max\{i^*, b+e\}$, we need to discuss two cases: $i = i^*$ and $i = b+e$. If $i = i^*$, Constraint (50) reduces to

$$\Delta N(i^*) = p_H B - bR,$$

which implies the following optimization problem for the bank:

$$\max_{b \geq 0} \Delta N(i^*) + b(R - c(p_H)). \tag{51}$$

Since $c(p_H) < R$ holds, maximizing Eq. (51) leads to $b \to +\infty$, which contradicts $i = i^* = \max\{i^*, b+e\}$. Therefore, $i = b+e$ must hold.

With $i = b + e$, Constraint (50), which must be binding, reduces to

$$p_H f(i) - eR - \left(p_H f(i^M) - i^M R\right) = p_H B. \tag{52}$$

Inserting Eq. (52) back to the bank's optimization problem (49) yields the following maximization problem:

$$\max_{b \geq 0, i = b+e} p_H f(i) - eR - \left(p_H f(i^M) - i^M R\right) - bc\left(p_H\right). \tag{53}$$

The first order condition (FOC) of optimization problem (53) is

$$p_H f'(b + e) = c\left(p_H\right). \tag{54}$$

Denoting the optimal contract as $\{B_H, b_H\}$, obviously $b = b_H$ is the solution of Eq. (54). $B_H$ is implied by Eq. (52) given that $b = b_H$. Because of $c\left(p_H\right) < R$, it must hold that $i_H \equiv b_H + e > i^*$ according to Eq. (54) and the definition of $i^*$. Therefore, we can verify that $i = b + e$ indeed holds. Inserting $b = b_H$ back into objective function (53) and simplifying it with the definition of $\Delta N\left(\cdot\right)$ yields the bank profit $\hat{\Pi}_H^B$. Obviously, $\hat{\Pi}_H^B > 0$ must hold because of the following inequality:

$$\hat{\Pi}_H^B > \Delta N\left(i^*\right) + \left(i^* - e\right)\left(R - c\left(p_H\right)\right) > 0.$$

Hence, the bank's PC $\Pi^B\left(B, b, p_H\right) \geq 0$ is satisfied by the contract $\{B_H, b_H\}$.

**Proof of Corollary 1.** The first result directly follows from Eq. (54) that determines $b_H$. Moreover, the loan amount $b_H$ and, in turn, $i_H - i^*$ as well as the firm's leverage $i_H/e$ are higher for a lower $c(p_H)$, which decreases with $\alpha$.

The bank's nominal lending rate $B_H/b_H$ is determined by the firm PC (52), which can be rewritten as:

$$p_H b_H \frac{B_H}{b_H} = p_H f(b_H + e) - eR - \left(p_H f(i^M) - i^M R\right). \tag{55}$$

For Eq. (55), taking the derivative with respect to $c(p_H)$ yields:

$$\begin{aligned} p_H b_H \frac{\partial (B_H/b_H)}{\partial c(p_H)} &= \left( p_H f'(b_H + e) - p_H \frac{B_H}{b_H} \right) \frac{\partial b_H}{\partial c(p_H)} \\ &= \underbrace{\frac{\partial b_H}{\partial c(p_H)}}_{<0} \left( c(p_H) - \frac{p_H B_H}{b_H} \right) \end{aligned}$$

According to Eq. (49) and the maximum bank profit $\hat{\Pi}_H^B$, we have

$$p_H B_H - b_H c(p_H) = \underbrace{\Delta N(b_H + e) + b_H (R - c(p_H)) > \Delta N(i^*)}_{\text{because the bank optimally chooses } b = b_H > i^* - e} \geq 0,$$

which implies $\partial (B_H/b_H) / \partial c(p_H) > 0$. As a result, $B_H/b_H$ increases with $c(p_H)$.

**Proof of Proposition 2.** If the firm implements the inefficient project, the bank's marginal funding costs equal $c(p_L)$, which is smaller than $R$. Based on Assumption 2, the firm does not have an incentive to borrow from investors when implementing the inefficient project because the marginal benefit of a unit of additional investment, $p_L \delta f'(i)$, is always lower than the market-based funding costs, $R$. As a result, $i = b + e$ must hold when the firm implements the inefficient project. Then, the bank's contracting problem (when the firm implements the inefficient project) is

$$\max_{B, b \geq 0} \Pi^B (B, b, p_L), \tag{56}$$

s.t.

$$p_L [\delta f(b + e) - B] \geq p_H f(i^M) - \left( i^M - e \right) R. \tag{57}$$

It is again straightforward to show that the firm's PC (57) must be binding in the optimum, so the maximization problem can be reduced to

$$\max_{b \geq 0} p_L \delta f(b + e) - p_H f(i^M) + \left( i^M - e \right) R - b c(p_L). \tag{58}$$

The first order condition is therefore

$$p_L \delta f'(b + e) = c(p_L). \tag{59}$$

Denoting the solution of Eq. (59) as $b_L$ and inserting $b = b_L$ back into the objective

function (58), we obtain for the bank's expected profit:

$$\Pi_L^B(b_L) = p_L\delta f(b_L+e) - p_H f(i^M) + \left(i^M - e\right)R - b_L c(p_L).$$

$\Pi_L^B(b_L) \geq 0$ holds if $|p_H - p_L\delta|$ is small and $c(p_L)$ is sufficiently lower than $R$, for which a necessary condition is $\alpha > 0$.

When $\Pi_L^B(b_L)$ is non-negative, the optimal loan repayment $B_L$ can be obtained using the binding Constraint (57), which is:

$$p_L\left(\delta f(b_L+e) - B_L\right) - eR = p_H f(i^M) - i^M(1+r).$$

Hence, the corresponding optimal contract is $\{B_L, b_L\}$; the firm's corresponding investment level is $i_L = b_L + e$.

**Proof of Proposition 3.** The bank prefers the inefficient project if and only if the firm's implementation of the inefficient project generates a higher expected profit for the bank than implementing the efficient project. According to Proposition 2, if the firm implements the inefficient project, the bank's maximum profit is $\Pi_L^B(b_L)$. We need to compare $\Pi_L^B(b_L)$ with the bank's profit when the firm implements the efficient project, which is $\hat{\Pi}_H^B$.

Since $b_L$ is the bank's optimal loan volume when the firm implements the inefficient project, we get the following inequality:

$$\Pi_L^B(b_L) \geq \underbrace{p_L\delta f(b_H+e) - p_H f(i^M) + \left(i^M - e\right)R - b_H c(p_L)}_{\Pi_L^B(b_H)}.$$

Therefore, a sufficient condition for $\Pi_L^B(b_L) > \hat{\Pi}_H^B$ to hold is $\Pi_L^B(b_H) > \hat{\Pi}_H^B$, which implies:

$$\left(p_L\delta - p_H\right) f(b_H+e) - \left(c(p_L) - c(p_H)\right) b_H > 0. \tag{60}$$

To show that there exist parameters to make Condition (60) hold, we can let $e = 0$ hold. When $e = 0$, Condition (60) reduces to

$$\left(p_L\delta - p_H\right)\frac{f(b_H)}{b_H} + c(p_H) - c(p_L) > 0. \tag{61}$$

Since $f(\cdot)$ is concave, we have $f(b_H)/b_H < f'(0)$. As a result, a sufficient condition for

Condition (61) to hold is

$$c\left(p_H\right) - c\left(p_L\right) > \left(p_H - p_L\delta\right) f'(0). \tag{62}$$

Condition (62) can hold if $|p_L\delta - p_H|$ and/or $f'(0)$ are small enough. Therefore, Condition (60) holds if $e$ is sufficiently small (i.e., close to 0) and Condition (62) holds; in this case, the bank prefers the inefficient project and hence waives monitoring. Since $i_H = b_H + e$ and $i_L = b_L + e$ are independent of $e$, a sufficiently $e$ implies that the bank's liabilities are sufficiently large.

Finally, we show that the firm will implement the inefficient project when the bank offers $\{B_L, b_L\}$. We prove the result by contradiction. If the firm has an incentive to implement the efficient project after taking $\{B_L, b_L\}$, we must have $f(i) > B_L$; otherwise, there is no residual project return for the firm after it pays $B_L$. Given that $f(i) > B_L$ holds, if the firm implements the efficient project after taking the contract $\{B_L, b_L\}$, the bank's expected profit $\Pi^B\left(B_L, b_L, p_H\right)$ must be higher than $\Pi_L^B\left(b_L\right)$ (which equals $\Pi^B\left(B_L, b_L, p_L\right)$) because the probability of receiving $B_L$ increases from $p_L$ to $p_H$. However, this implies that, from the bank's perspective, $\{B_L, b_L\}$ is strictly more profitable than $\{B_H, b_H\}$ when the efficient project is implemented, because

$$\Pi^B\left(B_L, b_L, p_H\right) > \Pi_L^B\left(b_L\right) > \hat{\Pi}_H^B$$

must hold when the bank prefers the implementation of the inefficient project. This contradicts the result that $\{B_H, b_H\}$ is the optimal contract and that $\hat{\Pi}_H^B$ is the maximum bank profit when the firm implements the efficient project. Therefore, the firm has no incentive to implement the efficient project if the bank voluntarily waives monitoring and offers $\{B_L, b_L\}$.

Note that $\Pi_L^B\left(b_L\right) > \hat{\Pi}_H^B$ implies $f(b_L + e) - \frac{c(p_L)}{p_L\delta} b_L > f(b_H + e) - \frac{c(p_H)}{p_H} b_H$. This inequality can hold only if $c\left(p_L\right)/p_L\delta < c\left(p_H\right)/p_H$, implying $b_L > b_H$. As a result, whenever $\Pi_L^B\left(b_L\right) > \hat{\Pi}_H^B$ holds, it holds that $b_L > b_H$ and $i_L > i_H$.

**Proof of Proposition 4.** To show the existence of $\hat{\alpha}$, we only need to show that if a certain $\alpha$ makes the bank prefer the inefficient project, then the bank still prefers the inefficient project for a higher $\alpha$. Specifically, we need to show that if $\Pi_L^B\left(b_L\right) > \hat{\Pi}_H^B$

holds for a given $\alpha$, then the inequality still holds when $\alpha$ increases. We can show that

$$\frac{\partial \Pi_L^B(b_L)}{\partial \alpha} = -\frac{\partial c(p_L)}{\partial \alpha} b_L + \underbrace{\frac{\partial \left(p_L \delta f(b_L + e) - b_L c(p_L)\right)}{\partial b_L} \frac{\partial b_L}{\partial \alpha}}_{=0 \text{ by Envelope Theorem}},$$

$$\frac{\partial \hat{\Pi}_H^B}{\partial \alpha} = -\frac{\partial c(p_H)}{\partial \alpha} b_H + \underbrace{\frac{\partial \left(p_H f(b_H + e) - b_H c(p_H)\right)}{\partial b_H} \frac{\partial b_H}{\partial \alpha}}_{=0 \text{ by Envelope Theorem}}.$$

When $\Pi_L^B(b_L) > \hat{\Pi}_H^B$, we have shown that $b_L > b_H$ holds. Meanwhile,

$$\underbrace{-\frac{\partial c(p_H)}{\partial \alpha}}_{>0} - \underbrace{\left(-\frac{\partial c(p_H)}{\partial \alpha}\right)}_{>0} = \frac{R(p_H - p_L)(p_H p_L - (1-p_H)(1-p_L)\alpha^2)}{(p_H + \alpha - p_H\alpha)^2 (p_L + \alpha - p_L\alpha)^2} > 0$$

because we have assumed $P > (1-P)\alpha$ for $P \in \{p_H, p_L\}$. As a result, when $\Pi_L^B(b_L) > \hat{\Pi}_H^B$ holds, it must hold that

$$\frac{\partial \Pi_L^B(b_L)}{\partial \alpha} > \frac{\partial \hat{\Pi}_H^B}{\partial \alpha} > 0,$$

so $\Pi_L^B(b_L)$ increases faster than $\partial \hat{\Pi}_H^B$ as $\alpha$ increases. Therefore, if $\alpha$ makes the bank prefer the inefficient project, then the bank still prefers the inefficient project as $\alpha$ increases.

**Proof of Corollary 2.** Since $p_L \delta f'(b_L + e) = c(p_L)$, it is obvious that $i_L$ and $i_L/e$ are negatively associated with $c(p_L)$ (i.e., increase with $\alpha$). In the case with inefficient project implementation, the bank's nominal lending rate $B_L/b_L$ is determined by firm PC (57), which can be written as:

$$p_L b_L \frac{B_L}{b_L} = p_L \delta f(b_L + e) - eR - \left(p_H f(i^M) - i^M R\right). \tag{63}$$

For Eq. (63), taking the derivative with respect to $c(p_L)$ (without changing $R$) yields:

$$\begin{aligned} p_L b_L \frac{\partial (B_L/b_L)}{\partial c(p_L)} &= \left(p_L \delta f'(b_L + e) - p_L \frac{B_L}{b_L}\right) \frac{\partial b_L}{\partial c(p_L)} \\ &= \underbrace{\frac{\partial b_L}{\partial c(p_L)}}_{<0} \left(c(p_L) - p_L \frac{B_L}{b_L}\right) \end{aligned}$$

If the bank waives monitoring and induces the firm to implement the inefficient project,

it must hold that

$$p_L B_L - b_L c\left(p_L\right) > \hat{\Pi}_H^B > 0$$

which implies $\partial\left(B_L/b_L\right)/\partial c\left(p_L\right) > 0$. As a result, $B_L/b_L$ increases with $c\left(p_H\right)$.

**Proof of Lemma 2.** In the fully solvent case, the bank's expected profit equals:

$$\begin{aligned}\Pi_{full} &= \left(\begin{array}{c} p\left(w\overline{p}_H B^{\uparrow} + (1-w)\,\overline{p}_L B^{\downarrow} - \left(b_w - e_b\right)R\right) \\ +(1-p)\left(w\underline{p}_H B^{\uparrow} - \left(b_w - e_b\right)R\right) - e_b R \end{array}\right) \\ &= w p_H B^{\uparrow} + (1-w)\,p_L B^{\downarrow} - \left(b_w - e_b\right)R - e_b R.\end{aligned}$$

Since $\Pi_{full}$ is linear in $w$, we have

$$\frac{\partial \Pi_{full}}{\partial w} = p_H B^{\uparrow} - p_L B^{\downarrow} - \left(b^{\uparrow} - b^{\downarrow}\right)R,$$

which implies $w \in (0,1)$ is never strictly optimal for the bank. We thus only need to compare $w = 1$ with $w = 0$. If an inefficient project contract $\{B^{\downarrow}, b^{\downarrow}\}$ can satisfy the firms' PC, the efficient project contract $\{B^{\uparrow}, b^{\uparrow}\}$ with $b^{\uparrow} = q^{\downarrow}$ and $B^{\uparrow} = p_L B^{\downarrow}/p_H + \mu$ (where $\mu$ is a sufficiently small positive value) must also satisfy the firms' PC because

$$\underbrace{p_H\left(f\left(i\right) - \frac{R\left(i - b^{\uparrow} - e\right)}{p_H} - B^{\uparrow}\right)}_{i=\max\left\{b^{\uparrow}+e,\, i^*\right\}} \geq p_H\left(f\left(b^{\uparrow}+e\right) - \left(\frac{p_L B^{\downarrow}}{p_H} + \mu\right)\right) \text{ and}$$

$$p_H\left(f\left(b^{\uparrow}+e\right) - \left(p_L B^{\downarrow}/p_H + \mu\right)\right) > p_L\left(\delta f\left(b^{\downarrow}+e\right) - B^{\downarrow}\right),$$

where the second inequality holds because $p_H > p_L\delta$ and $\mu$ is a sufficiently small positive value. With this efficient project contract $\{B^{\uparrow}, b^{\uparrow}\}$, we have

$$\frac{\partial \Pi_{full}}{\partial w} = p_H \mu > 0,$$

which implies $w = 1$ is strictly optimal for the bank in the fully solvent case.

**Proof of Proposition 5 and Corollary 3.** With $w = 1$, the bank's contracting problem in the fully solvent case is as follows:

$$\max_{B^{\uparrow}, b^{\uparrow} \geq 0} p_H B^{\uparrow} - \left(b^{\uparrow} - e_b\right)R - e_b R$$

$$s.t.$$

$$\underbrace{p_H\left(f\left(i\right)-\frac{R\left(i-b^{\uparrow}-e\right)}{p_H}-B^{\uparrow}\right)}_{i=\max\left\{b^{\uparrow}+e,i^*\right\}}-eR\geq p_Hf\left(i^M\right)-i^MR.$$

Following the proof of Proposition 1, we can show that the bank's profit is $\Delta N\left(i\right)$ for the investment level $i$. Since $\Delta N\left(i\right)$ is maximized when $i=i^*$, the bank's optimal loan volume to a firm, denoted by $b_{full}$, satisfies $b_{full}\in[0,i^*-e]$. $B_{full}$ solves a firm's PC:

$$p_H\left(f\left(i^*\right)-\frac{R\left(i^*-b_{full}-e\right)}{p_H}-B_{full}\right)-eR=p_Hf\left(i^M\right)-i^MR,$$

which yields

$$B_{full}=\frac{\Delta N\left(i^*\right)+b_{full}R}{p_H}.$$

In the fully solvent case, the bank can fully repay its debt in the bad state, which requires

$$\underline{p}_HB_{full}-\left(b_{full}-e_b\right)R\geq 0.$$

When $b_{full}=0$, the inequality above always holds.

**Proof of Proposition 6.** When the bank lends and monitors all firms in the partially solvent case, the contracting problem is given by:

$$\max_{B^{\uparrow},b^{\uparrow}\geq 0}\ p\left[\overline{p}_HB^{\uparrow}-\left(b^{\uparrow}-e_b\right)R\right]-e_bR. \tag{64}$$

$$s.t.$$

$$\underbrace{p_H\left(f\left(i\right)-\frac{R\left(i-b^{\uparrow}-e\right)}{p_H}-B^{\uparrow}\right)}_{i=\max\left\{b^{\uparrow}+e,i^*\right\}}-eR\geq p_Hf\left(i^M\right)-i^MR, \tag{65}$$

Since Eq. (64) increases with $B^{\uparrow}$, the firms' PC (65) must be binding. Therefore, we get two possible cases for the firms' PC (65): the case in which $i=i^*$, and the case in which $i=b^{\uparrow}+e$.

If $i=i^*$ holds, the firms' PC can be simplified to

$$p_HB^{\uparrow}=\Delta N\left(i^*\right)+b^{\uparrow}R. \tag{66}$$

By inserting Eq. (66) into Eq. (64), the objective function can be simplified to

$$\max_{B^{\uparrow},b^{\uparrow}\geq 0}\left(\begin{array}{c}\frac{p\overline{p}_H}{p_H}\Delta N\left(i^*\right)+pb^{\uparrow}\left(\frac{\overline{p}_H}{p_H}-1\right)R\\-\left(1-p\right)e_bR\end{array}\right). \tag{67}$$

Note that objective function (67) increases with $b^{\uparrow}$, so the optimal $b^{\uparrow}$ does not exist if $i=i^*$ holds. Therefore, we must have $i=b^{\uparrow}+e$.

With $i=b^{\uparrow}+e$, the firms' PC becomes

$$p_HB^{\uparrow}=p_Hf\left(b^{\uparrow}+e\right)-eR-\left(p_Hf\left(i^M\right)-i^MR\right). \tag{68}$$

Inserting Eq. (68) into Eq. (64) yields the following simplified objective function:

$$\max_{b^{\uparrow}\geq 0}\left(\begin{array}{c}p\overline{p}_Hf\left(b^{\uparrow}+e\right)-pRb^{\uparrow}-\frac{p\overline{p}_H}{p_H}\left(p_Hf\left(i^M\right)-i^MR\right)\\-\frac{p\overline{p}_H}{p_H}eR-\left(1-p\right)e_bR\end{array}\right). \tag{69}$$

The FOC of Eq. (69) with respect to $b^{\uparrow}$ is given by

$$p\overline{p}_Hf'\left(b^{\uparrow}+e\right)=pR=c_p. \tag{70}$$

The optimal loan contract $\{B_H^{part},b_H^{part}\}$ thus follows from jointly solving the firms' PC (68) and Eq. (70). Note that Eq. (70) implies $p_Hf'\left(b_H^{part}+e\right)<R$, so $b_H^{part}+e$ is higher than $i^*$. Inserting $\{B_H^{part},b_H^{part}\}$ back into the objective function yields $\hat{\Pi}_H^{part}$. The loan contract $\{B_H^{part},b_H^{part}\}$ sustains the partially solvent case if and only if the bank is insolvent in the bad states, which implies:

$$\underline{p}_HB_H^{part}<\left(b_H^{part}-e_b\right)R.$$

**Proof of Proposition 7.** The bank's net profit in the fully solvent case is $\hat{\Pi}_{full}=\Delta N\left(i^*\right)$. To show that the bank may prefer being partially solvent, we only need to show that the bank's profit in the partially solvent case can be equal to or greater than $\hat{\Pi}_{full}$. Define function $\hat{\Pi}_H^{part}(\cdot)$ as follows:

$$\hat{\Pi}_H^{part}(x)\equiv\left(\begin{array}{c}p\overline{p}_Hf\left(x+e\right)-pRx-\frac{p\overline{p}_H}{p_H}\left(p_Hf\left(i^M\right)-i^MR\right)\\-\frac{p\overline{p}_H}{p_H}eR-\left(1-p\right)e_bR\end{array}\right).$$

Obviously, $\hat{\Pi}_H^{part}$ is equal to $\hat{\Pi}_H^{part}(b_H^{part})$. Since $b_H^{part}$ maximizes the value of $\hat{\Pi}_H^{part}(\cdot)$, we have the following inequality:

$$\hat{\Pi}_H^{part} = \hat{\Pi}_H^{part}(b_H^{part}) > \underbrace{\left( \begin{array}{c} \frac{p\overline{p}_H}{p_H} \Delta N\left(i^*\right) + p\left(\frac{\overline{p}_H}{p_H} - 1\right)\left(i^* - e\right) R \\ -\left(1-p\right) e_b R \end{array} \right)}_{\equiv \hat{\Pi}_H^{part}(i^* - e)}. \tag{71}$$

Ineq. (71) implies that

$$\hat{\Pi}_H^{part} - \hat{\Pi}_{full} > \left(\frac{p\overline{p}_H}{p_H} - 1\right) \Delta N\left(i^*\right) + p\left(\frac{\overline{p}_H}{p_H} - 1\right) R\left(i^* - e\right) - R\left(1-p\right) e_b. \tag{72}$$

If $e = e_b = 0$, the RHS of Ineq. (72) is positive (and hence the bank prefers being partially solvent and offers $\{B_H^{part}, b_H^{part}\}$) when the following inequality holds:

$$\left(\frac{p\overline{p}_H}{p_H} - 1\right) \Delta N\left(i^*\right) + \left(\frac{p\overline{p}_H}{p_H} R - pR\right) I^* > 0.$$

It is straightforward to show that

$$\hat{\Pi}_{full} - \hat{\Pi}_H^{part} = C + R\left(1-p\right) e_b,$$

where $C$ is the collection of terms that are independent of $e_b$. Therefore, $\hat{\Pi}_{full} - \hat{\Pi}_H^{part}$ increases with $e_b$, which implies that the bank's preference moves toward being fully solvent as $e_b$ increases.

**Proof of Lemma 3.** We first prove item (i) and then item (ii).

**Item (i).** In the partially solvent case, the bank benefits only from the loan repayment in the good state, so its expected net profit is

$$\Pi^{part} \equiv p\left(w\overline{p}_H B^{\uparrow} + \left(1-w\right)\overline{p}_L B^{\downarrow} - \left(b_w - e_b\right) R\right) - e_b R.$$

The derivative of $\Pi^{part}$ with respect to $w$ is

$$\frac{\partial \Pi^{part}}{\partial w} = p\left[\overline{p}_H B^{\uparrow} - \overline{p}_L B^{\downarrow} - \left(b^{\uparrow} - b^{\downarrow}\right) R\right].$$

If some $w' < 1$ is optimal (i.e., maximizes $\Pi^{part}$), it must hold that $\partial \Pi^{part}/\partial w \leq 0$; otherwise, the bank will optimally choose $w = 1$. If $\partial \Pi^{part}/\partial w \leq 0$ holds, $w = 0$ also

maximizes $\Pi^{part}$.

**Item (ii).** When the bank chooses $w = 0$, which induces all firms to implement inefficient projects, the bank's optimization problem is

$$\max_{B^{\downarrow}, b^{\downarrow} \geq 0} p\left[\overline{p}_L B^{\downarrow} - \left(b^{\downarrow} - e_b\right) R\right] - e_b R, \tag{73}$$

$$s.t.$$

$$p_L\left(\delta f\left(b^{\downarrow} + e\right) - B^{\downarrow}\right) - eR \geq p_H f\left(i^M\right) - i^M R. \tag{74}$$

The firms' PC (74) reflects the fact that firms do not borrow from investors directly when they implement inefficient projects (see Proof of Proposition 2). Since the firms' PC (74) must be binding in the optimum, we can insert Condition (74) into Eq. (73) and then determine the FOC with respect to $b^{\downarrow}$, which yields:

$$p\overline{p}_L \delta f'\left(b^{\downarrow} + e\right) = pR = c_p. \tag{75}$$

Together, Eq. (75) and the binding Condition (74) determine the bank's optimal loan contract $\{B_L^{part}, b_L^{part}\}$. Inserting $\{B_L^{part}, b_L^{part}\}$ back into the bank's objective function yields $\hat{\Pi}_L^{part}$. The loan contract $\{B_L^{part}, b_L^{part}\}$ sustains the partially solvent case if and only if the bank is insolvent in the bad states, which implies $b_L^{part} > e_b$.

**Proof of Proposition 8.** We first show that $\hat{\Pi}_L^{part}$ can be higher than both $\hat{\Pi}_H^{part}$ and $\hat{\Pi}_{full}$. We start with comparing $\hat{\Pi}_L^{part}$ and $\hat{\Pi}_{full}$. We define function $\Pi_L^{part}(\cdot)$ as follows:

$$\Pi_L^{part}(x) \equiv \begin{pmatrix} p_L \delta f\left(x + e\right) - pRx - eR \\ -\left(p_H f\left(i^M\right) - i^M R\right) - \left(1 - p\right) e_b R \end{pmatrix}.$$

Obviously, $\hat{\Pi}_L^{part}$ is equal to $\Pi_L^{part}(b_L^{part})$. Since $b_L^{part}$ maximizes the value of $\Pi_L^{part}(x)$, it is straightforward to show that

$$\hat{\Pi}_L^{part} - \hat{\Pi}_{full} > \Pi_L^{part}(i^* - e) - \hat{\Pi}_{full} = \begin{pmatrix} \left(p_L \delta - p_H\right) f\left(i^*\right) + R\left(1 - p\right)\left(i^* - e\right) \\ -R\left(1 - p\right) e_b \end{pmatrix}.$$

If $e = e_b = 0$, $\Pi_L^{part}(i^* - e) - \hat{\Pi}_{full} > 0$ is equivalent to

$$R - Rp > \left(p_H - p_L \delta\right) \frac{f\left(i^*\right)}{i^*},$$

which holds when Condition (36) is satisfied because $f(i^*)/i^* < f'(0)$. Therefore, if Condition (36) holds, $\hat{\Pi}_L^{part} - \hat{\Pi}_{full} > 0$ holds when both $e$ and $e_b$ are sufficiently small.

Next, we show that $\hat{\Pi}_L^{part}$ can be higher than $\hat{\Pi}_H^{part}$. Since $\hat{\Pi}_L^{part} > \Pi_L^{part}(b_H^{part})$, the following inequality holds:

$$\hat{\Pi}_L^{part} - \hat{\Pi}_H^{part} > \Pi_L^{part}(b_H^{part}) - \hat{\Pi}_H^{part}, \tag{76}$$

where

$$\Pi_L^{part}(b_H^{part}) - \hat{\Pi}_H^{part} = \begin{pmatrix} (p_L\delta - p\overline{p}_H) f\left(i_H^{part}\right) - \left(1 - \frac{p\overline{p}_H}{p_H}\right) eR \\ - \left(1 - \frac{p\overline{p}_H}{p_H}\right) \left(p_H f\left(i^M\right) - i^M R\right) \end{pmatrix}.$$

When $e = 0$, the RHS of Ineq. (76) is positive if

$$\underbrace{p_L\delta - p\overline{p}_H}_{p(\overline{p}_L\delta - \overline{p}_H)} > \left(1 - \frac{p\overline{p}_H}{p_H}\right) \frac{\left(p_H f\left(i^M\right) - i^M R\right)}{f\left(i_L^{part}\right)},$$

Therefore, if Condition (35) holds, $\hat{\Pi}_L^{part} - \hat{\Pi}_H^{part} > 0$ holds when $e$ is sufficiently small. Overall, if both Conditions (35) and (36) hold, the bank prefers waiving monitoring and offering $\{B_L^{part}, b_L^{part}\}$ when $e$ and $e_b$ are sufficiently small.

According to the expressions of $\hat{\Pi}_L^{part}$ and $\hat{\Pi}_{full}$, it is straightforward to show that $\hat{\Pi}_L^{part} - \hat{\Pi}_{full}$ decreases with $e_b$.

**Proof of Corollary 4.** Since $\overline{p}_L\delta > \overline{p}_H$, $i_L^{part} > i_H^{part}$ must hold. $i_H^{part} > i^*$ holds because

$$p_H f'\left(i_H^{part}\right) = \frac{p_H}{\overline{p}_H} R < R.$$

**Proof of Proposition 9.** Since the firm has bargaining power vis-à-vis the bank, the loan contract $\{B, b\}$ should maximize the firm's profit while ensuring the bank's break-even condition (i.e., the bank makes zero expected profit). Since the bank's marginal funding cost is $c(P)$, which is lower than $R$, we need only consider the case in which the firm raises all external funds through the bank. If the firm implements the efficient project, its optimization problem is

$$\max_{B,b\geq 0} \Pi_H^F = p_H\left[f(e+b) - B\right] - eR \tag{77}$$

$$s.t.$$

$$p_H B - bc\left(p_H\right) \geq 0. \tag{78}$$

Condition (78) means that the bank must make a non-negative profit to break even. To maximize the firm's profit, Condition (78) must hold with equality, so the firm's optimization problem can be reduced to

$$\max_{b \geq 0} \Pi_H^F = p_H f(e+b) - bc\left(p_H\right) - eR.$$

The first order condition with respect to $b$ is $p_H f'(e+b) = c\left(p_H\right)$, implying $b = b_H$. Hence, the firm's maximum profit is $\hat{\Pi}_H^F$. The optimal loan repayment, denoted by $B_H^F$, is determined by the binding Condition (78), that is, $B_H^F = b_H c\left(p_H\right)/p_H$.

Following the same way, if the firm implements the inefficient project, then the loan volume is determined by $p_L \delta f'(e+b) = c\left(p_L\right)$, implying $b = b_L$. Hence, the firm's maximum profit is $\hat{\Pi}_L^F$. The optimal loan repayment in this case, denoted by $B_L^F$, should make the bank break even, that is, $B_L^F = b_L c\left(p_L\right)/p_L$.

The firm will implement the inefficient project if and only if $\hat{\Pi}_L^F \geq \hat{\Pi}_H^F$. Obviously, it holds that

$$\begin{aligned} \hat{\Pi}_L^F - \hat{\Pi}_H^F &= \Pi_L^B\left(b_L\right) - \hat{\Pi}_H^B \\ &= p_L \delta f(b_L + e) - b_L c\left(p_L\right) - \left(p_H f(b_H + e) - b_H c\left(p_H\right)\right). \end{aligned}$$

According to Proof of Proposition 3, $\Pi_L^B\left(b_L\right) \geq \hat{\Pi}_H^B$ holds if Condition (24) holds and $e$ is sufficiently small. Hence, $\hat{\Pi}_L^F \geq \hat{\Pi}_H^F$ holds if Condition (24) holds and $e$ is sufficiently small.

# Appendix B: Additional Tables

**Table 11:** Effect of Representation in U.S. Senate BHUA Committee on Capital Purchase Program (CPP) Approval

| | Approved CPP Applications | Approved if Applied to CPP | Investment if Applied to CPP |
|---|---|---|---|
| GG | 0.367* | 0.784** | 0.810*** |
| | (0.056) | (0.013) | (0.010) |
| $N$ | 370 | 283 | 249 |
| $p - R^2$ | 0.099 | 0.160 | 0.168 |

This table presents estimation results from a logit model on the likelihood for bank $b$ of receiving public investments through the Capital Purchase Program (CPP) during the last quarter of 2008 and the third quarter of 2009, conditional on the senator of the state in which bank $b$ is headquartered being part of the BHUA Senate Committee. We test this on a sub-sample of 370 publicly traded banks potentially eligible for the CPP during the program's launch in the fourth quarter of 2008. In total, 283 banks applied for the program, of which 229 got approved, 54 did not, and 195 accepted the program conditions after obtaining approval. The dependent variable is equal to one if bank $b$ application to CCP is approved, and zero otherwise. In Column (1) we estimate the probability of bank **b**'s application to CPP being approved across all potential CPP applicants. In Column (2) we estimate the probability of bank **b**'s application to CPP being approved, conditional on having applied to the program. In Column (3) we estimate the probability of bank **b**'s application to CPP being approved, conditional on having applied to the program and excluding those banks that were approved but did not accept the conditions of the program. The dummy $GG_{b,t}$ is equal to one if at least one senator from bank $b$'s headquarter state is a member in the BHUA Senate committee in year $t$. The regressions include a set of one-period lagged control variables for bank characteristics and CPP selection criteria (Duchin and Sosyura, 2014): log of state GDP, size (proxied as the logarithm of assets), age (in years), equity scaled by risk weighted assets, nonperforming loans scaled by total loans, management quality (total sanctions received during the previous year up to third quarter of 2008), return on equity (earnings scaled by total equity), liquidity (measured as cash holdings and short-term investments, scaled by assets), dividends (dummy variable identifying dividend payers), exposure to regional economic shocks (based on the state-coincident macro indicators form the FED - Philadelphia), funding mix (interest bearing deposits over total deposits) and wholesale debt (assets minus equity and deposits, divided by assets). Standard errors are clustered at the state level. p-values are reported in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.