Market Creditor Protection, Finance and Investment[†]

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Abstract

In contrast to traditional bank lending, bond market debt disperses the creditor base. Legal protections of such dispersed creditors can exacerbate coordination frictions and raise the cost of default. I show that market creditor protection can thus be excessive, discourage market-based lending and reduce firm investment in theory. I estimate the effects of a US court ruling which protected bond market creditors from coercive exchange offers: The ruling forced distressed firms to restructure bond market debt more frequently in costly court procedures. Healthy firms responded by cutting bond issuance and investment. Direction and magnitude of reactions indicate that over-protecting dispersed creditors can undermine public credit markets, with adverse real effects.

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1 Introduction

Credit is the dominant flow of business funding. Traditionally, firms concentrate their debt in the hands of a few creditors and establish lending *relationships* (Diamond, 1984). However, such relationships can be undesirable for the firm (Rajan, 1992; Bolton and Scharfstein, 1996; Boot, 2000; Schwert, 2020).[1] Alternatively, firms may issue standardized debt securities in public capital markets, where many investors buy and sell small positions to enjoy portfolio diversification and liquidity on an individual basis. Such *market-based* lending fragments the creditor base.

Creditor dispersion is costly to firms because it aggravates coordination frictions in a potential debt restructuring. First, dispersed creditors suffer a collective action problem that creates a temptation to hold out of agreements and free-ride on others' concessions (Gertner and Scharfstein, 1991). This can frustrate private debt restructuring and require costly court interventions. Second, insiders—i.e., the debtor and its relationship lenders—may out-maneuver poorly-coordinated market creditors and restructure debt opportunistically (Brudney, 1992; Baird, 2023). The possibility of opportunistic restructurings will create insider moral hazard and reduce credit supply by market creditors.

In this paper, I highlight that legal protection of market creditors trades off both frictions. Strong protection shields market creditors against opportunistic restructurings of their claims. But at the same time, makes it harder to implement a desirable restructuring against the dissent of hold-out creditors among them (Roe, 1987). That is, stronger market creditor rights may reduce the ex-ante cost of moral hazard, but at the expense of higher distress cost ex post. Which of the two effects dominates is an empirical question, and answers will depend on institutional context. For the US, I find that a recent strengthening of bond market creditor protection predominantly increased distress costs: Distressed firms were forced more frequently into costly court procedures, and healthy firms responded by cutting bond issuance and real investment.

I start with a model to illustrate the two opposing forces operating via moral hazard and distress cost. The model is grounded in the assumption that market creditors cannot contract on the borrower firm's management decisions.[2] This creates moral hazard: To the extent that the debtor and its relationship creditors can expect to rid the firm of market debt in financially dire circumstances, they care less to avoid those though prudent management and monitoring. To zoom in on this very conflict, the model

[1] Lending relationships can impair management incentives ex-ante—and thus firm value—due to hold-up power in good states and soft-budget-constraint problems in distress (Rajan, 1992; Bolton and Scharfstein, 1996). By contrast, arm's-length debt not only eschews the soft-budget-constraint problem but can mitigate it for senior relationship debt by serving as a buffer (Boot, 2000; Park, 2000; Rauh and Sufi, 2010). Moreover, relationship creditors' monitoring costs can be excessive i) in the sense of swamping the expected value of liquidity services in distress (Bolton and Freixas, 2000; Bolton et al., 2016) or ii) when creditors cannot benefit from upside potential (Besanko and Kanatas, 1993).

[2] Market creditors barely monitor management. Neither do they monitor the way in which relationship creditors exercise control over debtor management (Chava and Roberts, 2008; Roberts and Sufi, 2009; Nini et al., 2012; Roberts, 2015; Arnold and Westermann, 2023). That is, even if market creditors were to include provisions in their lending contracts on how management ought to act or in inter-creditor agreements on how relationship lenders ought to exercise control, they could not effectively enforce them.

groups firm owners, relationship creditors and the managers they appoint and interfere with under the label of firm *"insiders"*.[3] Anticipating insider moral hazard, market creditors will demand higher yields ex-ante. This effectively shifts moral hazard costs back onto insiders and discourages bond issuance in the first place. This raises financing costs and undermines real investment—as I assume that insider finance is more costly than market finance—modeled as wedge between insider and market discount rates (for related evidence, see Schwert, 2020). Importantly, protecting market creditors from aggressive restructurings will limit the ability of insiders to shed market debt in distress. This reduces moral hazard ex ante and increases market-based credit supply. However, such protection can push firms into costly bankruptcy whenever severe distress would actually warrant aggressive restructuring.[4] A calibration of the model indicates that the net effect can be sizable, but may go either way.

I test the economic ramifications of market creditor protection using a landmark US court ruling that strengthened bondholder protection in 2014 (Court of the Southern District of New York, 2014). The court broadened the interpretation of existing law to protect dispersed bondholders from coercive bond exchange offers: It ruled against *exit consents*—a class of bond exchange transactions commonly used to discourage hold-outs—arguing that they can be abused to force poorly-coordinated bondholders into accepting unfavorable terms. Because it re-interpreted federal law, the ruling set an important precedent for every subsequent bond exchange. It was motivated by legislative history rather than economic considerations and surprised practitioners as well as legal scholars.[5] The ruling came to be known under the name of the plaintiff hedge fund: *Marblegate*. To estimate the effect of this regime shift at the national level, I rely on differential firm-level exposure.

As a first step, I confirm that Marblegate exacerbated the hold-out problem in private bond exchange offers, forcing more distressed firms into a formal bankruptcy procedure. Filing rates surged, driven by firms with an above-median level of bond debt relative to book assets—henceforth referred to as *bond-intensive*. Other firms barely changed their filing behavior.[6] The effect is quantitatively large: among the quartile of bond-intensive firms with the highest levels of financial distress, bankruptcy filing rates essentially doubled. For out-of-court bond restructurings, I document that Marblegate resulted in higher bond recoveries in the exchanges that still did occur and document evidence consistent with a larger prevalence of hold-outs. Because bankruptcy procedures inflict additional direct and indirect

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[3]Monitoring relationship creditors influence debtor management (Chava and Roberts, 2008; Roberts and Sufi, 2009; Nini et al., 2012; Roberts, 2015; Arnold and Westermann, 2023). That is, firm governance is co-determined by owners and relationship creditors. To capture frictions between owners and relationship creditors (cf., Bergman and Callen, 1991; Aghion and Bolton, 1992; Rajan, 1992; Hart, 1995), the model subjects insiders' group-level behavior to an elevated discount rate: Equity and relationship credit carry extra opportunity cost—rooted in agency frictions—which incentivize bond issuance in the first place.

[4]In the model, the deadweight cost of bankruptcy is an implicit cost of market-based borrowing and born by both insiders and market creditors. Thus, yields reflect it only partially.

[5]In fact, litigation related to the multi-billion USD bankruptcy of *Caesars* casino conglomerate drew upon the Marblegate verdict soon after.

[6]Using the universe of US insurer bond holdings data, I confirm a given firm can expect to face wider bondholder dispersion when it increases the volume of outstanding bonds.

costs (Hotchkiss et al., 2008; Lubben, 2012; Epaulard and Zapha, 2022), this evidence is consistent with the aforementioned ex-post distress cost channel.

I examine the net effect of ex-post distress costs and ex-ante moral hazard on firms' bond issuance and real investment. I exploit heterogeneous exposure to Marblegate at the firm level: Those with low default risk or little reliance on bond finance will have been agnostic about Marblegate. By contrast, risky, bond-intensive businesses should have reacted more strongly. Estimating difference-in-differences (DiD) regressions on the sample of risky firms, I find a 25 percent cut in investment rates in the bond-intensive subsample relative to less bond-reliant peers. The cut occurs right after the verdict and persists over the next two years. I find no commensurate accumulation of cash or liquid assets, and thus refute a strong precautionary motive behind the cut. Instead, it mirrors a reduction of net debt issuance. Zooming in on bond issuance activity, I find that the quarterly probability to place a substantive bond issue halved from about 6 percent to only 3 percent. These bonds were partially substituted by additional loans. Higher loan issuance also refutes the notion that Marblegate merely operated through a debt overhang channel. A back-of-the-envelop calculation based on a q model connecting bankruptcy costs to investment rates confirms the plausibility of my estimates' magnitudes.

Running identical empirical specifications for the placebo sample of safe firms—who should care much less about institutional features of distress resolution such as Marblegate—I find no reaction in investment nor bond issuance nor loan issuance.[7]

Bond intensity as well as risk can be influence by management choices. To avoid endogenous selection in response to the ruling, DiD regressions are estimated with both features measured in the quarter right before Marblegate. Nevertheless, effects could still be driven by confounding features that co-determine i) bond-intensity and risk together with ii) the time profile of investment and debt issuance for reasons unrelated to Marblegate. To mitigate such concerns, I deploy an alternative identification approach exploiting firm-quarter-specific events that are unrelated to bond intensities or default risk ratings. Specifically, I estimate firm's ability to substitute into bond finance upon relationship lender balance sheet shocks, and compare this substitutability before and after Marblegate. Consistent with previous literature, I show that such shocks increase borrower's propensity to increase bond issuance. Importantly however, I find that this propensity almost collapses for shocks hitting after Marblegate, supporting the notion that it increased firms' effective cost of bond finance.

Overall, my results suggests that stronger bondholder rights predominantly elevated the ex-post distress cost of bond finance. Considering that the verdict was a mere re-interpretation of existing law, as opposed to a full-blown legal reform, the economic magnitude of effects on investment and bond issuance appear especially considerable. However, theory predicts that these effects are context-dependent and could vary across countries and time.

[7] Conclusions remain unchanged when I estimate the full triple-DiD specification splitting firms along both bond intensity and risk.

Other related literature I bridge research on creditor rights and corporate debt structure and contribute to the literature studying economic effects of bankruptcy institutions.

A large literature has analyzed how the protection of creditor rights against the interest of borrowers drives the supply of credit, the value of collateral and firms' incentive to lever up, take business risk and innovate (Djankov et al., 2007; Davydenko and Franks, 2008; Haselmann et al., 2009; Acharya and Subramanian, 2009; Acharya et al., 2011; Becker and Strömberg, 2012; Vig, 2013; Gennaioli and Rossi, 2013; Favara et al., 2017; Closset and Urban, 2019). An equally intense conflict rages *between creditors* (Welch, 1997; Bris et al., 2006; Berglöf et al., 2010; Baird, 2023). My analysis acknowledges the importance of creditor-creditor conflict and emphasizes how the collective action problem of dispersed creditors can be exploited by the debtor and his relationship creditors. The trade-off associated to the protection of dispersed creditors turns out to be similar in nature to the trade-off associated to credit default swap protection (Bolton and Oehmke, 2011): stronger protection reduces ex-ante costs of moral hazard but increases ex-post costs of default.

Relationship creditors tend to be senior to market creditors for various reasons (e.g Welch, 1997; Gennaioli and Rossi, 2013). However, I look beyond the long-standing debate over merits and caveats of absolute priority, i.e., strictly honoring the claims' seniority ranking (see Schwartz, 1994; Baird, 2017). Instead, I emphasize market creditors' double-sided ex post conflict, who often face an insider coalition of both senior creditors as well as junior equity. Moreover, the rift between relationship and market creditors might well run *through* a creditor class, i.e., creating a conflict between creditors with equal priority.

Recent cross-country studies examine the link between creditor rights and debt structure concentration of firms (Goyal et al., 2019; John et al., 2021; Aghaeea et al., 2024). Over time, this literature has made progress on measurement to pin down the direction of the average effect, it still lacks conclusive evidence on the exact channels and did not study real effects. First, I document that well-protected market creditors can encumber distress resolution through out-of-court bond exchange offers. This highlights that the common assumption of financially inflexible market debt (e.g., Bolton and Scharfstein, 1996; Bolton and Freixas, 2000; Boot, 2000; Hackbarth et al., 2007; Berglöf et al., 2010; Crouzet, 2018) is in fact subject to legal design. Second, I document real effects beyond a mere re-composition of financial structure which likely operate through a change in effective corporate discount rates.

A growing literature highlights how relationships can arise in corporate bond markets (Di Maggio et al., 2017; Zhu, 2021; Nagler and Ottonello, 2023). Conversely, coordination frictions may arise among multiple banks (Brunner and Krahnen, 2008; Bellon et al., 2022).[8] Both strands of literature illustrate that there is a conceptual difference between *market* creditor and *arm's-length* creditor, while relationship lending is neither tied to a specific financial organizations nor class of financial securities. Instead, the dichotomy of relationship and arm's-length lending actually spans a spectrum of hybrid approaches. My results are consistent with the view that market-based lending tends to establish weaker relationships

[8] However, loan syndicates tend to concentrate control rights in the hands of few relationship lenders who monitor and renegotiate on behalf of the entire syndicate (Berlin et al., 2020).

than other forms of debt finance.

Law shapes finance by complementing incomplete private contracts (Hart, 1995; La Porta et al., 1997; La Porta et al., 1998).[9] Legal institutions are particularly consequential when contract incompleteness and the need for re-negotiation tends to be very acute, e.g., when the borrower becomes financially distressed. Past scholarship has shown that the quality of bankruptcy law influences the size of credit markets in general and bond markets in particular (Djankov et al., 2008; Becker and Josephson, 2016).[10] In this paper, I examine laws regulating *out-of-court* restructurings. In contrast to bankruptcy laws, these laws have to work effectively without judicial investigation and verification. I will emphasize that efficient regulation of out-of-court restructuring will limit bankruptcy filings, complementing Donaldson et al. (2022) who highlight that more efficient bankruptcy can crowd-in out-of-court restructuring.

Creditor dispersion afflicts large firms especially. A growing body of evidence links the prevalence of large firms to economic development, pointing to returns to scale and the challenges in realizing them (Bento and Restuccia, 2017; Kwon et al., 2024; Chen, 2022). My results suggest that well-calibrated protection of dispersed creditors can facilitate cheap funding for firms that grow large.

Structure The paper proceeds with a description of the institutional background and a theory in Section 2. Section 3 presents empirical results, starting with a description of the court ruling and data sources, followed by a discussion of my empirical identification strategy and closing with the presentation of findings. Section 4 concludes.

2 Market debt restructuring

I focus on the corporate bond market, which intermediates the lion's share of capital market-based business credit in the US. The theory presented in Subsection 2.2 applies to any form of market lending.

2.1 Institutional background

Almost half of all US corporate debt restructurings occur outside the courts (Gilson et al., 1990; Asquith et al., 1994; Moody's, 2020). Out-of-court restructurings are preferable because they avoid additional costs of a bankruptcy process. Legal and consulting fees are larger in formal court procedures and total between 1% and 10% of firm asset value (Hotchkiss et al., 2008; Lubben, 2012). In addition, bankruptcy can inflict sizable indirect costs: A filing flags poor financial health to a wide array of stakeholders that do not usually monitor the firm's accounts. Suppliers, customers and (prospective) employees will then re-consider relationship-specific investments and disrupt operations by withholding trade credit,

[9] This is conditional on effective judicial enforcement (e.g., Alencar and Ponticelli, 2016).

[10] The economic implications of costly distress resolution can be sizable also for the macroeconomic cycle (see, for example, Jordà et al., 2022; Becker and Ivashina, 2022; Ma and Kornejew, 2022).

switch products or look for employers with superior job stability (Sautner and Vladimirov, 2017; Antill and Hunter, 2021; Elias, 2023).[11] In addition, preparations for disclosure in bankruptcy procedures and distributional conflicts between investors can distract management and undermine day-to-day operations. Existing empirical evidence indicates that these indirect costs can devour 20% of the firm's going-concern value (Hotchkiss et al., 2008; Epaulard and Zapha, 2022).

However, any creditor dispersion subjects out-of-court restructuring to hold-out risk (Gertner and Scharfstein, 1991; Asquith et al., 1994): A small creditor can free-ride on others' concessions for re-establishing borrower solvency—while enjoying full recovery himself. Thus, an entire bloc of many small creditors can be trapped in a prisoner's dilemma in which everyone refuses to write down debt, prohibiting debt restructuring altogether. Coordination afforded by a court-supervised procedure can overcome such grid-lock and rescue a firm's going concern value. In the traditional view, this justifies the additional costs of bankruptcy (Jackson and Scott, 1989; Gilson et al., 1990; Asquith et al., 1994).

The hold-out problem is particularly pronounced in the US by the *Trust Indenture Act* (TIA), a cornerstone of US securities law passed alongside other New Deal legislation in 1939. Section 316(b) prohibits amendments of "core payment terms" of corporate bond contracts—principal, coupon structure and maturity date—by a majority vote. Effectively, it grants each individual bondholder the right to refuse material restructuring of her debt—even if a majority of other investors holding bonds from the same issue would agree to change its indenture accordingly. The law was motivated by irregularities in corporate bond restructurings during the Great Depression that fell under the scrutiny of the newly formed US Securities and Exchange Commission (SEC) (Roe, 1987; Brudney, 1992). Its corresponding multi-volume report on the "Work, Activities, Personnel and Functions of Protective Reorganization Committees" states:

> "The inside group—namely, the management, the bankers, or the two together, as the case may be—is in control of the company on the eve of reorganization. It therefore starts with certain definite advantages over any other group. Accepted reorganization practices provide numerous means and devices which enable this group to maintain and further these advantages." (Securities and Exchange Commission, 1937, Part I, p. 243)

For decades to come, dispersed bond market debt could be restructured in the US only with the power and supervision of a bankruptcy court.[12] But this started to change in the 1980s, as professional distressed-debt investors played an increasingly prominent role in the riskiest segments of the (secondary) bond and loan markets (Altman, 2014). These investors—typically hedge funds or investment banks—specialized in forecasting economic potential and capital structure dynamics of distressed firms and strategically accumulated debt securities in secondary markets. Thereby, they acquired special bargaining positions and the chance to strike profitable restructuring deals. The professionalization of distress

[11] For example, (Bucola and Bornstein, 2023) highlight that suppliers' trade credit is one of the most important form of short-term financing in the economy.

[12] In fact, this was one of the original objectives pursued by the act's architects (see Baird, 2023).

resolution gradually overturned the traditional view that bond debt could only be restructured in-court: Stronger concentration of debt and repeated interactions between distressed-debt investors overcame coordination frictions that prevented out-of-court restructuring before (Buccola, 2019; Hotchkiss et al., 2021). Moreover, legal innovations of coercive bond exchange offers—so-called *exit-consents*—facilitated the restructuring bond debt that remained in dispersed ownership (Bratton and Levitin, 2018).

Exit-consents discourage hold-outs despite the TIA's strong individual bondholder rights. They link a bond exchange to a vote over protective indenture covenants: Bondholders can *exit*—and receive cash or new securities in exchange—if they *consent* to stripping the legacy bonds off certain protections.[13] One variant is to target a parent guarantee when bonds are owed by a subsidiary with little assets. Another is to subordinate the old bonds to the newly exchanged securities (this version is analysed in detail by Gertner and Scharfstein, 1991). These votes are permissible under the TIA because they do not directly concern principal, coupon or maturity. Exit-consents leave hold-outs with nominally unimpaired claims, but also fewer chances to actually collect on them. Thereby, they discourage opportunistic hold-out strategies—but also compel bondholders to accept whatever is marginally better than the hold-out recovery.[14] Thus, legal restrictions on exit-consents have a first-order impact on out-of-court recoveries for dispersed bondholders in general.

2.2 The economic effects of market creditor rights

I present a model to clarify how market creditor rights can affect firms' financing and investment policy. It illustrates two points:

1. Market creditor protection can reduce moral hazard—but also raise the deadweight cost of default.
2. The net effect on market borrowing and real investment is ambiguous.

The model characterizes a two period environment in which a firm chooses debt structure—the mix between inside and market-based finance—and costly, non-contractible investment quality. Importantly, the firm may default in the second period, subject to a legal parameter that limits the haircut that the firm can impose on market debt.[15]

Core mechanism and interpretations To resolve default on market debt, the firm has to rely on exchange offers. Due to coordination failure, dispersed market creditors may fail to refuse a (coer-

[13] Exchanges are often conditional on a minimum participation rate to ensure that collected votes satisfy the indentures majority requirements to legally remove the targeted covenant.

[14] Out-of-court renegotiations take place "under the shadow of the bankruptcy code", i.e., are framed by the outside option of resolving distress in court. Thus, parties effectively bargain over how to share the value saved by sparing the cost of bankruptcy.

[15] In Appendix II, I present and calibrate a dynamic version of the model to demonstrate that effects on market borrowing and real investment are sizable under plausible calibrations.

cive) debt exchange offer as long as it leaves them no worse off than bankruptcy would—for which they can file individually, i.e., unaffected by coordination frictions.[16] This carries two implications. Firstly, debt exchanges will occur only when market debt would actually be impaired in bankruptcy. Secondly, exchange offers can extract rents from market creditors as large as the deadweight costs of bankruptcy.[17,18,19] These rents increase the pie available to other claimants on the firm, e.g., relationship creditors and equity owners. To zoom in on this very conflict, I group relationship creditors and firm owners (alongside the managers they appoint and interact with) under the single label of firm *"insiders"*—i.e., the group comprising all agents possessing important control rights over the firm in some states of the world.[20,21]

Market debt exchange rents make financial distress less dreadful for firm insiders. This creates *moral*

[16] Coercive bond exchanges can force *higher* hair-cuts onto hold-outs if some majority of bondholders participates (Gertner and Scharfstein, 1991). If coordination frictions prevent a majority from jointly refusing the offer, each and every bondholder will find it weakly dominant to participate as long as the value of participation above the value of holding out *individually*. Then, in equilibrium, debtors may set the pay-off for participating bondholders just right above the hold-out value—in principle entirely independent of the actual going concern of the firm. Whenever bondholder can file for bankruptcy individually, the hold-out value may not be smaller than the bondholder's bankruptcy pay-off. Insiders can credibly commit to refuse any bilateral negotiation with individual minority bondholders to avoid being black-mailed with a bankruptcy filing by any individual bondholder.

[17] In the US, any claimant can essentially file for bankruptcy individually such that any out-of-court resolution occurs "under the shadow of bankruptcy". Effectively, each party must receive at least its bankruptcy payoff and the only value to be bargained over is the deadweight cost of bankruptcy saved in a private out-of-court restructuring. If market creditor coordination frictions are severe and very coercive bond exchanges are permissible, such exchanges can extract the entire extra value of avoiding a formal bankruptcy procedure.

[18] Firms *cannot commit* to forgo rents in bond restructuring because of contract incompleteness. Arm's-length creditors face prohibitive coordination (and information) frictions to tailor contracts to evolving circumstances. Inevitably, contractual loopholes and blind spots emerge, allowing debtors and relationship creditors to undermine and hollow-out any such protective provisions written into financial contracts ex-ante.

[19] A qualitatively similar mechanic emerges when assuming that bondholder have inferior information about the going concern value, i.e., the pie to be split during debt renegotiations. Appendix III presents a model clarifying how rent extraction may purely be based on information asymmetries. (Morris and Shin, 2004) highlight that better information does not generally reduce the risk of coordination failure, however.

[20] A large literature has analysed a wide array of important agency and information frictions within the group of insiders, shown how they matter for corporate governance along various dimensions. The mechanisms I study here does not rely on any single specific friction, but only on the fact that frictions of insider finance encourages the use of arm's-length (i.e., outside) financing. Hence, I will capture the entirety of frictions within the group of insiders through an elevation of the discount rate that governs their group-level behaviour: A insider discount rate is synonyms with higher opportunity cost of insider funds and thus induces the incentive to issue bonds in the first place. The key advantage of this approach is to be agnostic about and abstract from the exact interaction between insiders. However, potential interaction between specific insider frictions and market creditor rights calls for further research.

[21] Since the vast majority of fresh corporate financing is sourced via credit markets—equity issuance covers less than 10% of financing needs according to data of Erel et al. (2012)—the distinction between insider and market finance may be thought of more directly as the distinction between relationship and market-based lending.

hazard because market creditors cannot effectively contract on firm choices directed by firm insiders.[22] Instead, market creditors will protect their financial interest through higher rates ex-ante. This makes investment success—where debt obligations can be honored in full—less attractive for insiders. Both forces dis-incentivise firm insiders to implement costly management and monitoring measures that could increase the likelihood of investment success.

The law defines the permissible set of exchange offers. Extensive out-of-court protection—tolerating nothing but a narrow set of transactions involving minor market debt impairment—will curtail insider rent extraction. This improves their incentives to keep the firm's profitability high, i.e., constituting the commitment device needed to reign in on moral hazard in a way private incomplete contracts with dispersed market creditors cannot deliver (cf., Bolton and Scharfstein, 1996). At the same time, heavily distressed firms may be forced into bankruptcy as legal constraints on exchange offers prevent necessary bond hair-cuts to be to effectuated out-of-court. That is, at the margin, optimal out-of-court bondholder protection balances ex-ante commitment gains with ex-post distress costs associated to market finance.

2.2.1 Model assumptions

Investment At time 0, firm insiders—owners and relationship creditors—choose quality $Q \in [0, 1]$ for the investment operated by the firm. Quality corresponds to the probability with which the investment realizes high or low value $a_H > a_L \geq 0$ at time 1.

Quality inflicts upfront costs $c(Q) \geq 0$ which are zero for minimal quality, become infinitely large for perfect quality and grow convexly in between:

$$c(0) = 0, \quad c(1) \to +\infty, \tag{1}$$

$$c'(Q) \geq 0, \tag{2}$$

$$c''(Q) > 0 \tag{3}$$

I assume that the level of $c(\cdot)$ is sufficiently small relative to a_H such that the investment's net present value is positive.

Financing Insiders finance the investment with internal funds or marketable bonds. Insiders are risk neutral and internal funds carry an opportunity cost ρ_i. Bonds promising to pay a principal $B \geq 0$ at time 1 are sold to a perfectly competitive pool of risk neutral market creditors with opportunity cost of funds $\rho_m < \rho_i$.[23] Market creditors can contract on the principal value of market debt, B, but not on investment quality Q.[24] Hence, the *unit* price of bonds $p(\cdot)$ will depend on B, as well as what market

[22] A classical justification for this lack of contractability is that market creditors' small individual stakes render monitoring prohibitively costly while coordination friction make delegated monitoring infeasible.

[23] Higher opportunity cost of insider funding ought to reflect wealth limits of owners and agency frictions in relationship lending.

[24] This reflects the assumption of market creditor dispersion, preventing monitoring due to prohibitive cost given small stakes and their inability to coordinate.

creditors can rationally infer about insiders' quality choice $q(B)$.

Market creditors will never be paid more than the value of the firm (limited liability).

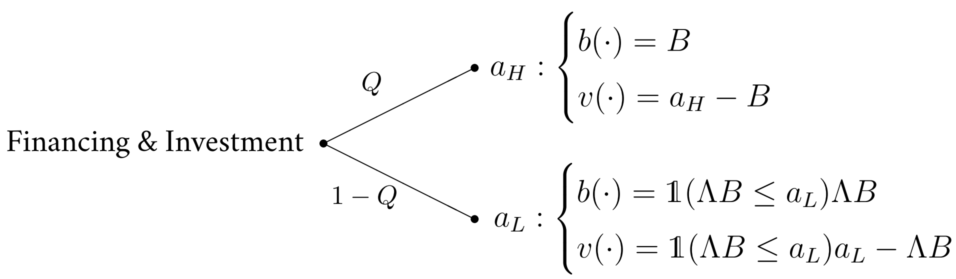
Restructuring Upon realization of low firm value a_L at time 1, insiders have the option to restructure market debt via a coercive debt exchange offer. I assume that market creditors accept any offer that grants a recovery rate $\Lambda \in [0, 1]$ to reflect market creditor dispersion allows insiders to extract value through exchange offers—subject to legal constraints. A higher Λ captures stronger legal rights for market creditors that effectively impose constraints on coercion in exchange transactions.

When private restructuring fails, i.e., $\Lambda B > a_L$, a bankruptcy procedure becomes necessary. For simplicity, I assume that bankruptcy deadweight cost equal a_L. Hence, bankruptcy absorbs the entire value of the firm and financial stakeholder receives nothing.

Upon realization of high firm value a_H, coercive debt exchange transaction are not feasible and market creditors are either paid B if $a_H > B$ or else $A - a_H$ (bankruptcy). I impose regularity assumptions that ensure that the firm will never borrow more than what it could repay under maximal value, i.e., $B \leq a_H$.[25]

Decision problem The previous assumptions define a payout structure $b(B, a)$ for market creditors and $v(B, a)$ for insiders as visualized in Figure 1.

Figure 1: Payout Structure



Market creditors price bonds according to their discounted expected value of $b(B, a)$. Due to Insiders set bond debt $B \in [0, a_H]$ and investment quality $Q \in [0, 1]$ to maximize their expected net present value $V(B, a)$, depending on upfront investment and quality cost, the value of borrowing and expected

[25]Borrowing $B > A$ implies that $Q = 0$. With $Q = 0$ it will be optimal to borrow $B = a/\Lambda$. Under the assumption that $a_L < \rho_m$, the firm's net present value is negative. Given that the firm is viable under financial autarky, $B > a_H$ cannot be optimal.

present value of their payouts $v(B, a)$:

$$\max_{B,Q} \left(-1 - c(Q) + p(B)B + \frac{1}{\rho_i} E\Big[v(B,a)\Big] \right) \tag{4}$$

s.t.

$$p(B) = \frac{1}{\rho_m} \frac{E\Big[b(B,a)|q(B)\Big]}{B} \tag{5}$$

2.2.2 Model implications

The expected values for insiders and bondholders are:

$$\begin{aligned} E\Big[v(B,a)\Big] &= Q(a_H - B) + (1-Q)\mathbb{1}_{B\Lambda \le a_L}(a_L - \Lambda B) \\ E\Big[b(B,a)|q(B)\Big] &= q(B)B + \Big(1 - q(B)\Big)\mathbb{1}_{B\Lambda \le a_L}\Lambda B \end{aligned}$$

Because market creditors are in perfect competition, insiders capture all value generated from market borrowing. That is, insiders end up maximizing the value of the firm subject to agency frictions. Their problem is convex in choice variables B and Q due to the convexity of $c(\cdot)$, so first order conditions identify the maximum. Based on this and the model assumptions detailed in the previous section, I can formulate four propositions.

Proposition 1 *Stronger market creditor protection increases the expected deadweight cost of default for any given market debt and investment quality:*

$$\frac{\partial \Big(E\Big[v(B,a)\Big] + E\Big[b(B,a)\Big] \Big)}{\partial \Lambda}\Bigg|_Q \le 0$$

This directly follows from the payout structure, e.g., see Figure 1: For any given market debt B, total payouts in the bad state will drop to zero—consumed by bankruptcy deadweight costs—once market creditor protection surpasses $\Lambda > a_L/B$. $\square$

Proposition 2 *Stronger market creditor protection reduces moral hazard, i.e.,*

$$\frac{\partial \frac{\partial q}{\partial B}}{\partial \Lambda} > 0$$

as long as the third derivative of the cost function is sufficiently large, e.g., zero.

Details on the proof can be found in Appendix I. Intuitively, the third derivative of the cost function matters because convexity disciplines moral hazard, see Appendix Equation (15). Stronger protection pushes the firm to increase quality for a given debt level. But if convexity of $c(\cdot)$ falls quickly enough in Q (locally), higher protection might actually increase moral hazard (locally). Hence, the overall effect on quality depends on debt levels and the reaction of debt to creditor protection.

Proposition 3 *Optimal market borrowing grows in market creditor protection as long as bankruptcy can be avoided*

$$\frac{\partial B^*}{\partial \Lambda} > 0 \quad if \quad B^* < \frac{a_L}{\Lambda}$$

but falls thereafter according to

$$B^* = \frac{a_L}{\Lambda}$$

as long as the third derivative of the cost function is non-negative and bankruptcy is sufficiently costly relative to the funding cost advantage of market debt.

Details on the proof can be found in Appendix I.

Proposition 4 *The equilibrium value of firm investment grows in market creditor protection for market creditor protection below some interior threshold value $\hat{\Lambda} \in (0, 1)$ but falls thereafter if the third derivative of the cost function is non-negative and bankruptcy is sufficiently costly relative to the funding cost advantage of market debt.*

Details on the proof can be found in Appendix I.

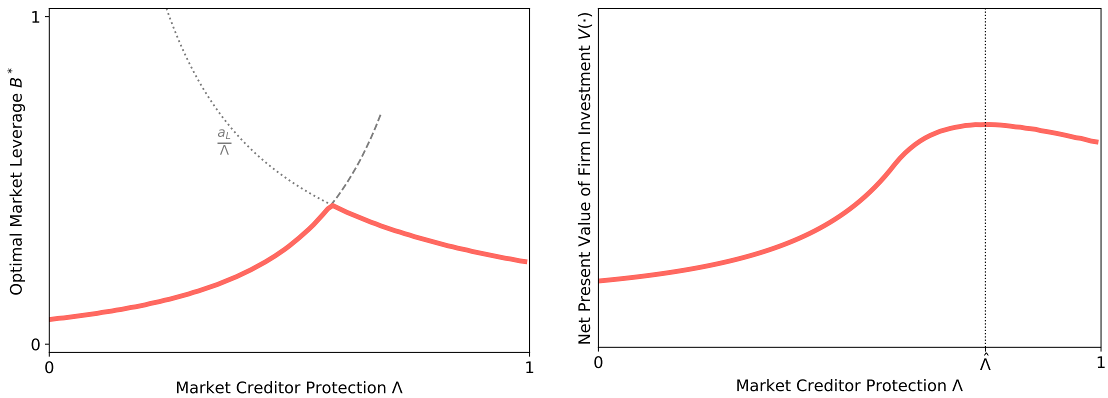
2.2.3 Numerical results

I assume a cost function that satisfies conditions (1) to (3) as well as $c''' > 0$

$$c(Q) = \gamma \frac{Q^2}{1 - Q} \tag{6}$$

and solve the model for a sequence of Λ values, fixing other parameters at values satisfying the condition of bankruptcy being sufficiently costly relative to the funding cost advantage of market debt. Figure 2 illustrates comparative statics in market borrowing and investment value with respect to market creditor protection, exhibiting an inverted U shape for both variables.

Figure 2: Comparative Statics Across Market Creditor Protection (Λ)



Notes: The left (right) figure shows numerical comparative statics of market leverage (investment value) across market creditor protection. Other parameters are fixed at $\rho_i = 1.05$, $\rho_m = 1.03$, $a_H = 2.0$, $a_L = 0.5$ and cost function parameter is $\gamma = 0.1$. The dashed line in the left figure indicates market debt levels that satisfy the first order condition of Appendix Equation 18. $\hat{\Lambda}$ marks the market creditor protection with the maximal value of firm investment.

3 Evidence on the economic role of market creditor rights

In this section, I describe the US court verdict which expanded market creditor rights in 2014, outline data sources, discuss my identification strategy and present the evidence on the verdict's economic ramifications. I group the latter into whether they concern outcomes ex post or ex ante of distress.

3.1 The Marblegate ruling

In *Marblegate Asset Management v. Education Management Corp*, the bondholder *Marblegate Asset Management* sued against an exit-consent transaction proposed by a coalition of the distressed debtor *Education Management Corp* and its secured term-loan creditors. The debtor business—founded in 1962 and growing into one of the largest for-profit providers of US college and graduate education with more than 20,000 employees—consisted of a holding company liable for 1.3 billion USD of secured term loans and a subsidiary liable for 500 million USD of unsecured bonds. Marblegate Asset Management was a minority bond investor, holding par value of 14.3 million USD.

When Education Management slid into financial distress in 2014, it commenced negotiations with secured term loan creditors. Negotiations resulted in a restructuring support agreement (RSA) which, among other things, offered bondholders to exchange their claims for new bonds with an effective recovery of roughly 33%. To discourage bondholders from holding out, the RSA stipulated the following exit-consent transaction: In case of any hold-outs, secured term lenders would release the parent holding of loan guarantees, triggering an indenture-conform cancellation of the bonds' parent guarantee via an extant intercreditor agreement. Then, secured term lenders would foreclose on the company's assets—including assets of the subsidiary liable for bond debt—and immediately sell to a newly formed subsidiary. Consenting bondholders would receive new claims against the newly formed subsidiary. Dissenting bondholders, by contrast, would be left with a nominally unimpaired, yet effectively worthless claim against an empty corporate shell.

Marblegate Asset Management held out and sued against the coalition in October 2014 at the Court of the Southern District of New York.[26] It essentially claimed that the bond exchange offer was overly coercive. After hearings and other proceedings in November, the court shared an opinion with both parties on December 15, which went into effect on December 30, 2014. Broadening the interpretation of the Trust Indenture Act Section 316(b), the court largely sided with bondholders:[27]

> The record before this Court, however, leaves little question that the Intercompany Sale [moving foreclosed assets out of reach for dissenting bondholders] is precisely the type of

[26] The Southern District of New York is the most important bankruptcy court in the US alongside Delaware and the Southern District of Texas.

[27] While the court made its objections clear at this point and ordered the Education Management Corp parent to continue to guarantee the bond debt, the final verdict condemning the transaction to run afoul of the Trust Indenture Act was officially issued on June 23, 2015.

> debt reorganization that the Trust Indenture Act is designed to preclude. [...] The Court cannot accept an interpretation that is neither mandated by the statute's text nor remotely in conformity with the statutory purpose and legislative history. [...]
>
> This Court is not so naïve as to think that establishing Plaintiffs' ultimate right to full payment will not pose problems for the Proposed Restructuring. [...] Yet, whatever the ultimate cost to [the debtor], its creditors, its employees, and its students, the Trust Indenture Act simply does not allow the company to precipitate a debt reorganization outside the bankruptcy process to effectively eliminate the rights of nonconsenting bondholders.

The verdict wielded implications far beyond the original case and prompted extensive press coverage, law firm client briefs and academic debate (New York Times, 2015a; Reuters, 2015; Wall Street Journal, 2015; Chapman and Cuttler LLP, 2015; Roe, 2016). Perhaps most importantly, the verdict was unanticipated: Members of the US National Bankruptcy Conference noted that

> [Marblegate] can be viewed as making out of court restructurings involving bonds covered by the [Trust Indenture Act] by a less than unanimous bondholder vote more difficult than *previously thought*. (National Bankruptcy Conference, 2015, emphasis added)

revealing how the verdict upended the prevailing understanding and expectations about how existing law is applied.

The plaintiff, *Marblegate Asset Management*, was a hedge fund accumulating distressed debt to seek the risk-return of active restructuring engagement. However, the court's ultimate concern lay with bondholders of the garden-variety: institutional wealth managers like insurers or pension funds as well as retail investors, who invest in bond markets for portfolio diversification purposes, that is, precisely to avoid debtor-specific monitoring and concentrated financial exposure. Lacking both the relationship as well as coordinative capacity to effectively participate in restructuring negotiations, they often see no better option than to sell to professional distressed debt investors once distress depresses the value of their securities. Hence, the ruling was driven by the desire to "give courts broad power to police workouts" (Bratton and Levitin, 2018) and ensure that arm's-length bondholders receive a more equitable share of the gains from avoiding the cost of bankruptcy.[28] As such, the verdict was not motivated by concurrent economic considerations. For example, there no single mentioning of economic terms like "corporate investment" (or variations thereof), "economic activity", "employment", "recession", "growth".

While the court acknowledged the risk posed to out-of-court restructurings, it emphasised its interpretation of the original intention of the law. However, market observers did worry about elevated default

[28]The larger the cost of bankruptcy, the more does the balance of power affect the distribution of value out-of-court. In fact, in the case of EDMC, the cost of bankruptcy would have been disastrous because a formal bankruptcy filing would have jeopardized an important source of revenue from the Department of Justice, so-called Title IV funding. This made the out-of-court conflict over value especially intense, cumulating in litigation.

costs as firms would be pushed into bankruptcy instead of restructuring debt swift and smoothly out of court:

> Ultimately, the largest take-away is that minority bondholders may now have increased leverage when negotiating with issuers and other creditors, and troubled companies and their creditors will therefore likely have to reconsider what they can accomplish in an out-of-court restructuring on a non-consensual basis, without resorting to the filing of a bankruptcy petition. (Chapman and Cuttler LLP, 2015)

The defendants filed the verdict for review in the Second Circuit Court of Appeals.[29] In a contentious two-vs-one decision, the higher court largely overturned the original Marblegate ruling on January 17, 2017. For this reason, my main analysis focuses on the original ruling of Dec 30, 2014 and the two-year sample until the end of 2016. A perceived positive probability of overturning renders estimates conservative.

The Second Circuit ruling itself is of narrower statistical value for three reasons. First, the overturning was partial in the sense that the Court of Appeals left uncertainty as to whether exit-consent transactions could target parent guarantees in the same way as they used to do (Millar, 2017; Bratton and Levitin, 2018). Second, after the original verdict sparked attention, anticipation effects accompanying the appeal process and adjustment measures taken in the meantime muddy economic impacts of the 2017 verdict. Finally, the split decision will have made market participants might have become wary about similar policy shifts or according use of judge discretion in the future. However, Appendix V.2 repeats the key event studies for the Court of Appeals ruling and documents a consistent reversal of effects.

3.2 Data

I explore firm-level balance sheets, cash flow statements, income statements, bankruptcy filings, data on bond issuance, returns, ownership and default recovery rates and information on loan issuance and lending relationships to build separate data sets. Throughout the analysis, I exclude financial firms (NAICS code 52) and public administration (NAICS code 9) and use the following notation: f indexes firms, q marks the quarter of the observation.

Quarterly firm financial statements are sourced from Standard & Poor's *compustat* merged with more detailed information on the debt structure in *CapitalIQ*. I match dates and auxiliary data for all bankruptcy filings in the sample between 2013Q1 and 2018Q4 covered by New Generation Research's *bankruptcy-data.com*.[30] In addition, I aggregate bond issuance from Mergent's FISD at the issuer-quarter level and match them to GVKEY-quarters via correct historical CUSIP-6 identifiers.[31]

[29] At the end of 2015, US congress lobbying attempted to overturn the courts decision through legislation but failed last minute (New York Times, 2015b).

[30] I merge information using CIK identifiers of SEC filings linked to GVKEY identifiers by WRDS.

[31] I use linking information provided via *CapitalIQ* to track changes in CUSIP-GVKEY affiliation over time.

To measure the actual dispersion of bondholdership, I can draw on the data from the National Association of Insurance Commissioners (NAIC) detailing the (corporate) bond portfolio for each an every insurance company in the US. The S&P *CapitalIQ* CUSIP-9 link allows me to consolidate the information at the firm level, gauge the size distribution of each firm's bond holdings and relate it to firm-level variables based on *CapitalIQ* or *compustat*.

Data on bond restructurings and associated recovery rates are sourced from Moody's Default and Restructuring Database.

For auxiliary analyses documented in Appendix IV, I use Refinitiv's *DealScan* database and associated linking tables updated from Chava and Roberts (2008) to identify lending relationships and measure lenders' financial health with Standard & Poor's SNL data via a name matching algorithm. Moreover, I obtain monthly bond returns from the TRACE database in the version compiled by WRDS to which I merge information about monthly bond ratings, bond maturity and covenants as well as issuer characteristics from Mergent's FISD.

3.3 Exposure to Marblegate and empirical identification

The Marblegate verdict affected debt restructuring by increasing bondholder protection,which affected different groups of firms differentially. First, regulation of distress resolution should concern firms only if they face default risk. Second, even risky firms should have been insensitive if bond markets were irrelevant to their financing. Taken together, firms' exposure to Marblegate should grow in the firm's

- default risk, and
- bond debt relative to asset value

both of which can be measured from ratings and balance sheet data.

The differential reaction of high-exposure firms compared to low-exposure peers can shed light onto the impact of Marblegate and hence the economic effects of stronger market creditor rights.[32] Associated difference-in-differences estimates can be interpreted based on the following three considerations.

First, broader economic shocks may confound Marblegate's effects on investment of borrowing activity. Fortunately, the macroeconomic environment was stable and rather favorable at the time as evidenced in Appendix IV.1.[33]

[32]The theory presented in Section 2.2 suggests that effects will go in different directions for different firms, depending on whether ex-ante disciplining or ex-post complications dominate. Analyzing potential effect heterogeneity across firms appears to be a promising route for future investigations.

[33]In mid 2014, oil prices dropped and triggered financial distress among US oil and gas producers, refineries and pipeline operators. I confirm that my results are not driven by distress in these sectors by excluding them in robustness checks shown in Appendix V.1. Any reductions in input costs for other sectors would go against the negative repercussions I am documenting for Marblegate.

Second, a firm's default risk and bond intensity correlates with other firm characteristics, including unobservable ones. Measuring default risk and bond intensity right *before* Marblegate renders such correlation innocuous for the identification of Marblegate's effects—unless: i) Marblegate coincides with another relevant shock or ii) confounding firm characteristics alter the firm's *sensitivity* to market creditor rights. The first concern is mitigated by the tranquil macroeconomic environment at the time—but can never be fully ruled out. Similarly, there is no obvious confounder fitting the second concern, but absolute elimination is likewise impossible. To simultaneously address these issues, I report results from an alternative empirical approach in Section 3.5.5 whose identifying assumptions do neither rely on the exact date of the Marblegate ruling nor on measures of bond intensity or risk. Specifically, I investigate firms' propensity to switch to bond market finance upon an adverse shock to the balance sheet of their relationship lender (Becker and Ivashina, 2014, and others). Comparing such firm-quarter-specific shocks occurring at some point before Marblegate to similarly sized shocks occurring sometime thereafter tests for any change in the marginal appeal of bond finance that could be attributed to the ruling.

Third, when bonds are in concentrated ownership, coercive debt exchange offers are irrelevant for effectuating out-of-court debt debt restructuring: large bondholders can engage and preserve their interests in negotiations with the debtor and other creditors, see Section 2.1. Hence, bond intensity is a valid measure of exposure only if it correlates well with bondholder dispersion. I test this below.

There is no exhaustive US micro data on bond ownership—except for the insurance industry. Insurers are the single most important class among US corporate bond investors (Koijen and Yogo, 2023) and security-level portfolio data from the US National Association of Insurance Commissioners allows me to calculate firm-level bondholder dispersion *within insurer holdings*. Yet, insurers still account only for about a third of all outstanding US corporate bonds, and even less within the segment of risky high-yield bonds. Thus, constructing a meaningful measure from the NAIC data requires the assumption that the distribution of individual positions among insurers is roughly representative—or at least independent—of the distribution among other classes of owners: mutual funds, hedge funds, banks and the household sector. This assumptions appears plausible enough to assess rough correlations.

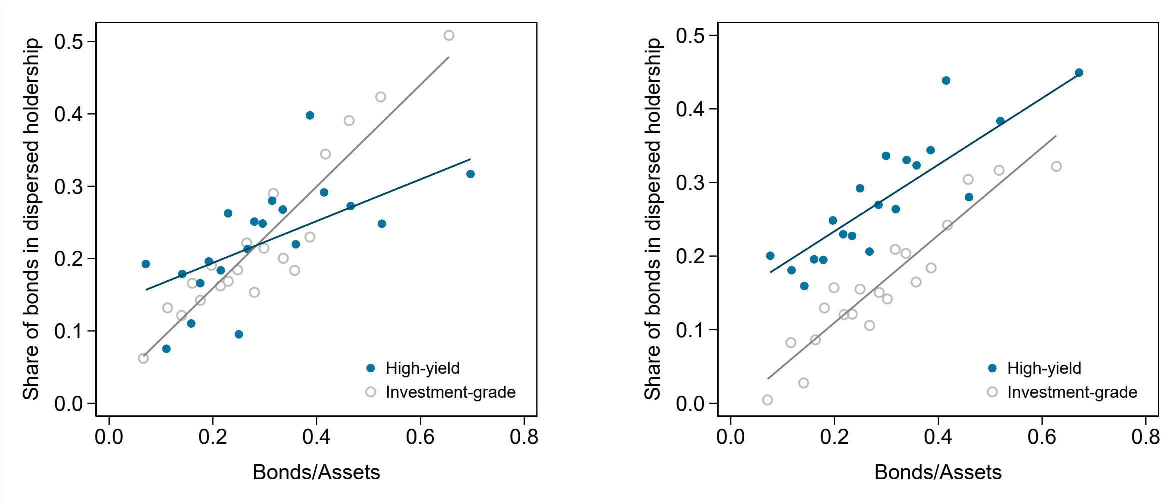
Figure 3 shows binned scatter plots relating a firm's bond intensity to its bond dispersion as measured by the share of the firm's bond debt spread over positions individually holding less than 0.1% of the firm's total outstanding bonds. The data concerns 2014 year-end values and is split by S&P's long-term issuer rating of default risk. The right panel controls non-linearly for firm size measured by its decile in the cross-sectional distribution of asset values. Irrespective of the perspective—and especially even after controlling for firm size—there is a strong positive association between bond intensity and bond dispersion.[34]

Beyond aforementioned shortcomings, contemporaneous bond dispersion is an imperfect measure of exposure to Marblegate because bonds are easily traded in secondary markets: bond dispersion today

[34] Interestingly, dispersion tends to be even larger for high-yield bond issuers after accounting for the fact that they tend to be smaller than investment-grade firms.

Figure 3: Bond intensity and bond ownership dispersion

(a) Unadjusted (b) Controlling for total assets



Notes: Binned scatter plots of firm-level data for 2014 Q4; right panel controls non-linearly for firm size measured by its decile in the cross-sectional distribution of asset values. Bond dispersion (y-axis) is defined as the share of a firm's bond debt spread over positions individually holding less than 0.1%. It is proxied using NAIC data on individual insurer bond portfolios, assuming that the holding size distribution of insurers is representative for other sectors (mutual funds, banks, households, and foreign investors).

will be an unreliable measure of bond dispersion when debt restructuring becomes necessary. Instead, the volume of outstanding bond debt indicates the expected dispersion at restructuring.[35] Relative to total assets, it will measure expected reorganisation risks posed by hold-outs.

3.4 Effects of Marblegate on distress resolution

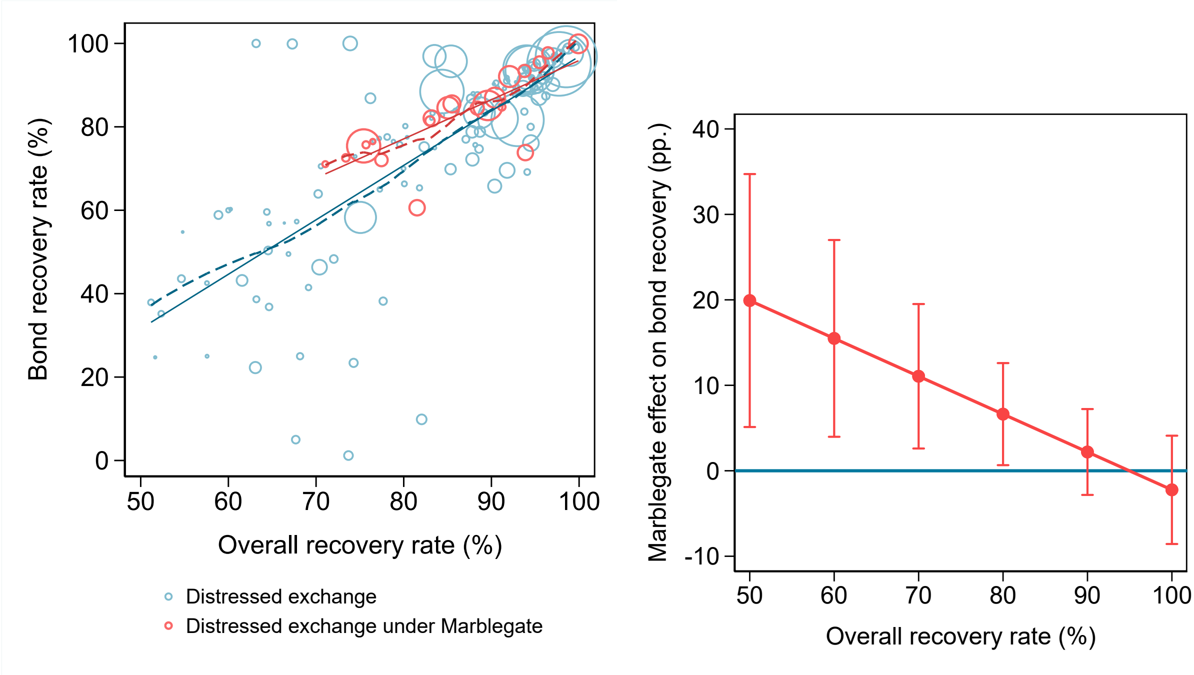
The ultimate intention behind the Marblegate ruling was to raise bondholders' recovery in distressed bond exchanges. But commentators warned at the time that it also would exacerbate the hold-out problem in private bond exchanges and force more distressed firms into a formal bankruptcy procedure.[36] In this subsection, I provide evidence for both higher out-of-court recovery as well as increased bankruptcy filing rates.

Figure 4 illustrates outcomes of 130 out-of-court distressed bond exchanges between 1990 and 2020 in the US, details on which are covered by Moody's Default and Restructuring Database. The left panel plots the recoveries of bonds against the total recovery for all debt claims, which can be interpreted as a measure of overall distress severity. Non-parametric local regression estimates plotted in dashes suggest a positive and essentially linear relationship between bond recoveries and total recoveries. Importantly, under Marblegate bond recovery rates increase *conditional on total recovery*. The effect strengthens

[35] Even when normalised by firm size, the left panel of Figure 3 confirms a strong correlation with bond dispersion.

[36] Bankruptcy procedures add direct and indirect costs which may devour as much as a fifth of the firm's going concern value (Epaulard and Zapha, 2022).

Figure 4: Marblegate bolstered bond recoveries out-of-court



Notes: Recovery rate information for 130 out-of-court distressed bond exchanges between 1990 and 2020 in the US from Moody's Default and Restructuring Database. Circle areas represent the total volume of debt outstanding before default. Estimates shown on the right conditional on linear time trend and industry fixed effects (NAICS single-digit).

as the distributional conflict between claimholders intensifies. This is consistent with the prediction Marblegate protected bondholders against coercive bond exchanges. In fact, Figure A.8 in Appendix IV suggests that much of the higher average bond recoveries are driven by *lower participation* in exchange offers, e.g., hold-outs.

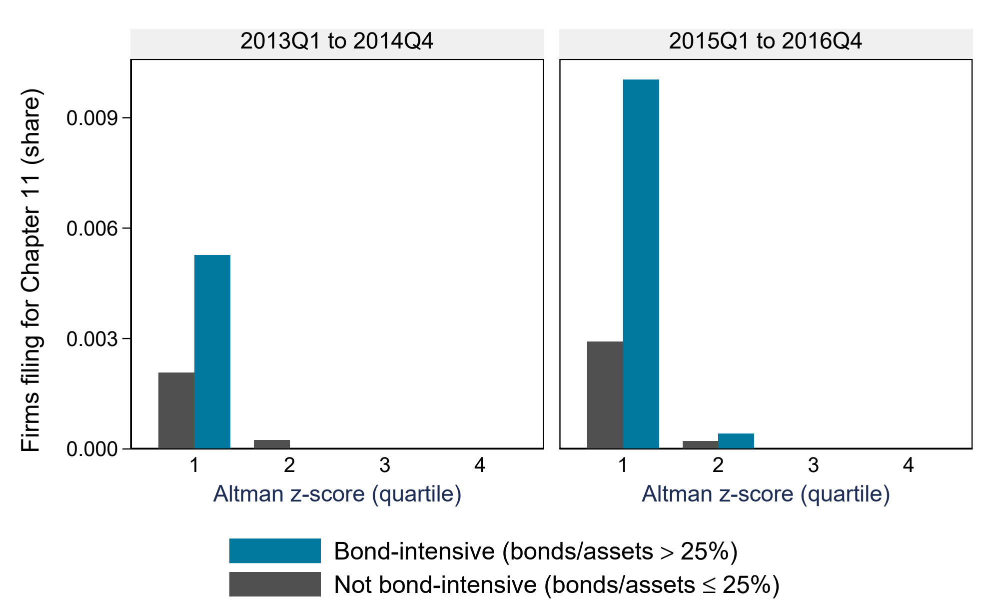
To test statistical significance within that set of 130 observations, I estimate

$$\text{bondrecovery}_i = \beta_0 + \sigma_{\text{sector}(i)} + \tau t_i + \beta_1 M_i + \beta_2 \text{totalrecovery}_i + \beta_3 (M_i \times \text{totalrecovery}_i) + e_i \quad (7)$$

where $\sigma_{\text{sector}(i)}$ filters industry-specific differences at the NAICS 1-digit level and τt_i captures any linear time trend in bond recovery rates from out-of-court exchange offers. The right panel of Figure 4 plots $\hat{\beta}_1 M_i + \hat{\beta}_2 \text{totalrecovery}_i + \hat{\beta}_3 (M_i \times \text{totalrecovery}_i)$ across different levels of total recovery alongside its 95% confidence intervals. Conditional on industry fixed effects and time trend, estimates indicate a statistically significant tilt induced by Marblegate in the relation between bond recovery and overall recovery to the benefit of bondholders was also statistically significant.

Figure 5 presents evidence suggesting that emboldened hold-outs indeed pushed additional firms into bankruptcy to restructure bond debt. It shows average Chapter 11 filing rates across groups of firms differing by financial distress and bond intensity, comparing the two-year period preceding with the two years after the Marblegate verdict. Conditioning on firm-quarter-specific financial distress—measured via classical Altman (1968) Z-scores—is important to filter any broad fluctuations in economic

Figure 5: Marblegate pushed bond-intensive firms into court



Notes: Shares of non-financial compustat firms filing for bankruptcy between 2013Q1 and 2016Q4 across quartiles of the distribution of distress Z-scores Altman (1968). Marblegate marks the period 2015Q1 to 2016Q4.

conditions. Two observations stand out. Firstly, the Z-score offers a reliable measure of distress in my sample, clustering the majority of bankruptcy filings in its lowest sample quartile. Secondly, and more importantly, the post-Marblegate period experiences an increase in the tendency to file for bankruptcy conditional on distress. This increase in concentrated among bond-intensive firms. This is consistent with the prediction that stronger protection of uncoordinated bondholders may create hold-outs that over-burdened out-of-court restructuring.

Are these differences statistically significant and robust? To test, I estimate a regression for quarterly bankruptcy filings of firms with Z-scores below the median. The effect of Marblegate on bankruptcy filing patterns will be detected by the interaction of two binary indicators: one for the Marblegate period, $M_q = \mathbb{1}(q \in \{2015Q1, ...2016Q4\})$ as well as one for bond-intensive firms $B_{fq} = \mathbb{1}(\text{bonds}_{fq}/\text{assets}_{fq} > 0.25)$:[37]

$$\text{filing}_{fq} = \beta_1 M_q + \beta_2 B_{fq} + \beta_3 (M_q \times B_{fq}) + \boldsymbol{x}_{fq}\boldsymbol{\gamma} + e_{fq} \tag{8}$$

where filing_{fq} is a binary variable indicating whether firm f filed for bankruptcy in quarter q. The interaction coefficient, β_3, captures the additional effect of Marblegate on the exposed population of firms. In the largest model, firm-level controls $\boldsymbol{x}_{fq}$ include firm and quarter fixed effects, the full set of indicators for quintiles of the quarterly distribution of total assets as well as the two-digit NAICS industry classification, both sets interacted with the Marblegate indicator. Controlling for the interaction of Marblegate and size is potentially important because large firms are more likely to be bond-intensive

[37]The median bond intensity for risky, non-financial firms is 24.3% in 2014 year-end compustat data. The average stands at 27.2%.

and may require formerly court procedures simply due to their size, and hence B_{fq} might simply capture a size effect. Similarly, controlling for period-specific industry effects rules out that bond-intensity simply picks up on industry-specific shocks.[38]

Table 1 presents estimates of β_3, alongside β_1 and β_2 and across a cascade of different control vectors. The estimated $\hat{\beta}_3$ remains stable and highly significant across the board, and is economically sizable: Marblegate increased the propensity to file for Chapter 11 bankruptcy by around 0.5 percentage points for bond-intensive firms—more than doubling their sample base rate.

It is worth noting that all these effects become more pronounced when I restrict attention to pre-packaged bankruptcy filings, i.e., bankruptcy petitions filed *after* major claim holders agreed on a restructuring plan. These pre-packs are the closest in-court substitute to an out-of-court restructuring. Private restructuring support agreements (RSAs) often stipulate a bankruptcy petition with a restructuring plan akin to the out-of-court deal in case of debt exchange failure.[39]

3.5 Effects of Marblegate on finance and investment

By affecting size and distribution of firm value ex post, institutions for distress resolution carry profound implications for economic choices ex ante (e.g., Djankov et al., 2008; Becker and Josephson, 2016; Lian and Ma, 2021). The theory in Section 2.2 describes how market creditor rights may bolster or curb bond financing and investment of healthy firms, depending on the relative strength of two effects: The erosion of resolution efficiency ex post, and the control of moral hazard ex ante. I presented evidence on adverse ex-post effects of Marblegate in the previous section. But ex-ante outcomes also depend on potential insider commitment. This section presents evidence on the impact of Marblegate on ex-ante financing and investment choices of US firms. Ultimately, the direction of effects carry information about whether market creditor rights prevailing in the US are too strong or too weak. Estimates of the reaction in stock and bond prices are presented in the Appendix Sections IV.5 and IV.6.

3.5.1 Investment

Did Marblegate affect firm investment, in which direction, and how much? To test, I estimate the difference-in-differences of risky firms' investment rates across firms with different bond intensity, i.e., how bond-intensive firms differ in their investment activity over time (the first difference) relative to other firms (the second difference). Investment rate refers to capital expenditures relative to last quarter's assets. [40] I measure bond-intensity a quarter before the verdict to side-step potential Marblegate-induced

[38] For example, firms in the extraction, distribution or refining of oil and gas experience economic difficulties after a sustained drop in oil prices throughout 2014.

[39] Pre-packaged bankruptcy filings are often argued to be faster and cheaper. This is consistent with the theory outlined in Section 2.2: Stronger market creditor rights push those firms into bankruptcies for which dead-weight losses are small. For other cases, stronger market creditor rights re-distribute value out-of-court instead, e.g., see Figure 4.

[40] To prevent outliers from driving OLS estimates, I winsorise investment rates by 1% at both tails.

Table 1: Chapter 11 filings of bond-intensive firms, before and after Marblegate

	(1) Raw	(2) Firm FE	(3) Time FE	(4) Period× Industry	(5) Period× Size
Marblegate × Bond-intensive	0.0026*	0.0052***	0.0052***	0.0044***	0.0051***
	(0.0014)	(0.0016)	(0.0016)	(0.0017)	(0.0018)
Bond-intensive	0.0019**	0.0016	0.0015	0.0015	0.0013
	(0.0008)	(0.0020)	(0.0020)	(0.0021)	(0.0021)
Marblegate	0.0003	0.0013**			
	(0.0006)	(0.0006)			
Firm FE		Yes	Yes	Yes	Yes
Quarter FE			Yes	Yes	Yes
Marblegate × Industry FE				Yes	Yes
Marblegate × Size FE					Yes
R^2	0.001	0.002	0.003	0.006	0.008
Filings	68	68	68	68	67
N	26666	26666	26666	25305	25158

Notes: Sample of non-financial compustat firms in distress (Z-score below the median) between 2013Q1 and 2016Q4. Marblegate marks the period 2015Q1 to 2016Q4. Firms are considered to be "bond-intensive" if liable for bond debt exceeding 25% of total asset value. Size measured by quintiles of quarter-specific distribution of total assets. Industry fixed effects based on 2-digit NAICS codes. With quarter fixed effects, M_q becomes collinear and is thus omitted from specifications (3)-(5). Standard errors in parentheses clustered at the firm level. *** p <0.01, ** p <0.05, * p <0.10.

selection, indicating bond-intensive firms by $B_{f,2014Q3} = \mathbb{1}(\text{bonds}_{f,2014Q3}/\text{assets}_{f,2014Q3} > 0.25)$.[41] The threshold of 25% is close to the variable's median (mean) of 24.3% (27.2%) in 2014Q3. To verify Marblegate coincided with a clear shift—as opposed to merely bisecting a pre-existing trend—I estimate quarter-specific coefficients $\beta(q)$:

$$\frac{\text{capex}_{fq}}{\text{assets}_{f,q-1}} = \phi_f + \tau_q + \beta(q)B_{f,2014Q3} + e_{fq} \tag{9}$$

where fixed effects ϕ_f and τ_q filter firm and quarter-specific variation.[42] I estimate (9) on the sample with a S&P long-term entity high-yield rating as well as in the placebo sample of investment-grade firms for comparison.

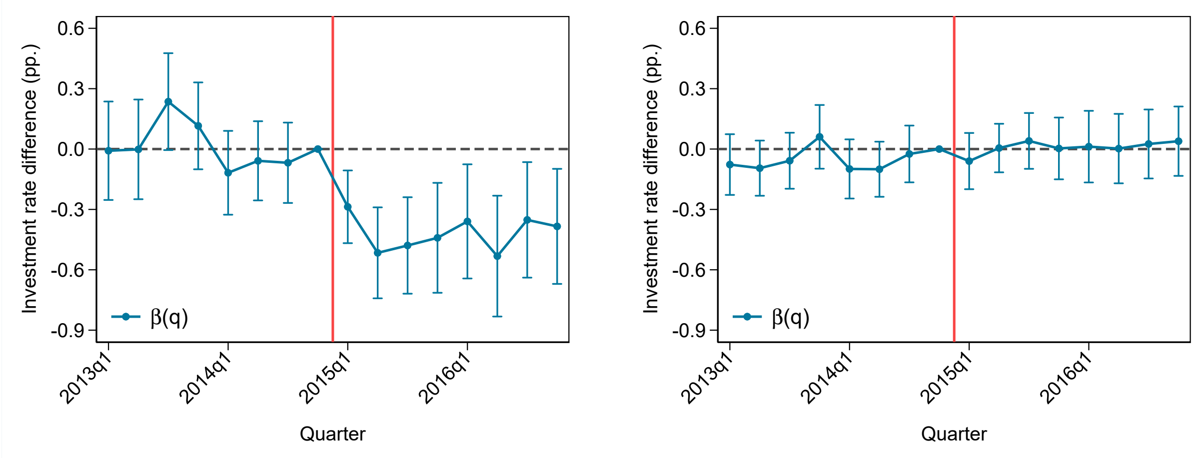
Figure 6 visualizes estimates of $\beta(q)$ relative to 2014Q4, together with 95% confidence intervals,. The left panel shows estimates for the sample of risky firms—with a S&P long-term entity high-yield rating—as well as in the placebo sample of investment-grade firms for comparison on the right. To avoid selection effects, I also use ratings from 2014Q3, the quarter before Marblegate.

[41] However, effects are actually robust towards alternative measurement timing assumptions. For example, see Figure A.13 in Appendix V.1 using quarter-specific, that is, contemporaneous bond intensities.

[42] I control for firm dynamics and other potential confounders in a next step.

Figure 6: Marblegate's effect on firm investment rates

(a) Risky firms (b) Safe firms (placebo)



Notes: Estimates of average investment rates—net of firm-fixed effects—by quarter and bond intensity from Equation (9) within compustat non-financial firms. The left panel shows results for risky firms with a S&P high-yield rating right before Marblegate in 2014Q3. The right panel shows results for safe firms with a S&P investment-grade rating in 2014Q3. Whiskers mark 95% CI for $\beta(q)$ based on standard errors clustered at the firm level.

Among risky firms, I find bond-intensive businesses to sharply cut investment rates by more than -40 basis points relative to low-bond peers. The effect occurs right after Marblegate in the first quarter of 2015 and persists for the next two years with some mild reversal. These effects are statistically significant but also quantitatively considerable given that average quarterly investment rates range around 1.5 percent. Before 2014Q4, differences between the two groups of firms are insignificant and show no trend. By contrast, safe firms are virtually unaffected, consistent with the hypothesis that firms with little risk of distress should not react to a change in institutions governing distress resolution.[43, 44]

These effects are robust to additional controls and in alternative samples. The DiD setup of Equation (10) adds a variable vector of controls $\boldsymbol{x}_{fq}$ and captures the average Marblegate effect for bond-intensive firms by β:[45]

$$\frac{\text{capex}_{f,q}}{\text{assets}_{f,q-1}} = \phi_f + \tau_q + \beta(M_q \times B_{f,2014Q3}) + \boldsymbol{x}_{f,q}\boldsymbol{\gamma} + e_{f,q} \tag{10}$$

Table 2 presents results across a range of specifications varying controls and sample. Firm controls

[43] Consistent with Marblegate affecting bond-intensive firms, the drop shown in the left panel of Figure 6 indeed reflects bond-intensive firms *cutting* investment instead of low-bond firms *increasing* investment. Appendix Figure A.9 plots average quarterly investment rates for each group of firms in each sub-samples. While investment rates for bond-intensive risky firms almost always ranged above those of low-bond firms before Marblegate, the relation reversed for the post-Marblegate period, driven by movements of bond-intensive firms.

[44] After the Second Circuit overturned the original Marblegate ruling on January 17, 2017, investment effects reverse, see Figure A.15 in Appendix V.2. As discussed earlier, the January 2017 ruling is less clear-cut from a statistical viewpoint, which may explain why effects are more gradual.

[45] Note that firm and quarter fixed effects ϕ_f and τ_q render level effects for $B_{f,2014Q3}$ and M_q superfluous.

Table 2: Marblegate's average effect on investment rates across specifications

	(1) W/o Firm Controls	(2) Baseline	(3) IG	(4) Quarter × Industry	(5) Low Z-Score	(6) BB Rating
Marblegate × Bond-intensive	-0.0043***	-0.0047***	0.0010	-0.0022**	-0.0030***	-0.0030***
	(0.0010)	(0.0009)	(0.0006)	(0.0009)	(0.0006)	(0.0011)
Firm controls		Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter × Industry FE				Yes		
Investment rates, mean	0.0153	0.0155	0.0119	0.0155	0.0119	0.0132
R^2	0.71	0.71	0.79	0.75	0.55	0.70
N	9489	8475	6559	8468	22058	4561

Notes: Estimates of Equation (10) using compustat sample of non-financial firms. Sample restricted to firms with a S&P rating of BB+ or worse; except column (3) and (4), which focus on investment grade-rated firms and all firms with a below-median Z-score, respectively. Ratings and Z-scores refer to pre-Marblegate values observed in 2014Q3. Dependent variable is capital expenditures rel. to last quarter's assets. The binary variable *Marblegate* indicates quarters 2015Q1-2016Q4. Firms are considered to be "bond-intensive" if their bond debt relative to assets exceeds 25% a quarter before Marblegate. Firm controls include four lags of asset growth, lagged Tobin's Q and the firm's lagged liquidity ratio. Industry fixed effects based on 2-digit NAICS codes. Standard error in parentheses clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

include four lags of asset growth, lagged Tobin's Q and the firm's lagged liquidity ratio to filter differences due to growth dynamics, prospects and financial position. The effect remains statistically significant, ranging from -30 to -43 basis points, corresponding to an average relative reduction of firm-level investment rate of about -15% to -29%. Notably, the effect in the placebo sample of investment-grade firms is quantitatively small, positive and statistically indistinguishable from zero. The last column (5) dispenses with ratings data and instead measures firm default risk using Z-scores to include unrated firms, documenting a very similar effect. Appendix Table A.3 shows estimates to be robust for alternative samples, controls, measurement choices and essentially unchanged when I estimate a triple-DiD using both bond intensity and risk.

Discussing alternative interpretations In the model of Section 2.2, moral hazard associated with market leverage lured insiders to care less about distress. Alternatively, it is conceivable that insiders would use bond finance to gamble and (over-) invest into very risky projects. Would the interpretation of estimated investment effects be different if moral hazard was of the gambling type? Bond-financed over-investment into risky negative-NPV projects would allow insiders to benefit from greater upside while squeezing market creditors more in bad states. But again, market creditors would guard ex ante by demanding higher yields, forcing insiders to internalize the cost of moral hazard and thus ultimately deter market finance—and investment, albeit of lower quality. Market creditor protection in turn limits insiders' ability to squeeze market creditors in bad states, discouraging gambling and thereby sets into motion the same virtuous spiral of market lending and investment. Hence, also under these assumptions, negative investment effects indicate that the (negative) default cost effect of market creditor rights overcompensates its (positive) commitment effect.

May results be driven by a precautionary motive instead of an increase in corporate discount rates? Arguably, firms might become reluctant to convert safe liquid assets into illiquid investment lotteries if Marblegate increases default costs. In the presence of financial constraints, such a precautionary motive could explain the cut in capital expenditure even without any changes to financing costs. In this case, investment cuts would mirror cash accumulation rather than reductions in net debt issuance, which I test in the next subsection.

3.5.2 Other cash flow variables

Evidence in the previous section suggests that Marblegate reduced capital expenditure cash outflows among exposed firms. Did it also affect financial investments? And how did firms balance the reduction in outflows: Did they increase cash buffers or did they cut financing inflows?

Examining the last question carries particular significance because it helps to evaluate whether investment cuts are driven by a precautionary motive rather than a shift in corporate discount rates. As Marblegate increased the cost of default, firms might become reluctant to convert safe liquid assets into illiquid investment lotteries. In the presence of financial constraints, such a precautionary motive could explain the cut in capital expenditure without any effect on corporate discount rates.

I estimate regressions for different cash flow variables using the same specification as for investment rates

$$\frac{\text{CF}_{f,q}}{\text{assets}_{f,q-1}} = \phi_f + \tau_q + \beta(M_q \times B_{f,2014Q3}) + \boldsymbol{x}_{f,q}\gamma + e_{f,q} \tag{11}$$

where $\text{CF}_{f,q}$ denotes either capital expenditures, net long-term financial investments, net total cash accumulation or net debt issuance. Firms controls are identical to the previous specification, including four lags of asset growth, lagged Tobin's Q and the firm's lagged liquidity ratio.

Table 3 presents the estimates. Column (1) reproduces the main capex result for reference. Column (2) reports negative effects for net financial investments smaller than for capital expenditure but of similar order of magnitude. Importantly, columns (3) and (4) document that there is virtually no effect on total cash accumulating and that all adjustments appear to be balanced by a reduction in net debt issuance. Taken together, these results corroborate the interpretation, that Marblegate increased effective corporate discount rates by distorting debt structure choices, with negative consequences for firm investment.

3.5.3 Debt issuance

Previous evidence suggests that healthy firms exposed to Marblegate cut investment and net debt issuance. This aligns with the interpretation that the ruling increased financing costs by complicating

Table 3: Marblegate's effect across the cash flow statement

	(1) Capex (base)	(2) Financial investment	(3) Cash	(4) Liquid assets	(5) Net debt issuance
Marblegate × Bond-intensive	-0.0047***	-0.0009*	-0.0007	-0.0017	-0.0065**
	(0.0009)	(0.0005)	(0.0022)	(0.0024)	(0.0025)
Firm controls	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes
Dependent variable, mean	0.0155	0.0008	0.0014	0.0012	0.0102
R^2	0.71	0.29	0.18	0.20	0.12
N	8475	7980	8474	6797	8232

Notes: Estimates of Equation (11) using compustat non-financial firms with a S&P rating of BB+ or worse. The sample period covers quarters 2013Q1 to 2016Q4. The binary variable Marblegate indicates quarters 2015Q1-2016Q4. Firms are considered to be "bond-intensive" if their bond debt relative to assets exceeded 25% a quarter before Marblegate. Firm controls include four lags of asset growth, lagged Tobin's Q and the firm's lagged liquidity ratio. Standard error in parentheses clustered at the firm level. *** $p<0.01$, ** $p<0.05$, * $p<0.10$.

bond restructurings. Accordingly, cuts to debt issuance should concentrate in bond issuance. Loan issuance should stay unaffected or even increase to the extent that firms substituted sources of debt finance. To test this, I investigate bond and loan issuance analogously to the way I estimate investment effect.

Bond issuance I replace the dependent variable in the DiD Equation (10) by an indicator for bond issuance:

$$\mathbb{1}(\text{Issuance}_{fq}) = \phi_f + \tau_q + \beta(M_q \times B_{f,2014Q3}) + \boldsymbol{x}_{fq}\boldsymbol{\gamma} + e_{fq} \tag{12}$$

Notation and measurement of right-hand side variables replicates the previous set-up, i.e., controls $\boldsymbol{x}_{fq}$ include four lags of asset growth, lagged Tobin's Q, the firm's lagged liquidity ratio and quarter-industry-specific fixed effects. Several bond issues are small, i.e., barely complicating distress resolution, so I focus on quarters where volumes exceed 5% of book assets.[46]

Table 4 presents the results across a range of specifications varying controls and sample. The different columns replicate set-ups tested for investment rates and add Column (6) with estimates for the intensive margin of bond issuance. Estimates of β are significantly negative, indicating that bond-reliant firms reduced the quarterly probability of new issuances for significantly by about -3 percentage points after to the ruling—except among the placebo sample of investment-grade companies, where effects are not statistically different from zero. Given average issuance rates of about 6% among bond-intensive firms, these estimates imply a 50% reduction of bond financing activity for affecting companies. I also find a mild reduction at the intensive margin. Appendix Table A.4 documents robustness of results in

[46] Results are robust to using all bond issues, see Appendix Table A.4.

Table 4: Marblegate's effect on bond issuance

	(1) W/o firm controls	(2) Baseline	(3) IG	(4) Quarter × Industry	(5) Low z-score	(6) Issuance size
Marblegate × Bond-intensive	-0.029***	-0.034***	-0.015	-0.034***	-0.018***	-0.004*
	(0.008)	(0.008)	(0.010)	(0.009)	(0.004)	(0.002)
Firm controls		Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	
Quarter FE	Yes	Yes	Yes	Yes	Yes	
Quarter × Industry FE				Yes		
Level effects						Yes
$\hat{P}$(issuance), bond-intensive	0.058	0.059	0.065	0.059	0.024	0.047
$\hat{P}$(issuance), not bond-int.	0.022	0.022	0.049	0.022	0.006	0.048
R^2	0.11	0.12	0.09	0.14	0.12	0.05
N	9546	8484	6562	8477	22111	425

Notes: Estimates of Equation (12) using compustat sample of non-financial firms covering quarters 2013Q1 to 2016Q4. Dependent variable is a binary indicator for a bond issuance >5% of assets, except column (6) showing results for log bond issuance relative to assets. Sample restricted to firms with a S&P rating of BB+ or worse; except column (3) and (5), which focus on investment grade-rated firms and all firms with a below-median Z-score, respectively. Column (6) restricts to firm-quarters with bond issuance. The binary variable *Marblegate* indicates quarters 2015Q1-2016Q4. Firms are considered to be "bond-intensive" if their bond debt relative to assets exceeded 25% a quarter before Marblegate. Firm controls include four lags of asset growth, lagged Tobin's Q and the firm's lagged liquidity ratio. Industry refers to 2-digit NAICS sectors. Standard error in parentheses clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

alternative samples, for additional controls, other measurement choices and within a triple-DiD using both bond intensity and risk.

Loan issuance I find evidence that firms attempt to substitute from bonds into loans. Appendix Section IV.7 repeats the analysis of this section for loan issuance measured from CapitalIQ and documents quarterly loan issuance probabilities to increase by about 2 percentage points. Substitution is imperfect, however, as total net debt issuance falls, see Table 3. Importantly, the increase in loans underscores that Marblegate operated through higher financing costs as opposed to mere debt overhang.

3.5.4 Back-of-the-envelope calculation

The estimated change in capital expenditures after Marblegate is considerable, ranging between -10% and -30% among bond-intensive and risky firms relative to other risky firms with little or no bond debt. I suggest that firms reacted to higher cost of default, based on evidence of higher bankruptcy risk. But can the estimated increase in bankruptcy risk plausibly trigger investment effects of this magnitude? I assess the quantitative plausibility using a back-of-the-envelope calculation, which I summarize it below. All details can be found in Appendix V.

Bankruptcy risk and financing cost I first gauge how elevated bankruptcy risk would translate into financing costs. I use a simple accounting framework to link the cost component of bonds to their bankruptcy risk. Based on corresponding estimates from Table 1 Column (2) and available estimates of the cost of bankruptcy, I calculate that Marblegate increased the quarterly marginal cost of bond finance by +1.7 to +8.7 basis points, depending on exact assumptions about the cost of bankruptcy.

Multiplying the increase in the cost of bond debt with the share of bond in fresh finance based on estimates from Table 4, I calculate that Marblegate should have increased *quarterly* corporate discount rates of risky and bond-intensive firms by around +0.4 to +2 basis points.

Financing cost and investment I use a simple q model to link changes in the corporate discount rate to firm investment. To obtain a tractable formulation whose components can be measured from the data, I build on Gormsen and Huber (2023): I add the standard assumptions of Hayashi (1982), to approximate the marginal value of capital, q_t, with its average value measured by Tobin's Q. Then, I relate Q to the duration of net earnings via the Gordon growth model (Gormsen and Lazarus, 2023).

The literature on q models offers a range of estimates for the adjustment cost parameter (Gilchrist and Himmelberg, 1995; Hall, 2004; Cooper and Haltiwanger, 2006; Philippon, 2009; Groth and Khan, 2010; Eberly et al., 2012; Lin et al., 2018). I compute investment effects under three different values that enclose estimates from the aforementioned literature.

Taken together, I obtain a grid of possible investment effects, depending on assumptions about bankruptcy cost β and the adjustment cost ϕ. To ease interpretation, I divide effects by the average investment rate of 0.016 and multiply by 100 to obtain percent values. Resulting elasticities are presented in Table 5: They span a large range of -2.5% to -75%, reflecting inconclusive evidence about two important parameters. This means that under plausible economic assumptions, my estimates of bankruptcy risk from Section 3.5 can rationalize investment cuts in the range of -10% to -30% which I document in Section 3.4.

Table 5: Investment effects implied by bankruptcy risk estimates

	$\beta = 0.02$	$\beta = 0.05$	$\beta = 0.10$
$\phi = 2$	-14.9%	-37.3%	-74.5%
$\phi = 4$	-7.5%	-18.6%	-37.3%
$\phi = 12$	-2.5%	-6.2%	-12.4%

Notes: Relative changes in investment rates for bond-intensive and risky firms as implied by estimates of higher bankruptcy risk after the Marblegate ruling. Numbers are based on a back-of-the-envelope calculation and are shown across different plausible assumptions for bankruptcy costs β (as a fraction of asset value) and the parameter ϕ from a standard quadratic capital adjustment costs function.

3.5.5 Marblegate and loan-bond substitutability

Becker and Ivashina (2014) documented firms turning to the bond market as a "spare tire" (Greenspan, 1999) to mitigate adverse credit supply shocks from distressed banking systems. To the extent that Marblegate changed ex-post distress or ex-ante moral hazard cost of bond finance, the ruling should have changed firms ability to smoothing out adverse bank loans shocks.

To test this, I estimate the effect of shocks to relationship lender balance sheets on firms bond issuance, and compare reactions before and after the Marblegate ruling. I identify banking relationships of compustat firms with *DealScan* lead arrangers and proxy lenders' balance sheet shocks using SNL data: Variation in the level of non-performing loans relative to total loans that cannot be predicted by lagged non-performing loans relative to total loans, lagged market-to-book and lagged loan-loss reserves relative to total loans. Specifically, I estimate a panel regression of bond issuance on relationship lender non-performing loan ratios and its interaction with a Marblegate dummy controlling for lender characteristics, firm characteristics and fixed effects:

$$\mathbb{1}(\text{issuance}_{f,q+1}, \text{issuance}_{f,q+2}) = \phi_f + \tau_q + \beta_1 \lambda_{f,q} + \beta_2 (M_q \times \lambda_{f,q}) + \boldsymbol{x}_{f,q} \boldsymbol{\gamma} + e_{f,q} \tag{13}$$

where $\mathbb{1}(\text{issuance}_{f,q+1}, \text{issuance}_{f,q+2})$ assumes a value of 1 when the firm issues bonds of at least 5% of book asset value during the next two quarters. $\lambda_{f,q}$ measures the share of non-performing loans at the firm's relationship lender. Vector $\boldsymbol{x}_{f,q}$ controls for lender and firm characteristics. On the lender's side, it captures lags of the lenders' non-performing loan share, market-to-book ratio, loan-loss reserves ratio and log total assets. In the firm's side, it includes contemporaneous and lagged Tobin's Q, liquidity ratio, leverage, bond leverage and asset growth. Similar to before, ϕ_f, τ_q, M_q denote firm fixed effects, quarter fixed effects and a dummy marking the Marblegate period. I restrict attention to firms with non-zero bond debt to exclude those without bond market access to start with. Note that this specification tests predictions about Marblegate without relying on neither i) the precise date of the verdict nor ii) possibly endogenous measures of bond intensity or default risk.

Estimation results are presented in Table 6. Column (1) confirms that firms increased the probability of future bond issuance after relationship lender balance sheet health deteriorated unexpectedly:[47] In response to a +1 percentage point increase in the lender's non-performing loan ratio, the firm's probability of bond issuance increases by +1.7 percentage points. However, this no longer holds true under the Marblegate regime, when the sensitivity of bond issuance essentially collapses. Reassuringly, this pattern is entirely driven by risky firms, see Column (2). Similar to what Becker and Ivashina (2014) document, safe firms are unresponsive to lender distress, both prior to and after Marblegate as shown in Column (3).

Column (4) reports estimates from an regression analogous to Column (2) but replacing the dependent variable by capital expenditures over the next two quarters, normalized by contemporaneous assets. Results are consistent with the interpretation that poorer substitutability of bank loans upon lender

[47] This finding also indicates that changes in the relationship lender's non-performing loan ratio are not driven by distress at—and hence are exogenous to—the firm itself.

Table 6: Marblegate and the impact of relationship lender distress on bond issuance

	(1) Full sample	(2) Risky firms	(3) Safe firms	(4) Capex, risky firms
Marblegate × Lender distress	-2.70**	-5.50***	-0.64	-0.25
	(1.20)	(1.72)	(1.44)	(0.34)
Lender distress	1.65*	4.73***	-1.02	0.07
	(0.96)	(1.32)	(1.09)	(0.20)
Firm controls	Yes	Yes	Yes	Yes
Lender controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes
Average dependent	0.10	0.09	0.10	0.03
R^2	0.22	0.23	0.23	0.65
N	4592	2369	2564	2083

Notes: Estimates of Equation (13) for rated compustat non-financial firms with non-zero bond debt over the period 2013Q1 to 2016Q4. Column (2) restricts the sample to firms with a S&P rating of BB+ or worse. Column (3) restricts the sample to firms with a S&P rating of BBB- or better. Column (4) replaces the dependent by capital expenditures over the next two quarters, normalized by next quarter's assets. The binary variable Marblegate indicates quarters 2015Q1-2016Q4. Lender distress is measured by the ratio of non-performing loans. Lender controls include lags of non-performing loans relative to total loans, market-to-book ratios and loan-loss reserves relative to total loans as well as the log of lender total assets. Firm-level controls include the contemporaneous value and one lag of the firm's asset growth, Tobin's Q, liquidity ratio, leverage, bond leverage as well as asset growth. Standard error in parentheses clustered at the firm level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

distress also worsen effects on real investment. Before Marblegate, lender distress shock were not associated with investment cuts. After Marblegate, however, an unpredicted +1 percentage point increase in the relationship lender's non-performing loans ratio decreased investment of the next two quarters by -0.18 percentage points relative to assets. This is quantitatively meaningful given a base rate of about 3% but estimates are statistically imprecise.

4 Conclusion

The inability to restructure market debt is a central assumption in a long tradition of scholarship in corporate finance and macro-finance (e.g., Bolton and Scharfstein, 1996; Bolton and Freixas, 2000; Boot, 2000; Hackbarth et al., 2007; Berglöf et al., 2010; Crouzet, 2018). I highlight the role of legal design: Poorly-coordinated market creditors will impede negotiations *to the extent that they command relevant legal rights*. In fact, much empirical support for market debt's financial inflexibility came from the US, where corporate bond markets have been governed by particularly strict bondholder protection since the Trust Indenture Act of 1939.[48]

I argue that market creditor rights affect the cost of market finance by trading-off moral hazard and restructuring frictions. The trade-off roots in the dispersion of market creditors: Their collective action problem warrants special protection against opportunistic restructurings, but makes such protection costly by empowering hold-outs strategies. In theory, these two countervailing forces can be economically considerable under plausible parameter calibrations.

I test the economic ramifications of market creditors using a sudden expansion of bondholder protection in the US at the end of 2014. I provide evidence consistent with worse hold-out problems and higher rates of bankruptcy filings, i.e., higher cost of debt restructuring. More importantly, I show that healthy firms cut bond issuance and real investment. These results suggest that additional costs of restructuring swamped any potential benefits from moral hazard containment.

Effects are economically sizable, despite the marginal nature of the institutional change. This highlights the risk that over-protecting market creditors may choke public credit markets and jeopardize their potential to augment traditional bank intermediation. However, theory suggests that effects are context-specific. Fully understanding the macroeconomic role of market creditor rights—e.g., for bond market development and its *spare-tire* function during banking crises—calls for additional research.

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APPENDIX

I Model details and proofs

Optimal quality choice The first order condition for Q

$$c'(Q) = \frac{a_H - B - \mathbb{1}_{B\Lambda \le a_L}(a_L - \Lambda B)}{\rho_i} \tag{14}$$

implicitly defines $q(B)$ and hence allows to compute various derivatives implicitly. Moral hazard shows up as a negative derivative $\forall \Lambda \neq 0$:

$$\frac{\partial q}{\partial B} = \frac{\Lambda \mathbb{1}_{B\Lambda \le a_L} - 1}{\rho_i c''} < 0 \tag{15}$$

To investigate comparative statics of the model, it is useful to derive expressions for derivatives with respect to Λ. Fixing B, stronger protection increases quality as long as bankruptcy can be avoided:

$$\left.\frac{\partial q}{\partial \Lambda}\right|_B = \frac{B \mathbb{1}_{B\Lambda \le a_L}}{\rho_i c''} \tag{16}$$

The sensitivity of moral hazard to market creditor protection is at the heart of the comparative statics of the model.

Proof of Proposition 2 When taking the derivative of Equation (15) with respect to Λ, it turns out to depend on whether and how convexity of $c(\cdot)$ changes across Q:

$$\begin{aligned}\frac{\partial \frac{\partial q}{\partial B}}{\partial \Lambda} &= \frac{\mathbb{1}_{B\Lambda \le a_L} \rho_i c'' - (\mathbb{1}_{B\Lambda \le a_L}\Lambda - 1)\rho_i c''' \left(\frac{\partial q}{\partial \Lambda}|_B + \frac{\partial q}{\partial B}\frac{\partial B}{\partial \Lambda} \right)}{(\rho_i c'')^2} \\ &= \frac{\mathbb{1}_{B\Lambda \le a_L}}{\rho_i c''} - \frac{(\Lambda - 1)\rho_i c'''}{(\rho_i c'')^3} \mathbb{1}_{B\Lambda \le a_L} B - \frac{(\Lambda \mathbb{1}_{B\Lambda \le a_L} - 1)^2 \rho_i c'''}{(\rho_i c'')^3} \frac{\partial B}{\partial \Lambda}\end{aligned} \tag{17}$$

But if convexity of $c(\cdot)$ falls quickly enough in Q (locally), higher protection might actually increase moral hazard (locally). Hence, the overall effect on quality depends on debt levels and the reaction of debt to creditor protection. In particular, the derivative of is positive—stronger protection lessening the negative response of quality to an increase in market debt—if $c''' \ge 0$. $\square$

Optimal market borrowing Rearranging the first order condition for B and plugging in $Q = q(B)$ yields:

$$B^* = c''(\rho_i - \rho_m) \left(\frac{q(B^*)}{1 - \Lambda \mathbb{1}_{B\Lambda \le a_L}} + \frac{\Lambda \mathbb{1}_{B\Lambda \le a_L}}{(1 - \Lambda \mathbb{1}_{B\Lambda \le a_L})^2} \right) \tag{18}$$

Proof of Proposition 3 (Comparative statics of B^*) Without market creditor protection ($\Lambda = 0$), optimal market borrowing is weakly positive. To investigate how market borrowing changes with market creditor protection, I first assume that $B^*|_{\Lambda=0}$ is below the bankruptcy threshold a_L/Λ.

Case 'No Bankruptcy': For $\mathbb{1}_{B\Lambda \leq a_L} = 1$, the derivative with respect to Λ

$$\frac{\partial B^*}{\Lambda} = (\rho_i - \rho_m)\left(c'''\left(\frac{\partial q}{\partial \Lambda}\Big|_B + \frac{\partial q}{\partial B}\frac{\partial B^*}{\partial \Lambda}\right)\left(\frac{q(B)}{1-\Lambda} + \frac{\Lambda}{(1-\Lambda)^2}\right) + c''\left(\frac{\frac{\partial q}{\partial B}\frac{\partial B^*}{\partial \Lambda}(1-\Lambda) + q(B)}{(1-\Lambda)^2} + \frac{1+\Lambda}{(1-\Lambda)^3}\right)\right)$$

can be condensed and rearranged into

$$\frac{\partial B^*}{\Lambda} = \theta_0\left(\frac{\frac{c''}{1-\Lambda}\left(\theta_1 + \frac{1}{1-\Lambda}\right) + \theta_1\frac{B^*}{\rho_i c''}c'''}{1 + \frac{\rho_i - \rho_m}{\rho_i}(1 + \theta_1 c''')}\right) \tag{19}$$

$$\text{where} \quad \theta_0 = \frac{\rho_i - \rho_m}{1-\Lambda} \quad \text{and} \quad \theta_1 = q(B^*) + \frac{\Lambda}{1-\Lambda}$$

All terms in this expression are positive—except c''', which has been left unrestricted so far. For $c''' \geq 0$, we have $\frac{\partial B^*}{\Lambda} > 0$, i.e., stronger protection of market creditors bolsters market borrowing.

However, if the third derivative of the quality cost function falls below a certain negative threshold x at the optional choice point, $c'''(q(B^*)) < x < 0$, market borrowing might possibly *shrink* in response to stronger protection. The intuition for this behavior roots in Equations (16) and (17): Stronger protection pushes the firm to increase quality for a given debt level. However, moral hazard is disciplined by the convexity of the cost function. So if convexity of $c(\cdot)$ falls quickly enough in Q, higher protection might increase moral hazard (locally) and hence reduce borrowing.

What is a reasonable assumption for c'''? Because $c(\cdot)$ has a positive asymptote at $Q = 1$, all its derivatives have it, too. Hence, curvature could fall only locally and $c''' < 0$ cannot be maintained as a general assumption. In conclusion, equilibrium market debt will increase with market creditor protection under stereotypical cost functions $c(Q)$—as long as $\Lambda B \leq a_L$.

As long as $B\Lambda \leq a_L$, $B^* \geq 0$ and $\lim_{\Lambda\to 1} B = \infty$. Taken together with Equation (19), this means that stronger market creditor protection ultimately push to $B^* = a_L/\Lambda$. At this point, any further increase in Λ will either i) push B^* *down* along the constraint or ii) induce insiders to borrow so much as to risk bankruptcy deadweight losses.

Case 'Bankruptcy': Under $B\Lambda > a_L$, Equation 18 becomes

$$B^{**} = c''(\rho_i - \rho_m)q(B^{**}). \tag{20}$$

Note that $\partial B^{**}/\partial\Lambda = 0$. Hence, model variables will be insensitive to increases in market creditor protection (once it surpassed a critical threshold).

The first order condition in Equation 14 implies for $B^{**} > a_L/\Lambda \geq B^*$ that $q(B^{**}) < q(B^*)$ because $c' \geq 0$ and $c'' > 0$. However, this yields a contradiction with Equation 18. If $c''' = 0$, we would then get a contradiction based on Equation 18 for any $\Lambda > 0$. However, for $c''' > 0$, $B\Lambda > a_L$ might be optimal.
□

One can derive sufficient parameter conditions that rule out such bankruptcy choices. If $V(B^*) > V(B^{**})$ for $\Lambda = 1$, this will be true for any Λ. Such inequality will hold if:

$$a_L > (\rho_i - \rho_m)c''\Big(q(a_L)\Big) \tag{21}$$

Intuitively, insiders will choose to avoid bankruptcy if bankruptcy is sufficiently costly for a given degree of moral hazard (cost function curvature) and market lending efficiency (discount rate differential)—or conversely, moral hazard is sufficiently severe or market borrowing is sufficiently desirable for given bankruptcy cost.

Proof of Proposition 4 (Comparative statics of V) Beyond market lending activity, it is of interest how optimal firm value $V^* = V(B^*, q(B^*))$ changes with Λ, not least because higher (lower) firm value will (dis-) incentivize investment.

For $\Lambda B \leq a_L$, the Envelope Theorem implies

$$\begin{aligned}\frac{\partial V^*}{\partial \Lambda} &= \frac{\partial V}{\partial \Lambda}\bigg|_{B=B^*,Q=q(B^*)} \\ &= \underbrace{\frac{1}{\rho_i}B^*\frac{\partial q}{\partial \Lambda}\bigg|_B(1-\Lambda)}_{>0} + \underbrace{\left(\frac{1}{\rho_m}-\frac{1}{\rho_i}\right)\Big(1-q(B^*)\Big)B^*}_{>0}\end{aligned}$$

Note that this result is *independent* of assumptions about c'''.

For $\Lambda B = a_L$, one can obtain

$$\begin{aligned}\frac{\partial V^*}{\partial \Lambda} &= \frac{\partial V}{\partial \Lambda}\bigg|_{B=a_L/\Lambda,Q=q(B^*)} \\ &= \underbrace{\frac{1}{\rho_m}\frac{\partial q}{\partial \Lambda}\bigg|_B(B^*-a_L)}_{\geq 0,\ =0 \text{ for } \Lambda=1} - \underbrace{\left(\frac{1}{\rho_m}-\frac{1}{\rho_i}\right)\frac{a_L}{\Lambda^2}q(B^*)}_{<0}\end{aligned}$$

That is, firm value eventually falls as market borrowing becomes constrained.[49] □

For $\Lambda B > a_L$, it can be easily shown that firm value is insensitive to changes in market creditor protection.

II Dynamic model

Model horizon In a finite (two or three) period model, the firm's continuation value cannot be endogenized. This is an important caveat because the going concern value i) affects firm policy and distress resolution and ii) changes with market creditor rights to the extent they affect firm behaviour.

[49] It can be shown that the above derivative evaluates to a positive value at the point where Equation (18) evaluates hits the constraint.

Hence, *quantitative* assessment of how market rights influence firm outcomes will be more reliable if based on an infinite-horizon model that fully endogenises—and hence captures the channel running through—the firm's going concern value.

II.1 Model assumptions

In every period t, insiders choose the scale of operations $K_t \geq 0$ through investment or divestment,[50]

$$k(K_{t-1}, K_t) = K_t - (1-\delta)K_{t-1} \tag{22}$$

incur fire sale discounts that depend on market depth $\theta > 0$ in case of divestment[51]

$$\frac{\theta - k_t \mathbb{1}(k_t \geq 0)}{\theta - k_t} = \begin{cases} \frac{\theta}{\theta - k_t} \in [0,1) & \text{if} \quad k_t < 0 \\ 1 & \text{else} \end{cases} \tag{23}$$

and generate operating profits in the next period $t+1$ subject to decreasing economies of scale $\alpha \in (0,1)$,[52]

$$a_{t+1} K_t^{\alpha}. \tag{24}$$

Operative profitability $a_{t+1} \in \mathbb{R}$ is unknown at time t. All agents rationally expect $\overline{a} > 0$ with probability $p(a_t, M_t)$ and a less fortunate outcome $\underline{a} < \overline{a}$ with the complementary probability $1-p(\cdot)$.[53] Probability $p(\cdot)$ depends on firm insiders' management and monitoring expenses $M_t \geq 0$, effectiveness of which may differ across states a_t. I assume that i) success probability strictly increases with management and monitoring expenses while ii) certain success is infinitely costly:

$$M_t^1 > M_t^2 \iff p(a_t, M_t^1) > p(a_t, M_t^2), \tag{25}$$
$$M_t \to \infty \iff p(a_t, M_t) \to 1. \tag{26}$$

Specifically, I stipulate the following functional form for the probability of success $p(\cdot)$, conforming with conditions (25) and (26):

$$p(a_t, M_t) = \pi + (1-\pi)\frac{M_t}{\gamma(a_t) + M_t} \qquad \text{with} \quad \gamma(a_t) = \begin{cases} \underline{\gamma} & a_t = \underline{a} \\ \overline{\gamma} & a_t = \overline{a} \end{cases} \tag{27}$$

where $\pi \in [0,1)$ determines the overall (ir-) relevance of management and monitoring while $\underline{\gamma} > 0$ and $\overline{\gamma} < 0$ govern its marginal effectiveness in each state.

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[50] K_t is to be interpreted as the *book* value of assets.

[51] Incomplete depreciation generates realistic steady-state investment rates. Asset sale discounts capture asset specificity.

[52] Operating profits are sales and other income less operating expenses, including wage bill and material costs but excluding capital maintenance expenses. Stronger curvature implies higher long-term profitability, and hence models degree and dynamics of competition (Hennessey and Whited, 2005).

[53] Operating profitability might be negative, i.e., $\underline{a} < 0$ is permissible.

To fund capital expenses, insiders can issue market bonds at each point in time t for unit price $P(\cdot)$, promising market creditors to pay $B_t > 0$ at $t+1$. *Actual* repayment $\tilde{B}(\cdot)$ depends on whether the realised state warrants debt restructuring.[54] Thus, the price that market bonds fetch at issuance depends on expectations about next periods actual repayment. While scale of operations K_t and market debt issuance B_t are easy to verify and contract upon, market creditors cannot effectively monitor insider governance quality M_t. Instead, they anticipate insiders' optimal policy based on the observed state and the contracted choice, i.e., $M^*(K_{t-1}, B_{t-1}, a_t, K_t, B_t)$.[55] Market bonds will thus be priced according to $P(\cdot) = P(E[\tilde{B}(K_t, B_t, a_{t+1})], M^*(\cdot))$.[56] Market creditors are risk-neutral, in perfect competition and willing to lend without limit as long as they can expect to cover their opportunity cost of funds ρ_b.

Insiders cover any remaining financing needs themselves, e.g., through credit lines, term loans or equity. In return, they extract free cash-flow in future periods, e.g., dividends and loan repayment.[57] Importantly, insiders discount future value at the exogenous rate $\rho_i > \rho_b$. This captures opportunity costs elevated above the market discount rate through obstacles specific to insider funding: agency and information frictions associated to relationship lending (e.g., Rajan, 1992; Bolton and Scharfstein, 1996; Schwert, 2020) and equity issuance (e.g., Myers and Majluf, 1984), but also limited owner wealth and bank balance sheet constraints. This is a stark simplification. But it appears to be an elegant way to summarize complex incentives without wedding the model to a specific mechanism.[58] Ultimately, insiders seek to balance cost of insider finance against the cost of restructuring distressed bond debt (see Bolton and Scharfstein, 1996; Crouzet, 2018).

Risk-neutral insiders maximize their expected discounted payouts by selecting scale of operation, bond issuance, and corporate governance (K_t, B_t, M_t) conditional on past investments, legacy bond debt as well as current profitability (K_{t-1}, B_{t-1}, a_t) with initial conditions $K_{-1} = B_{-1} = 0$. Insiders will file for bankruptcy and receive $V_C(\cdot)$ in court if operating the firm carries a lower (expected) value.[59] Taken

[54] Restructuring outcomes depend on—and thus will be explained after—the firm's value function.

[55] Market creditors effectively know the equilibrium effort choice, but they cannot commit insiders to choose a possibly value-enhancing higher effort level if that would give insiders the incentive to deviate after issuance.

[56] Further details are presented later alongside assumptions on restructuring and bankruptcy.

[57] Insiders may re-negotiate of their contractual relationships at any time, e.g., allowing banks to accommodate distressed firms or squeeze profitable ones.

[58] In the background, I assume insiders to optimally compose equity and relationship lending in a way that balances issuance cost and information frictions in equity finance with elevated intermediation and monitoring cost, hold-up and soft-budget-constraint problems associated with relationship credit. Ultimately, these costs force the firm to forgo investments that would have a positive net present value in absence of these frictions, i.e., when financed with arm's-length bonds. They are thus a simple modeling device to implicate insider agency frictions without imposing a selected mechanism while keeping the model tractable.

[59] Further details are presented alongside other restructuring and bankruptcy assumptions below.

together, the insiders' value function $V(\cdot)$ satisfies the following Bellman equation:

$$V(K_{t-1}, B_{t-1}, a_t) = \max\Bigg\{V_C(K_{t-1}, a_t), \\ \max_{K_t, B_t, M_t}\Bigg(a_t K_{t-1}^{\alpha} - k(K_{t-1}, K_t)\frac{\theta - k\mathbb{1}(k \geq 0)}{\theta - k} - M_t \\ - \tilde{B}(K_{t-1}, B_{t-1}, a_t) + P(a_t, K_t, B_t, M_t^*)B_t \\ + \frac{1}{\rho_i}\Big[p(a_t, M_t)V(K_t, B_t, \overline{a}) \\ + \big(1 - p(a_t, M_t)\big)V(K_t, B_t, \underline{a})\Big]\Bigg)\Bigg\} \tag{28}$$

In bankruptcy, the (going concern) value of the firm is $V(K_{t-1}, 0, a_t)$. This value is always non-negative and nests the option to liquidate ($K_t = 0\ \forall t$). I assume that the bankruptcy process devours fraction $\beta \in (0, 1)$ of the going concern value as dead-weight loss and splits the remaining value according to absolute priority: Insider claims are junior to market debt except secured claims totalling some fraction $\omega \in (0, 1)$ of book assets K_{t-1}.[60] That is, insiders receive[61]

$$V_C(K_{t-1}, a_t) = \min\{\omega K_{t-1}, V(K_{t-1}, 0, a_t)(1 - \beta)\} \tag{29}$$

Market creditors receive the remainder $V(K_{t-1}, 0, a_t)(1 - \beta) - V_C(K_{t-1}, a_t)(\leq B_{t-1})$, defining their reservation value for accepting any out-of-court debt exchange offer in the absence of regulation. Crucially, I assume that the market debt recovery rate from an exchange offer must not fall short of $\Lambda \in [0, 1]$, capturing **market creditor protection**. Given these bounds, insiders will engage in

[60] I interpret ωK_{t-1} as banks' first-lien and revolving debt claims, which receive priority over bond market claims in bankruptcy—in order to minimise agency frictions *among* insiders (contain management moral hazard and create incentives to monitor in the first place Diamond, 1993; Park, 2000) and limit bankruptcy litigation costs (Welch, 1997). These mechanisms are beyond this model so ω is exogenous. If endogenised, insiders would *always* set $\omega = 0$: It redistributes ex-post from market creditors to insiders and because insiders have higher discount rates than market creditors, the market debt price today increases by more than the expected continuation value from the perspective of insiders. Moreover, by reducing market creditor recovery in bankruptcy, higher ω expands the set of states in which out-of-court restructurings are restrained by the legislator, risking additional bankruptcy dead-weight losses, see the description of how bankruptcy and out-of-court restructuring are modelled.

As a consequence, I have to assume that insiders' incentive to tame internal agency friction by placing some of their claims senior (ω) is by and large invariant to changes in *out-of-court* market creditor rights. Relaxing this assumption, however, is seems worthy of future research.

[61] Strictly speaking, there is another outer $\max$ operator, comparing the $\min$ with the bankruptcy pay-out in case market debt could be honoured in full, i.e., $V(K_{t-1}, 0, a_t)(1 - \beta) - B_{t-1}$. This is superfluous in the model however, as insiders will never file for bankruptcy in these cases in the fist place—honouring market debt in full out-of-court spares the bankruptcy dead-weight loss.

out-of-court restructuring only if profitable, and thus effectively need to repay[62]

$$\tilde{B}(K_{t-1}, B_{t-1}, a_t) = \min\left\{B_{t-1}, \max\left\{V(K_{t-1}, 0, a_t)(1-\beta) - V_C(K_{t-1}, a_t), \Lambda B_{t-1}\right\}\right\}. \tag{30}$$

Risk neutral market creditors price bonds at their expected returns discounted by their opportunity cost of funds ρ_b:

$$\begin{aligned} P(a_t, K_t, B_t, M_t^*) = \frac{1}{\rho_b}\Bigg(p(a_t, M_t^*)\Big(&\mathbb{1}(V(K_t, B_t, \overline{a}) > V_C(K_{t-1}, \overline{a}))\frac{\tilde{B}(K_t, B_t, \overline{a})}{B_t} \\ &+ \mathbb{1}(V(\cdot) = V_C(\cdot))\frac{V(K_{t-1}, 0, \overline{a})(1-\beta) - V_C(K_{t-1}, \overline{a})}{B_t}\Big) \\ + (1 - p(a_t, M_t^*))\Big(&\mathbb{1}(V(K_t, B_t, \underline{a}) > V_C(K_{t-1}, \underline{a}))\frac{\tilde{B}(K_t, B_t, \underline{a})}{B_t} \\ &+ \mathbb{1}(V(\cdot) = V_C(\cdot))\frac{V(K_{t-1}, 0, \underline{a})(1-\beta) - V_C(K_{t-1}, \underline{a})}{B_t}\Big)\Bigg) \end{aligned} \tag{31}$$

II.2 Model implication

Solution of the model boils down to solving the Bellman equation (28), corresponding policy functions of which prescribe optimal investment, financing and management policy of the firm.

The link between success probability p and management and monitoring intensity M_t specified in Equation allows me to derive a closed-form solution for effort conditional on bond issuance and investment directly from the first-order condition of the maximization in (28):

$$\frac{\partial p}{\partial M_t} = \frac{\rho_i}{V(K_t, B_t, S_t, \overline{a}) - V(K_t, B_t, \underline{a})} \quad \text{for} \quad M > 0 \tag{32}$$

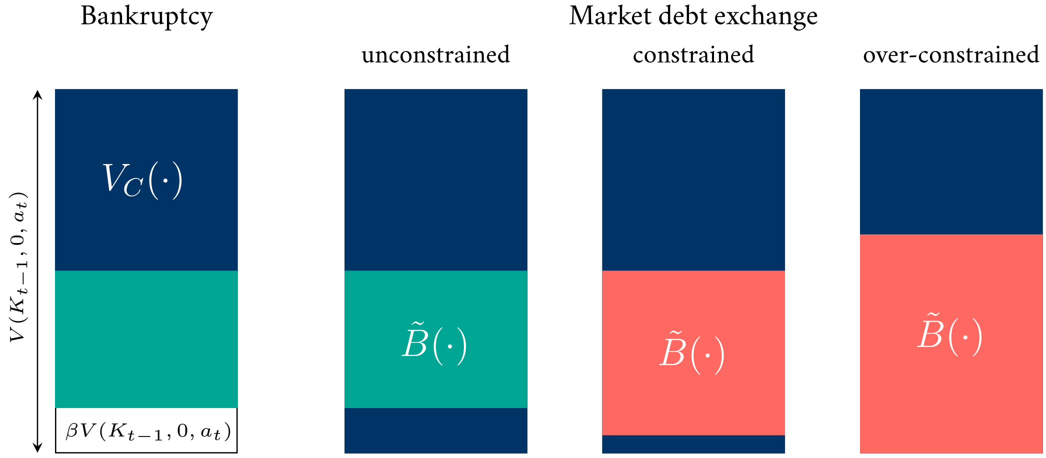
$$\Rightarrow M^*(a_t, K_t, B_t) = \max\left\{0, \sqrt{\frac{\gamma(a_t)}{\rho_i}(1-\pi)\Big(V(K_t, B_t, \overline{a}) - V(K_t, B_t, \underline{a})\Big)} - \gamma(a_t)\right\} \tag{33}$$

In addition to saving considerable computational resources during numerical solution, expression (33) facilitates insights into how bondholder protection can reign in on moral hazard and increase bond issuance.

In the remainder of this Subsection, I first describe the model mechanisms underpinning the trade-off for market creditor protection between ex-post cost of default and ex-ante discipline. I then present the numerical solution and calibration procedures. Finally, I explore counterfactual predictions for alternative market creditor rights regimes using comparative statics. Additional details to each of these steps can be found in Appendix II.

[62]The option to file for bankruptcy protects market debt against exchange offers in good states, in which the going concern value less bankruptcy cost is larger than what is owed to bondholders. In bad states, the legal constraint helps to prevent market creditors being always pressed against their bankruptcy reservation value.

Figure A.1: The effect of market creditor protection on out-of-court restructuring



Notes: Schematic illustrations of how different levels of market creditor rights affect the distribution of value in market debt exchanges and may push insiders to file for bankruptcy, increasing the cost of default.

Market creditor rights and ex-post cost of default To understand how out-of-court market creditor protection affects ex-post cost of default, consider equation (30) together with the Bellman equation, both of which summarize the decision to file for bankruptcy:

$$V(K_{t-1}, B_{t-1}, a_t) = \max\left\{V_C(\cdot), V(K_{t-1}, 0, a_t) - \tilde{B}(\cdot)\right\} \tag{34}$$

When firm value is large, insiders are effectively unable to cut market debt and thus $\tilde{B}(\cdot) = B_{t-1}$. When firm value is sufficiently small, however, three qualitatively distinct cases may arise. They are illustrated in Figure A.1. In the first, legal constraints are too lax to affect out-of-court market debt exchanges such that market creditors will receive exactly their bankruptcy reservation value. Notably, insiders are able to extract extra value equal to the dead-weight loss of bankruptcy. In the second case, laws constrain out-of-court bond exchanges, but the additional value which market creditors receives is less than the bankruptcy dead-weight. Hence, insiders still benefit from restructuring bond debt out-of-court relative to a bankruptcy filing. Finally, if market creditors protection is too strong for the prevailing circumstances of a distressed firm, out-of-court bond exchanges would have to grant bondholders a recovery which leaves insiders with less value than what they can expect to obtain in court. That is, market creditor rights inflict additional cost of default by prompting insiders to file for bankruptcy.

Firms become over-constrained in their out-of-court exchange offer when legacy contractual market debt debt B_{t-1} exceeds threshold $\Lambda^{-1}(V(K_{t-1}, 0, a_t) - V_C(\cdot))$. That is, strengthening market creditor protection tightens limits on market debt beyond which default costs increase due to bankruptcy dead-weight losses. For additional algebraic details, see Appendix II.2.1.

Market creditor rights and ex-ante discipline To understand how out-of-court market creditor rights can reign in on moral hazard and promote market bond issuance, consider first the response of insider value to additional market debt absent bankruptcy risk:[63,64]

$$\frac{\partial V}{\partial B_t} = \underbrace{\left(\frac{1}{\rho_i} - \frac{1}{\rho_b}\right)}_{<0} \underbrace{\left[p(a_t, M_t)\frac{\partial V(\cdot, \overline{a})}{\partial B_t} + \left(1 - p(a_t, M_t)\right)\frac{\partial V(\cdot, \underline{a})}{\partial B_t}\right]}_{<0} + \underbrace{\frac{\partial P(\cdot) B_t}{\partial M^*}}_{>0} \underbrace{\frac{\partial M^*}{\partial B_t}}_{\leq 0} \tag{35}$$

Under bankruptcy risk, the first summand becomes *negative* for non-negligible bankruptcy dead-weight because market creditors will receive less in expectation than insiders pay out. Taken together, insiders will issue market debt until the risk of bankruptcy looms—except when moral hazard drives down the price of market debt too much before that point.[65]

What determines the magnitude of moral hazard effects $\frac{\partial M^*}{\partial B_t}$? Considering equation (30), market debt repayment will react one-for-one to bond issuance in financially healthy states where market debt is honoured in full. By contrast, it will increase by only $\Lambda \in [0, 1]$ if regulation binds and will not react at all if debt exchanges occur in unconstrained fashion. Hence, the differential effect of market debt on future values will be zero if market debt is sufficiently small so that it can be honoured in full in *both* states.[66] For all intermediate levels, the differential effect of bond debt on future states will be negative and equal $-\mathcal{A}$ under unconstrained debt exchanges and $-\mathcal{A}(1-\Lambda)$ for constrained or over-constrained debt exchanges. For a precise definition of $\mathcal{A}$ see details in Appendix II.2.1. That is, as market creditor rights bind and tighten, moral hazard shrinks towards zero, increasing market debt issuance.

Note that the value of market debt issuance changes with Λ only due to moral hazard. This will lead to a non-monotonic reaction to expanding market creditor rights: Once moral hazard is shrunk beyond the state-specific threshold, firms will lever up with bond debt until the next unit would provoke bankruptcy dead-weight costs. Ultimately, the jump is due to the discrete nature of the profitability state space carrying positive point masses. A continuum of profitability states, by contrast, would imply a continuum of thresholds such that effects on market debt issuance cumulate continuously with growing Λ.

Market debt and firm investment In the model, insider agency frictions captured by ρ_i effectively reduce investment compared to a hypothetical firm fully funded with market-based debt. Market debt can circumvent these frictions by substituting the applicable discount rate to the proportion in which *marginal* continuation value is pledged to market creditors. Effectively, market finance allows firm

[63] If bankruptcy dead-weight costs are sufficiently large, the firm will always manage avoid bankruptcy in equilibrium due to the binary profitability state space.

[64] Derivation of Equation (35) builds on the first order condition for bond issuance together with some intermediate steps, all of which are detailed in Appendix II.2.1.

[65] Remember that market creditors will anticipate any moral hazard and demand yield compensation today, by lowering the price at which they are willing to buy newly issued market debt.

[66] Theoretically, market debt may be so large as to trigger debt resolution in *both* states, in which case the differential effect of market debt on future values will be zero as well. For $\alpha \in (0, 1)$, this would lead to bond-to-asset ratios of above 1. These equilibria are infeasible if insider governance is sufficiently sensitive, i.e., moral hazard is non-negligible, see Equation (40) in Appendix II.2.1.

insiders to sideline their agency frictions and move the corporate discount rate closer to the market discount rate. A detailed analysis can be found in Appendix II.2.1.

Numerical solution I solve the model using value function iteration, plugging the closed-form solution for M^* of Equation (33) into bondholders willingness to pay given by Equation (31) found in Appendix II. My initial guess for the value function iteration is $V(K_{t-1}, B_{t-1}, a_t) = 0 \forall (B_{t-1}, K_{t-1}, a_t)$. Hence, the equilibrium will correspond to that of a model where the firm faces a distant terminal period, after which the firm's value is zero. More details can be found in Appendix II.3.

Calibration The calibration targets key moments of risky *compustat* firms (S&P entity rating BBB- or worse) over the decade 2010Q1 to 2019Q4. Details are described in Appendix II.4 alongside Table A.1 showing calibrated parameter values.[67]

Figure A.2 compares selected empirical moments to those of simulated model data. Panel A.2a presents averages for the market debt share and operating profitability (model counterpart: $a_t K_{t-1}^{\alpha} / K_{t-1}$) as well as moments characterising its dispersion. The calibrated model matches baseline balance sheet metrics almost perfectly: The average bond intensity is 27.95% (27.55% in the data) and average profitability is 2.81% (2.73% in the data). Equally important, it realistically captures extreme profitability events: Under low (high) profitability, operating profits relative to assets averages to -18.8% (3.4%) in the model. In the data, I can split the distribution of profit rates such that averages of both partitions, -18.9% and 3.0%, come very close.[68] The 95%-confidence interval for the empirical probability to transition from the higher into the lower profitability partition is $[0.49\%, 0.66\%]$. In the model, this probability endogenously depends on governance quality and averages at 0.63%.

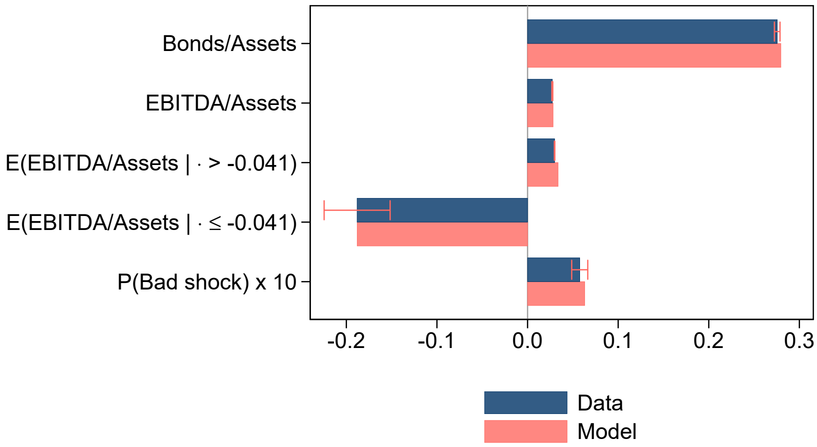
Panel A.2b compares Kaplan-Meier survival estimates of expected probabilities for spells of low profitability to exceed a given duration. In the data, low profitability is defined as before, i.e., the partition of the profitability distribution whose mean matches the corresponding model moment. The simulated data spells track the distribution of empirical spell durations reasonably closely. Probabilities for spells to persist beyond the first five quarters are slightly higher in the model but are compensated by higher exit probabilities thereafter. Taken together, the expected duration of low profitability spells stands at about five quarters in the model and does not deviate significantly in the data.

[67] Naturally, magnitude and pattern of model predictions are sensitive to calibration choices. Rigorous structural estimation—even if it was less computationally burdensome than it would be in this case—cannot reliably clear quantitative ambiguity as it still may be corrupted by features entirely artefact to model choices taken for the sake of tractability. For this reason, I turn to reduced-form estimation exploiting an unexpected change in jurisprudence which substantially strengthened the protection of bondholder rights.

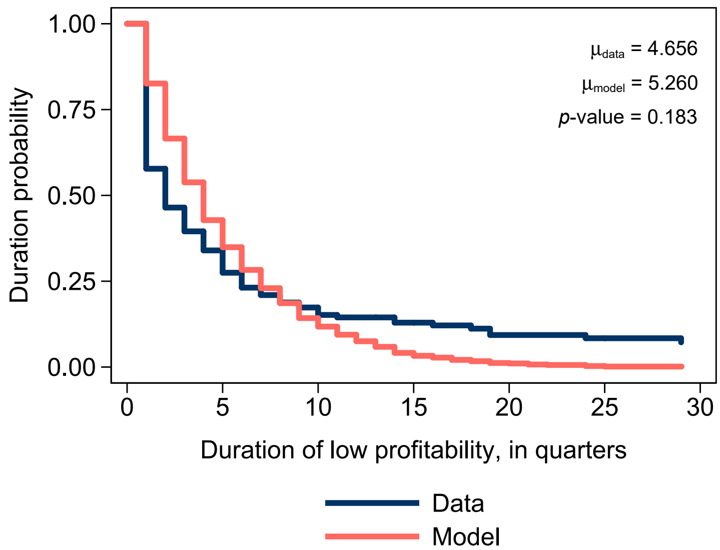
[68] Overall, profitability states are slightly more spread out in the model. This is necessary to match other moments, especially to prevent overshooting in the high-low transition probability and the bond share.

Figure A.2: Moments from model simulations and empirical counterparts

(a) First order moments



(b) Kaplan-Meier duration estimates



Notes: Comparing moments from 5000 model firms simulated for ten years (40 model periods) to empirical counterparts from quarterly compustat data on risky non-financial firms (S&P rating BBB or worse) for the decade starting 2010Q1. Top panel: Averages of four continuous variables and one binary variable. Whiskers mark 95% confidence intervals for empirical moments. A *bad shock* refers to a shift from the fortunate into the unfortunate profitability regime, i.e., $a_t = \underline{a}|a_{t-1} = \overline{a}$ in the model and $\text{EBITDA}_t/\text{Assets}_t \leq x|\text{EBITDA}_{t-1}/\text{Assets}_{t-1} > x$ in the data. Bottom panel: Kaplan-Meier survival estimates for the duration of low profitability spells. Average spell durations for data and model displayed in the top right corner alongside the p-value of a test on their equality.

Comparative statics across regimes of different market creditor rights How do firm outcomes change across different degrees of bondholder protection? I keep all parameters at their calibrated baseline values and vary Λ. The resulting comparative statics are shown in Figure A.3: For each value of Λ, it plots the firm's average bond debt and capital stock from 5000 firms simulated for 40 model quarters. As bond haircuts get compressed in out-of-court bond exchanges, neither bond issuance nor investment reacts initially. However, once bondholder rights push the effective (moral hazard) cost of bond finance below the excess cost of insider finance, bond issuance shifts into a new equilibrium (levering up to the point where the next unit would trigger bankruptcy upon and unfortunate profitability shock), making additional investments profitable. Where exactly the shift occurs depends on parameters including ρ_i, $\gamma(a_t)$ and π, all of which plausibly vary empirically across individual firms within the population of firms. Hence, the aggregate response is likely to look more hump-shaped, depending on the distribution of those parameter constellations.

Once bondholder protection overcomes insider moral hazard, further strengthening only adds constraints to ex-post bond exchanges, increasing the expected cost of distress for any given bond leverage. In response, firms shrink their bond issuance, gradually this time, and curtail investment. Total firm value tracks the pattern of capital very closely and is displayed in Figure **??** in Appendix **??**

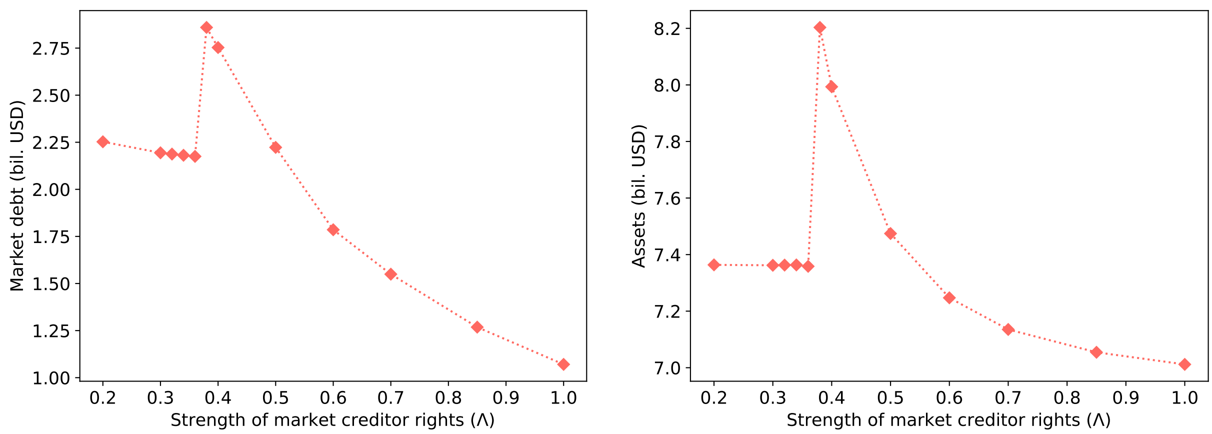
The net effect on total assets (and hence investment) is ambiguous. Reforming market creditor rights regimes may change capital stocks by -4.4% to +13% relative to the baseline ($\Lambda = 0.57$). Given that the aggregate of assets held by high-yield-rated public firms stands at about 150% of GDP, aggregate wealth gains may be considerable. Similarly, effects observed for bond issuance could imply growth in the aggregate corporate bond market between -15% and +45%, considering that outstanding high-yield issues account for about a third of overall market by volume. However, the aggregate can be influenced by amplifying or dampening general equilibrium feedback as well as the distribution of firm-specific sensitivity points. Dispersion thereof will attenuate the economy-wide effects relative to largest firm-specific impact.

To summarize, the economic impact of market creditor rights is possibly large but its direction is a-priori ambiguous. Knowing on which side of the curve a given institutional setup resides indicates the desirable nature of reform.

Figure A.3: Potential effects of market creditor rights on finance and investment

(a) Firm's average market debt

(b) Firm's average capital stock



Notes: Comparative statics across Λ; average across a firm's life-cycle obtained from 5000 model firms simulated for ten years (40 model periods). Units scaled such that average capital in the baseline ($\Lambda = 0.57$) matches compustat's average asset value in US Dollars for risky non-financial firms.

II.2.1 Details

Market creditor rights and ex-post cost of default To understand effect of out-of-court market creditor protection on ex-post cost of default, consider equation (30) together with the simplified version of the Bellman equation:

$$V(K_{t-1}, B_{t-1}, a_t) = \max\left\{V_C(\cdot), V(K_{t-1}, 0, a_t) - \tilde{B}(\cdot)\right\} \tag{36}$$

If $\tilde{B}(\cdot) = B_{t-1}$, there is no need for debt restructuring, and nobody has the incentives to file for bankruptcy. Otherwise, there are three qualitatively distinct cases. In the first, legal constraints are too lax to affect out-of-court bond exchanges such that bondholder will receive exactly their bankruptcy reservation value:

$$\text{Unconstrained bond exchange:} \quad \tilde{B}(\cdot) = V(K_{t-1}, 0, a_t)(1-\beta) - V_C(K_{t-1}, a_t) \tag{37}$$

Plugging this into equation (36), clarifies that insiders will not want to file for bankruptcy in this case (while bondholders are indifferent). In particular, insiders are able to extract extra value equal to the dead-weight loss of bankruptcy.

In the second case, laws constrain out-of-court bond exchanges, but the additional value which bondholders receives is less than the bankruptcy dead-weight. Hence, insiders still benefit from restructuring bond debt out-of-court relative to a bankruptcy filing:

$$\text{Constrained bond exchange:} \quad \tilde{B}(\cdot) = \Lambda B_{t-1} \leq V(K_{t-1}, 0, a_t) - V_C(\cdot) \tag{38}$$

Finally, if bondholder protection is too strong for the prevailing circumstances of a distressed firm, out-of-court bond exchanges would have to grant bondholders a recovery which leaves insiders with less value than what they can expect to obtain in court. That is, market creditor rights inflict additional cost of default by prompting insiders to file for a bankruptcy procedure, as made explicit when plugging in the relation below into Equation (36):

$$\text{Over-constrained bond exchange:} \quad \tilde{B}(\cdot) = \Lambda B_{t-1} > V(K_{t-1}, 0, a_t) - V_C(\cdot) \tag{39}$$

Market creditor rights and ex-ante discipline To understand how out-of-court market creditor rights can reign in on moral hazard and promote market bond issuance, start by considering the response of insider value to additional market debt:

$$\frac{\partial V}{\partial B_t} = \frac{\partial P(\cdot)B_t}{\partial B_t} + \frac{\partial P(\cdot)B_t}{\partial M^*}\frac{\partial M^*}{\partial B_t} + \frac{1}{\rho_i}\left[p(a_t, M_t)\frac{\partial V(\cdot, \overline{a})}{\partial B_t}\Big(1 - p(a_t, M_t)\Big)\frac{\partial V(\cdot, \underline{a})}{\partial B_t}\right] \tag{40}$$

Putting changes in governance aside for the moment, the bond pricing equation (31) implies that additional value market creditors expect to receive tomorrow equals the value insiders expect to loose—

as long as there will be no bankruptcy. However, note the difference in discounting:[69]

$$\text{if } V(\cdot,a_t) \geq V_C(\cdot,a_t)\ \forall a_t \in \{\underline{a},\overline{a}\}:$$
$$\frac{\partial P(\cdot)B_t}{\partial B_t} = -\frac{1}{\rho_b}\left[p(a_t,M_t)\frac{\partial V(\cdot,\overline{a})}{\partial B_t} + \Big(1-p(a_t,M_t)\Big)\frac{\partial V(\cdot,\underline{a})}{\partial B_t}\right] \tag{41}$$

As soon as the next unit of market debt pushes insiders' future value of operation (in state of low profitability) marginally below their bankruptcy reservation value V_C, market creditors anticipate potential dead-weight losses from bankruptcy, provoking to a non-continuous drop-down in market debt prices, i.e., an infinite slope. Absent bankruptcy risk, plugging (41) into (40) yields

$$\frac{\partial V}{\partial B_t} = \underbrace{\left(\frac{1}{\rho_i}-\frac{1}{\rho_b}\right)}_{<0}\underbrace{\left[p(a_t,M_t)\frac{\partial V(\cdot,\overline{a})}{\partial B_t} + \Big(1-p(a_t,M_t)\Big)\frac{\partial V(\cdot,\underline{a})}{\partial B_t}\right]}_{<0} + \underbrace{\frac{\partial P(\cdot)B_t}{\partial M^*}}_{>0}\underbrace{\frac{\partial M^*}{\partial B_t}}_{\leq 0}$$

Under bankruptcy risk, the first summand becomes *negative* for non-negligible bankruptcy dead-weight because market creditors will receive less in expectation than insiders pay out. Taken together, insiders will issue market debt until the risk of bankruptcy looms—except moral hazard, $\frac{\partial M^*}{\partial B_t} < 0$, drives down the price of market debt too much before that point.[70]

What determines the magnitude of moral hazard effects? Consider how the optimal insider effort, M^*, changes with market bond issuance (at some interior point, i.e., $M^* > 0$):

$$\frac{\partial M^*}{\partial B_t} = \underbrace{\sqrt{\frac{\gamma(a_t)(1-\pi)}{\rho_i 4\Big(V(K_t,B_t,\overline{a}) - V(K_t,B_t,\underline{a})\Big)}}}_{\equiv \mathcal{A}}\left(\frac{\partial V(K_t,B_t,\overline{a})}{\partial B_t} - \frac{\partial V(K_t,B_t,\underline{a})}{\partial B_t}\right) \tag{42}$$

If the firm operates, i.e., $K_t = 0$, the radicand will be finite and strictly positive such that the strength of moral hazard is determined by the differential effect of bond debt on either future state. Specifically,

$$\frac{\partial V(\cdot,a_t)}{\partial B_t} = \begin{cases} -\frac{\partial \tilde{B}(\cdot,a_{t+1})}{B_t} & \text{if } V(\cdot) > V_C(\cdot) \\ 0 & \text{else} \end{cases}$$

Considering equation (30), market debt repayment will react one-for-one to bond issuance in financially healthy states where market debt is honoured in full. By contrast, it will increase by only $\Lambda \in [0,1]$ if regulation binds and will not react at all if debt exchanges occur in unconstrained fashion. Moreover, note that bankruptcy occurs in the good state only if would also take place in the bad, while dead-weight cost will always deter the firm from issuing so much bond as to trigger bankruptcy in all states.

[69]This logic compels insiders to issue market ebt in the first place, because insiders face higher opportunity cost of funds and their future value shrinks in today's bond issuance today.

[70]Remember that market creditors will anticipate any moral hazard and demand yield compensation today, by lowering the price at which they are willing to buy newly issued market debt.

Hence, the differential effect of market debt on future values will be zero if market debt is sufficiently small so that it can be honoured in full in *both* states.[71] For all intermediate levels, the differential effect of bond debt on future states will be negative and equal $-\mathcal{A}$ under unconstrained debt exchanges and $-\mathcal{A}(1-\Lambda)$ for constrained or over-constrained debt exchanges. That is, as market creditor rights bind and tighten, moral hazard shrinks towards zero, increasing market debt issuance.

Note that the value of market debt issuance changes with Λ only due to moral hazard. This will lead to a non-monotone reaction to expanding market creditor rights: Once moral hazard is shrunk beyond the state-specific threshold, firms will lever up with bond debt until the next unit would provoke bankruptcy dead-weight costs. Ultimately, the jump is due to the discrete nature of the profitability state space carrying positive point masses. A continuum of profitability states, by contrast, would imply some continuum of thresholds such that effects on market debt issuance cumulate continuously with growing Λ.

Market debt and investment To understand how exactly bond finance can spur additional investment, consider how insider value changes with additional investment while assuming for now that insiders will not want to file for bankruptcy in t nor in either state of $t+1$:

$$\frac{\partial V}{\partial K_t} = -1 + \frac{1}{\rho_i}\left[p(a_t, M_t)\frac{\partial V(\cdot, \overline{a})}{\partial K_t} + \Big(1 - p(a_t, M_t)\Big)\frac{\partial V(\cdot, \underline{a})}{\partial K_t}\right] + \frac{\partial P(\cdot)B_t}{\partial K_t} + \frac{\partial P(\cdot)B_t}{\partial M^*}\frac{\partial M^*}{\partial K_t}$$

Using an argument similar to that underlying Equation (41), bondholders can expect to receive what insiders expect to give up—or less, in case of bankruptcy. That is, there is equivalence in the first order conditions up to the discount factor—with a discontinuity around bankruptcy, where the derivative becomes ∞. Hence, analogous to before, but implicitly allowing for bankruptcy as indicated by the inequality:

$$\begin{aligned}\frac{\partial V}{\partial K_t} \geq &\overbrace{-1 + \frac{1}{\rho_i}\left[p(a_t, M_t)(\alpha\overline{a}K_t^{\alpha-1} + 1 - \delta) + \Big(1 - p(a_t, M_t)\Big)(\alpha\underline{a}K_t^{\alpha-1} + 1 - \delta)\right]}^{\text{Baseline marginal value}} \\ &\underbrace{+\left(\frac{1}{\rho_b} - \frac{1}{\rho_i}\right)\left[p(a_t, M_t)\frac{\partial \tilde{B}(\cdot, \overline{a})}{\partial K_t} + \Big(1 - p(a_t, M_t)\Big)\frac{\partial \tilde{B}(\cdot, \underline{a})}{\partial K_t}\right] + \frac{\partial P(\cdot)}{\partial M^*}\frac{\partial M^*}{\partial K_t}B_t}_{\text{Additional marginal value from bonds}}\end{aligned}$$

That is, bond issuance makes investment more valuable because it effectively applies a higher discount factor to the portion of the continuation value which is pledged to outside market creditors—or even averts bankruptcy. In addition, investment functions as commitment device attenuating moral hazard

[71]Theoretically, market debt may be so large as to trigger debt resolution in *both* states, in which case the differential effect of market debt on future values will be zero as well. For $\alpha \in (0, 1)$, this would lead to bond-to-asset ratios of above 1. These equilibria are infeasible if insider governance is sufficiently sufficiently sensitive, i.e., moral hazard is non-negligible, see Equation (40).

associated to outstanding market debt.[72]

In the model, marginal value of investment related to the discount rate differential may disappear in some states, e.g., when there is no restructuring in the high-profitability and constrained restructuring in the low-profitability state. However, this is an artifact of a discrete profitability state space. Under continuous profitability state—i.e., a probability-weighted integral inside the square brackets of the lower term—there would always be some state with unconstrained bond exchanges. Hence, future bondholder values, and thus current bond prices, would always be sensitive to investment policy.

How market creditor rights ultimately increase investment For sufficiently small levels of Λ, bond restructuring (in the poor profitability state) will be unconstrained. The exact level is determined by the balance between the value of substituting insider finance on the one hand and the moral hazard effects scaled by the sensitivity of bond prices to success probability in turn scaled by the sensitivity of success probability to governance on the other. There will be some equilibrium bond exchange hair-cut x such that from $\Lambda = x$ onward, exchanges become constrained and abruptly shrink the negative effect of moral hazard from $-\mathcal{A}(1-0)$ to $-\mathcal{A}(1-\Lambda)$. The marginal benefit of issuing bonds jumps up, remaining positive until bond debt becomes so large as to threaten bankruptcy (in the poor profitability state) next period. Yet, exchange offers start becoming attractive in the other state, (re-)activating the bond-related marginal value of investment and thus prompting capital to grow as long as bondholder recovery is sensitive to investment.[73] The motion comes to a halt once the volume of market leverage hits the bankruptcy boundary.

The non-monotone increase in bond issuance and investment roots in the discrete nature of the profitability state space. By contrast, a continuum profitability states implies some continuum of thresholds $\{x_j\}$. When Λ passes the next threshold, effects on bond issuance and investment cumulate continuously.

[72] Note that

$$\frac{\partial \tilde{B}(K_t, B_t, a_{t+1})}{\partial K_t} = \begin{cases} 0 & \text{if no haircut, i.e., } B(K_t, B_t, a_{t+1}) = B_t \\ (1-\beta)(\alpha a_{t+1} K_t^{\alpha-1}) - \omega & \text{if unconstrained, i.e., } B_t > B(K_t, B_t, a_{t+1}) > \Lambda B_t \\ 0 & \text{if constrained, i.e., } B_t > B(K_t, B_t, a_{t+1}) = \Lambda B_t \end{cases}$$

as well as

$$\begin{aligned} \frac{\partial M^*}{\partial B_t} &= \mathcal{A}\left(\frac{\partial V(K_t, B_t, \overline{a})}{\partial K_t} - \frac{\partial V(K_t, B_t, \underline{a})}{\partial K_t}\right) \\ &= \mathcal{A}\left(\alpha K_t^{\alpha-1}(\overline{a} - \underline{a}) + \frac{\partial \tilde{B}(\cdot, \underline{a})}{\partial K_t} - \frac{\partial \tilde{B}(\cdot, \overline{a})}{\partial K_t}\right) \\ &> 0 \end{aligned}$$

[73] If bankruptcy dead-weight loss is sufficiently small or profitability states sufficiently far apart, the process may not trigger that intermediate stage and thus leave the capital stock unchanged. However, this is an artefact of only modelling two profitability states: Generally, growing bond debt triggers unconstrained restructuring—activating the additional value for ex-ante investment—in the future state neighbouring the constrained state in terms of profitability. As the set of profitability states grows to infinity, the minimal bankruptcy dead-weight loss thus shrinks to zero.

II.3 Numerical implementation

I solve the model using value function iteration, plugging the closed-form solution for M^* of Equation (33) into bondholders willingness to pay given by Equation (31).[74]

1) Guess a value function (stipulate the terminal value function $V(\cdot) = 0$).

2) Compute the right-hand side of the Bellman equation (28), including M^*, for all states $(K_{t-1}, B_{t-1}, S_{t-1}, a_t)$ to obtain a new value function.

↻ Iterate until the maximal absolute discrepancy between guessed and resultant value function falls below a (small) threshold.

3) Obtain policy mapping for final value function.

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[74] Value function iteration alone would be insufficient without a closed-form solution of M_t^*. That is, for other functional forms of $c(M_t)$ and $p(M_t)$ that do not permit such a solution, value function iteration would be conditional on a (state-dependent) guess for M_t^* and have to be wrapped into an outer numerical root finding procedure for the equilibrium effort policy. Legacy code for this solution approach is stored in module `./compute/theory/model_armslength_dynamic/modules/_archive/twoStage/`

1.) Stipulate investor beliefs about the effort policy $M_t^*(B_{t-1}, K_{t-1}, a_t)$. (Possibly use the fact that in a simple version of the model policies will be state-*independent*, i.e., constant across states.)

2A.) Find the corresponding (firm insider) policy mapping based on value function iteration.

- 2.1) Guess a value function.
- 2.2) Given investor beliefs and value function guess, compute the right-hand side of the Bellman equation (28) for all states (K_{t-1}, B_{t-1}, a_t) to obtain new value function.
- ↻ Iterate until the maximal absolute discrepancy between guessed and resultant value function falls below a (small) threshold.
- 2.3) Obtain policy mapping for final value function and stipulated investor beliefs.

2B.) Find the corresponding (firm insider) policy mapping based on numerical root finding (this guards against non-convergence in the iteration, but is computationally much more expensive of course).

- 2.1) Guess a value function.
- 2.2) Given investor beliefs and value function guess, compute the right-hand side of the Bellman equation (28) for all states (K_{t-1}, B_{t-1}, a_t).
- 2.3) Calculate the absolute discrepancy in the Bellman equation across all states, take maximum.
- ↻ Repeat with procedure (Broyden) numerically minimising the maximal absolute value function discrepancy.
- 2.4) Obtain policy mapping for final value function and stipulated investor beliefs.

3) Compute maximal absolute discrepancy between actual effort policy and corresponding investor beliefs.

↻ Repeat with procedure to minimising the maximal absolute discrepancy in policies (either Broyden or, under state-independent policies, loop through all points on the M grid.).

II.4 Calibration

Table A.1 shows the calibration of the 13 parameters. Where applicable, I target related moments from risky *compustat* firms (S&P entity rating BBB- or worse), using a full decade of data, 2010Q1-2019Q4, to capture a robust number of extreme profitability observations.

- ρ_b is set to 1%, slightly above the three-month US Treasury bill rate around the Marblegate ruling.
- β is set to 0.05, consistent with empirical evidence on total direct and indirect costs of bankruptcy, estimated to range between 1% and 20% of the firm's going concern value (Hotchkiss et al., 2008; Lubben, 2012; Epaulard and Zapha, 2022).
- δ is set to the empirical average quarterly depreciation rates of 0.013.
- θ is set to 0.01, consistent with an asset liquidation value of about 40% in an "orderly liquidation process" spanning three quarters (Kermani and Ma, 2022).
- ω is set to 0.289, the average volume of secured loans relative to assets at the eve of a bankruptcy filing in compustat data.

The following parameters are calibrated jointly to match the moments shown in the main text Figure A.2, i.e., average bonds-to-assets ratio, average profitability as well as its dispersion across states, the probability to transition from the high into the low profitability state and the duration distribution of low-profitability spells. Each parameter affects certain model features more than others.

- ρ_i is set to ρ_b + 10 basis points, primarily targeting the average bond share
- α is set to 0.85, primarily targeting average profitability[75]
- $\overline{a}, \underline{a}$ are set to 0.02 and -0.10, primarily targeting the dispersion of profitability (while generating the need for debt restructuring, without which the model would be uninteresting)
- $\pi, \underline{\gamma}$ are set to 0.195 and ∞ primarily targeting the duration distribution of spells of low profitability
- $\overline{\gamma}$ is set to 1×10^{-6}, primarily targeting the probability to transition from high to low profitability
- Λ is set to 0.57, primarily targeting the average bond share

[75] Existing structural estimates have found the curvature of operating profits to be 0.55 (Hennessey and Whited, 2005). However, these models featured constantly changing profitability which renders the capital stock generally suboptimal, reducing profit rates. By contrast in my model, firms eventually hit the optimal capital stock and stick with it for a potentially long time. These models were also estimates on annual data.

Table A.1: Parameter calibration values

ρ_b	Market discount rate	1.0100000
ρ_i	Insider discount rate	1.0110000
α	Profit curvature	0.8500000
δ	Depreciation rate	0.0130000
θ	Ease of liquidation	0.0100000
π	Base success probability	0.1950000
$\overline{a}$	High profitability	0.0200000
$\underline{a}$	Low profitability	-0.1000000
$\underline{\gamma}$	Governance costs, unfortunate state	9.9990000
$\overline{\gamma}$	Governance costs, fortunate state	0.0000010
Λ	Out-of-court market creditor rights	0.5700000
ω	Share of senior insider claims	0.2890000
β	Bankruptcy dead-weight loss	0.0500000

Notes: All model parameters alongside short description and the value set during calibration to match data moments.

III Model of bond restructuring with asymmetric information

In this section, I illustrate theoretically i) how an coalition of debtor and relationship creditors can extract information rents from restructuring arm's-length debt, ii) why these information rents can undermine investment success and iii) clarify under which assumptions law should protect arm's-length creditors out-of-court and by how much. The model builds on the following key notions:

1. Arm's-length creditors hold significantly *less information* about business prospects than the debtor and its relationship creditors, which I will refer to as "insiders". This can result in a transfer of value from arm's-length creditors to insiders when debt needs to be restructured.

2. Information rents make the state of financial distress less dreadful for insiders, undermining incentives to exert managerial effort (debtor) and engage in costly monitoring (relationship creditors). At the same time, arm's-length creditors demand compensation through higher rates ex-ante, making investment success—where arm's-length debt obligations are honoured in full—less attractive. Both forces *dis-incentivise insiders* to implement costly (but efficient) measures maximising the investment's net present value (NPV).

3. Insiders *cannot commit* ex ante to forego information rents ex post. Contracts are incomplete and arm's-length creditors face prohibitive frictions in adjusting contracts ex-post. Emerging contractual loopholes allow insiders to undermine and hollow-out protective provisions possibly stipulated ex ante.

Investment choice Consider a single-project firm that requires a fixed amount α of arm's-length credit to pursue an investment opportunity.Other financing is provided by insiders: firm owners and relationship creditors. To focus the analysis, I abstracts from agency frictions between insiders. That is, I assume that they share value accruing to the group as a whole in a way that aligns individual incentives with the objective of maximising total group value.[76]

Insiders maximise their expected value $E[V_i(\cdot)]$ choosing management and monitoring strategies $\boldsymbol{m}$ and gross return to arm's-length credit R_a. To supply α, creditors must cover their opportunity cost of funds ρ in expectation. Because arm's-length creditors do not acquire insider information, they effectively cannot contract on management or monitoring $\boldsymbol{m}$. Instead, they will anticipate insiders' equilibrium choice $\boldsymbol{m}^*$:[77]

$$\max_{\boldsymbol{m},R_a} E\Big[V_i(\boldsymbol{m}, R_a)\Big] \quad \text{s.t.} \quad E\Big[V_a(\boldsymbol{m}^*, R_a)\Big] \geq \rho\alpha \tag{43}$$

The following assumptions clarify the structure and distribution of $V_i(\cdot)$ and $V_a(\cdot)$.

Investment outcomes and information structure Investment success depends on management and monitoring $\boldsymbol{m}$ as well as unobserved factors. Agents learn the investment outcomes *after* the implementation of $\boldsymbol{m}$ and common ex ante beliefs about the distribution of unobserved factors imply a success probability of $p(\boldsymbol{m})$ and a failure probability of $1 - p(\boldsymbol{m})$. Success yields cash flows Φ while failure cash flows ϕ fall between $\underline{\phi}$ and $\overline{\phi}$ with uniform probability. The variability of ϕ is key: While everybody is able to observe investment success and infers failure otherwise, arm's-length creditors do not observe the exact realisation of ϕ upon failure: the actual extent of the economic malaise is insider information. Figure A.4 summarises key features of the investment process.

Management and monitoring $\boldsymbol{m}$ is associated to cost $c(\boldsymbol{m})$ born privately by insiders. I assume that cost grow with management and monitoring quality, specifically:

$$p(\boldsymbol{m}_1) > p(\boldsymbol{m}_1) \implies c_i(\boldsymbol{m}_1) > c_i(\boldsymbol{m}_1), \tag{44}$$

Perfect management and monitoring is infinitely costly, while insider behaviour without costs is completely ineffective:

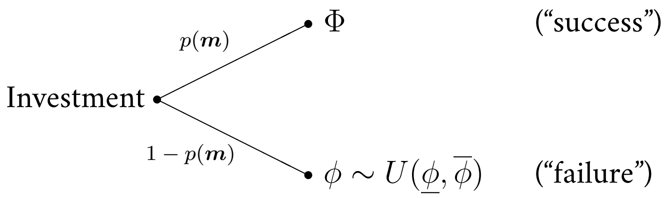
$$p(\boldsymbol{m}) \to 1 \iff c_i(\boldsymbol{m}) \to \infty \tag{45}$$

$$p(\boldsymbol{m}) = 0 \iff c_i(\boldsymbol{m}) = 0 \tag{46}$$

[76] The literature on conflicts between shareholders, management and creditors is vast and particular attention is given to information asymmetries and agency frictions between entities which I refer to as insiders in this paper. Without trivialising the economic importance of these frictions, my assumption rules out that they *interact* with arm's-length creditor rights. Exploring such interactions appears to be an interesting route for future research. The notion that insiders share value in various states of the world is consistent with important practical features of distressed restructurings as well as bargaining power of relationship creditors over firm profits (Rajan, 1992).

[77] This is the key characteristic of arm's-length lending. No monitoring can be desirable because i) it taps the credit supply of dispersed investors each holding small positions due to a diversification objective given limited funds, making monitoring prohibitively costly or ii) to reduce ex-post hold-up associated to relationship lending (Rajan, 1992).

Figure A.4: Investment outcomes



In-court debt restructuring I assume that investment failure always implies insolvency by setting $\overline{\phi} < \rho$ such that available cash flows will always fall short of even the lightest contractual debt obligations that could possibly be compatible with creditor participation.

Insolvency can be resolved in front of a bankruptcy court at the cost of δ. In this case, the court learns the realisation of ϕ and distributes value remaining after covering the verification costs δ according to absolute priority

$$\hat{R}_a\alpha = \phi - \delta, \tag{47}$$

leaving $\phi - \delta - R_a\alpha = 0$ to firm owners. Naturally, I assume that the bankruptcy court can bind hold-outs and order arm's-length creditors to relinquishing their original claims R_a and accept $\hat{R}_a$.

Without loss of generality, I assume that $\underline{\phi} \geq \delta$, implying bankruptcy being always an economically viable option. Both insiders and arm's-length creditors can initiate a bankruptcy procedure.

Out-of-court debt restructuring Insolvency can alternatively be resolved out-of-court through a private debt exchange offer. An out-of-court resolution saves the verification costs ϕ of court procedures.[78] Because arm's-length creditors do not know the actual value of the firm ϕ, they would agree to exchange their claims $R_a\alpha$ against devalued debt securities $\tilde{R}_a\alpha$ if the value of new securities is greater or equal to what they can *expect* to extract from a bankruptcy process. Such debt exchanges face two complications.

First, I assume that arm's-length creditors are dispersed in the sense of individually holding very small positions with prohibitively costly coordination. As a result, arm's-length creditors have the incentive to free-ride on the debt hair-cuts of the others. Without coercion, all creditors will thus hold out, making out-of-court restructuring infeasible. By contrast, if the firm is able to coerce hold-out creditors to accept a return of Λ, offers $\tilde{R}_a > \Lambda$ become viable. I assume that Λ is set by the legislator ("arm's-length creditor rights").[79] Arm's-length creditors are always free to drag a failed firm before the bankruptcy

[78]Thus, out-of-court resolution is always increases ex-post efficiency.

[79]Λ may vary with verifiable firm characteristics, such as its contractual structure. But cannot depend on ϕ because the government and its courts do not know ϕ (without incurring the bankruptcy cost δ).

court and realise $\hat{R}_a\alpha = E_a[\phi] - \delta$. Hence, effective out-of-court coercion implies

$$\tilde{R}_a \geq \max\left(\Lambda, \frac{E_a[\phi] - \delta}{\alpha}\right) \tag{48}$$

Second, the fact that an offer $\tilde{R}_a$ is made can reveal information to arm's-length creditors about ϕ. I denote the mapping between the state ϕ and insiders' choice to make an offer by the binary $W(\phi) \in \{0, 1\}$.[80] This information will update their expectations of bankruptcy payoffs and hence possibly shift effective out-of-court coercion, on which insiders depend to bind hold-outs. Arm's-length creditors expect insiders to play the strategy that maximises their payoff. In equilibrium, thus, they know insiders' mapping between ϕ and $(W, \tilde{R}_a)$ and can use it to back-out information about ϕ. Ultimately, arm's-length creditors are willing to leave value to insiders in exchange for saving bankruptcy cost δ. This ability of debt exchange offers to make arm's-length creditors better off by saving the cost of formal bankruptcy procedure is what makes it viable and efficient.

Payoff structure Based on assumptions above, agents form rational expectations about potential future payoffs at the time of contracting:

$$E\Big[V_i(\boldsymbol{m}, R_a)\Big] = p(\boldsymbol{m})(\Phi - R_a\alpha) + \Big(1 - p(\boldsymbol{m})\Big)E\left[W(\phi)(\phi - \tilde{R}_a(\phi)\alpha)\right] - c_i(\boldsymbol{m}) \tag{49}$$

$$E\Big[V_a(\boldsymbol{m}^*, R_a)\Big] = p(\boldsymbol{m}^*)R_a\alpha + \Big(1 - p(\boldsymbol{m}^*)\Big)E\left[W(\phi)\tilde{R}_a(\phi)\alpha + (1 - W(\phi))\,(\phi - \delta)\right] \tag{50}$$

Solution and predictions The model can be solved via backward induction. Details are described in the following appendix subsection. The core implications of aforementioned assumptions are the following:

Upon investment failure and conditional on remaining value ϕ, the firm decides whether to make a debt exchange offer ($W(\phi)$) and if so, how generous it shall be ($\tilde{R}_a(\phi)$). In equilibrium, arm's-length creditors rationally anticipate insiders' strategies $W(\phi)$ and $\tilde{R}_a(\phi)$ and can use realisations to back-out information about ϕ. Hence, insiders will make the level of $\tilde{R}_a$ independent of ϕ to reveal no information through the generosity of the exchange and fully extract its informational rent. For levels of ϕ for which the equilibrium offer $\tilde{R}_a$ would induce losses, insiders will rather choose for file for bankruptcy ($W(\phi) = 0$)—and receive nothing.[81] Hence, the value offered has to be larger than what creditors can expect from bankruptcy *conditional* on the signal that an exchange offer has been actually made ($W(\phi) = 1$).[82] As I show in the appendix, insiders' information rent—the value they can extract

[80] $W = 0$ implies resolution via the bankruptcy court.

[81] Insider's debt exchange policy will not involve mixing because of the following considerations: i) Any shift away from the optimal jump location in $W(\phi)$ as well as any shift in the optimal $\tilde{R}_a$ yields lower payoff, hence, mixing such levels is suboptimal. ii) Any increase of $W(\cdot)$ to values larger than 0 in regions where $\phi - \tilde{R}_a$ is negative, as well as and reductions in regions where $\phi - \tilde{R}_a$ is positive reduces the insiders' payoff. Hence, mixing such levels reduces payoffs as well.

[82] Arm's-length creditors will in never play mixing strategies. For each creditor it is not individually rational to mix

out-of-court although the firm is insolvent—equals

$$\min\left(\delta, \frac{\overline{\phi} - \underline{\phi}}{2}\right) \tag{51}$$

that is, the firm's information rent increases in the distance $(\overline{\phi} - \underline{\phi})/2$, i.e., the creditors' uncertainty about the state, up to the full gain from avoiding bankruptcy, δ. In the extreme case of a degenerate distribution ($\overline{\phi} = \underline{\phi}$), there is no information asymmetry and hence no information rent.

Importantly, the legislator can redistribute the value of private debt workouts by changing Λ. In the case that arm's-length creditor rights Λ are strong enough ($\Lambda > E_a[\phi|W(\phi)] - \delta/\alpha$), arm's-length creditor recovery increases, eating into the information rents of insiders. Importantly, insiders will change when to offer to exchange debt in response, leading to fewer out-of-court restructuring and thus *additional* bankruptcy costs in expectation of

$$\delta\left(\Lambda\alpha - \max(\underline{\phi}, \overline{\phi} - 2\delta)\right) > 0 \tag{52}$$

The first-order conditions to the problem of choosing ex-ante business strategy and credit return then imply

$$\boldsymbol{p}'(\boldsymbol{m}^*)\left(\Phi + \frac{(1 - p(\boldsymbol{m}^*))V_a^f - \rho\alpha}{p(\boldsymbol{m}^*)} - V_i^f\right) = \boldsymbol{c}_i'(\boldsymbol{m}^*) \tag{53}$$

$$R_a^* = \frac{\rho\alpha - (1 - p(\boldsymbol{m}^*))V_a^f}{p(\boldsymbol{m}^*)} \tag{54}$$

Re-distribution of value from insiders to arm's-length creditors in the state of investment failure increases the bracketed term in (53). If $p(\cdot)$ is more concave than $c(\cdot)$—common and plausible assumptions—the first order condition dictates an increase in the success probability $p(\cdot)$. Intuitively, a more dreadful outcome upon investment failure incentivises insiders to exert privately costly effort to increase the probability of investment's success. This is the key rationale for protecting arm's-length creditor rights in out-of-court debt restructuring. There is a countervailing force, however. When the expected costs of bankruptcy filings increase by more than what arm's-length creditors can expect to gain out-of-court, R_a has to rise ex-ante to compensate. This undermines the desirability of investment *success* from the point of view of insiders, discouraging effort and hence reducing the value of investment. Overall, protecting arm's-length creditors may thus back-fire.

To illustrate these forces, I use a numerical example based upon the following additional functional form assumptions with $b > 0$ and $\theta > 0$:

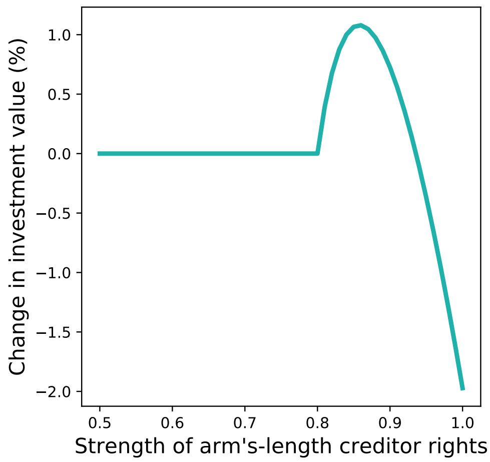
$$p(b) = \frac{b}{1+b} \qquad \in [0, 1)$$

$$c(b) = \theta b \qquad > 0$$

between tendering and taking the coercion pay-out Λ. By assumption of dispersion, it is also no equilibrium to mix between tendering and filing for bankruptcy: Dispersion as assumed earlier prevents coordination and implies an infinite number of identical creditors and thus any mixing of bankruptcy implies bankruptcy with certainty.

The explicit model solution then allows to assess ex-ante expected values of investment $E[V_i(\cdot)]$ across different calibrations of arm's-length creditor protection Λ.[83] Figure A.5 illustrates the trade-off for insider incentives set by arm's-length creditor rights: Up to the point where arm's-length creditor protection is sufficiently weak—i.e., out-of-court coercion is weaker than in-court coercion—private workouts are unaffected as shown by a flat expected investment value. In this calibration, arm's-length creditor rights start to bite at $\Lambda = 0.8$. At first, the redistribution unfolds positive effects on insider incentives to labour for the investment's success ex-post of contracting. However, when creditor protection start to frustrate too many private debt exchange offers, arm's-length creditor's gain on the surviving ones get swamped by the increasing dead-weight cost of bankruptcy—and lending rates grow again to the point where they revert insider incentives to labour for the good state (in which these high debt obligations are to be honoured in full).[84]

Figure A.5: Arm's-length creditor rights and the value of investment



Notes: Functional form assumptions of $p(b) = b/(1 + b)$ and $c_i(b) = \theta b$ with $b \geq 0$. Plot shows expected value of investment ($E[V_i]$) relative to laissez-faire level at $\Lambda = 0$ across degrees of arm's-length creditor protection (Λ). All other parameters are held fixed at the following levels: $\alpha = 1$, $\rho = 1.01$, $\Phi = 1.3$, $[\underline{\phi}, \overline{\phi}] = [0.2, 1.0]$, $\delta = 0.1$ and $\theta = 0.0025$. Across calibrations, arm's-length creditors contract for a gross rate R_a between 1.07 and 1.08; success probability $p(\cdot)$ ranges from 85 to 90%.

III.1 Solution of the model with asymmetric information

The model can be solved via backward induction.

[83] Note that the net value of arm's-length creditors $E[V_a(\cdot)] - \rho\alpha$ will be zero in equilibrium, such that the total value of investment and the incentive for the firm to undertake coincide.

[84] Obviously, the size of possible gains depends on the calibration. In fact, under some constellations, gains can be enormous while for others, there never can be any benefits from additional legislative interference. That is, Marblegate might have benefited some firms and not others and the questions primarily concerns the average firm exposed to the verdict.

Investment outcome: Failure Upon investment failure and conditional on remaining value ϕ, the firm decides whether to make a debt exchange offer ($W(\phi)$) and if so, how generous it shall be ($\tilde{R}_a(\phi)$).

In equilibrium, arm's-length creditors know the firm's mapping between ϕ and $\tilde{R}_a$ and can use its to back-out information about ϕ. Hence, the firm will make the level of $\tilde{R}_a$ independent of ϕ to fully extract its informational rent. For levels of ϕ for which the equilibrium offer $\tilde{R}_a$ induces losses, the firm will rather choose for file for bankruptcy ($W(\phi) = 0$)—and receive nothing.[85] Hence, the value offered has to be larger than what creditors can expect from bankruptcy *conditonal* on the signal that an exchange offer has been actually made. Adding the constraint of effectively feasible out-of-court coercion, such an equilibrium strategy solves the following problem:[86]

$$\max_{\tilde{R}_a \in \mathbb{R}_+, W(\phi) \in \{0,1\}} \Big(W(\phi)(\phi - \tilde{R}_a \alpha) \Big) \tag{55}$$

s.t.

$$W(\phi)\tilde{R}_a \alpha \geq W(\phi) \Big(E_a[\phi | W(\phi)] - \delta \Big) \tag{56}$$

$$W(\phi)\tilde{R}_a \geq W(\phi) \max \left(\Lambda, \frac{E_a[\phi | W(\phi)] - \delta}{\alpha} \right) \tag{57}$$

Firm's payoff strictly decreases in $\tilde{R}_a$, hence the first constraint will bind. Upon receiving an offer ($W(\phi) = 1$), arm's-length creditors learn that the residual value $\phi - \tilde{R}_a \alpha$ is non-negative. Thus:[87]

$$\begin{aligned} E_a[\phi | W(\phi) = 1] &= E_a[\phi | \phi \geq \tilde{R}_a \alpha] \\ &= \frac{\max(\underline{\phi}, \tilde{R}_a \alpha) + \overline{\phi}}{2} \\ &= \begin{cases} \frac{\tilde{R}_a \alpha + \overline{\phi}}{2} & \text{if} \quad \tilde{R}_a \alpha > \underline{\phi} \\ E_a[\phi] & \text{if} \quad \tilde{R}_a \alpha = \underline{\phi} \end{cases} \end{aligned} \tag{58}$$

Given the first constraint, the second constraint either becomes redundant or will be binding for exchange offers. If the second constraint does not bind (and hence becomes redundant), the optimal generosity of debt exchange offers can be determined by substituting 58 into the first constraint (still

[85] Firm's debt exchange policy will not involve mixing because of the following considerations: i) Any shift away from the optimal jump location in $W(\phi)$ as well as any shift in the optimal $\tilde{R}_a$ yields lower payoff, hence, mixing such levels is suboptimal. ii) Any increase of $W(\cdot)$ to values larger than 0 in regions where $\phi - \tilde{R}_a$ is negative, as well as and reductions in regions where $\phi - \tilde{R}_a$ is positive reduces the firm's payoff. Hence, mixing such levels reduces payoffs as well.

[86] Arm's-length creditors will in never play mixing strategies. For each creditor it is not individually rational to mix between tendering and taking the coercion pay-out Λ. By assumption of dispersion, it is also no equilibrium to mix between tendering and filing for bankruptcy: Dispersion as assumed earlier prevents coordination and implies an infinite number of identical creditors and thus any mixing of bankruptcy implies bankruptcy with certainty.

[87] Using that i) ϕ is uniformly distributed, ii) in equilibrium, firms cannot offer less than $\underline{\phi}$ without provoking a bankruptcy filing by arm's-length creditors.

with $W(\phi) = 1$):

$$
\begin{aligned}
&\text{If } \tilde{R}_a\alpha > \underline{\phi}: && \tilde{R}_a\alpha = \frac{\tilde{R}_a\alpha + \overline{\phi}}{2} - \delta \\
&\iff && \tilde{R}_a\alpha = \overline{\phi} - 2\delta \\
&\iff && \tilde{R}_a = \frac{\overline{\phi} - 2\delta}{\alpha} \\
&\text{else} && \tilde{R}_a = \frac{\underline{\phi}}{\alpha} \\
&\implies && \tilde{R}_a^* = \frac{\max(\underline{\phi}, \overline{\phi} - 2\delta)}{\alpha}
\end{aligned} \tag{59}
$$

For which ϕ will the firm actually offer to exchange debt?

$$
W^*(\phi) = \mathbb{1}(\phi - \max(\underline{\phi}, \overline{\phi} - 2\delta) > 0) \tag{60}
$$

That is, upon investment failure and under sufficiently weak arm's-length creditor rights, firm owner can expect to extract an information rent of

$$
\begin{aligned}
E[W^*(\phi)(\phi - \tilde{R}_a^*\alpha)] &= E[(\phi - \max(\underline{\phi}, \overline{\phi} - 2\delta)|\phi > \max(\underline{\phi}, \overline{\phi} - 2\delta))] \\
&= E[(\phi|\phi > \max(\underline{\phi}, \overline{\phi} - 2\delta))] - \max(\underline{\phi}, \overline{\phi} - 2\delta) \\
&= \frac{\max(\underline{\phi}, \overline{\phi} - 2\delta) + \overline{\phi}}{2} - \max(\underline{\phi}, \overline{\phi} - 2\delta) \\
&= \frac{\overline{\phi} - \max(\underline{\phi}, \overline{\phi} - 2\delta)}{2} \\
&= \min\left(\delta, \frac{\overline{\phi} - \underline{\phi}}{2}\right)
\end{aligned} \tag{61}
$$

That is, the firm can increase an information rent that increases in the distance $(\overline{\phi} - \underline{\phi})/2$, i.e., the creditors' uncertainty about the state, up to the full gain from avoiding bankruptcy. In the extreme case of a degenerate distribution ($\overline{\phi} = \underline{\phi}$), there is no information asymmetry and hence no information rent.

In the case that arm's-length creditor rights Λ are strong enough ($\Lambda > E_a[\phi|W(\phi)] - \delta/\alpha$), the second constraint will be binding (again, because firm's payoff strictly decreases in $\tilde{R}_a$), implying

$$
W(\phi)\tilde{R}_a = W(\phi)\Lambda \quad \iff \quad \tilde{R}_a^{**} = \Lambda
$$

Specifically, arm's-length creditor rights Λ are "strong enough" if[88]

$$
\begin{aligned}
& && \Lambda > \frac{E_a[\phi|W(\phi) = 1] - \delta}{\alpha} \\
&\iff && \Lambda > \frac{\max(\underline{\phi}, \tilde{R}_a^{**}\alpha) + \overline{\phi} - 2\delta}{2\alpha} \\
&\iff && \Lambda > \frac{\max(\underline{\phi}, \Lambda\alpha) + \overline{\phi} - 2\delta}{2\alpha} \\
&\iff && \Lambda > \frac{\max(\underline{\phi}, \overline{\phi} - 2\delta)}{\alpha}
\end{aligned} \tag{62}
$$

[88] Using that $\max(\underline{\phi}, \Lambda\alpha) = \Lambda\alpha$ as otherwise the information set binds the firm's exchange offer, not the law.

Intuitively, strong arm's-length creditor rights increase their recovery ($\tilde{R}_a^{**} > \tilde{R}_a^{*}$), eating into the information rents of firm owners. Importantly, firms will also change when to offer to exchange debt:

$$W^{**}(\phi) = \mathbb{1}(\phi - \Lambda\alpha > 0) \tag{63}$$

Ultimately, the re-distributional effect comes at the expense of fewer out-of-court restructuring and thus *additional* bankruptcy costs in expectation:

$$\begin{aligned} \delta E\left[(1 - W^{**}(\phi)) - (1 - W^{*}(\phi))\right] &= \delta E\left[W^{*}(\phi) - W^{**}(\phi)\right] \\ &= \delta E\left[\mathbb{1}(\phi - \max(\underline{\phi}, \overline{\phi} - 2\delta) > 0) - \mathbb{1}(\phi - \Lambda\alpha > 0)\right] \\ &= \delta E\left[\mathbb{1}(\max(\underline{\phi}, \overline{\phi} - 2\delta) < \phi < \Lambda\alpha)\right] \\ &= \delta P(\max(\underline{\phi}, \overline{\phi} - 2\delta) < \phi < \Lambda\alpha) \\ &= \delta\left(\Lambda\alpha - \max(\underline{\phi}, \overline{\phi} - 2\delta)\right) > 0 \end{aligned} \tag{64}$$

Investment outcome: Success Upon investment success, there are no choices and cash flows are distributed according to ex-ante contracts.

Ex ante contracting and choice of business strategy Because firm owners' expected payoff strictly falls in R_a, they will offer interest such that arm's-length creditors are just willing to lend, i.e., their participation constraints binds:

$$E\Big[V_a(R_a, \boldsymbol{b}^*, \boldsymbol{\sigma}, \phi)\Big] = \rho\alpha \tag{65}$$

Substituting transforms the firm's ex-ante objective into

$$\max_{\boldsymbol{b}} p(\boldsymbol{b})\left(\Phi - \frac{\rho\alpha - (1 - p(\boldsymbol{b}^*))V_a^f}{p(\boldsymbol{b}^*)}\right) + \Big(1 - p(\boldsymbol{b})\Big)V_e^f - c_e(\boldsymbol{b}) \tag{66}$$

where V_a^f and V_e^f denote the expected payoffs in case of investment failure for both agent types, which are independent of $\boldsymbol{b}$:

$$V_e^f = E\left[W(\phi)(\phi - \tilde{R}_a(\phi)\alpha)\right] \tag{67}$$

$$V_a^f = E\left[W(\phi)\tilde{R}_a(\phi)\alpha + (1 - W(\phi))\,(\phi - \delta)\right] \tag{68}$$

Using previous solutions on the firm's debt exchange policy, these values can be expressed in terms of model parameters only. Recall that in equilibrium, offered amounts are actually independent of ϕ. If arm's-length creditor rights are sufficiently strong to affect out-of-court exchanges ($\Lambda > \max(\underline{\phi}, \overline{\phi} - 2\delta)/\alpha$), expected failure payoffs become

$$\begin{aligned} V_e^f &= E\left[W^{**}(\phi)(\phi - \tilde{R}_a^{**}\alpha)\right] \\ &= \frac{\overline{\phi} - \Lambda\alpha}{2} \end{aligned} \tag{69}$$

$$\begin{aligned} V_a^f &= E\left[W^{**}(\phi)\tilde{R}_a^{**}\alpha + (1 - W^{**}(\phi))\,(\phi - \delta)\right] \\ &= \Lambda\alpha\frac{\overline{\phi} - \Lambda\alpha}{\overline{\phi} - \underline{\phi}} + \frac{\underline{\phi} + \Lambda\alpha}{2} - \delta \end{aligned} \tag{70}$$

otherwise they are

$$
\begin{aligned}
V_e^f &= E\left[W^*(\phi)(\phi - \tilde{R}_a^*\alpha)\right] \\
&= \min\left(\delta, \frac{\overline{\phi} - \underline{\phi}}{2}\right) \qquad (71) \\
V_a^f &= E\left[W^*(\phi)\tilde{R}_a^*\alpha + (1 - W^*(\phi))\,(\phi - \delta)\right] \\
&= \max(\underline{\phi}, \overline{\phi} - 2\delta)\frac{\overline{\phi} - \max(\underline{\phi}, \overline{\phi} - 2\delta)}{\overline{\phi} - \underline{\phi}} + \frac{\underline{\phi} + \max(\underline{\phi}, \overline{\phi} - 2\delta)}{2} - \delta \qquad (72)
\end{aligned}
$$

First-order conditions pin down $\boldsymbol{b}^*$ implicitly

$$
\boldsymbol{p}'(\boldsymbol{b}^*)\left(\Phi + \frac{(1 - p(\boldsymbol{b}^*))V_a^f - \rho\alpha}{p(\boldsymbol{b}^*)} - V_e^f\right) = \boldsymbol{c}_e'(\boldsymbol{b}^*) \qquad (73)
$$

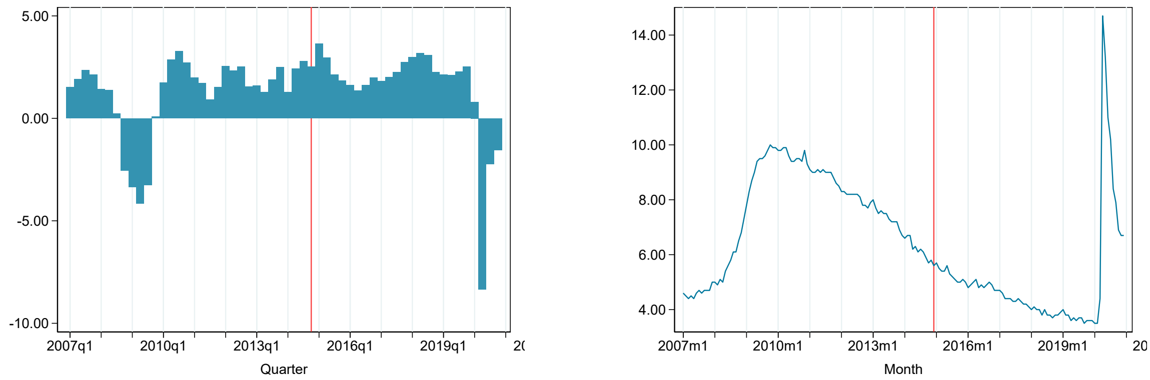
IV Auxiliary evidence

IV.1 Macroeconomic tranquility

In its opinion underpinning the Marblegate ruling, the court did not refer to an economic motive. Yet, macroeconomic shocks might coincidentally confound the effects of the verdict. Fortunately, Figure A.6 confirms that the macroeconomic environment was stable and healthy around the Marblegate ruling at the end of 2014, right in the middle between the Great Financial Crisis and the Pandemic Recession.

Figure A.6: Macroeconomic environment around the Marblegate ruling

(a) GDP growth (b) Unemployment rate



Notes: Left panel shows year-on-year growth of quarterly real GDP measured by expenditure. Right panel shows monthly unemployment rate seasonally adjusted as reported by the U.S. Bureau of Labor Statistics. Red line marks date of the Marblegate ruling.

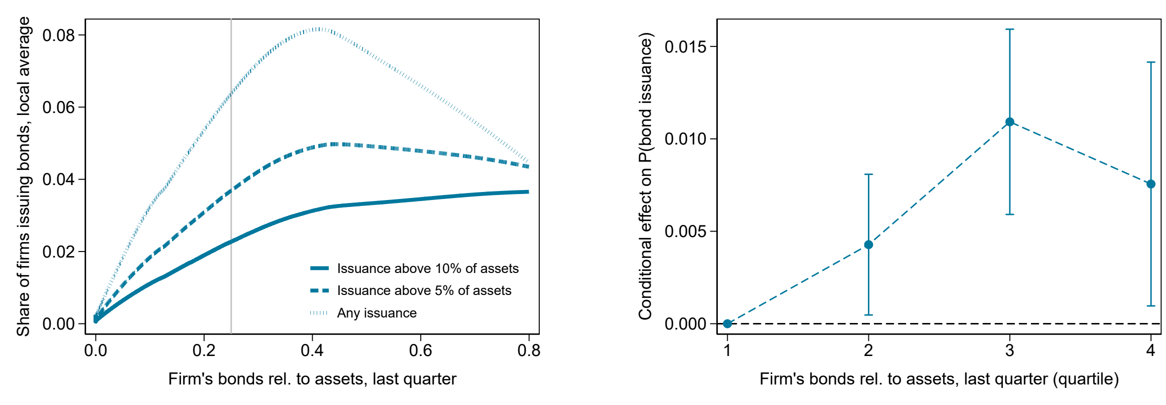
IV.2 Bond intensity and the propensity to issue new bonds

Marblegate changed (i) cost default cost and (ii) moral hazard risk associated with bond financing. Accordingly, firms heavily reliant on bonds should react the most. However, to facilitate empirical analysis it is important that observed bond intensity is predictive of future bond finance as well. Figure A.7 presents evidence in that vein. In particular, firms above median intensity—the cut-off used throughout the paper—are substantially and significantly more likely to issue bond in sizable volumes.

Figure A.7: Bond issuance probability by bond intensity

(a) Descriptive

(b) Panel regression

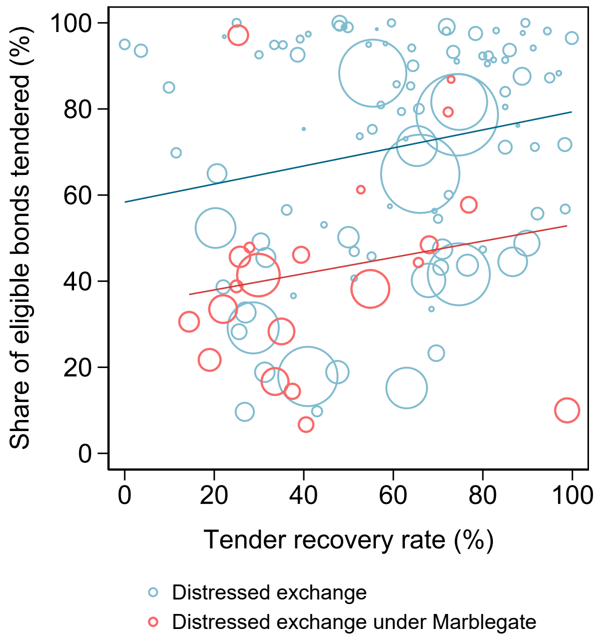


Notes: The left panel shows local averages by bond intensity for bond issuance, by size of issuance. Estimates are based on the cross-section of compustat firms of 2013. Bond issuance data matched from FISD. The right panel shows coefficients for dummies marking the full-sample distribution of bond intensity from a linear probability panel regression of future bond issuance of at least 5% of assets controlling 16 lags of past bond issuance as well as quarter and firm fixed effects. Effect for the first quartile is normalized to zero. Sample is 2010Q1 to 2018Q4.

IV.3 Hold-outs in bond exchanges

At the time of the ruling, a wide-spread concern was that stronger protection would embolden minority bondholders to hold out of agreements, be it because they deemed the offer unfair or out of strategic considerations. Examining detailed information on distressed bond exchanges from Moody's Default and Restructuring Database allows to shed light on whether hold-outs did indeed become more prevalent under the Marblegate regime. For each distressed bond exchange covered in the data, Figure A.8 shows that the volume of bonds being exchanged was indeed about 20 percentage points smaller under Marblegate, conditional on the recovery rate offered (x-axis). Note that unobserved selectivity of bond exchanges offers—only a subset of holders, such as "qualified institutional investors", being eligible to participate—is unlikely to drive this result unless the data misspecifies the total volume of eligible bonds.

Figure A.8: Marblegate and bond exchange offer hold-outs



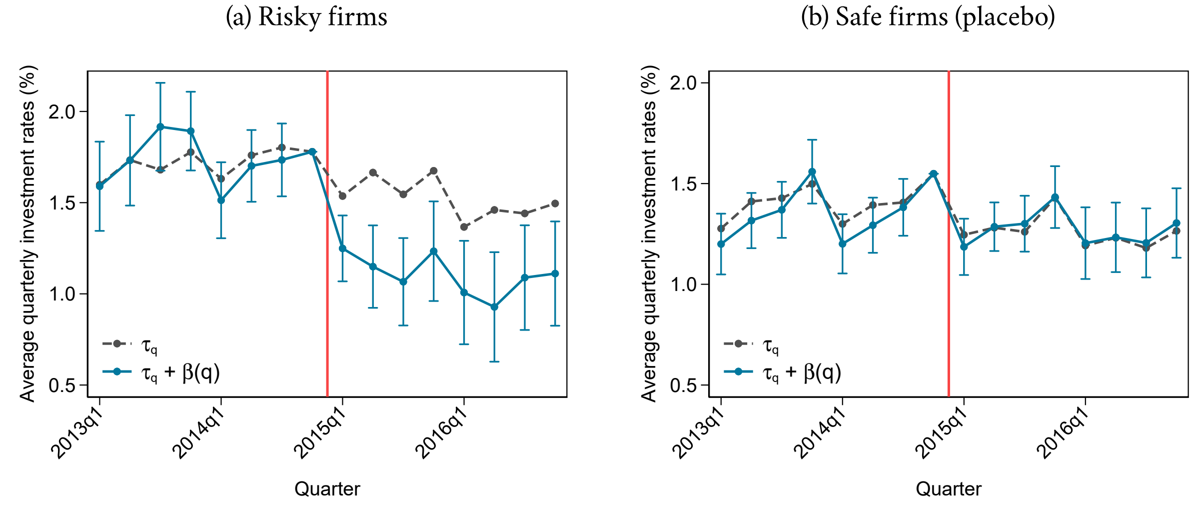
Notes: Recovery rate information for 130 out-of-court distressed bond exchanges between 1990 and 2020 in the US from Moody's Default and Restructuring Database. Marblegate denotes the period between Dec 31, 2014 and Jan 16, 2017. Circle areas represent the total volume of debt outstanding before default.

IV.4 Investment drop among treated or increase among control group?

I find that after the Marblegate ruling, quarterly interest rates diverge between bond-intensive and other firms. In principle, this may be driven by an investment rate cut among the exposed firms or an increase of investment rates among the less exposed firms (or any mix thereof).

To test, I also examine the evolution of investment rates among the control group as estimated by the quarter fixed effects and compare it with the path of the treated firms by adding the treatment effect. Trajectories shown in Figure A.9 confirm that adjustments took place predominantly among the exposed firms. This is consistent with the interpretation that exposed firms were forced to deviate from their desired capital structure while others were much less affected.

Figure A.9: Marblegate's effect on firm investment rates



Notes: Estimates of average investment rates—net of firm-fixed effects—by quarter and bond intensity from Equation (9) within compustat non-financial firms. The left panel shows results for risky firms with a S&P high-yield rating. The right panel shows results for safe firms with a S&P investment-grade rating. Whiskers mark 95% CI for $\beta(q)$ based on standard errors clustered at the firm level.

IV.5 Reactions in daily stock price data

Did capital markets actually care about the Marblegate ruling? And were market reactions consistent with effects I estimate at lower frequencies? To obtain high-quality high-frequency data, I turn to stock market.

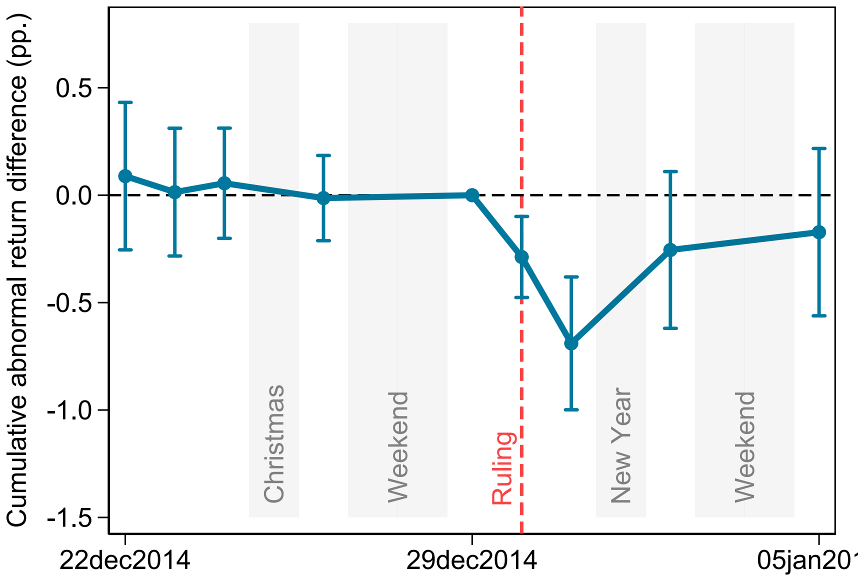
I obtain daily returns on common stock from CRSP, time series of Fama and French (1992) as well as momentum factors from WRDS and match quarterly capitalIQ financials and rating data via compustat identifiers. I estimate daily abnormal stock returns as residuals of stock-specific regressions on factors and cumulate them relative to Dec 29, 2014, the day before the Marblegate ruling. For each trading day of the week before as well as after Marblegate, I estimate the difference in cumulated abnormal returns (CAR) between firms with high and low bond intensity using the following regression:

$$\text{CAR}_{f,d}^{\text{Dec 29}} = \beta(d) B_{f,2014Q4} + \delta_{d\times\text{industry}(f)} + e_{f,d} \tag{74}$$

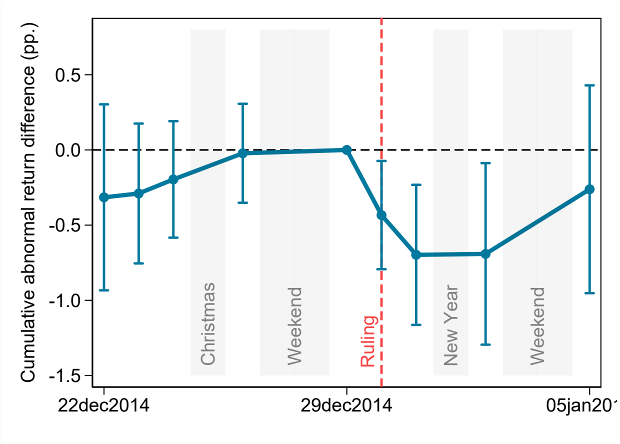
(f, d) index firms and days. Bond intensity $B_{f,q(d)}$ is the quarter-end value of outstanding bond debt relative to assets and is defined to be "high" when it exceeds a value of 25%—analogous to all other empirical specifications. To control for any concurrent industry-specific news, I filter day $\times$ 3-digit NAICS industry fixed effects.

Figure A.10 plots date-specific coefficients $\beta(d)$ which measure the difference in cumulative abnormal returns around the ruling between firms of different bond intensity, within narrow industries. While both groups of stocks deliver identical average returns during any trading day of the preceding week, stock prices of bond-intensive firms drop when the court's opinion became public on December 30. Importantly, I obtain point estimates which are larger in absolute terms when zooming in on the sample

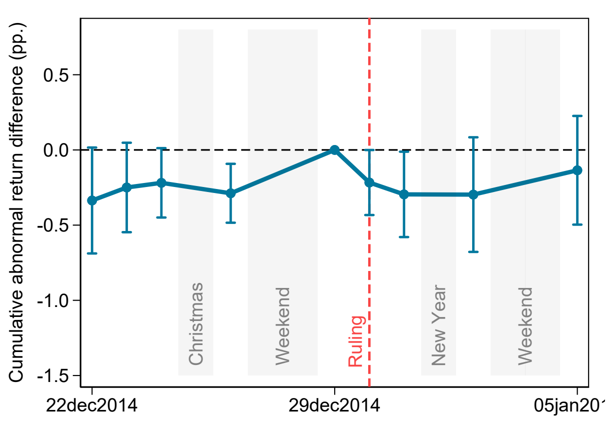
Figure A.10: Daily stock returns around Marblegate



(a) Sample of risky firms



(b) Sample of safe firms (placebo)



of firms with a speculative-grade credit rating. The difference narrows later the following week, possibly driven by additional shocks unrelated to the ruling.

IV.6 Bond pricing

I examine bond prices to see whether bond investors price the changes brought about by Marblegate. In particular, by restricting the possible set of exit-consent strategies, which would couple bond exchanges with a vote over stripping the original bond issue off protective guarantees or covenants, Marblegate should have increased the value of these provisions in the eyes of investors. To test this, I run an OLS regression of monthly bond returns on month fixed effects and the full set of their interactions with a dummy G_b indicating the presence of a guarantee, insurance or letter of credit, as measured in FISD.

To purge bond price from common movements in narrowly defined risk $\times$ maturity classes, I follow the literature and construct abnormal monthly bond returns $\tilde{R}_{bm}$ as the difference of a bond's return above and beyond its benchmark portfolio. Monthly benchmark portfolio returns are constructed as the monthly average within a rating $\times$ maturity bin spanned by the rating classes AAA, AA, A, BBB, BB, B, CCC, CC and worse one the one hand and ten maturity classes on the other, yielding 90 different portfolios in total.[89]

$$\tilde{R}_{bm} = \tau_m + \beta(m)G_b + e_{bm} \tag{75}$$

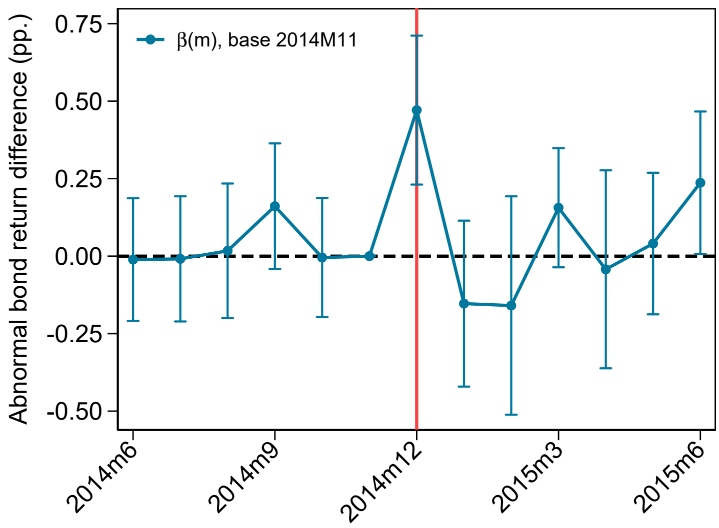
To prevent outlier returns from driving the OLS estimate, I winsorize the entire sample of abnormal returns by 1%. As common in the literature, I also restrict the sample of bonds to publicly traded, non-convertible, unsecured senior bonds issued by domestic non-financial firms before Dec 30, 2014 with remaining maturity of 12 to 120 months—however, non of these individual criteria turns out to be crucial for the estimates.

Figure A.11 presents the month-specific estimates of $\beta(m)$, normalized by the return in the month before the Marblegate verdict, November 2014. Recall that these estimate the difference in monthly returns between two bonds within the same rating $\times$ maturity class where one of the bonds is guaranteed by another entity (typically the parent) while the other is not. None of the estimates is significantly different from the average return in November—except during the months of the the Marblegate verdicts: December 2014 and June 2015. Consistent with the reading of secondary sources, the shock was larger in December 2015, raising monthly abnormal returns by as much as 50 basis points. By contrast, the final verdict in June 2015 was largely anticipated, showing a smaller excess impact on bond returns, which is barely significant at the 5% level.

Figure A.12 illustrates that these effects are indeed driven by risky bonds, consistent with the notion that Marblegate should have stronger effects on financial distress is more likely.

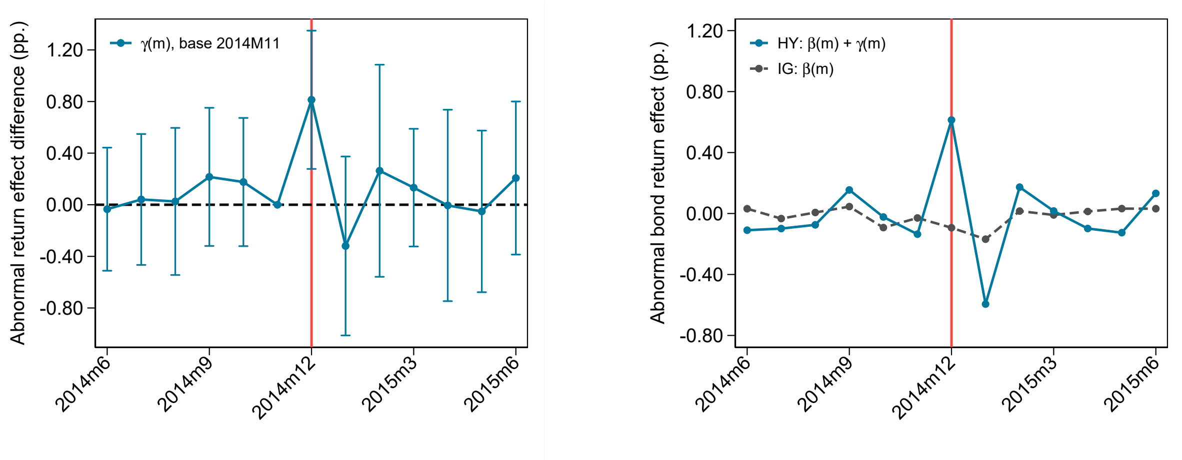
[89] Maturity classes are 0-3 months, 3-12 months, 1-2 years, 2-3, 3-4, 4-5, 5-7, 7-10, 10-20 and above 20.

Figure A.11: Marblegate's effect on bond pricing



Notes: TRACE-FISD sample of publicly traded, non-convertible, unsecured senior bonds issued by domestic non-financial firms before Dec 30, 2014 with remaining maturity of 12 to 120 months. Whiskers mark 95% CI based on robust standard errors clustered at the issuer level.

Figure A.12: Effects on bond prices are driven by high-yield bonds



Notes: OLS estimates of the model $\tilde{R}_{bm} = \tau_m + b_m HY_{bm-1} + \beta(m)G_b + \gamma(m)\big(G_b \times HY_{bm-1}\big) + e_{bm}$. HY_{bm-1} indicates bonds issues rated worse than BBB in the previous month. TRACE-FISD sample of publicly traded, non-convertible, unsecured senior bonds issued by domestic non-financial firms before Dec 30, 2014 with remaining maturity of 12 to 120 months. Whiskers mark 95% CI based on robust standard errors clustered at the issuer level.

IV.7 Loan issuance

I estimate firms' loan issuance around Marblegate using the specification below, analogous to how I estimate bond issuance effects in Section 3.5.3:

$$\mathbb{1}(\text{Issuance}_{fq}) = \phi_f + \tau_q + \beta(M_q \times B_{f,2014Q3}) + \boldsymbol{x}_{fq}\boldsymbol{\gamma} + e_{fq} \tag{76}$$

I proxy loan issuance using quarterly loan data from CapitalIQ. Analogous to the estimation of bond issuance effects, the indicator $\mathbb{1}(\text{Issuance}_{fq})$ will mark firm-quarters in which the increase in loans exceed +5% of assets and controls $\boldsymbol{x}_{fq}$ include four lags of asset growth, lagged Tobin's Q and the firm's lagged liquidity ratio.

Table A.2 presents estimates of Equation . Columns mirror specifications tested for bond issuance Estimates of β are significantly positive, indicating that bond-reliant firms increased the quarterly probability of new loans significantly by about 2 percentage points after to the ruling—except among the placebo sample of investment-grade companies, where effects are not statistically different from zero. Given average issuance rates of almost 10%, these estimates imply a considerable but moderate increase of about 20%. I find no effect at the intensive margin.

Table A.2: Marblegate's effect on loan issuance

	(1) Plain	(2) Baseline	(3) Placebo	(4) Time × Industry	(5) Beyond Ratings	(6) Int. Margin
Marblegate × Bond-intensive	0.035***	0.022*	-0.000	0.025*	0.032***	0.007
	(0.012)	(0.012)	(0.010)	(0.013)	(0.009)	(0.038)
Firm dynamics		Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	
Quarter FE	Yes	Yes	Yes	Yes	Yes	
Quarter × Industry FE				Yes		
Level effects						Yes
Average dependent, bond-intensive	0.084	0.083	0.031	0.083	0.093	0.290
Average dependent, not bond-int.	0.099	0.095	0.050	0.095	0.104	0.294
R^2	0.11	0.11	0.13	0.15	0.19	0.10
N	9461	8445	6527	8438	21572	748

Notes: Estimates of Equation (IV.7) using compustat sample of non-financial firms covering quarters 2013Q1 to 2016Q4. Dependent variable is a binary indicator for a loans increase >5% of assets, except column (6) showing results for loans relative to assets. Sample restricted to firms with a S&P rating of BB+ or worse; except column (3) and (5), which focus on investment grade-rated firms and all firms with a below-median Z-score, respectively. The binary variable *Marblegate* indicates quarters 2015Q1-2016Q4. Firms are considered to be "bond-intensive" if their bond debt relative to assets exceeded 25% a quarter before Marblegate. Firm controls include four lags of asset growth, lagged Tobin's Q and the firm's lagged liquidity ratio. Industry refers to 2-digit NAICS sectors. Standard error in parentheses clustered at the firm level. *** p <0.01, ** p <0.05, * p <0.10.

V Details on back-of-the-envelope calculation

The estimated change in capital expenditures after Marblegate is considerable, ranging between -10% and -30% among bond-intensive and risky firms relative to other risky firms with little or no bond debt. I suggest that firms reacted to higher cost of default, based on evidence of higher bankruptcy risk. But can the estimated increase in bankruptcy risk plausibly trigger investment effects of this magnitude? I assess the quantitative plausibility using a back-of-the-envelope calculation which I describe below.

Bankruptcy risk and financing cost I first gauge how elevated bankruptcy risk would translate into financing costs. The cost of borrowing from the bond market over a given time interval—denoted by r—is composed of investors' opportunity cost of funds r_f and expected cost of a potential default during that period r_d:

$$r = r_f + r_d \tag{77}$$

Bonds' cost of default r_d may include various components of which I focus on risk of bankruptcy:

$$r_d = \frac{1}{1+\tilde{\rho}} \left(\beta \frac{\partial P(\text{bankruptcy})}{\partial \text{bond debt}} + \omega \right) \tag{78}$$

where $\tilde{\rho}$ denotes the applicable discount rate, β is the cost of a bankruptcy process and ω captures other possible default cost components. The derivative captures the notion that coordination frictions among bondholders increase firm's propensity to resolve distress in court. Default costs can be incurred by the debtor directly—e.g., junior equity standing first in line to absorb the dead-weight costs of bankruptcy. They may also be incurred by bondholders or other creditors, who will raise financing rates accordingly, however. Ultimately, default costs are thus borne by the debtor. Depending on the distribution of default costs, the discount rate $\tilde{\rho}$ will be a composite of creditors' and the debtor's discount rate and capture by corresponding risk preferences.

Arguably, Marblegate changed r_d but not r_f. Moreover, I assume that bankruptcy risk is the only default cost component that reacted to Marblegate, i.e., $\partial\omega/\partial\text{Marblegate} = 0$. Because Marblegate did not change bankruptcy *procedures*, I assume their costs β to be constant here. Likewise, I abstract from any potential change in the discount rate. The impact on the marginal cost of bond finance then obtains as

$$\frac{\partial r}{\partial \text{Marblegate}} = \frac{1}{1+\tilde{\rho}} \beta \underbrace{\frac{\partial \left(\frac{\partial P(\text{bankruptcy})}{\partial \text{bond debt}} \right)}{\partial \text{Marblegate}}}_{A} \tag{79}$$

I plug in the following (quarterly) values:

- ρ: I set the applicable quarterly discount rate to 5%, i.e., deliberately high to be conservative.
- β: I compute effects for a range of values that plausibly reflects the range of estimates in the literature (Hotchkiss et al., 2008; Lubben, 2012; Epaulard and Zapha, 2022): $[0.02a, 0.05a, 0.10a]$, where a is the value of the firm's assets.
- A: Based on estimates from Table 1 Column (2), Marblegate increased the quarterly probability of a bankruptcy filing for firm-quarters with z-score below the median by 0.0056 (0.0011) for bond-intensive (not bond-intensive) firms. The differences between the median bond-to-asset ratio across both groups is 0.3583. Compustat firms rated speculative grade have a below-median z-score with a probability of 0.7276. Hence, the change in the marginal bankruptcy risk—conditional

on having a below-median z-score—can be estimated by $0.7276 \times (0.0056 - 0.0011)/0.3583a = 0.0091/a$, where a is the value of the firm's assets.[90]

The firm size variable, a, cancels as I compute

$$\frac{\partial r}{\partial \text{Marblegate}} = \frac{0.02a}{1+0.05}\frac{0.0091}{a} \approx 0.00017$$
$$\frac{\partial r}{\partial \text{Marblegate}} = \frac{0.05a}{1+0.05}\frac{0.0091}{a} \approx 0.00043$$
$$\frac{\partial r}{\partial \text{Marblegate}} = \frac{0.10a}{1+0.05}\frac{0.0091}{a} \approx 0.00087$$

Accordingly, Marblegate increased the quarterly marginal cost of bond finance by +1.7 to +8.7 basis points.

By how much did total financing costs increase? Before Marblegate, the relevant sample of bond-intensive and risky compustat firms had an average bonds-to-asset ratio of 47%. I estimate that those firms reacted to Marblegate by halving the probability of bond issuance, translating a lower bond intensity going forward. If all bonds were perfectly substituted by loans or equity, $47\%/2 = 23.5\%$ of fresh finance would be in bonds. This underestimates the true share because substitution was imperfect and investment shrank as well. However, I will stick with 23.5% to be conservative.

Multiplying the increase in the cost of bond debt with the share of bond in fresh finance among risky and bond-intensive firms, I calculate that Marblegate increased their *quarterly* corporate discount rate, henceforth denoted by ρ, by around +0.4 to +2 basis points.

Financing cost and investment I use a simple q model to link changes in the corporate discount rate to firm investment. In the model, firms set their investment policy, $\{k_t\}_0^\infty$ to maximize the stream of earnings $\Pi(k_t)$ less investment expenditures $k_t - (1-\delta)k_{t-1}$ and adjustment costs $\Phi(k_t, k_{t-1})$, discounted by the corporate discount rate ρ:

$$\max_{\{k_t\}} \sum_{t=0}^{\infty} \frac{\Pi(k_{t-1}) - \Big(k_t - (1-\delta)k_{t-1}\Big) - \Phi(k_t, k_{t-1})}{(1+\rho)^t} \equiv V(k_{t-1}, \rho) \tag{80}$$

Parameter δ is the depreciation rate of capital. Adjustment costs are quadratic in net investment rates and are governed by the cost parameter ϕ:

$$\Phi(k_t, k_{t-1}) = \frac{\phi}{2}\frac{(k_t - k_{t-1})^2}{k_t - 1} \tag{81}$$

[90]Firms might have taken additional measures to avoid financial distress after Marblegate. In this case, observed bankruptcies underestimates the original increase in bankruptcy risk. That is, the net effect on bankruptcy risk, $(0.0056 - 0.0011)/0.3583a$, is conservative with respect to its investment impacts. At the same time, the probability to observe a below-median z-score would increase by approximately the same factor by which bankruptcy risk is underestimated, compensating the aforementioned error in this calculation.

The firm's optimal investment rate is given by

$$\frac{k_t - (1-\delta)k_{t-1}}{k_{t-1}} = \frac{1}{\phi}\left(\underbrace{\frac{1}{1+\rho}\frac{\partial V(k_t,\rho)}{\partial k_t}}_{\equiv q_t} - 1\right) + \delta \tag{82}$$

The derivative of this expression with respect to ρ involves an infinite sum of horizon-weighted and discounted future net earnings. To obtain a tractable formulation whose components can be measured from the data, I build on Gormsen and Huber (2023): I add the standard assumptions of Hayashi (1982), to approximate the marginal value of capital, q_t, with its average value measured by Tobin's Q. Then, I relate Q to the duration of net earnings via the Gordon growth model (Gormsen and Lazarus, 2023) :

$$q_t = Q_t = \frac{1}{\rho - g}\frac{y_{t+1}}{k_t} \tag{83}$$

where $y_{t+1} = \Pi(k_t) - \Big(k_{t+1} - (1-\delta)k_t\Big) - \Phi(k_{t+1}, k_t)$ and g is the (long-run) growth rate of y_{t+1}. Intuitively, the value of capital depends on the earnings yields and how fast earnings grow relative to the discount rate in the long term. Plugging (83) into (82) allows me to derive the sensitivity of investment rates with respect to discount rates as

$$d\frac{k_t - (1-\delta)k_{t-1}}{k_{t-1}} = -\frac{1}{\phi}\frac{Q_t}{\rho - g}d\rho \tag{84}$$

and I quantify its components as follows:

- ϕ The literature on q models offers a range of estimates for the adjustment cost parameter (Gilchrist and Himmelberg, 1995; Hall, 2004; Cooper and Haltiwanger, 2006; Philippon, 2009; Groth and Khan, 2010; Eberly et al., 2012; Lin et al., 2018). I compute investment effects under three different values that enclose estimates from the aforementioned literature. Since these estimates concern adjustment costs for *annual* investment, corresponding quarterly adjustment cost should be approximately four times as large: $[0.5 \times 4, 1 \times 4, 3 \times 4]$

- Q_t In the sample of risky and bond-intensive compustat firms in 2013, Tobin's Q is about 1.498.

- $\frac{1}{\rho-g}$ For the average compustat firm, Gormsen and Lazarus (2023) calculate this value—the duration of earnings—to be around 20 (years) using annual discount and growth rates. Adapting to quarterly frequency, I set a value of 20×4.

- $d\rho$ I plug in values computed in the first step, based on three different assumptions about bankruptcy cost: $[0.00017 \times 0.235, 0.00043 \times 0.235, 0.00087 \times 0.235]$.

Taken together, I obtain a grid of possible investment effects, depending on assumptions about bankruptcy cost β and the adjustment cost ϕ. To ease interpretation, I divide effects by the average investment rate of 0.016 and multiply by 100 to obtain percent values. Resulting elasticities are presented in Table 5: They span a large range of -2.5% to -75%, reflecting inconclusive evidence about two important parameters. This means that under plausible economic assumptions, my estimates of bankruptcy risk from Section 3.5 can rationalize investment cuts in the range of -10% to -30% which I document in Section 3.4.

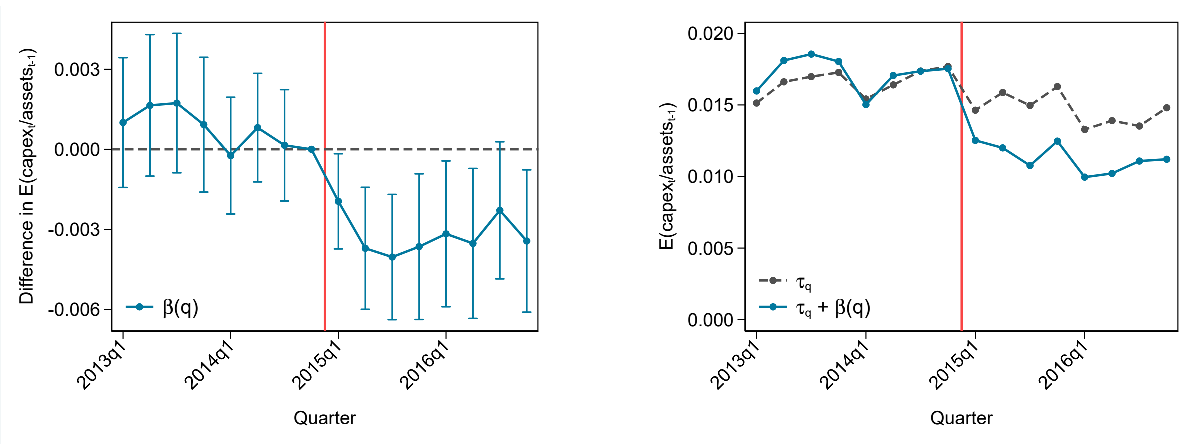
V.1 Robustness checks

Table A.3: Marblegate's effect on investment across alternative specifications

	(1) Trend	(2) B at 20%.	(3) B at 30%.	(4) B at 2013Q4	(5) Excl. Oil	(6) Triple DiD
Marblegate × Bond-intensive	-0.0039***				-0.0014**	-0.0048***
	(0.0011)				(0.0007)	(0.0010)
Marblegate × Bond-int.$_{>20\%}$		-0.0040***				
		(0.0009)				
Marblegate × Bond-int.$_{>30\%}$			-0.0040***			
			(0.0011)			
Marblegate × Bond-int.$_{2013Q4}$				-0.0042***		
				(0.0010)		
Safe × Marblegate						-0.0011*
						(0.0007)
Safe × Marblegate × Bond-intensive						0.0058***
						(0.0011)
Time trend × Bond-intensive	-0.0001					
	(0.0001)					
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes
Dependent variable, mean	0.0155	0.0155	0.0155	0.0155	0.0117	0.0139
R^2	0.71	0.71	0.71	0.73	0.65	0.73
N	8475	8475	8475	7850	7516	15034

Notes: Estimates of Equation (10) with the following variations of the baseline specification presented in the main text in companion Table 2: Column (1) controls for group-specific time trends. Column (2) categorizes firms to be *bond-intensive* if their bond debt relative to assets exceeds 20% a quarter before Marblegate, instead of 25%. Column (3) categorizes firms to be *bond-intensive* if their bond debt relative to assets exceeds 30% a quarter before Marblegate. Column (4) measures bond intensity a year before Marblegate instead of a quarter. Column (5) excludes firms engaged in oil or gas extraction, refinement or distribution. Column (6) includes both safe and risky firms and estimates a triple-DiD specification. As in the companion table, standard error in parentheses are clustered at the level of a firm. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Figure A.13: Splitting firms according to quarter-specific bond intensity



Notes: OLS estimates of $\frac{\text{capex}_{f}q}{\text{assets}_{f,q-1}} = \phi_f + \tau_q + \beta(q)B_{f,q} + e_{f,q}$. Compustat sample of non-financial firms with S&P investment-grade rating (BBB+ or better). Left panel illustrates how capex of bond-intensive firms drops relative to other firms after Marblegate verdict. Right panel plots average investment rates for each group. Whiskers mark 95% CI based on standard errors clustered at the firm level.

Table A.4: Marblegate's effect on bond issuance under alternative assumptions

	(1) Any Issues	(2) B at 20%.	(3) B at 30%.	(4) B at 2013Q4	(5) W/ time trend	(6) Excl. Oil	(7) Triple DiD
Marblegate × Bond-intensive	-0.032***				-0.021***	-0.038***	-0.035***
	(0.009)				(0.007)	(0.009)	(0.010)
Marblegate × Bond-int.$_{>20\%}$		-0.031***					
		(0.008)					
Marblegate × Bond-int.$_{>30\%}$			-0.033***				
			(0.009)				
Marblegate × Bond-int.$_{2013Q4}$				-0.039***			
				(0.009)			
Safe × Marblegate							0.007
							(0.006)
Safe × Marblegate × Bond-intensive							0.019*
							(0.011)
Time trend × Bond-intensive					-0.002***		
					(0.000)		
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Quarter FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$\hat{P}$(issuance), bond-intensive	0.072	0.056	0.063	0.058	0.055	0.054	0.062
$\hat{P}$(issuance), not bond-int.	0.027	0.017	0.027	0.027	0.020	0.021	0.034
R^2	0.13	0.11	0.11	0.11	0.10	0.11	0.10
N	8484	8484	8484	7862	12104	7525	15046

Notes: Estimates of Equation (12) with the following variations of the baseline specification presented in the main text in companion Table 4: Column (1) changes the dependent variable to be a binary indicator for any bond issuance, i.e., also those with volume below 5% of total assets. Column (2) categorizes firms to be *bond-intensive* if their bond debt relative to assets exceeds 20% a quarter before Marblegate, instead of 25%. Column (3) categorizes firms to be *bond-intensive* if their bond debt relative to assets exceeds 30% a quarter before Marblegate. Column (4) measures bond intensity a year before Marblegate instead of a quarter. Column (5) controls for group-specific time trends and adds the two years after Marblegate was overturned. Column (6) excludes firms engaged in oil or gas extraction, refinement or distribution. Column (7) includes both safe and risky firms and estimates a triple-DiD specification. As in the companion table, standard error in parentheses are clustered at the level of a firm. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

V.2 Effects of the Second Circuit ruling on Jan 17, 2017

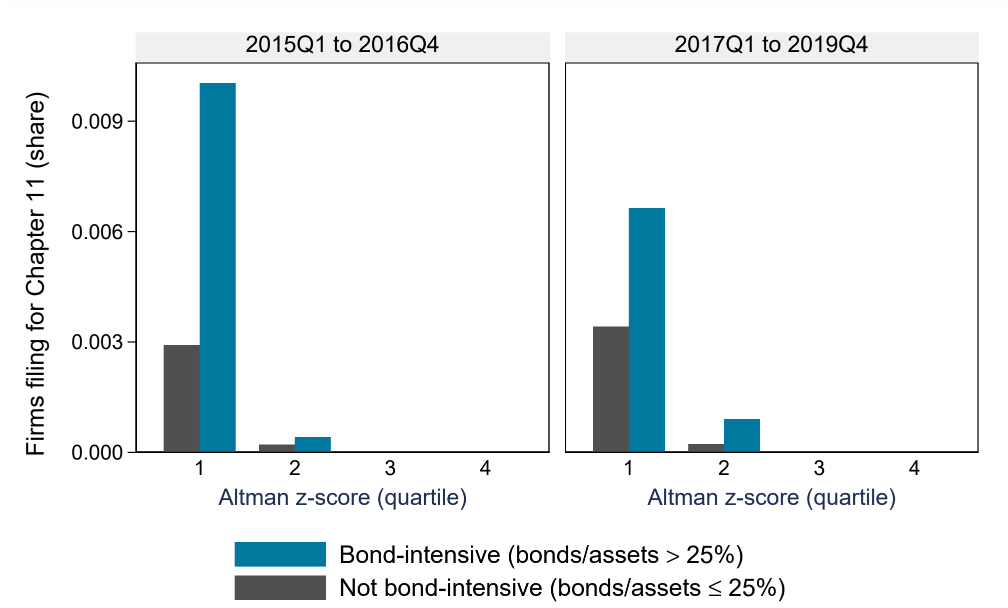
The Marblegate verdict was filed for review at the Second Circuit Court of Appeals. In a contentious two-vs-one decision, the higher court overturned Marblegate on January 17, 2017, about two years after the original verdict. The Second Circuit ruling does not provide a policy shift as sharp as the original for three reasons. First, the Court of Appeals left uncertainty as to whether exit-consent transactions could target parent guarantees in the same way as they used to do (Millar, 2017; Bratton and Levitin, 2018). Second, market participants might have become wary about similar policy shifts of judge discretion in the future, given that the Second Circuit ruling was indeed not unanimous. Third, the anticipation effect as well as and adjustment measures undermine the statistical value of the January 2017 decision. Nevertheless, I repeat key analyses in this appendix, using January 17, 2017 as an additional treatment date.

Figure A.14 confirms that the elevated propensity to restructure distressed bond debt in bankruptcy indeed reverses after the Second Circuit ruling. The overall filing propensity is above the pre-Marblegate level in the lowest quartile of the Z-score distribution. But the ratio of filing rates across firms split by bond intensity is very similar again.

Figure A.15 extends the time horizon for the analysis of Equation (9), adding the two years after the Second Circuit ruling. Indeed, investment rates start reverting to their pre-Marblegate benchmark, becoming statistically indistinguishable from 2017Q3 onwards. The reversal is not as sharp as the original drop and point estimates never fully reach the pre-Marblegate benchmark by 2018Q4. This might reflect that the January 2017 ruling was perceived to not refute all aspects of the original reasoning in the Southern District of New York (Millar, 2017; Bratton and Levitin, 2018).

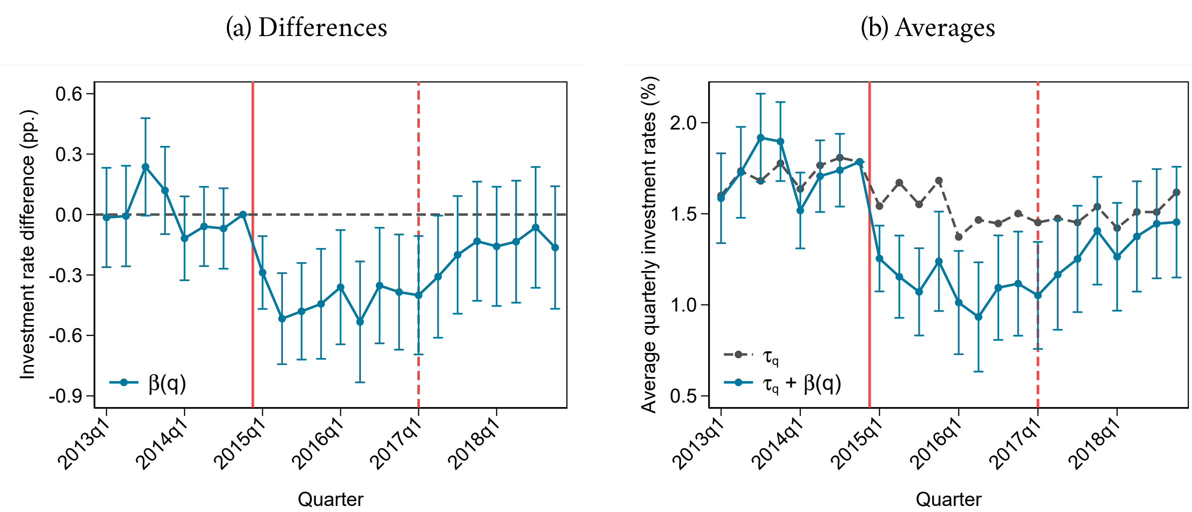
Similarly, Figure A.16 show quarter-specific bond issuance across the two firm sub-samples split by bond intensity. Estimates are subject to substantial noise given the low frequency of bond issuance, however, a consistent pattern emerges. Issuance rates for bond-intensive firms were below the control group during all quarters during the Marblegate regime except a spiky outlier in 2015Q2. During 2017, the pattern reveres again and issuance rates closely track each other thereafter.

Figure A.14: Marblegate overturning reduced bankruptcy filings by bond-intensive firms



Notes: Shares of non-financial compustat firms filing for bankruptcy between 2015Q1 and 2018Q4 across quartiles of the distribution of distress Z-scores Altman (1968). Marblegate marks the period 2015Q1 to 2016Q4.

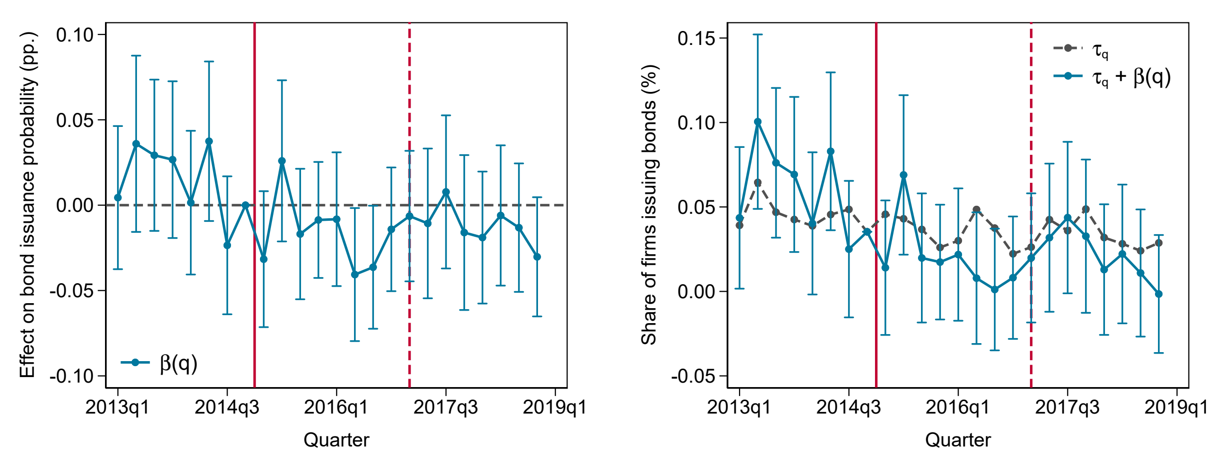
Figure A.15: Marblegate's effect on firm investment rates beyond January 2017



Notes: Estimates of Equation (9) using the compustat sample of non-financial firms with an S&P rating BB+ or worse including quarters 2013Q1 to 2018Q4. Left panel illustrates how capital expenditure of bond-intensive firms first drops after the original Marblegate verdict and then recovers relative to other firms after its overturning; estimates $\hat{\beta}(q)$ are shown relative to $\hat{\beta}(2014Q4)$. Right panel plots average investment rates—net of firm-fixed effects—for bond-intensive firms in green and other firms in blue. Whiskers mark 95% CI based on standard errors clustered at the firm level.

Figure A.16: Marblegate's effect on bond issuance rates beyond January 2017

(a) Differences (b) Averages



Notes: Estimates from Equation (12) controlling for fixed effects using the compustat sample of non-financial firms with an S&P rating BB+ or worse including quarters 2013Q1 to 2018Q4. Left panel illustrates how the probability of bond issuance drops for bond-intensive firms after the original Marblegate verdict and then recovers relative to other firms after its overturning; estimates $\hat{\beta}(q)$ are shown relative to $\hat{\beta}(2014Q4)$. Right panel plots average issuance rates—net of firm-fixed effects—for bond-intensive firms in green and other firms in blue. Whiskers mark 95% CI based on standard errors clustered at the firm level.