Maturity Walls*

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Abstract

Maturity walls occur when a majority of a firm's debt comes due within a short period (∼1-2 years). While maturity walls exacerbate rollover risk for firms, they are common among large non-financial firms. This paper aims to understand firms' decision to adopt maturity walls and its implications for the aggregate economy. Using Mergent FISD data, I document that firms incur substantial fixed costs in bond issuance (68% of underwriter fees). Based on this, I develop a dynamic model where firms decide each period how much debt to issue and whether to adopt a maturity wall. The main trade-off is the heightened rollover risk from maturity walls in the presence of costly equity injections, versus the lower issuance costs incurred from infrequent rollovers. I estimate the model to match both aggregate and distributional moments of firms' debt payment schedules. Consistent with the data, maturity walls increase credit spreads by 21% (36 bps) and default rates by 25% (30 bps). Moreover, the model underscores the importance of accounting for maturity walls when assessing the transmission of aggregate shocks: omitting maturity walls could underestimate the transmission of a credit market freeze up to 60%.

Keywords: Maturity Wall, Firm Financing, Capital Structure, Firm Dynamics, Default
JEL: G32, G33, E32, E44

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1 Introduction

Maturity walls occur when a significant portion of corporate debt is due within a short period (typically 1–2 years), potentially exposing firms to severe financial stress. Large, infrequent debt payments increase a firm's rollover risk — the risk of being unable to raise enough external funds to cover current liabilities — especially in the face of negative shocks. Firms that fail to roll over their debt often cut investments, lay off workers, or default on their obligations (Almeida, Campello, Laranjeira, and Weisbenner, 2009; DeFusco, Nathanson, and Reher, 2023; Meeuwis, Papanikolaou, Rothbaum, and Schmidt, 2023). In fact, credit rating agencies take maturity walls seriously when analyzing firms. For instance, on August 29, 2023, Fitch Ratings downgraded Lumen Technologies, a telecommunications firm, to "B–". In their assessment, they noted:

> The combination of the large *maturity wall* with weak operating results calls into question the long-term sustainability of the company's capital structure and gives rise to an increasing potential of distressed debt exchanges in the event access to debt capital markets or other refinancing options becomes more restricted.

Given that managing rollover risk is a key concern for corporate CFOs (Lins, Servaes, and Tufano, 2010), firms should want to disperse their debt maturities, rolling over smaller amounts more frequently to smooth interest rate risk. However, Lumen Technologies is not an outlier; maturity walls are a common feature of non-financial firms' capital structures. Using the universe of U.S. corporate bond issuances, I will show that 47 percent of firms have a maturity.

Existing frameworks in the literature often focus on total leverage or average debt duration when modeling firms' capital structure decisions, which is not suitable for capturing the risk caused by maturity walls. Moreover, little is known about why firms adopt maturity walls even though they are a significant source of risk. In this paper, I suggest fixed issuance cost of debt as the driving force for firms to hold maturity walls. Further, I extend the existing literature by introducing a framework that explicitly captures the timing and concentration of debt payments through maturity walls, providing a deeper understanding of firms' rollover risk. Finally, I use the framework to evaluate the importance of incorporating maturity walls when understanding how an aggregate shock, such as a credit market freeze, transmits to the aggregate economy.

An empirical definition of maturity walls is crucial to quantitatively analyze the implications of maturity walls on individual firms' default risk and the aggregate economy. In this paper, I use the standard deviation of weighted maturity dates to define maturity walls.

This measure captures the concentration of a firm's debt payments over time. A maturity wall occurs when the standard deviation of weighted debt maturity dates is less than 1 year, meaning that once a firm begins repaying its debt, nearly all of it will be repaid within two years. The presence of maturity walls is indeed strongly correlated with negative outcomes for firms in the data. Firms with maturity walls have higher probabilities of default (97 bps), even after controlling for various firm characteristics. These firms also face higher credit spreads on newly issued bonds (34 bps), suggesting that lenders price in the additional default risk associated with maturity walls. The proposed measure is preferable to others in the literature, such as the Herfindahl index, which sums the squared share of debt due each year, because it captures debt concentration in two critical ways: (i) when a large share of debt is due in a single period and (ii) when debt is maturing over closely spaced periods[1].

To analyze the idiosyncratic and aggregate risks associated with maturity walls, I develop a structural credit risk model where firms jointly choose debt issuance amount and maturity wall adoption. Firms, which can strategically default, borrow debt primarily for the tax benefits. When issuing debt, they can choose between two types of securities that differ only in their repayment schedules: (i) a dispersed schedule or (ii) a concentrated schedule. A bond with a dispersed repayment schedule is similar to one with a sinking fund provision, where the firm makes fractional principal payments each period. In contrast, a bond with a concentrated schedule makes one payment at a random maturity date. This framework provides a tractable way to model firms' choices of payment schedules without needing to track each bond's maturity date, which would be computationally infeasible. When issuing debt, firms face a fixed issuance cost, similar to underwriting fees observed in the data. Additionally, firms incur quadratic costs when issuing equity, which increases the risk of being unable to roll over debt in public markets. Finally, debt is priced by a representative lender who expects to break even. In the event of default, the lender can only recover part of the firm's value, resulting in bankruptcy costs.

The key trade-off firms face when deciding whether to concentrate or disperse their debt payments is between the fixed issuance cost and the risk of costly equity issuance, which represents rollover risk in my framework. All else being equal, firms prefer to concentrate their debt into a few repayment dates to minimize issuance costs, effectively creating a maturity wall. However, if a firm experiences a negative shock when a large portion of its

[1] For example, suppose two firms each have $100 million in debt due in Year 1. Firm A has an additional $100 million due in Year 2, while Firm B has $100 million due in Year 20. A measure like the Herfindahl index would treat these firms as having the same concentration of debt because it focuses only on the distribution of debt across periods, not the spacing of those periods. In contrast, the standard deviation of maturity dates accounts for the timing difference: Firm A's debt is concentrated in the near term, while Firm B's is more dispersed over time. This distinction is crucial for understanding rollover risk and default potential.

debt is due, it may be forced to raise equity at a high cost to repay its debt.

The model also captures the rich heterogeneity in firms' maturity wall choices observed in the data: smaller, younger, more leveraged, and higher revenue firms tend to hold maturity walls more frequently. The fact that smaller and younger firms more often hold maturity walls can be alarming and counter-intuitive as they already face higher capital market costs compared to their larger counterparts. However, it is important to note that the decision to adopt a maturity wall is made *jointly* with the firm's leverage choice. When firms have low leverage, the risk of being unable to roll over their debt is minimal, making the cost of repeated issuance outweigh the benefits of dispersing payments. As firms increase their leverage, they shift to dispersed payments because the risk of rolling over concentrated debt grows, driven by the potential need for costly equity injections, while issuance costs remain fixed. This shift helps mitigate default risk, consistent with the data.

I estimate the model using the simulated method of moments (SMM). The model is estimated to match both the aggregate and distributional moments of firms' debt payment schedules, with empirical moments constructed from Mergent FISD and Compustat data. The fixed issuance cost of debt and equity injection cost parameters are estimated to match the average dispersion in maturity dates, average per unit underwriter fee, and the average debt to income ratio. The estimated model aligns well with the observed relationship between maturity walls and firm default risk. For a given level of debt, firms that concentrate their payments in a maturity wall face higher credit spreads and a greater risk of default. Using the estimated model, I address the following key questions.

First, I quantify how much maturity walls contribute to firm default risk and borrowing costs. In equilibrium, maturity walls account for 14% of defaults. However, since maturity walls are an endogenous choice, there is a selection issue: firms with maturity walls are not the same as those without. To address this, I model a counterfactual economy where all firms maintain their baseline borrowing levels but can only issue debt with a concentrated payment schedule. This allows me to generate exogenous variation in firms' debt composition and estimate the causal impact of maturity walls on default risk and borrowing costs. I find that firm default rates increase by 25% (30 bps) and credit spreads rise by 21% (36 bps).

Given that maturity walls significantly increase default risk and borrowing costs, I explore whether firms would be less risky in an environment without maturity walls. Surprisingly, I find that firms are *more* risky compared to the baseline economy. This outcome is driven by two opposing effects: the direct effect of eliminating maturity walls, which reduces risk, and a substitution effect, where firms increase borrowing in response to having a less risky security. Therefore, it is theoretically ambiguous whether firms would be more or less risky without maturity walls. Quantitatively, I find that the substitution effect outweighs the direct effect, making firms riskier in a world without maturity walls.

Second, I use the model to quantify the inefficiencies caused by underwriter market power. Recent studies, such as Manconi, Neretina, and Renneboog (2018), estimate that 16–25% of underwriter fees are due to market power. I examine the effect of eliminating this market power on firm outcomes and value. Reducing underwriter market power lowers the cost of debt issuance, prompting firms to spread out their debt maturity dates. However, firms also respond by borrowing more. As a result, the reduction in underwriter market power has no net effect on firms' overall default risk, as the benefits of dispersed debt are offset by the increase in borrowing.

Finally, I explore how the presence of maturity walls may amplify aggregate shocks to the economy. Specifically, I consider an unexpected, one-time credit market freeze, during which debt markets shut down completely, preventing new borrowing or early pre-payment of debt. Additionally, the cost of injecting equity rises. Firms with maturity walls are particularly vulnerable during such events, as they face a higher risk of default if they need to roll over their debt while credit markets are frozen.

During a credit market freeze, I find that aggregate defaults increase by 1.68 percentage points from baseline. The presence of maturity walls amplifies this effect, with firms facing a 4 percentage point increase in default rates when they must repay a maturity wall, driving up overall defaults. Additionally, I show that omitting maturity walls, as is done in conventional models, leads to underestimating the impact of a credit market freeze on defaults. For example, a standard model of long-term debt, such as Leland and Toft (1996); Chatterjee and Eyigungor (2012), underestimates default rates by 60%, while a model of average maturity, such as Arellano and Ramanarayanan (2012); He and Milbradt (2016), underestimates the transmission of a credit market freeze to aggregate defaults by 16%.

Literature Review

There is a long tradition in corporate finance of modeling firms' maturity choice. In Leland and Toft (1996), Leland (1998), Diamond and He (2014), DeMarzo and He (2021), and Dangl and Zechner (2021), firms are not allowed to actively adjust the maturity structure of their debt over time. In Brunnermeier and Oehmke (2013) and He and Milbradt (2016), firms are allowed to dynamically adjust maturity but the total value of debt is fixed. In my paper, firms dynamically choose their optimal maturity structure and level of debt each period.

My paper also relates to models of debt maturity and rollover frictions. He and Xiong (2012) show that short term debt can exacerbate rollover risk and that staggered debt is more susceptible to dynamic runs. Diamond and He (2014), which shows that maturing short-term debt can create more debt overhang than nonmaturing long-term debt. He and Milbradt (2016) endogenize the feedback between secondary market liquidity and rollover risk. Poor secondary market conditions exacerbates rollover risk in the primary market, making it more likely for firms to default. Chen, Xu, and Yang (2021) study the link between credit spreads, systematic risk, and lumpy maturity structure. Hu, Varas, and Ying (2022) analyze the dynamics of both leverage and maturity of corporate debt. They argue that long-term debt allows borrowers more efficiently to take advantage of the tax shield and offers better hedging against downside risk while short-term debt offers lenders of distressed borrowers protection from dilution and commitment to delever. A common theme in these papers is that long-term debt helps shield the firm from rollover risk. In contrast, my paper argues that long-term debt with concentrated maturity dates can still be potent sources of rollover risk.

Furthermore, my paper is most closely associated with an early literature on the dispersion of debt maturity dates. Choi, Hackbarth, and Zechner (2018) document substantial time and cross-sectional variation in dispersion of maturity dates. They argue that staggering maturities allows firms to avoid costly asset sales. I also document cross-sectional variation in dispersion of maturity dates and use this as motivation for the development of a quantitative structural credit risk model. This allows me to quantify trade-offs involved when firms choose to concentrate or disperse their debt maturity dates. Huang, Oehmke, and Zhong (2019) develop a multi-period model of debt structure in which firms trade off incentives to repay debt and prevent costly early liquidation in the presence of privately observable cash flows. I develop a model where firm's cash flow is public information, but the presence of debt issuance costs and costly equity injection generate a trade-off to firm's maturity concentration choice.

Typically quantitative models of finite debt maturity assume either a dispersed maturity structure (i.e. Leland and Toft (1996), Jungherr and Schott (2021) for corporate bonds and Arellano and Ramanarayanan (2012), Hatchondo and Martinez (2009) for sovereign bonds) or a perfectly concentrated maturity structure (i.e. Geelen (2019) and Chen, Xu, and Yang (2021)). These repayment schedules are at odds with what firms do in the data. This paper endogenizes the choice of repayment schedules in a tractable way so as not to deal with a large state space. Chaderina (2023) explores the dispersion of debt in a model where firms have a one period bond and a two period bond. In contrast, my modeling approach allows for a better mapping of the model to the data, given that most firm debt is long term (greater than 2 period length).

Finally, my paper offers a methodological contribution to quantitative credit risk models.

I adapt a similar approach to Dvorkin, Sánchez, Sapriza, and Yurdagul (2021), which solves a model with long-term debt and an endogenous maturity structure choice of sovereign debt. It is challenging to solve for the optimal default, debt, and maturity structure choices, and for the equilibrium prices of different bond types in a quantitative model. Exploiting methods from dynamic discrete choice models, I introduce idiosyncratic shocks affecting the borrower's debt portfolio decisions. Under standard assumptions on the distribution of these shocks, I characterize the choice probabilities and use them to deliver a smooth equilibrium bond-price equation.

Road map

The paper is organized as follows. In Section 2, I describe the data set, estimation strategy, and empirical findings. Section 3 develops the heterogeneous structural credit risk model with an endogenous choice of repayment schedule concentration. In Section 4, I characterize equilibrium firm behavior, emphasizing the role of rollover risk and fixed issuance costs in firms' decisions to adopt dispersed or concentrated repayment schedules. Section 5 explains how the model is mapped to the data, while Section 6 examines the properties of the estimated model. Section 7 presents the quantitative analysis, and Section 8 concludes.

2 Empirical Facts

In this section, I demonstrate that firms vary significantly in the number of bonds they have outstanding, which directly influences the concentration of their debt repayment schedules and the likelihood of facing a maturity wall. I introduce a measure of debt repayment schedule concentration, which captures the extent to which firms' debt payments are clustered in time. The analysis shows that smaller, younger, and lowly leveraged firms tend to adopt maturity walls. Additionally, I find that firms with maturity walls correlates with real firm outcomes, including their default risk and cost of borrowing.

2.1 Data Sources

I use data from Mergent FISD to document the concentration of bond repayment schedules. Mergent FISD contains the universe of corporate bond issuances across all credit ratings and provides detailed information on issue date, amount, coupon, and bond maturity. This enables me to construct a complete bond maturity profile at the firm-year level. Issue amounts, coupons, and maturities are aggregated annually, weighted by the bond issuance amount. Following Boyarchenko, Kovner, and Shachar (2022), I exclude bonds issued in foreign currency, as well as Yankee, Canadian, convertible, and asset-backed bonds.

To analyze firm characteristics associated with dispersed or concentrated debt schedules, I merge the Mergent FISD data with balance sheet information from Compustat. In line with the literature, I exclude financial firms (SIC 6000–6999) and utilities (SIC 4900–4999). The sample consists of non-financial firm-year observations from 1995 to 2019 for firms issuing corporate bonds[2]. All variables are winsorized at the top and bottom 0.5% to mitigate the influence of outliers. My final sample includes 1,432 firms and 17,972 firm-year observations

2.2 Summary Statistics

Table 1 presents summary statistics for my sample. The average firm size is $11.98 billion, which is larger than the average Compustat firm because my sample focuses on bond issuers, who tend to be larger than non-bond issuers. The average market leverage ratio is 0.34, and firms hold around 7% of their assets in cash. Bonds account for the majority of firms' total debt – 59% on average – with the remainder consisting of bank loans, credit lines, commercial paper, and capital leases. Among bank debt, which is the main substitute for bond debt, 88% is in the form of bonds.

On average, firms have 5.4 bonds outstanding at any given time, although the distribution is skewed, with a median of 3 bonds. The average bond issuance size in a year is $941 million, while the average total bond debt outstanding is $1.58 billion. The distribution of bond issuance size is skewed toward larger issuances, with the 25th percentile at over $460 million, suggesting the presence of fixed costs associated with corporate bond issuance. Additionally, firms generally hold their bonds to maturity, with only 15% of firms partially or fully repurchasing their debt[3]. This pattern aligns with the high costs associated with recalling bonds.

Regarding bond characteristics, the average bond maturity is 8.3 years. Firms pay an average coupon of 6.43%, an average credit spread of 188 bps on newly issued bonds, and an underwriter fee of 0.79% of the bond issuance.

2.3 Measuring Maturity Walls

As noted earlier, the concept of a maturity wall is often cited as a reason for firm downgrades by credit rating agencies, such as in the recent case of Lumen Technologies. Despite

[2]While Mergent FISD contains earlier issuances, it only becomes comprehensive after 1995.

[3]A more detailed breakdown shows that 8% of bonds are fully called, 1% are partially called, and 7% are repurchased via tender offers.

its frequent use, "maturity wall" remains a loosely defined term in the industry, generally referring to a period when a substantial portion of a firm's debt must be repaid within a short time frame. In this section, I provide a more formal definition of a maturity wall and assess its prevalence among firms.

Before formally defining a maturity wall, it is essential to establish a way to measure the concentration or dispersion of a firm's debt payments. This is particularly relevant given the long-term nature of most corporate borrowing. For instance, in 2007, the median share of debt maturing in more than three years was 56.5% among publicly traded U.S. corporations Custódio, Ferreira, and Laureano (2013), with the average maturity of newly issued corporate bonds being around 11 years. As a result, firms are not necessarily making debt principal payments frequently, and there may be long periods with no payments at all. Additionally, firms vary significantly in the number of bonds they have outstanding, which affects their repayment schedules. Figure 1 shows that firms have an average of 5.4 bonds outstanding, with a median of 3, and the top 5% holding at least 19 bonds. This variation highlights the importance of capturing the concentration of debt payments, as firms with more bonds may have a more dispersed repayment schedule, while others may face significant rollover risk due to concentrated debt payments.

To formalize the concentration of a firm's debt repayment schedule, I introduce a novel measure of maturity date concentration that builds on existing approaches in the literature. I define the standard deviation of debt maturity dates, which offers a straightforward interpretation. For instance, a standard deviation of $\sigma_{Mat} = 1$ corresponds to a one-year dispersion of debt payments around the average maturity. While other studies, such as Choi, Hackbarth, and Zechner (2018), have used the Herfindahl index (or its inverse) as a measure of concentration, my results are robust to alternative concentration measures.

The standard deviation of debt maturity dates is defined as:

$$\sigma_{Mat,t} = \sqrt{\sum_{m=1}^{M} s_{m,t}(m - \mu_{Mat,t})^2} \tag{1}$$

where $s_{m,t} = b_{m,t}/\sum_{j=1}^{M} b_{j,t}$ represents the share of outstanding debt due in m years, $\mu_{Mat,t} = \sum_{m=1}^{M} s_{m,t}m$ is the average maturity of outstanding debts, and M is the longest bond maturity a firm can have[4]. The measure $\sigma_{Mat,t}$ is time-varying, adjusting as firms issue new bonds or repay existing ones.

The interpretation of σ_{Mat} is intuitive: a lower standard deviation indicates that debt payments are more concentrated around the average maturity. In the extreme case where

[4] I set M to 35 years, as bonds with maturities longer than 35 years account for only 0.5% of the sample.

$\sigma_{Mat,t} = 0$, all of a firm's debt payments come due in a single year, indicating maximum concentration.

I argue that $\sigma_{Mat,t}$ is a preferred measure of debt maturity concentration over those previously proposed in the literature due to its two key advantages. First, $\sigma_{Mat,t}$ is low when a large share of debt, $s_{m,t}$, is due within a single year, which aligns with the basic requirement for any concentration measure—this feature is shared by other measures, such as the Herfindahl Index. However, $\sigma_{Mat,t}$ also accounts for the dispersion of debt payments over time, capturing not just the concentration in a single period, but also the size of payments due around that period. This feature is essential for assessing how concentrated a firm's debt schedule truly is.

For example, consider two firms that each have 50% of their outstanding debt due in $m = 1$. Firm A pays the remaining 50% in $m = 2$, while Firm B pays the remaining 50% in $m = 20$. The Herfindahl Index, $\sum_{m=1}^{M} s_{m,t}^2$, would treat both firms identically, giving each a score of 0.5. However, intuitively, we might expect Firm A to face greater rollover risk, since it must repay 100% of its debt within two years. My proposed measure, $\sigma_{Mat,t}$, distinguishes between these two firms: Firm A would have a $\sigma_{Mat,t}$ of 0.5, while Firm B would have a $\sigma_{Mat,t}$ of 9.5, reflecting the much wider dispersion of its debt payments. This is important because credit analysts typically consider debt payments over a window of a few years when assessing rollover risk[5].

2.4 Fact 1: 47% of firms choose maturity walls

Figure 2 shows the distribution of σ_{Mat}, binned by one-year increments. There is significant heterogeneity in the concentration of debt maturity dates across firms. The average σ_{Mat} is 2.7 years, with a median of 1.4 years. Notably, a substantial number of firms have relatively concentrated debt payments, with $\sigma_{Mat} \leq 1$. Based on this structural break in the distribution of debt concentration, I define a maturity wall as a firm with $\sigma_{Mat,t} \leq 1$. This implies that the firm will pay off the majority of its debt within two years of starting debt repayments. Using this definition, I find that 47% of firms have a maturity wall. Therefore, the presence of a maturity wall, like that of Lumen Technologies, is not unusual but rather a common feature in corporate debt structures.

Table 2 presents summary statistics for firms with and without maturity walls, revealing substantial heterogeneity in firm and bond characteristics based on the dispersion of their repayment schedules. Notably, firms that disperse their debt payments tend to be larger ($18B vs. $4B), older (36 vs. 18 years), and have better investment opportunities ($Q = 1.76$

[5] For example, on April 2, 2020, Fitch Ratings downgraded Antero Resources, citing a large maturity wall of $2.63 billion due between 2021 and 2023.

vs. $Q = 1.55$) compared to those with more concentrated schedules. The fact that larger firms opt for more dispersed repayment schedules suggests the presence of large fixed costs associated with issuing debt, which these firms can better economize on. Indeed, firms with dispersed repayment schedules incur lower underwriter fees (72 bps vs. 121 bps).

Similarly, the trend that older firms prefer dispersed repayment schedules indicates that adverse selection may play a role in bond issuance; lenders likely have better information about older, more mature firms. As for firms with better investment opportunities, Choi, Hackbarth, and Zechner (2018) explain that these firms may spread out their debt maturities to protect against rollover risk. In the event of a rollover crisis, a firm may be forced to forgo profitable growth opportunities to meet its debt obligations.

The table also highlights differing financing strategies between firms that disperse and concentrate their debt repayments. Firms with dispersed schedules are more likely to pay dividends and less likely to issue equity, suggesting that spreading out debt payments helps mitigate the need for costly equity injections during rollover crises, as explored by He and Xiong (2012).

The decision to disperse or concentrate debt repayment schedules also correlates with bond characteristics. Firms with more dispersed schedules tend to issue a higher number of bonds and at larger amounts. On average, firms with dispersed repayment schedules have 8.6 bonds outstanding, compared to 1.8 for firms with concentrated schedules. The average bond issuance size for firms with dispersed repayments exceeds $1.2 billion, while firms with concentrated schedules issue bonds averaging $361 million. This suggests that firms needing larger amounts of financing opt to disperse their debt payments to mitigate rollover risk.

Additionally, firms with dispersed repayment schedules secure more favorable borrowing terms. They pay lower coupon rates, face narrower credit spreads, and have a lower probability of default compared to firms with concentrated debt payments. Notably, firms with concentrated debt structures do not appear to be substituting bond debt for bank debt, as they still hold a significant proportion of bond debt relative to bank debt.

2.4.1 Which firms hold maturity walls?

Table 2 provides summary statistics comparing firms with and without maturity walls, revealing key differences in firm characteristics that correlate with the concentration of debt repayment schedules. To further explore these relationships and identify the characteristics that drive firms' decisions to hold maturity walls, I estimate a linear probability model. This allows me to examine the effects of various firm-level factors on the likelihood of having a maturity wall while controlling for unobservable characteristics through fixed effects and clustering standard errors at the firm level.

The model is specified as follows:

$$Maturity\_Wall_{i,t} = X'_{i,t-1}\beta + \alpha_{FE} + \varepsilon_{i,t}, \tag{2}$$

where X is a vector of firm controls, and α_{FE} represents a set of fixed effects. The dependent variable is a binary indicator that specifies whether a firm has a maturity wall. The independent variables are chosen based on factors likely to influence the choice of having a maturity wall. Specifically, I include market leverage, firm size, firm age, Q (Tobin's Q), firm revenue, cash holdings, the average maturity of outstanding debt, and the firm's credit rating. All variables are standardized to facilitate interpretation and comparison.

The decision to have a maturity wall may be influenced by unobservable firm- or industry-specific characteristics, as well as time-varying macroeconomic conditions. To account for this, I include either industry- or firm-level fixed effects to capture the impact of unmeasured characteristics on both across- and within-firm variation in repayment schedule concentration. I also include time fixed effects to control for changes over time. Standard errors are clustered at the firm level.

Table 3 presents the estimation results. Across all specifications, leverage, size, and age are statistically and economically significant predictors of whether a firm has a maturity wall. The model also has strong explanatory power, with a high R^2. The coefficient signs on leverage and size provide insight into the trade-off firms face when managing their debt repayment schedules.

Firm size emerges as the strongest predictor of having a maturity wall. The coefficient on firm size, measured by the log of total book assets, is positive and large. In specification 2, which includes firm fixed effects, a one standard deviation increase in log assets is associated with a 17% decrease in the probability of having a maturity wall. Similarly, firm age is a significant predictor, with a negative relationship. A one standard deviation increase in age (23 years) decreases the probability of having a maturity wall by 15%. These findings suggest that larger and older firms are more likely to opt for dispersed repayment schedules, which aligns with the presence of large fixed costs in bond issuance. For instance, Altınkılıç and Hansen (2000) show that underwriter fees account for roughly 1% of corporate bond value, or approximately $2 million, a cost that larger firms can better absorb. Moreover, as firms age, there is more publicly available information about them, facilitating their access to credit markets and reducing the need to cluster debt payments.

Market leverage is another strong predictor, with a significant negative coefficient. A one standard deviation increase in market leverage (0.28%) corresponds to an 11% decrease in the likelihood of having a maturity wall. Firms with higher leverage face increased rollover risk, which could lead to costly equity injections, early project terminations, or default. To mitigate these risks, highly leveraged firms may choose to disperse their repayment schedules, reducing the concentration of debt payments and minimizing per-period rollover risk.

These results remain robust even after controlling for firms' investment opportunities, revenue, cash holdings, average maturity, and credit rating. Investment opportunities are negatively associated with maturity walls, indicating that firms with more investment opportunities are more likely to disperse their debt repayments. The positive coefficient on revenue suggests that firms with higher revenue, being less at risk of failing to roll over their debt, are more inclined to have a maturity wall. Although the coefficient on cash holdings is positive, it is statistically insignificant. Average maturity is negatively correlated with the presence of a maturity wall, but the results suggest that its economic significance is limited in this context. Lastly, firm credit rating is negatively related to maturity walls, implying that more creditworthy firms are less likely to have concentrated debt repayment schedules.

2.5 Fact 2: Firms with maturity walls appear more risky

The previous section showed that maturity walls are strongly correlated with firm characteristics. Given the potential risks associated with holding maturity walls, it is plausible that they also influence real firm outcomes. This section investigates these questions further.

To explore how a firm's choice of repayment schedule affects its outcomes, I estimate the following regression model:

$$Y_{i,t} = X'_{i,t-1}\beta + \alpha_{FE} + \varepsilon_{i,t}, \tag{3}$$

where Y represents firm outcomes, and X is a vector of firm-level controls. The key variables of interest include the firm's maturity structure characteristics—specifically, leverage, average maturity, and the presence of a maturity wall. To account for unobserved heterogeneity, I include industry-by-year fixed effects as well as a fixed effect for firms' credit ratings. As before, all independent variables are standardized to facilitate interpretation and comparison of their effects on firm outcomes.

I focus on two key firm outcomes: the probability of default (measured by a firm's distance to default) and the credit spread of newly issued bonds, as shown in Table 4. First, I examine the probability of default in specification (1). Market leverage is a strong positive predictor, with a one standard deviation increase in leverage associated with a 3 percentage point increase in the probability of default. Maturity walls are also positively correlated with default probability, with firms holding maturity walls having a nearly 1 percentage point higher default likelihood. This positive relationship is intuitive, as large, infrequent debt payments can increase a firm's risk, particularly if debt must be rolled over during adverse market conditions or poor firm performance. Although average bond maturity is positively correlated with default probability, it is not statistically significant in this specification.

Next, I analyze the credit spreads on newly issued bonds, shown in specification (2). Market leverage is again a significant predictor, with a one standard deviation increase in leverage resulting in a 22 basis point increase in credit spreads. Firms with maturity walls face an even larger increase in spreads—about 34 basis points—highlighting the perceived risk of concentrated debt repayment schedules. In contrast, the average maturity of bonds is negatively related to credit spreads, but the effect is small and not statistically significant. These results suggest that both leverage and debt concentration are important factors in how lenders price corporate bonds and assess default risk.

2.6 Fact 3: Firms face economies of scale in bond issuance

Next, I demonstrate that firms face significant fixed issuance costs when issuing corporate bonds. I provide evidence of both observed direct costs, such as underwriter fees, and unobserved indirect costs, such as relationships, CFO expertise, and other intangible factors.

When a firm raises capital by issuing bonds, it selects an investment bank or a syndicate of banks (underwriters) to facilitate the process[6]. The underwriters assist the firm in structuring the bond deal, determining critical details such as the bond amount, maturity date, coupon rate, and pricing strategy. As part of this process, underwriters conduct due diligence on the firm's financial health and creditworthiness, which helps in setting the terms of the bond, including the interest rate and offer price. Underwriters charge fees for their services, typically as a percentage of the total bond issue. These fees cover underwriting, distribution, and marketing costs, and consist of both (i) fixed costs, which are independent of the bond issue size (e.g., legal and regulatory filings), and (ii) variable costs, which scale with the size of the issuance.

Given the presence of fixed costs associated with underwriting corporate bonds, firms may reduce costs by issuing a smaller number of large bonds to take advantage of economies of scale. To quantify the size of the fixed cost component of underwriter fees, I estimate the following regression model:

$$Underwriter\_Fee_{i,t} = C_f + C_\ell B_{i,t} + C_q B_{i,t}^2 + X_{i,t}'\beta + \alpha_i + \alpha_t + \alpha_{rating} + \varepsilon_{i,t}, \qquad (4)$$

where $Underwriter\_Fee$ represents the underwriter fee paid by the firm (in \$M), B is the size of the bond issuance (in \$M), and X is a vector of firm controls, including size, age, and

[6]For more details on the corporate bond underwriting process, see Siani (2022).

leverage. I also include firm, time, and credit rating fixed effects to control for unobserved heterogeneity. The term C_f captures the average fixed cost component of underwriter fees across all firms, while C_ℓ and C_q capture variable costs associated with bond issuance size. Importantly, an estimate of $C_f > 0$ provides evidence of fixed issuance costs, supporting the existence of economies of scale in corporate bond issuance.

Table 5 presents the estimates, providing evidence of significant fixed costs associated with underwriting corporate bonds. The average fixed cost is \$2.46M, accounting for 69% of the average total underwriter fee, which is \$3.51M. Additionally, underwriter fees increase with the size of the bond issuance: for every \$10M increase in bond size, firms pay approximately \$78,000 more in fees. Larger and more established (older) firms tend to face lower underwriter fees, suggesting that information asymmetries may contribute to the fees firms incur. However, there is substantial heterogeneity in the fixed costs across firms. Figure 3 illustrates this variation by plotting the distribution of firm-specific fixed costs, captured through the firm fixed effect.

My estimate of the fixed cost of underwriter fees is larger compared to other studies in the literature. For instance, Altınkılıç and Hansen (2000) estimate that the fixed cost of underwriting a bond is approximately \$227,000—significantly lower than my estimate of \$2.46M. While the specifications are similar, as dividing through by bond issuance size in my model yields a comparable structure to theirs, the difference in estimates likely arises due to several factors. First, the underlying datasets differ, with Altınkılıç and Hansen (2000) focusing on bond issuances from 1990 to 1997, while my analysis covers a more recent and broader sample. Second, their specification emphasizes the dominance of variable costs in larger bond issuances, with fixed costs diminishing as issue size increases, which may explain their smaller estimate of fixed costs. In contrast, my specification emphasizes the role of fixed costs, capturing different dimensions of the cost structure. Additionally, differences in firm characteristics, bond types, and market conditions across the two studies may contribute to the differences in estimates

I conduct several robustness checks to confirm that the fixed cost component remains a significant portion of the underwriter fee. First, to ensure that my estimate of the fixed cost is not overly influenced by the functional form, I include a cubic term for bond size, $B_{i,t}$, in the regression. The inclusion of this term does not meaningfully change the fixed cost estimate. Second, I test whether the average fixed cost per bond decreases significantly when firms issue multiple bonds in a given year. If the fixed cost primarily reflects the due diligence performed by underwriters, firms may economize on this cost by issuing more bonds, not just larger ones. I find that firms issuing additional bonds in a year face a lower underwriter fee, with the marginal decrease per bond amounting to roughly \$105,000, or about 5% of the estimated fixed cost.

Why does a large fixed cost remain? First, firms often use different underwriters for their bonds. As Manconi, Neretina, and Renneboog (2018) note, firms may choose underwriters based on their specialization in certain types of bonds. Second, even when using the same underwriter, separate fixed fees are incurred for each bond, as legal and regulatory filings are distinct for each issuance. Additionally, underwriters assess demand for each bond individually. Siani (2022) highlights that underwriters must evaluate the market for each bond they bring to market, and given that corporate bonds vary across many dimensions, estimating demand for each bond separately is necessary. Investors, as noted by Mota and Siani (2023), often have distinct preferences for different bond types, which requires separate demand assessments even when multiple bonds are issued simultaneously.

2.7 Taking stock

I have documented a series of key facts characterizing firms in the corporate bond market that choose maturity walls and how this decision affects their outcomes. Additionally, I have shown the presence of substantial fixed costs associated with issuing corporate bonds. In the next section, I develop a quantitative model based on these stylized facts, demonstrating that some firms optimally choose to hold maturity walls when facing fixed debt issuance costs and rollover risk. I also show how the model can replicate the empirical findings presented in this section.

3 Environment

In this section, I build a model that can replicate features of my empirical exercise. To do so, I consider a discrete time structural credit risk model. There are two agents in my model: firms and lenders. I take the real interest rate to be a policy parameter as in a small open economy framework. This allows me to understand the mechanism delivered in my model that would carry through in a richer quantitative model. All firms are ex-ante homogeneous and ex-post heterogeneous, due to idiosyncratic sequence of shocks they receive. In my model, firms borrow in debt that has dispersed debt payments or debt that has concentrated debt payments, pay a dividend out to equity holders, and make a default decision. There is a representative lender that buy firms' debt. Given firms can renege on their promised debt payment, the lender forecasts if a firm is likely to default on their debt to set the price on debt borrowed by the firm.

3.1 Firms and Profits

Firms, indexed by j, are endowed with an asset that generates stochastic revenue. Firm j wishes to maximize the expected present discounted value of dividends. Formally:

$$\max_{\{b_{D,j,t+1},b_{C,j,t+1}\}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \psi(d_{j,t}), \tag{5}$$

where $b_{D,j,t+1}$ is the level of debt with dispersed repayment schedules of firm j, $b_{C,j,t+1}$ is the level of debt with concentrated repayment schedules of firm j, $d_{j,t}$ is the per-period dividend payout of firm j, $\psi(\cdot)$ is function governing the dividend payout, and β is the firm's discount factor. This environment can be thought of as a small open economy where the real interest rate is taken to be exogenously given.

To make the problem tractable, I make a few assumptions about the support of the debt instruments and introduce additive manager preference shocks to choices. I assume that the debt instruments can only take values in a discrete support: $b_k \in \mathcal{B}_k \equiv \{b_{1,k}, b_{2,k}, \ldots, b_{n_{b_k},k}\}$ for $k \in \{D, C\}$. Second, I assume there is a random vector ε of size $n_{b_D} \times n_{b_C}$, which corresponds to the number of all possible combinations of debt instruments. As mentioned, the introduction of these shocks are useful to solve the model numerically using the tools of dynamic discrete choice. I assume ε is drawn from a multivariate distribution with joint cumulative density function $F(\varepsilon) = F(\varepsilon^{(b_{D,1},b_{C,1})}, \varepsilon^{(b_{D,2},b_{C,1})}, \ldots \varepsilon^{(b_{D,n_{b_D}},b_{C,n_{b_C}})})$ and joint density function $f(\varepsilon) = f(\varepsilon^{(b_{D,1},b_{C,1})}, \varepsilon^{(b_{D,2},b_{C,1})}, \ldots \varepsilon^{(b_{D,n_{b_D}},b_{C,n_{b_C}})})$.

Firm j has a unit of installed capital that generates a stochastic income $y_{j,t} \in Y \equiv \{y_1, y_2, \ldots, y_{n_y}\}$, which follows a first-order Markov process with transition matrix $G_y(y_{j,t+1}|y_{j,t})$. In order to produce each period, firms must pay a fixed production cost c_f. Their pre-tax profits are defined as their income less any costs of production:

$$\pi_{j,t} = y_{j,t} - c_f. \tag{6}$$

Firm j pays corporate taxes on operating profits. Consistent with the tax code, firms are able to subtract of interest payments on debt from their operating income:

$$\Upsilon_{j,t} = \pi_{j,t} - \varsigma b_{j,t} \tag{7}$$

where $b_{j,t}$ is the total amount of debt borrowed by firm j and ς is the coupon rate. The tax benefits to holding debt comes by way of firm j's ability to deduct interest rate expenses from their overall taxable income. Corporate taxes paid by the firm are then defined to be $T_t^c = \mathbb{1}_{\{\Upsilon_{j,t} \geq 0\}} \tau \Upsilon_{j,t}$, where $\mathbb{1}$ is an indicator function and τ is the corporate tax rate.

3.2 Firm Financing

The firm's operating cash flows can turn negative for low realisations of y_t. In order to finance its operations, the firm can rely on either on internal funds accumulated from previous periods, on borrowing from the bond market, or on proceeds from seasonal equity offerings. Issuing debt requires the payment of a fixed issuance cost c_I.

Firms can issue two different types of bonds: a bond that promises a dispersed set of principal payments (b_D) and a bond that offers a single concentrated payment (b_C). I assume that a bond with a dispersed set of principal payments is a bond that promises an infinite steam of principal payments which decreases at a constant rate λ. A bond of size b_D issued in period t promises to pay $\lambda(1-\lambda)^{s-1}b_D$ in period $t+s$. Thus, to not default, a firm must make a payment of $b_D(\lambda+\varsigma)$. An alternative interpretation of this bond is one with a sinking fund provision and a constant amortization rate. This is a common and tractable approach to modeling long term bonds found in both the corporate finance and sovereign default literature[7], as it does not increase the state-space[8]: The entire schedule of payments is summarized by the level of outstanding debt (b_D) and the decay parameter (λ). While it is common to model a long-term bond as such, it implies a certain type of repayment schedule, which is often at odds with the empirical observation that firms hold maturity walls and make lumpy payments on their debt.

To account for the fact that firms make concentrated payments, the firms can also issue a bond that has a single principal payment (b_C). I assume that a bond with a concentrated principal payment has a random maturity date. This is akin to a perpetuity bond with a put position, where the holder of the bond decides when the principal is due. When the outstanding bond is retired, firms must fully repay b_C at which point they optimally reissue a new quantity of debt with a concentrated repayment schedule. The process for which debt matures is captured by the i.i.d. random variable η which takes a value of one with probability λ and zero otherwise[9]. Thus, to not default, the firm must make a payment

[7]See, among others, Hatchondo and Martinez (2009); Arellano and Ramanarayanan (2012); Leland and Toft (1996); He and Xiong (2012); Dangl and Zechner (2021); Jungherr and Schott (2021)

[8]Suppose, for instance, that the firm can issue any bond of maturity m less than some maximum maturity M. In order to solve the model, one would need to keep track of M state variables (one for each maturity). Thus, for large M,it would not be possible to summarize all future payment obligations with one state variable.

[9]While bonds to not mature randomly, I opt to model this bond as one with a random maturity date as opposed to one with a deterministic maturity date for two reasons. First, from the firms perspective, the event that a bad fundamentals shock arrives when firms need to make a large debt payment is random. Thus, a model with deterministic maturity date and random fundamentals would look the same. In Tables 6 - 7, I verify empirically that the presence of large debt payments coming due does not induce the firm to hoard cash or decrease investment in any economically significant way. Second, to model the bond maturing deterministically, it would add an additional state variable, which is computationally costly.

of $b_C(\varsigma + \eta)$. Modeling bonds in this way is also strongly rooted in the corporate finance literature[10].

Figure 4 highlights what the model implied debt repayment schedules look like for a given realization of the repayment shock. We can see that the bond with a dispersed repayment schedule makes small frequent principal payments, while the bond with a concentrated repayment schedule makes one at period 5. The two types of bonds that firms can issue capture in a stylized way the different types of debt payment schedules we observe firms choosing in the data. In particular, the two bonds are identical along two dimensions: (i) conditional on not defaulting, both bonds will repay the same amount and (ii) both bonds have an average maturity of $1/\lambda$. The only difference, however, is that the differ in the schedule of payments.

3.3 Financial Markets

Lenders

There is a representative financial intermediary who has access to long-duration risk free bond at a price one and lends discount bonds to firms at a firm-specific loan price $q_{D,j,t}(b_{D,j,t+1}, b_{C,j,t+1}, y_{j,t})$ and $q_{C,j,t}(b_{D,j,t+1}, b_{C,j,t+1}, y_{j,t})$. Lenders have full information about firms' states. The price of bonds is a function of: (i) the amount of debt with dispersed payment schedules the firm plans to borrow (ii) the amount of debt with concentrated payment schedules the firm plans to borrow, and (iii) firm specific income level. To price debt for firms, lenders must forecast the likelihood of default given the firm j's current and future debt choices, and idiosyncratic income level. This will be formalized in the next section.

Equity Issuance

If firms choose to issue equity (negative dividends), they must pay a cost $\psi(d_{j,t})$, which is increasing in the amount of equity needed to be injected.

3.4 Timing

At each period t:

1. Idiosyncratic productivity $y_{j,t}$ and repayment shock $\eta_{j,t}$ is realized by firms. The state space for an incumbent firm is $(b_{D,j,t}, b_{C,j,t}, y_{j,t}, \eta_{j,t})$.

[10]See, among others, Geelen (2019); Gomes and Schmid (2021); Chen, Xu, and Yang (2021)

2. Default decisions are made by firms. If a firm chooses to default on their debt, the firm is liquidated and the lender recovers a fraction χ of the firm's unlevered value. In addition, they avoid paying the fixed cost of production. After an incumbent firm has defaulted, a new firm enters.

3. If a firm does not choose to default, it pays the fixed cost of production and repay their debt in full. They then decide debt choices for next period.

4 Equilibrium

To save on notation, I drop the firm specific j subscript. Additionally, date t variables have dropped the time subscript and date $t+1$ variables are denoted by primes.

4.1 Recursive Representation of the Firm's Problem

I begin with the problem faced by an incumbent firm. An incumbent firm enters the period with debt with dispersed repayment schedules b_D, debt with a concentrated repayment schedule b_C, and idiosyncratic income y. The firm chooses between two discrete actions: (i) to stay in the economy and produce or (ii) to default on its debt payment and exit the economy. In other words, the firm maximizes its value over these two distinct choices:

$$V(b_D, b_C, y, \eta) = \max_{\delta} \Big\{(1-\delta)V^{stay}(b_D, b_C, y, \eta) + \delta V^{default}(b_D, b_C, y, \eta)\Big\}, \tag{8}$$

where $\{V^{stay}, V^{default}\}$ denote the value of the firm if it chooses to stay in the economy and if it chooses to default on its debt. In the event that its debt obligation is larger than the funds they are able raise from debt markets or the amount of equity they can inject, the firm chooses to default and obtains a value $V^{default}(b_D, b_C, y, \eta) = 0$. I define $\delta(b_D, b_C, y, \eta)$ to be default decision rules made by the firm. In the event of default, $\delta(b_D, b_C, y, \eta) = 1$.

If the firm does not choose to default on their debt obligation, we can express the firm's problem of staying in the following recursive form:

$$V^{stay}(b_D, b_C, y, \eta) = \int_{\varepsilon} W(b_D, b_C, y, \eta, \varepsilon) dF(\varepsilon) \tag{9}$$

$$W(b_D, b_C, y, \eta, \varepsilon) = \max_{b'_D, b'_C} \Big\{\psi(d) + \varepsilon^{(b'_D, b'_C)} + \beta \mathbb{E}_{\{y', \eta'\}} V(b'_D, b'_C, y', \eta')\Big\} \tag{10}$$

subject to

$$\psi(d) = \begin{cases} d & \text{if } d \geq 0 \\ d - \alpha d^2 & \text{if } d < 0 \end{cases}$$

where

$$d = (y - c_f - \varsigma(b_D + b_C))(1-\tau) - (\lambda b_D + \eta b_C) + \\ q_D(b'_D, b'_C, y)I_D + q_C(b'_C, b'_C, y)I_C - c_I(\mathbb{1}_{I_D>0} + \mathbb{1}_{I_C>0})$$

and

$$I_D = b'_D - (1-\lambda)b_D$$
$$I_C = b'_C - (1-\eta)b_C.$$

The dividend the firm pays out to shareholders is d and is composed of a number of terms. The first summand represents the firm's after-tax income. The firm receives a stochastic income y and pays the fixed operating cost c_f. Additionally, it pays any coupon payments on outstanding debt. Notice that firms deduct coupon payments off their pretax income, highlighting the tax benefits of debt in this framework. The second summand captures principal payments the firm must make this period. With certainty, it must make a fractional payment on its outstanding dispersed debt (λb_D). Additionally, it only makes a principal payment on the concentrated debt (b_C) when $\eta = 1$, which occurs with probability λ. The third and fourth summand captures the total revenue raised from the bond market. $q_D(b'_D, b'_C, y)I_D$ captures the revenue raised by issuing new bonds with dispersed debt payments and $q_C(b'_D, b'_C, y)I_C$ captures the revenue raised by issuing a new bond with a concentrated payment. I_j is the law of motion for debt issuances of type j and $q_j(b'_D, b'_C, y)$ is the price of newly issued debt for debt of type j, for $j \in \{D, C\}$. Finally, the the last term captures the cost of issuing new debt. Any time issuances are positive for dispersed or concentrated debt, the firm must pay the fixed debt issuance cost c_I.

Firm pays out their dividend according to the piece-wise function $\psi(d)$. When $d \geq 0$, the firm linearly pays out excess cash-flows to shareholders. When $d < 0$, firms need to inject equity from shareholders. They are able to inject equity from shareholders subject to a convex cost αd^2. In the model, costly equity injections serves as the cost to the firm from not being able to raise enough revenue from the bond market and roll over their debt.

4.2 Entrants Problem

A new firm enters the economy when an incumbent firm defaults. I assume here that the entering firms come in with zero debt and draws its idiosyncratic income from the stationary Markov distribution of $\bar{G}_y$.

4.3 Lender's Problem

To price debt for firms, the representative lender must forecast the likelihood of default given the firm's debt choices and current idiosyncratic income level. On a given loan to a firm with idiosyncratic income y who chooses debt with dispersed repayment schedules b'_D and debt level with a concentrated repayment schedule b'_C, the lender expects makes zero profits on all loans. Thus, we can express the price of a unit of dispersed debt in the following recursive form:

$$\begin{aligned} q_D(b'_D, b'_C, y) = \beta \mathbb{E}_{\{y',\eta'\}} \Big\{ &(1 - \delta(b'_D, b'_C, y', \eta'))(\varsigma + \lambda + (1-\lambda) q_D(b''_D, b''_C, y')) \\ &+ \delta(b'_D, b'_C, y', \eta') \min \left[1, \chi \frac{\tilde{V}(y')}{b'_D + b'_C} \right] \Big\} \end{aligned} \tag{11}$$

where $\tilde{V}(y) = \psi(y) + \beta \mathbb{E}_{\{y'\}} \max \{\tilde{V}(y'), 0\}$ is un-levered firm value. Similarly the price of a unit of concentrated debt in the following recursive form:

$$\begin{aligned} q_C(b'_D, b'_C, y) = \beta \mathbb{E}_{\{y',\eta'\}} \Big\{ &(1 - \delta(b'_D, b'_C, y', \eta'))(\varsigma + \eta + (1-\eta) q_C(b''_D, b''_C, y')) \\ &+ \delta(b'_D, b'_C, y', \eta') \min \left[1, \chi \frac{\tilde{V}(y')}{b'_D + b'_C} \right] \Big\} \end{aligned} \tag{12}$$

Lender's profits for a given loan can be decomposed into the cost to the lender today (left hand side of equation 11 and 12) and the expected revenue the lender gets over the duration that the bond is outstanding (right hand side of equation 11 and 12). Notice that the bond price depends both on the one period ahead default decision of the firm $\delta(b'_D, b'_C, y', \eta')$, which is a function of firm debt choices today. Thus, if the firm is more likely to default in the future when issuing debt that has a concentrated repayment schedule, the lender will purchase the debt at a lower price (higher interest rate). In addition, the price of debt depends on future firm borrowing choices b''_D and b''_C, since this impacts the creditworthiness of the firm in the future. Because these are long-term contracts, the lender cares about the future creditworthiness of the firm and prices it in.

4.4 Characterizing firm choices

The model laid out this far presents a trade-off to the firm when deciding on the composition of its debt. In particular, there are thee factors the firm considers: (i) the equity smoothing benefits of dispersed debt, (ii) the issuance cost savings of concentrated debt, and (iii) dispersed debt and concentrated debt may not raise the same amount of revenue on the bond market.

Equity smoothing benefits of dispersed debt

Consider, first, the equity smoothing benefits of dispersed debt. Dispersed debt can act as a hedge against rollover risk for firms. Recall that firms may need to inject equity from shareholders if they are not able to raise enough revenue on the bond market to roll over their debt. Given that equity injection costs are convex, the firm has an incentive to smooth equity injections from shareholders over time. This arises from the fact that the firm acts as if it were a risk averse agent, due to the curvature the dividend payout function $\psi(d)$.

Why does dispersed debt smooth equity injections for the firm? It is due to the dispersed repayment schedule b_D comes with. Consider a firm with a low realization of y, such that it has a high likelihood of injecting equity. The dispersed bond offers small and deterministic principal payments to lenders (λb_D), which translates to small and deterministic equity injections, since the amount of equity needed to inject is independent of η. In contrast, the concentrated bond *is* dependent on η: it offers infrequent but potentially large equity injections, if it is required to repay all of b_C.

This can be most clearly observed in Figure 5. The left panel shows the amount of equity needed to inject when its entire debt holdings are in b_D. As the firm holds higher levels of debt, it requires larger equity injections, and these grow convexly, due to the equity injection cost. Further, note that the amount of equity needed to be injected is independent of η, since the firm makes deterministic principal payments. The right panel shows the amount of equity needed to inject when its entire debt holdings are in b_C. Again, the amount of equity needed to be injected grows as b_C grows. However, the amount of equity needed to be injected is dependent on η: When $\eta = 1$, and the firm needs to roll over b_C, the firm needs to inject a higher amount of equity, while when $\eta = 0$, the firm needs to inject hardly any. Given that the firm's preference is to smooth equity injections over future states, the dispersed bond is preferred, all else equal. In effect, dispersed debt acts as an insurance product for the firm to protect against rollover risk, or large equity injections.

Issuance cost savings of concentrated debt

Next consider how concentrated debt can save the firm on issuance cost payments. A common feature of this class of models is the presence of a target leverage ratio, or a total level of debt that balances the costs and benefits of holding debt, that the firm would like to maintain, conditional on stable income shocks over time. Suppose that a firm is at it's target leverage ratio and it understands that it's income is to remain relatively stable over the future periods. How would a firm choose the composition of its debt?

Given the presence of fixed issuance costs, the firm is going to prefer to issue the concentrated debt, due to its infrequent principal payments, and thus, infrequent issuance cost payments. In contrast, the dispersed debt requires frequent principal payments, and as a result, frequent issuance cost payments by the firm. The frequent issuance costs are a result of the firm wanting to maintain it's target leverage ratio over time. Thus, the firm tops-up its total level of debt each period to return to its target leverage ratio. But in doing so, it pays the issuance cost.

Figure 6 highlights this scenario for a firm. In this example, a firm has deterministic income $y_t = \bar{y}$ for all t and is at its target leverage ratio. Thus, for all t, the firm wants to remain at its target leverage ratio. The top panel considers the issuance behavior of a firm at its target leverage ratio holding b_D. Each period it repays principal λb_D, but since it would like to remain at a leverage ratio of b_D, it chooses to re-issue the amount of λb_D, thus incurring the debt issuance cost. The bottom panel considers the issuance behavior for a firm at its target leverage ratio holding b_C. In this setting, the firm does not have to make any principal payments until $t = 8$. Since it is already at its target leverage ratio, it also does not make any new issuances, thus avoiding paying the issuance cost until $t = 8$.

Dispersed debt and concentrated debt are not perfect substitutes

Finally, observe that the price of dispersed debt $q_D(b'_D, b'_C, y)$ and concentrated debt $q_C(b'_D, b'_C, y)$ need not be the same in equilibrium. The difference comes from the fact that the default choices may depend on the composition of debt, as can be seen in Figure 7. Indeed, it is possible for $q_D(b'_D, b'_C, y) > q_C(b'_D, b'_C, y)$ and $q_D(b'_D, b'_C, y) < q_C(b'_D, b'_C, y)$ in equilibrium.

To see this, consider a stylized three-period environment where a firm borrows a total amount of debt B in period 1 and can either borrow all in b_D or in b_C. It receives deterministic income y_2 in period 2 and $y_3 = -\infty$ in period 3. As a result, the firm will default with certainty in period 3[11]. Additionally, the lender cannot recover any of the firm's assets

[11] This assumption is in place to keep the setup simple and allows me to ignore future borrowing decision

($\chi = 0$). What would the prices of debt $q_D(B, 0, y_2)$ and $q_C(0, B, y_2)$ be?

To see how $q_D(B, 0, y_2) > q_C(0, B, y_2)$, suppose that $\delta(B, 0, y_2, \eta_2) = 0$ for all realizations of η_2 and $\delta(0, B, y_2, \eta_2 = 0) = 0$ and $\delta(0, B, y_2, \eta_2 = 1) = 1$. In other words, the when the firm borrows in the concentrated bond, it defaults with probability λ in period 2. Each bond can be priced in period 1 in a straightforward way.

$$
\begin{aligned}
q_D(B, 0, y_2) &= \beta(\varsigma + \lambda) \\
q_C(0, B, y_2) &= \beta(1 - \lambda)\varsigma
\end{aligned}
$$

It is easy to see that that $q_D(B, 0, y_2) > q_C(0, B, y_2)$ since the lender expects to higher total payments when the firm borrows in the dispersed bond.

A similar argument can be constructed to see that $q_D(B, 0, y_2) < q_C(0, B, y_2)$. Instead, suppose that $\delta(B, 0, y_2, \eta_2) = 1$ for all realizations of η_2. Then, the price of each bond is

$$
\begin{aligned}
q_D(B, 0, y_2) &= 0 \\
q_C(0, B, y_2) &= \beta(1 - \lambda)\varsigma.
\end{aligned}
$$

This difference in debt price is an important trade-off the firm considers as it chooses which type of debt to issue. Given that the default decision is dependent on the composition of debt, and, as a result, bond prices differ by each type of debt, bonds are not perfect substitutes in the firm's eyes. Thus, if the firm is interested in raising as much revenue as possible from the bond market, the firm have a preference for type of bond over the other.

4.5 Definition of Equilibrium

A recursive Markov equilibrium is a set of value and policy functions $\{V^*, b_D^*, b_C^*, \delta^*\}$ and debt prices $\{q_D^*, q_C^*\}$ such that:

1. Given prices q_D^* and q_C^* firms optimize yielding V^*, b_D^*, and b_C^*.
2. The default decision δ^* is consistent with firm decision rules.
3. Debt prices q_D^* and q_C^* are such that the representative lender expects to earn zero profits.
4. Stationary distribution of firms is determined by firm decision rules and law of motion for y and η

by the firm. The firm will not borrow anything since prices are 0, or interest rates are infinite; lenders will not receive any cash-flow from the new borrowing since the firm is guaranteed to default.

- Mass of defaulting firms are replaced with an equal mass of firms with $b_D = 0$, $b_C = 0$, $\eta = 1$ and $y \sim \bar{G}_y$.

5 Mapping the Model to the Data

The data used for the model estimation is the same as in Section 2. In order to discuss counterfactual assessments of maturity walls at the firm and aggregate level, I match the quantitative model with key moments on firm heterogeneity related to maturity walls, the total level of borrowing, the cost of borrowing firms face on bonds, and their default rates. Matching these moments ensures that the choices of firms in my model is similar to what I observe the data.

5.1 Estimation Strategy

The model has 11 parameters. Model estimation occurs in two stages: an external calibration, where a six of parameters are chosen outside the model, and an internal estimation, where the remaining five parameters parameters are chosen to match a set of moments in the data via simulated method of moments (SMM). Table 8 summarizes the baseline parameters of the model.

Externally Calibrated Parameters

Similar to my data, the model period is one year. The discount factor, β, is common to of all agents in the economy. I set the discount factor to be 0.96, which implies an annualized risk free rate of 4.0%. The coupon rate is set to be the risk free rate, implying that risk free bonds are issued at par, or price of 1. Following Hennessy and Whited (2007), I set $\tau = 0.30$.

To calibrate my model, I make a parametric assumption on the shock process. I assume that idiosyncratic productivity follows an AR(1) process:

$$log(y_{t+1}) = \rho_y log(y_t) + \epsilon_{y,t+1}, \quad \epsilon_y \sim \mathcal{N}(0, \sigma_y),$$

where $\rho_y < 1$ is the persistence parameter on the shock. To break up the shock into a discrete grid of points, I follow the method proposed in Tauchen (1986). To estimate the parameters in the process for y, I estimate the following regression:

$$log(Sales_{i,t-1}) = \rho_y log(Sales_{i,t-1}) + \alpha_i + \alpha_t + \epsilon_{i,t},$$

where α_i and α_t are firm and year fixed effects. The results provide us with an estimate of ρ_y and σ_y. I calibrate $\rho_y = 0.66$ and $\sigma_y = 0.31$. Additionally, I calibrate $1/\lambda = 8.3$ to be the average time to maturity of bonds held on firms' balance sheet observed in the data.

Internally Estimated Parameters

The remaining five parameters are estimated via SMM by minimizing the distance between six model moments and data moments. The model is over-identified and the moments are selected to provide identification for the parameters. Specifically, the parameters are chosen to minimize the following objective function:

$$J(\Theta) = \min_{\Theta}(m^D - m^M(\Theta))' W^* (m^D - m^M(\Theta)), \tag{13}$$

where, m^D is a vector of data moments, $m^M(\Theta)$ is a vector of moments calculated within the model, conditional on vector of parameters Θ. For the weighting matrix, W^* , I use the covariance of the empirical moments, constructed using the influence function approach of Erickson and Whited (2002). Standard errors are given by:

$$\left(1 + \frac{1}{K}\right) \left[\left(\frac{\partial m^M(\Theta)}{\partial \Theta} \right)' W^* \left(\frac{\partial m^M(\Theta)}{\partial \Theta} \right) \right]^{-1}, \tag{14}$$

where the term $\left(1 + \frac{1}{K}\right)$ is the adjustment for simulation error. The success of SMM relies on effective model identification, which requires selecting moments that are sensitive to variations in the structural parameters. Next, I describe and rationalize the 6 moments that I match in the estimation. Since every moment that results from the model is a function of all parameters, there is no one-to-one link between parameters and moments. However, we can point to moments that are more informative to pin down a given parameter or set of parameters than others. The fixed cost of production, c_f is informative for pinning down the default rate in the economy. As the cost of production increases, firms have lower pre-tax profits and the profitability of the underlying is lower, increasing the likelihood that the firm will choose to default. I estimate the fixed cost of production to be 0.967. This implies a free-cash flow to sales ratio of roughly 3%. Note that the fixed cost is capturing both fixed and variable costs of production (such as labor inputs) typically found in the data. The convex equity issuance cost. α is estimated to be 0.01 and is identified off of the average debt to income level. In this class of models, firms hold debt to trade off the benefits of holding debt versus the costs. The benefits of debt include the tax benefit of debt and the (relative) cost of not having to inject equity. Since I fix the tax rate, the key trade-off governing how beneficial debt is to the firm is the relative cost of equity injections. As α increases, the marginal cost of injecting equity rises, increasing the benefits of debt. The lender recovery rate χ is estimated to be 9.3% and is identified by the average credit spread observed. Recall that χ shows up directly in the structural equation for the bond price firms borrow at, which maps directly to credit spreads. As lenders are able to recover a higher fraction of the firm's unlevered value in default, credit spreads will be lower. Finally, I estimate the fixed debt issuance cost off of two moments. First, I target the average dispersion of maturity dates (σ_{Mat}) observed in the data. I exploit the fact that there exists a one-to-one mapping between the share of dispersed debt firms hold in the model and σ_{Mat}. The fixed debt issuance cost is informative for pinning down the average dispersion of maturity dates since it is one of the fundamental trade-offs firms present that encourages firms to chose between dispersed and concentrated debt payments. Additionally, pin down the fixed debt issuance cost by targeting the average underwriter fee observed in my data. This is to ensure that fixed costs in the model are empirically reasonable. If, for example, my model implied underwriter fee was greatly at odds with what is observed in the data, this would imply that the presence of fixed debt issuance costs may not be the correct trade-off firm's face when choosing to hold maturity walls or not. I estimate the fixed debt issuance cost to be 0.003, which is about 10% of the free-cash-flow to the firm. This is an economically large value and consistent with the empirical observation that firms face large fixed costs when choosing to issue corproate bonds through underwriters.

To estimate the variance of the manager preference shocks, I target the variance of the debt to income ratio. Since the manager preference shocks are simply injecting some noise into the debt choices of the firm, they should not impact the average choice of the firm, just the spread in choices firm's make. The value of σ_ε must be positive for the computational benefits of the extreme value shocks to apply. The benefit of these shocks comes because they assign similar probabilities of selecting choices that yield similar levels of utility to the firm. In models of long-term debt, it is well known that there can often exist choices of debt far apart from each other in the state space, but that still delver similar levels of utility for the firm, increasing computational challenges. Economically, these preference shocks are capturing unobserved costs and benefits to managers of selecting a given level of debt and composition of debt maturity dates.

One measure of the size of the extreme value shocks is how noisy the debt decisions are; at an individual level, the variance of debt decisions, conditional on the firm's current states, is zero without the extreme value shocks. In my model, the average coefficient of variation of debt to income across all firms is only moderately high at 11.67%[12]. While somewhat large,

[12]At each point in the state space, I compute the standard deviation and mean of debt-to-income implied

this should not be too surprising and can be explained by the fact that the preference shock is capturing other unobservable factors behind the debt choice decision not included in the model model, such as investment decisions taken by firms.

5.2 Model fit: Unconditional distributions

I next assess how the model performs relative to certain non-targeted properties in the data. In particular, I ask how the model matches the general distribution of the market leverage rates and the dispersion of debt maturity dates (σ_{Mat}), presented in Figures 8 – 9.

First, consider the distribution of market leverage rates in the model (in red) and in the data (in blue), which is completely untargeted. As in the data, the model correctly generates a long-left tail for market leverage. While the model does a good job matching the qualitative properties of the market leverage distribution – particularly the long right tail – it slightly overstates the fraction of firms with a market leverage ratio below 0.2.

Second, I consider the fit on the standard deviation of maturity dates. The model does a good job of matching the distribution of debt payment dispersion: in particular, it implies a large fraction of firms with relatively concentrated debt payments: In the model and data, around 50% percent of firms have a standard-deviation of maturity dates less than 2 years. In addition, the model matches the fraction of firms with very dispersed debt payments. Since the maturity of the long-term bonds in the model is fixed at $1/\lambda$, the maximum dispersion the model can generate is truncated at just below 8 years. As a result, to consider the relative fit of the model generated distribution of σ_{Mat} to the data, I also truncate the data at 8 years[13].

6 Model Properties

I begin by describing decision rules concerning capital structure choices. I then move on to explore how differences in firms' composition of debt affects their probability of default and credit spreads.

by the decision rules. I then take the ratio of these numbers at each point and average over the stationary distribution.

[13]It is likely that a more flexible model with a choice on the average maturity parameter $1/\lambda$, similar to Bocola and Dovis (2019); Dvorkin, Sánchez, Sapriza, and Yurdagul (2021); Poeschl (2023) would allow for a better fit of firms with very dispersed debt payment dates.

6.1 Maturity walls and capital structure choices

Figure 10 plots the firm's choice of the share of dispersed debt – $b'_D/(b'_D + b'_C)$ for firms entering the period with various debt levels and different debt structures. The red line considers firms who enter the period holding all dispersed debt ($b = b_D$) and the black line considers firms who enter the period holding all concentrated debt ($b = b_C$). The left panel presents decision rules for firms with low income (y_L) and the right panel presents decision rules for firms with high income ($y = y_H$).

As is evident from the figure, the choice of how much b'_D the chooses depends on a number of factors. First, it depends on the type of debt the firm enters the period with. There is substantial persistence in the composition of firm's debt choice: firms that enter the period with all dispersed debt exit the period with higher shares of dispersed debt than firms who entered the period with concentrated debt. This holds across income levels. Second, as enter the period with higher *total* levels of debt, firms prefer to issue dispersed debt.

What explains this issuance pattern? Recall that issuing b'_D minimizes rollover risk for the firm but comes at the cost of repeatedly paying the issuance cost to maintain their target leverage ratio. Firms with low levels of leverage have low rollover risk. Opting for debt with a concentrated payment, firms are likely to be able to rollover the principal upon a realization of $\eta = 1$. Even if they cannot fully rollover their debt, the amount of equity they would need to inject from equity holders to make up the difference would be small, too. These firms do not find it beneficial to repeatedly pay the fixed debt issuance cost, since they do not capture any of the benefits from debt with dispersed payments. Thus, they opt to issue higher shares of b'_C. However, as firms lever up, this changes. When firms have higher levels of leverage, they face higher rollover risk when their debt composition is tilted more toward concentrated debt. Failing to rollover large amounts of debt translate to large equity injection for firms which is exceedingly costly. As a result, firms now find it optimal to repeatedly pay the debt issuance cost, which allows them to tilt their debt composition toward debt with dispersed payments, since debt with dispersed payments aims to minimize rollover risk by smoothing equity injections.

Firms' choice of debt structure also varies with their income level in perhaps counter intuitive ways. The model predicts that firms with *low* income opt for debt with dispersed payments while firms with high income opt for debt with concentrated debt. What may seem particularly counter intuitive about this result is that firms with low income are opting to repeatedly pay the fixed debt issuance cost, while many models, such as Melitz (2003) suggest that the presence of fixed costs are more costly (in a per-unit sense) for small firms. However there is a competing channel which is at play in my model, which is the presence of rollover risk. Holding large shares of b_C for the firm has downside risk, by way of having to inject a large amount of equity upon having to repay the principal. This downside risk is particularly strong for firms with low realizations of y. Thus, the model suggests that the down side risks associated with holding concentrated debt, particularly in low income states dominates the need to repeatedly pay the issuance costs for these firms.

The qualitative predictions of the model are consistent with the data. Table 9 runs the same regression in my model as in the data. In it, I regress a firm's choice of a maturity wall on a lagged indicator if the firm had a maturity wall last year, their book leverage choice, and their sales revenue[14]. As is evident from the table, firms' choice of having a maturity wall is persistent over time. Additionally, a one standard deviation in firms' book leverage decreases the probability of having a maturity wall by about 10%. Finally, the data lends support to the prediction about the relationship between revenue and a firm's choice to have a maturity wall: In the model and data, a one standard deviation increase in sales revenue increases the probability of having a maturity wall by roughly 4%.

6.2 Maturity walls and firm default risk

Figure 11 plots the credit spread firms face given their choice of the share of dispersed debt – $b'_D/(b'_D + b'_C)$, conditional on two levels of debt: high and low. The red line considers firms who choose a high total level of debt ($b' = b'_H$) and the black line considers firms who choose a low level of debt ($b' = b'_L$). Additionally, the left panel presents spreads faced by firms for firms with low income (y_L) and the right panel presents decision rules for firms with high income ($y = y_H$).

Recall that the credit spread, defined as the interest rate firms face on new bonds issued over the risk free rate, captures the likelihood of default by the firm over the duration the debt is outstanding. Since firms are in a stationary equilibrium with no aggregate shocks, the risk free rate is constant. Thus, the credit spread maps one-to-one to the interest rate firms face. A higher credit spread corresponds to a higher risk of default by the firm.

As is evident from the figure, the choice of how much total debt b' the firm chooses is reflected in the credit spread. Firms that choose higher levels of debt (b'_H vs b'_L) face higher credit spreads, since firms with higher levels of debt are more likely to default. Similarly, firms with low income face higher credit spreads. These are common features of models with firm borrowing. The figure also highlights a relationship between the share of dispersed debt

[14]In the data, I additionally control for other factors that are likely to impact a firm's choice to have a maturity wall that are absent from my model. The controls include, size, age, average maturity, cash holdings, the fraction of bond debt, and an dummy variable that takes 1 if a firm's credit rating is Investment Grade.

– conditional on a total level of borrowing b' – and the credit spread. I find that conditional on a total level of borrowing by the firm, a firm with a debt portfolio more tilted toward dispersed debt payments offers lower credit spreads for the firm. This follows from the fact that debt with dispersed payments helps the firm mitigate rollover risk and, by extension, default risk. Thus, lenders can expect to lower long-run default risk and a larger stream of debt payments from the firm when it borrows more debt with dispersed payments. In particular, the benefits of dispersed debt of lowering default risk are strongest when (i) firms borrow higher levels of debt (b'_H vs b'_L) and (ii) when firms have lower income (y_L vs y_H). This further helps rationalize the choices firms make explored in the section above.

Again, the qualitative predictions of the model are consistent with the data. Table 10 runs the same regression in my model as in the data. In it, I regress a firm's credit spread on a newly issued bond on the firm's choice of book leverage, an indicator if the firm chooses a maturity wall, and their sales revenue[15]. The following observations can be made from the table. First, firms with higher levels of leverage face higher credit spreads: a one standard deviation in firms' book leverage increases credit spreads by 29 bps in the data and 82 bps in the model. Second, firms with high revenue face lower credit spreads: a one standard deviation in revenue decreases spreads by between 33 bps and 63 bps. Finally, firms with maturity walls face higher credit spreads: firms with maturity walls in the data see higher credit spreads by 23 bps, while firms in the model see higher credit spreads by 35 bps.

7 Quantitative Results

The previous section showed that the model successfully replicates key cross-sectional facts about the financing choices of U.S. public firms. The model thus provides an appropriate quantitative framework for quantifying the role of maturity walls in the presence of idiosyncratic and aggregate shocks.

7.1 How much do maturity walls contribute to firm default & credit spreads?

In equilibrium, firms may default for a variety of reasons, one of them being the inability to roll over a maturity wall. How much of the equilibrium default rate can be attributed to maturity walls? To address this question, I can decompose total defaults observed in equilibrium into those that coincide with firms needing to roll over a maturity wall ($\eta = 1$) and those that are unrelated to firms needing to roll over a maturity wall ($\eta = 0$). It is now

[15] I additionally control for the same variables as in Footnote 14.

straight forward to quantify the fraction of defaults coming from firms failing to roll over maturity walls. I find that maturity walls account for 14% (0.17 pp) of all defaults observed in equilibrium.

In the next exercise I ask how much higher firm default rates and credit spreads would be if all firms had maturity walls? The above decomposition uses steady state values that arise in equilibrium. It is not sufficient to simply compare how credit spreads or defaults differ for firms with maturity walls and those without since it is not an apples-to-apples comparison. Firms with maturity walls are qualitatively different, in terms of their states and choices, from firms without maturity walls. Thus, an exercise of simply looking at how credit spreads or defaults differ for firms with and without maturity walls would not be isolating the *impact* of maturity walls on these outcomes as it would be confounded with firms' states and choices in the model

To isolate the effect that maturity walls have on firms default rates and credit spreads, I use the structural model to generate exogenous variation in firms' debt structure, while holding all other choices and states fixed. In particular I solve for a counterfactual economy where firms make the same total leverage choice as they do in equilibrium, but firms are restricted to borrow in b_C, the debt with a concentrated payment. In addition, firms optimally choose if to default or not and lenders price all new loans consistent with them making zero profits in expectation. Finally, new moments are calculated under the baseline stationary distribution.

As a result, the following exercises successfully alleviates the concerns presented above by only relying on steady state values. I hold fixed firms total debt choices, which are jointly chosen when firms pick the concentration of their debt payments. In addition, by using the baseline stationary distribution, I ensure that firms are in the same states. As I exogenously vary firms' debt structure choice by restricting them to borrow in b_C I can be confident that I am isolating the causal direct effect of having maturity walls on firm's default choice and their credit spreads.

What is the causal effect of having a maturity wall on firms' default risk and credit spreads? I find that maturity walls increases firm default risk by 25% (30 bps). In addition, I find that firms see an increase in their credit spread by 21% (36 bps).

Why does this happen? As is detailed in Figure 12, firms see an increase in their default risk and their credit spreads because they are losing out on the equity smoothing benefits of b_D. The top two panels explores how firms with all dispersed debt and all concentrated debt change their default behavior in the baseline model (solid black line) and the counterfactual economy (dashed red line). It is evident from the figure that firms who held dispersed debt in the baseline economy cannot sustain as high of a level of debt in the counterfactual economy, due to the fact that they have random large principal payments they need to make. As a result, these firms now find it optimal to default, rather than inject costly equity to cover their rollover losses. Perhaps not surprisingly, the default behavior of firms with concentrated debt does not change. In the bottom two panels looks at how lenders react by changing their credit spread. Lenders, recognizing this shift in firm's behavior, demand higher interest rates on new loans to compensate for the risk. The loan changes are largest for firms who held dispersed debt in the baseline economy as these are the firms that see the highest default risk. However, spreads for firms with concentrated debt also slightly rise, as these firms also have elevated long-run default risk.

7.2 Are firms less risky without maturity walls?

By choosing to have maturity walls, firms are taking on some rollover and default risk. The above exercise highlighted that maturity walls can be risky for firms and quantifies that the presence of maturity walls increases default risk by 25% and credit spreads by 21%. A natural question arises: would firms be less risky without maturity walls? Suppose market participants or an over zealous regulator observes that maturity walls are risky, and naively believe that to minimize firm risk, firms borrowing with dispersed payments will be less risky. Thus, they have strong preferences, or, even regulate, that firms borrow in debt with dispersed payments.

However, to answer this question, an equilibrium analysis must be undertaken. Why? Holding current firm choices fixed, eliminating maturity walls would make firms safer. However, recall that firm's choice to have a maturity wall or not is jointly chosen with their total level of debt. Thus, by eliminating maturity walls, firms will adjust and make new debt level choices. Indeed, since in the baseline framework firms that do not have maturity walls have higher total levels of debt, it is likely that firms will opt to borrow even *more* debt, potentially undoing the risk minimization benefits of dispersed debt. As a result, it is quantitatively ambiguous how eliminating maturity walls would impact firm creditworthiness.

To quantify how eliminating maturity walls would impact firm creditworthiness, I solve for a counterfactual economy where firms can only borrow in debt with dispersed payments. Different to the exercise above – and key to this exercise – is that firms are free to pick whatever level of debt is optimal for them.

Table 11 reports the moments from the baseline economy compared to the counterfactual economy. The first thing I find is that firms are more levered. I find that firms increase their book leverage, or total amount of borrowing, from 0.21 to 0.37 and increase their market leverage, which captures their total level of borrowing relative to shareholder value, from 0.16

to 0.25. This increase in borrowing is arises from the fact that as firms hold all dispersed debt, they opt to hold higher levels of debt because they reassess the benefits of holding debt with the costs of holding debt. Relative to their original debt choices, firms are safer and thus they opt to take on more default risk through higher borrowing because of the higher tax benefits of debt they can claim. However, strikingly, firms increase their borrowing so much that they see a 66% increase in their default rates and a 41% increase in the cost of borrowing. Increases in defaults and spreads are driven in part by the fact that firms are choosing higher levels of debt, but it is also driven by the fact that all firms now are paying the fixed debt issuance cost more frequently: The PDV of all future debt issuance costs made by firms increases by 56%. This is bad for total firm value: I find that firm value decreases by nearly 7%. However, this should not come as a surprise; maturity walls are clearly valuable to firms in equilibrium otherwise they would not be choosing them.

7.3 Efficiency costs of underwriter fees

A key trade-off in the model that governs the firm's choice of a maturity wall is the debt issuance cost, or the empirical equivalent underwriter fee. As discussed above, the underwriter fee is in part serving as a transaction cost, where the underwriter conducts due diligence on the firm and brings the bond to market. However, a non-trivial component of the underwriter fee has also been attributed to rents underwriters extract due to their market power. Manconi, Neretina, and Renneboog (2018) document that the underwriter market has different levels of competition, with underwriters often exploiting their market power when bringing corporate bonds to market. They find that the most powerful underwriters use their market power to extract rents at the expense of issuing firms, typically by demanding higher fees. These higher underwriter fees, driven by market power, have often drive firms to alter their issuance strategies, as they try to avoid paying these rents.

My model provides an interesting framework to assess the effects of underwriter market power on firms choice of maturity walls, their total borrowing choice, and their default risk and credit spreads. In addition, I can also quantify the economic inefficiency to firms that arises due to the presence of underwriter market power. Manconi, Neretina, and Renneboog (2018) estimate the fraction of underwriter fees that is directly attributed to underwriter market power, finding that the on average, market power accounts for 16% (12.2 bps) of underwriter fees; the maximum rents account for 25% (19.4 bps) of the underwriter fee[16]. To answer these questions, I solve for a counterfactual equilibrium where my debt issuance

[16]To arrive at this number, I use their estimate on the relationship between *Power* and the underwrite fee issuers face in Table 2.A.1, combined with the fact that the mean (max, in absolute value terms) power is -2.23 (-3.53).

cost is reduced by the mean and maximum estimated rents to approximate the underwriter fees that would arrive in a competitive equilibrium.

Decreasing the underwriter fee has predictable implications for firms choice of maturity walls and their total level of debt. Clearly, reducing the underwriter fee will allow more firms to disperse their debt payments, as it is cheaper to hold dispersed debt. Additionally, firms will also increase their total of level of borrowing for similar reasons discussed in the previous sections. For a given level of debt, firms are less risky because they hold dispersed debt. As a result, they reassess the relative benefits and costs of holding higher levels of debt and find it optimal to lever up. However, ex ante, it is unclear how eliminating market power in the economy will impact firm's default rate and their credit spreads. Clearly, a shift to more dispersed debt will attenuate default risk, holding the level of borrowing fixed. However, since firms are likely to increase their level of borrowing, this increases their default risk, holding all else fixed. The effect of eliminating underwriter power on default risk and credit spreads again will determine on the relative size of each channel.

I find that firms substitute toward a higher share of dispersed debt, increasing σ_{Mat} by 0.5 to 1.1 years. This comes from the reduction in the debt issuance cost by 16%-25%. Additionally, I find that firms increase their level of borrowing by 2%-4.4%. With regard to firm's default risk, I find that the substitution to dispersed debt essentially cancels out with the increased borrowing the firm does. As a result, firms see a *very* slight decrease in their default risk of 0.06 bps (0.05%) - 0.08 bps (0.07%). I also see a small increase in firms cost of borrowing, raising by 3 bps (1%) - 7 bps (4%). This is likely attributed to the ability for firms to dilute creditors easier[17]. When there are low issuance costs, firms are able to issue debt more freely. Given the nature of long-term debt, firms are unable to commit to future borrowing decisions, and as a result, they are likely to dilute creditors by increasing their borrowing in the future.

How does the reduction in underwriter market power impact total firm value? I find that the reduction in market power leads to substantial growth in the market value of firms, defined as $V(\mathcal{S}) + q_D(b'_D, b'_C, y)b'_D + q_C(b'_D, b'_C, y)b'_C$. Figure 13 plots the change in market value for the distribution of firms. The x-axis considers the market value of the firm in the baseline economy and the y-axis displays the percent growth in that firm's market value. The black line considers the case when the mean underwriter rents are removed and the red line considers the case when the maximum underwriter rents are removed. In both cases, all firms are weakly seeing growth in their market value, while firms with the lowest market

[17]This is a common feature of models with long-term debt where firms cannot commit to future debt choices. See Arellano and Ramanarayanan (2012); DeMarzo and He (2021); Aguiar, Amador, Hopenhayn, and Werning (2019); Aguiar and Amador (2020) for further discussions on this channel.

value in the baseline economy sees the largest growth. On average, I find that market value increases by 0.6% to 1.1%.

Decomposing Firm Value Growth

[To be completed]

7.4 Maturity walls and credit market freezes

The model assumes firm default failure is driven by idiosyncratic shocks to the asset value of individual firms. In reality, many firm failures occur due to aggregate shocks. Aggregate shocks may further interact with the presence of maturity walls in non-trivial ways. For example, numerous papers (Almeida, Campello, Laranjeira, and Weisbenner, 2009; DeFusco, Nathanson, and Reher, 2023; Meeuwis, Papanikolaou, Rothbaum, and Schmidt, 2023), note that firms that need to roll over their debt during a credit market freeze often struggle to do so, and as a result they see real cuts to their investment rate and labor hires. Credit market freezes, such as the 2008 GFC, can be particularly high periods of rollover crises because credit market freezes are typically characterized by a large reduction in the volume of transactions in the bond market and other forms of external financing becomes more costly. Thus, firms that get unlucky and need to roll over a maturity wall during a credit market freeze may not be able to cover the principal payment out of their cash flows, and injecting equity may be too expensive. As a result, they may opt to default. However firms that only need to roll over a small portion of their debt may be more likely to cover it out of their cash-flows.

In this section I explore if the presence of maturity walls can amplify the transmission of an aggregate credit shock to the aggregate default rate. As a simple framework to study the transmission of a credit shock and its interaction with maturity walls, I introduce a one-period, unanticipated shock to the credit market in the benchmark economy. A credit market freeze will be characterized by two things. First debt markets completely shut down and firms cannot issue new debt or buy back debt early. This is equivalent to an infinite interest rate on new debt issuances or prices $q_D = q_C = 0$. Second, equity injections become more expensive. I calibrate the increase in the equity injection cost (α) to target the increase in firm defaults observed in the 2008 GFC.

Effects of a credit market freeze

Figure 14 plots the deviation of aggregate default rates and aggregate book leverage from steady state in response to the unanticipated market freeze. I find that the aggregate default rate increases and by 168 bps (140%) at the impact of the credit market freeze and aggregate leverage declines by 2.5 pp. Defaults increase, because many firms cannot roll over their debt, and thus they opt to default rather than inject costly equity. Additionally, leverage falls in the first period since non-defaulting firms can only repay principal, but not borrow new debt. The impact of the shock is short lived, given that it is only a one-period shock. After the shock dissipates, the default rate falls below its steady state level – because firms are under-levered – and slowly returns back to steady state. Further, firms slowly build back up their leverage after the shock dissipates.

How do firms that need to rollover their maturity walls fair compared to those that don't? I explore the heterogeneous responses to a credit market freeze in Figure 15. The black line plots the baseline average response of firms for reference, while the red line plots the response of firms that must repay maturity walls at the time of the market freeze and the blue line plots the response to firms that do not need to repay a maturity wall. I find that firms that need to rollover their maturity walls at the onset of the credit market freeze are most likely to default, defaulting at a rate of nearly 4pp more than they do in steady state. This has the effect of pulling up the aggregate default rate in the economy in response to a credit market freeze. However, the effect is small since roughly λ percent of firms need to roll over a maturity wall in any given period. Firms that successfully repay their maturity walls at the onset of a credit market freeze exit the period with zero debt, which explains the large drop in their leverage choice.

Credit market freezes during aggregate maturity wall

[To be completed]

Credit market freezes under model misspecification

To highlight the role of maturity walls for the aggregate transmission of a credit market freeze, I compare my benchmark model to two alternative economies: (i) one in which firms in which firms can only issue long-term debt modeled as debt with disperse payments (b_D) a la Chatterjee and Eyigungor (2012) and (ii) one in which firms make a maturity choice over their debt debt holdings a la Arellano and Ramanarayanan (2012). Each model is then re-estimate to match the same data moments as our benchmark model. Then, using the newly estimated parameters, I shock the economy with the same credit market freeze and study how aggregate default rates differ. The model environment and parameter estimates are described in the appendix. Figure 16 plots the default rate response in the baseline model (black line), model with a maturity choice (blue line), and model with long-term debt choice (red line). I find that in a model with only long-term debt modeled as a dispersed bond, the default rate response to the credit shock is sufficiently muted: defaults are 60% (100 bps) lower compared to the baseline model. Similarly, a model with a maturity choice underestimates the default rate response but by a smaller margin; default rates are 14% (25 bps) lower compared to the baseline model. What is the reason for why each model is underestimating the transmission of a credit shock to firm default rates?

First, consider a model with just a long-term debt choice. As discussed throughout the paper, the classical way to model a long-term bond is debt with dispersed payments. The the framework essentially makes firms as insulated from rollover risk as they can possibly be *by assumption*. Thus, it is not surprising that a credit market freeze has an attenuated effect on firm default risk since firms do not need to roll over a large amount of principal at the time of the credit market freeze. Thus,

Second, consider a model with a maturity choice, where the long-term debt asset is modeled as debt with dispersed payments. This environment produces significantly higher default rates compared to the model with only the long-term bond because firms with sufficiently short average maturity have to roll over a large portion of their debt stock at the time of the market freeze. However, this framework still underestimates the transmission of the credit shock to defaults because firms that are borrowing heavily in short term debt are endogenously borrowing a smaller amount of it compared to firms with maturity walls, since maturity walls are concentrated, yet distant, payment events. Thus, even though these firms need to roll over a sizeable portion of their debt during a market freeze, because it is small, they are more likely to be able to do so.

8 Conclusion

Maturity walls are events where a majority of debt comes due within a short period of time. This paper investigates the role of maturity walls in shaping firms capital structure choices, cost of borrowing, and default risk. I document empirically that maturity walls are a common feature of non-financial firms capital structure and I build a quantitative model explicitly modeling the choice to have a maturity wall. I find that maturity walls increase credit spreads by 21% (36 bps) and default rates by 30% (25 bps). Additionally, maturity walls amplify the transmission of an aggregate credit market freeze to aggregate defaults. The model also underscores the importance of accounting for maturity walls when assessing the transmission of aggregate shocks: omitting maturity walls would underestimate the transmission of a credit market freeze by 14%-60%.

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Figures and Tables

Figures

Figure 1: Number of Bonds outstanding

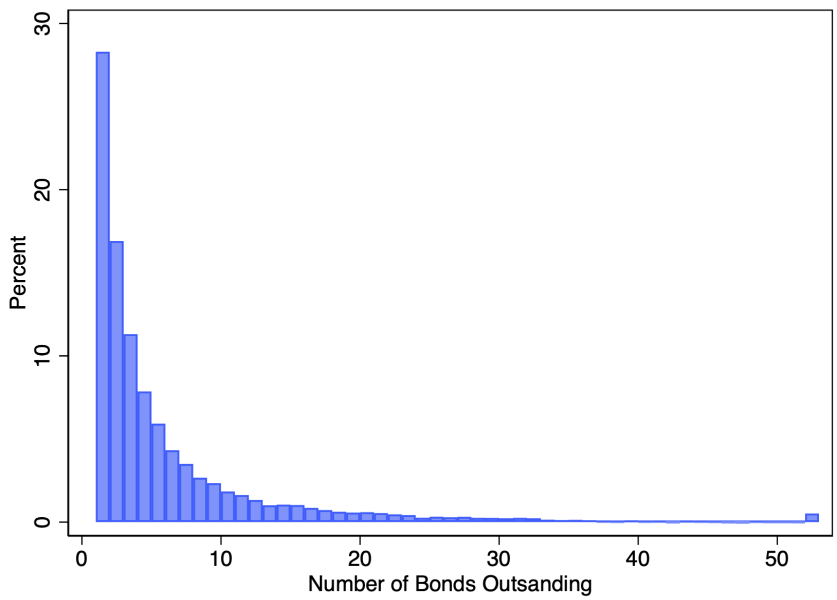


Figure 2: St. Dev of Bond debt payments
— Debt Repayment Schedule —

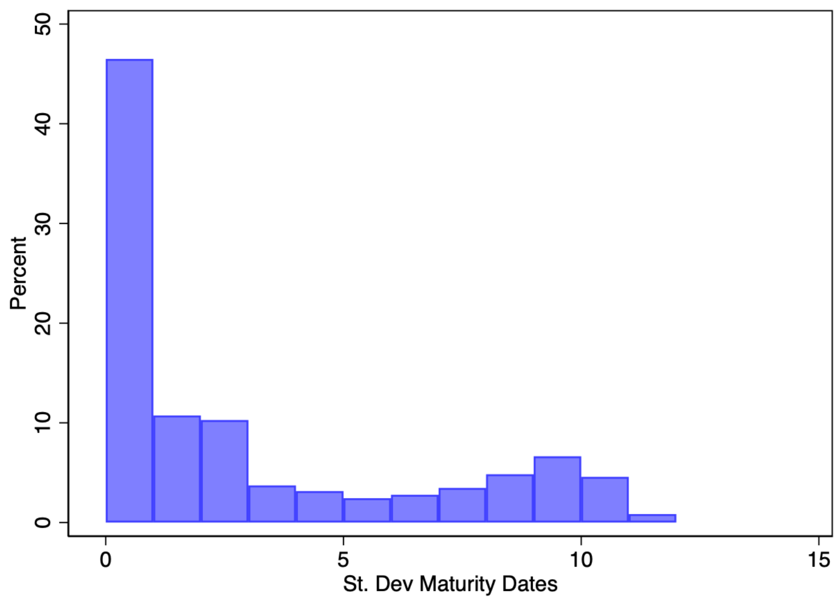


Figure 3: Distribution of Fixed Debt Issuance Cost

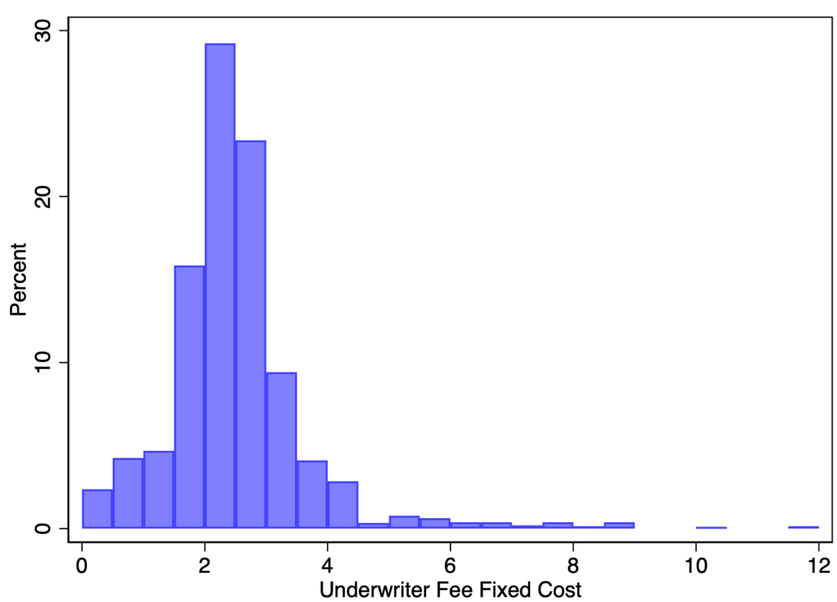


Figure 4: Model Implied Debt Repayment Schedules

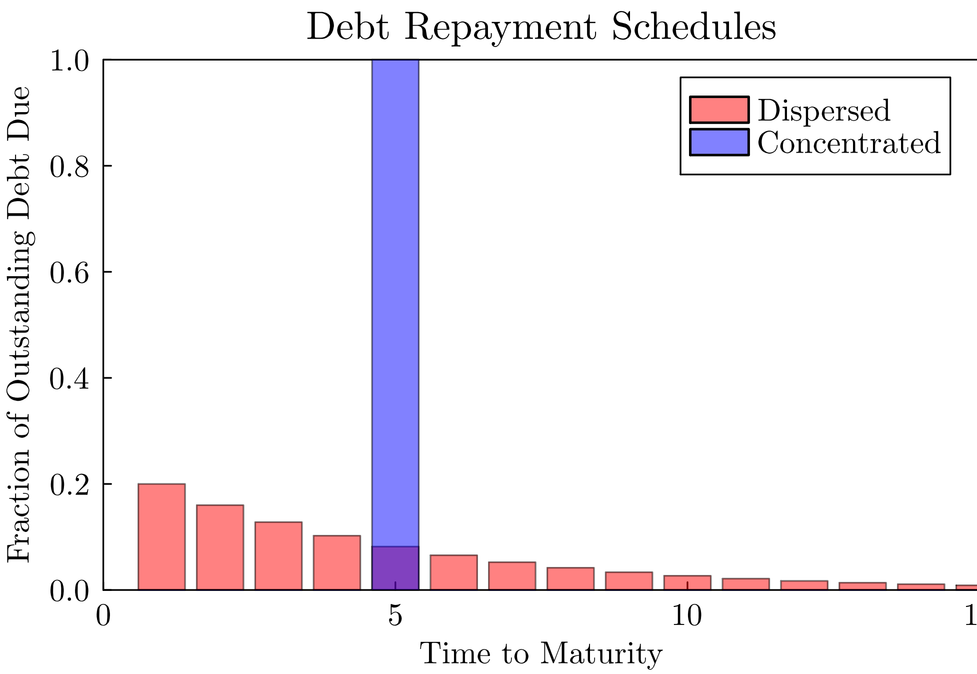


Figure 5: Equity Smoothing Benefits of Dispersed Debt

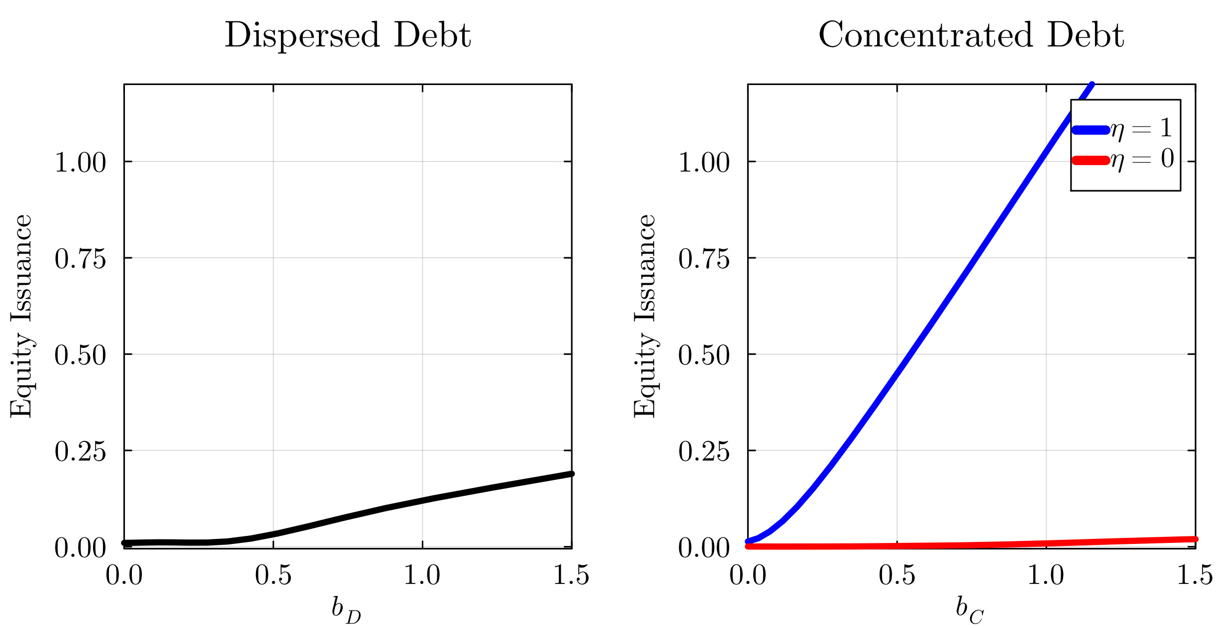


Figure 6: Issuance Cost Savings of Concentrated Debt

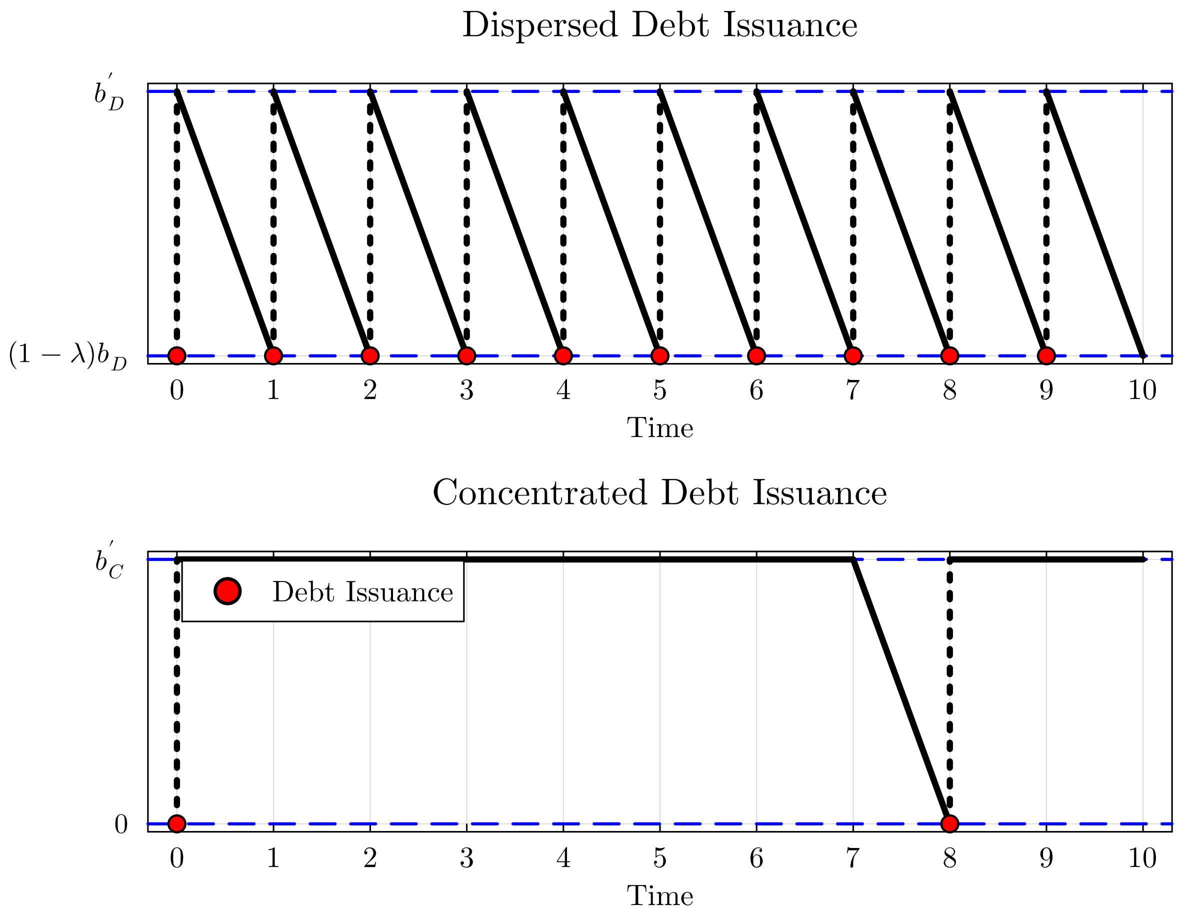


Figure 7: Default Choice: Dispersed vs Concentrated Debt

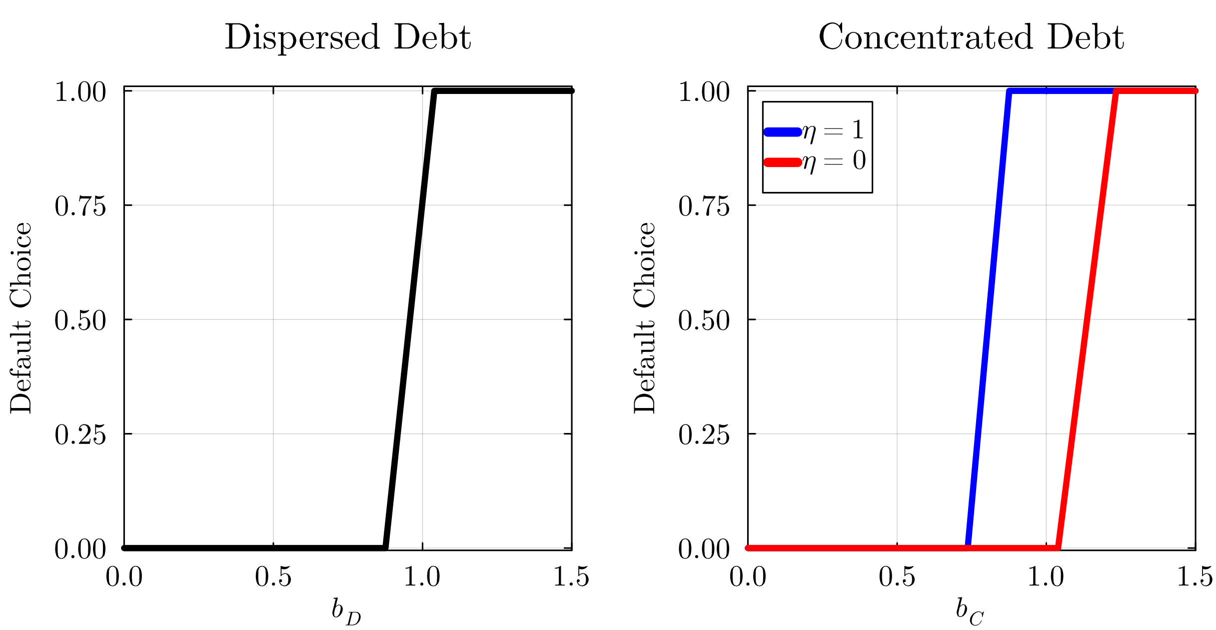


Figure 8: Distribution of Market Leverage
— Model and Data —

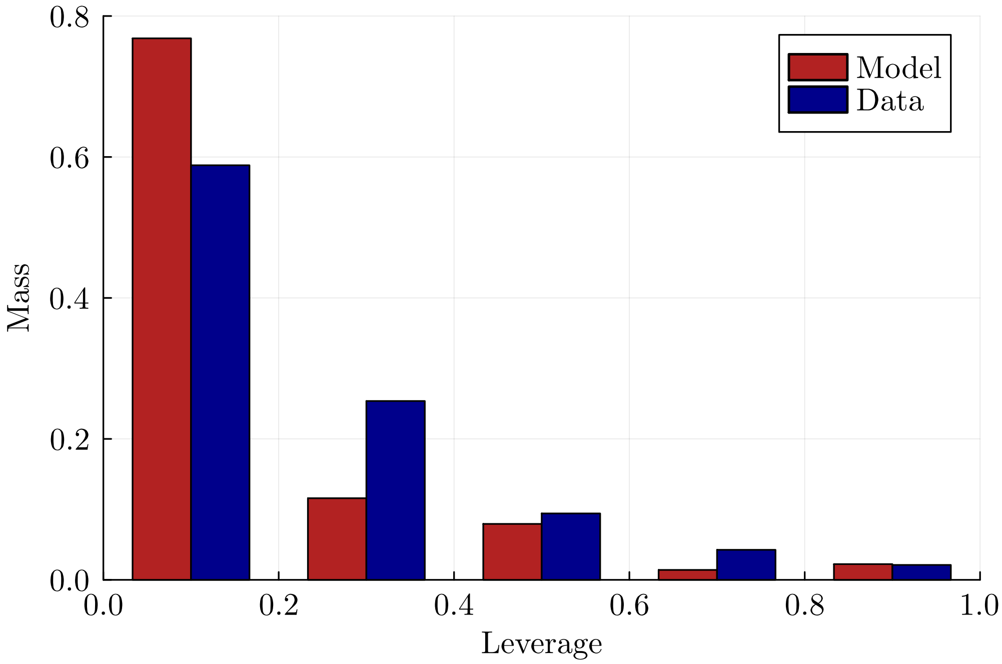


Figure 9: Distribution of St. Dev Maturity Dates
— Model and Data —

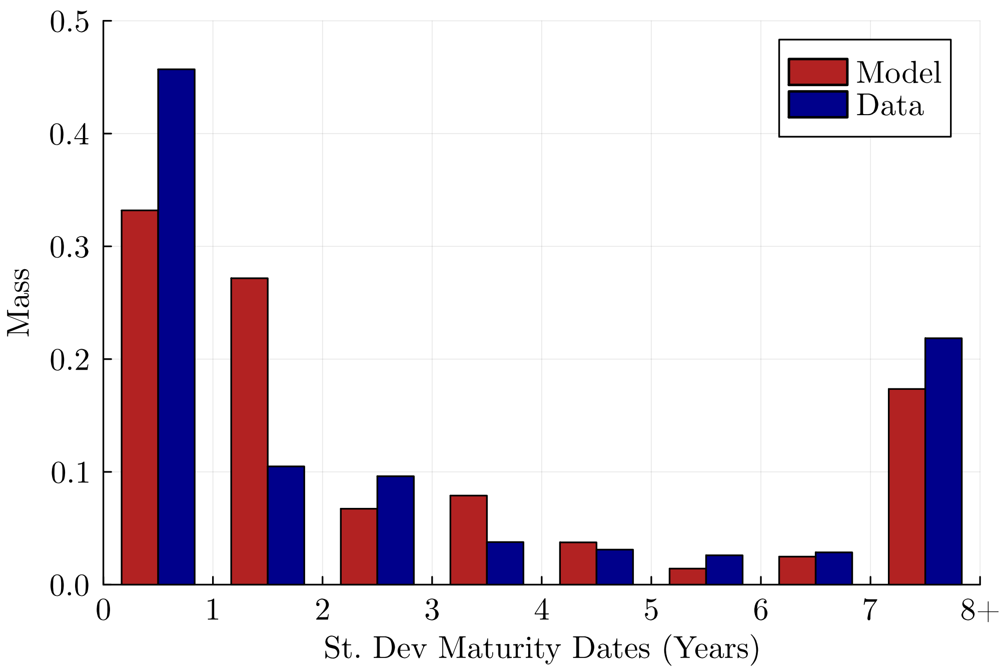


Figure 10: Share of Dispersed Debt Policy Function

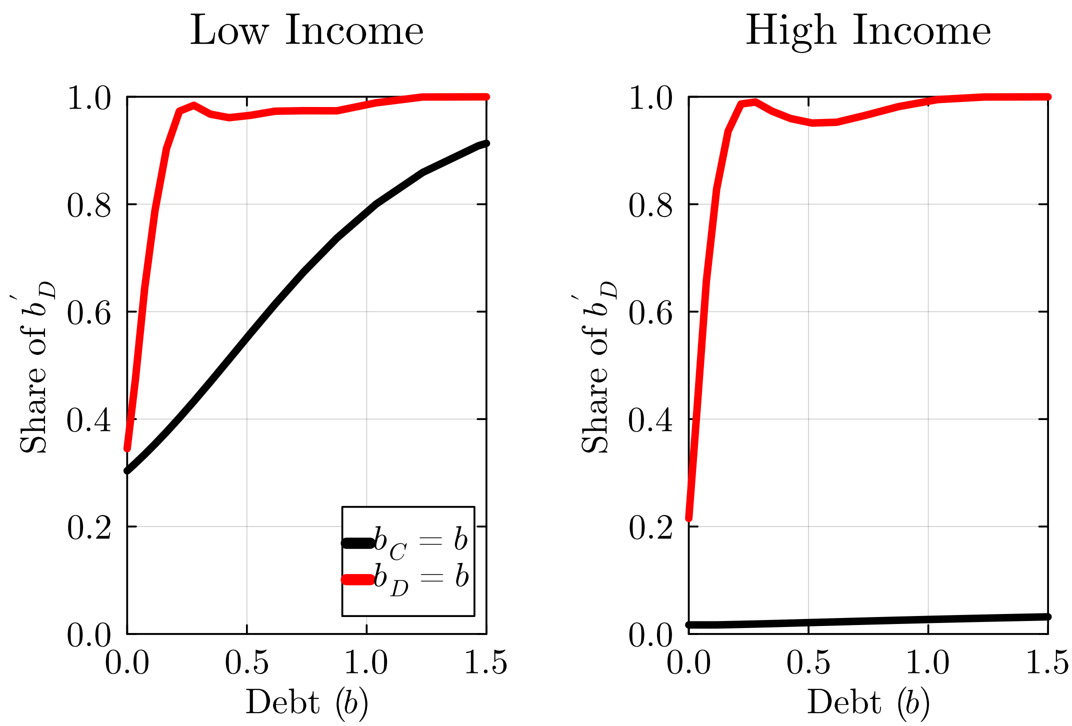


Figure 11: Credit Spreads by Share of Dispersed Debt

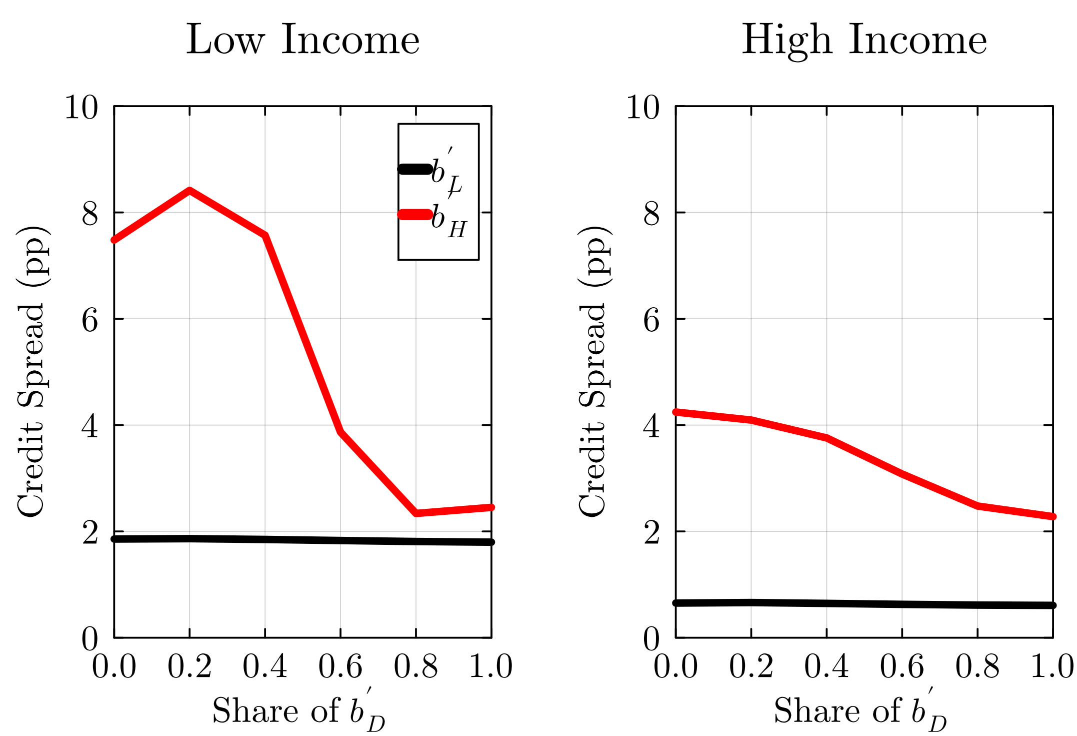


Figure 12: Direct Effect of Maturity Walls

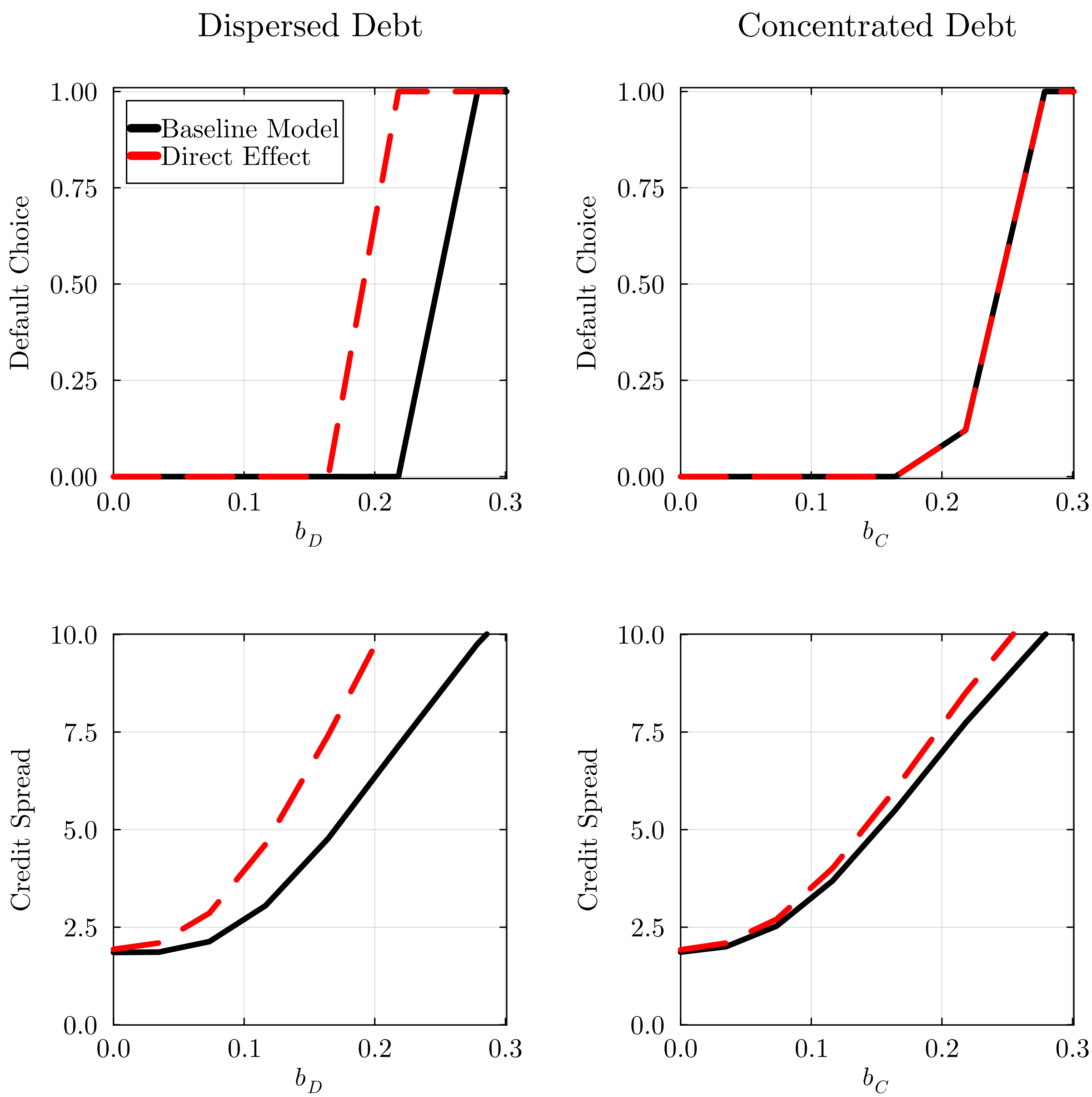


Figure 13: Firm Value Growth in Perfectly Competitive Underwriter Market

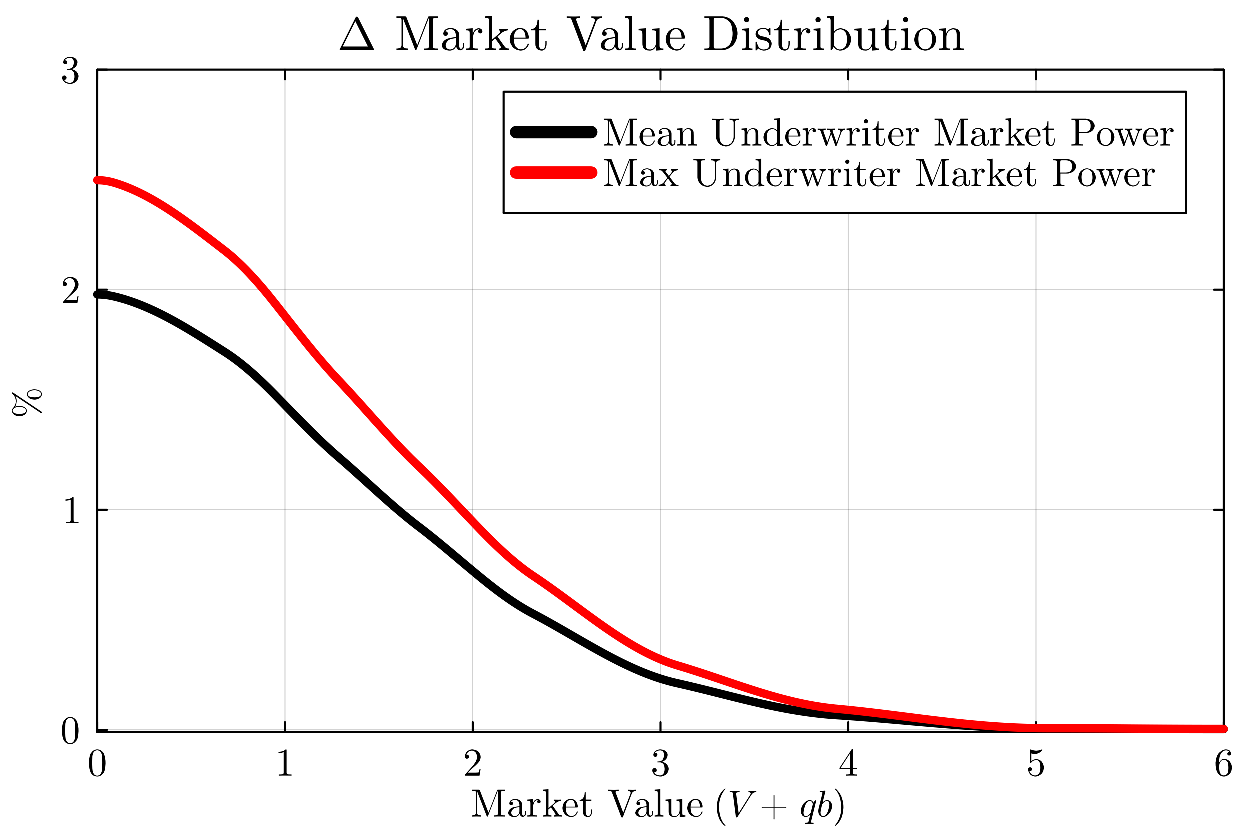


Figure 14: Aggregate Effects of Credit Market Freezes

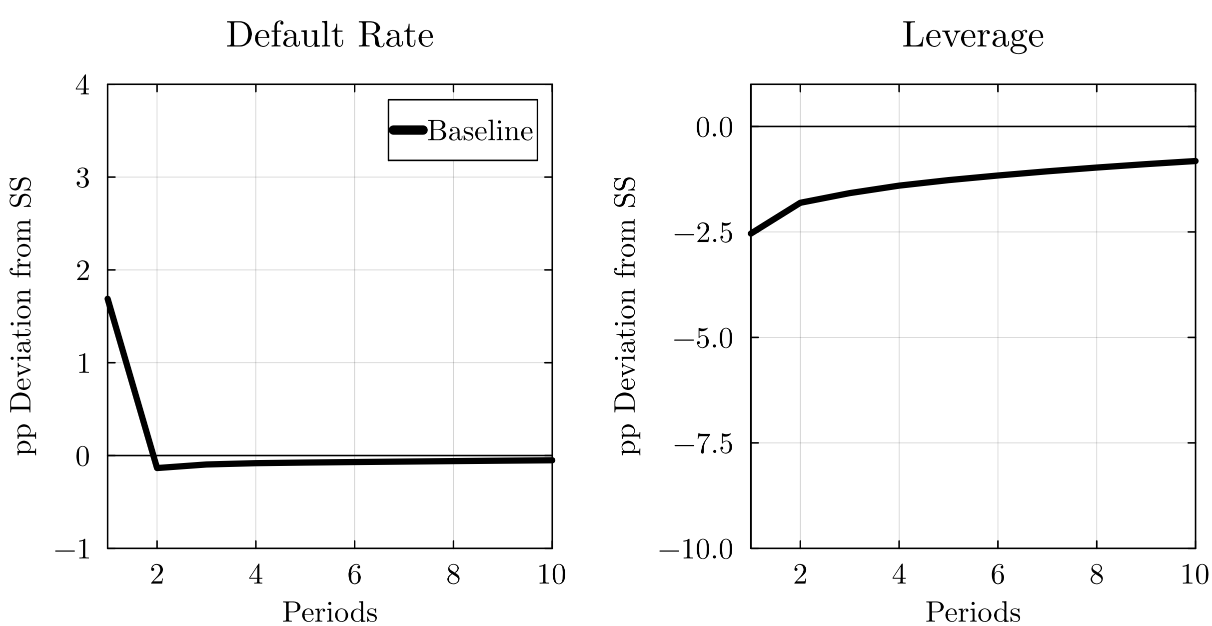


Figure 15: Heterogeneous Effects of Credit Market Freezes

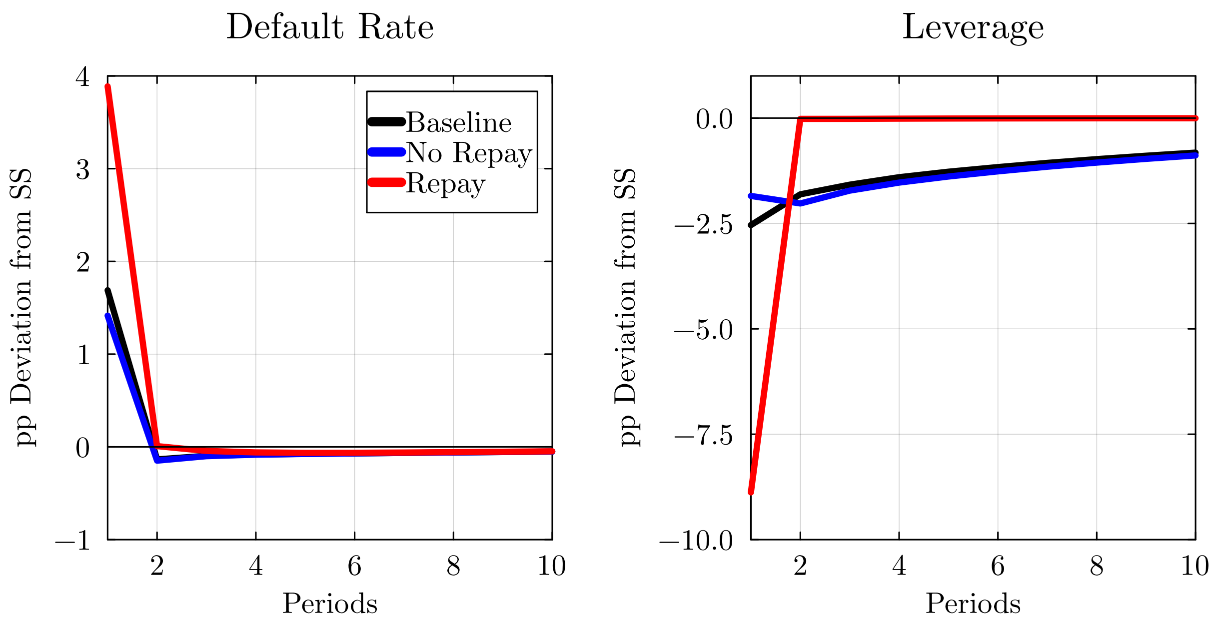
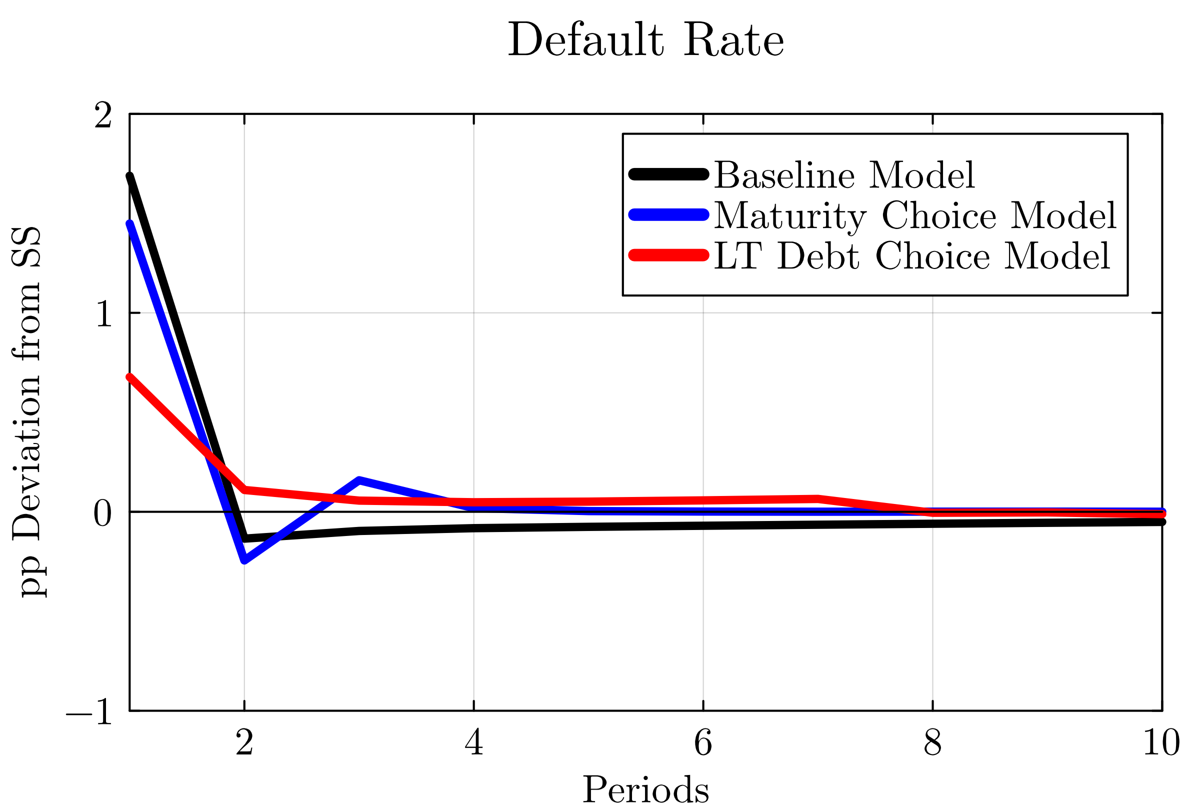


Figure 16: Credit Market Freeze under Model Misspecification



Tables

Table 1: Summary Statistics: Full Sample

	Mean	Std. Dev	P25	Median	P75
Mkt Value ($M)	15802.657	4,946.319	1,759.315	4,946.319	14523.744
Size ($M)	11984.706	4,486.572	1,816.425	4,486.572	11716.066
Age	28.657	23.000	9.000	23.000	42.000
Q	1.670	1.407	1.109	1.407	1.903
Market Leverage	0.338	0.288	0.164	0.288	0.477
Profit	0.135	0.131	0.094	0.131	0.175
Tangibility	0.348	0.287	0.141	0.287	0.525
Profit Volatility	0.036	0.024	0.014	0.024	0.041
Interest Coverage Ratio	7.391	4.105	1.785	4.105	8.492
Debt and Interest Coverage Ratio	4.888	2.435	1.089	2.435	5.195
Cash	0.068	0.044	0.016	0.044	0.094
Pays Dividend	0.709	1.000	0.000	1.000	1.000
Equity Issuance	0.015	0.003	0.000	0.003	0.009
Prob. Default	0.043	0.000	0.000	0.000	0.000
Number of Bonds Outstanding	5.409	3.000	1.000	3.000	6.000
Bond Debt to Bank + Bond Debt Fraction	0.876	1.000	0.857	1.000	1.000
Bond Debt to Total Debt Fraction	0.593	0.612	0.372	0.612	0.841
Bond Debt Issued ($M)	940.532	462.622	250.000	462.622	1,000.000
Bond Debt Outstanding ($M)	1,581.626	555.389	238.268	555.389	1,559.876
Bond Buyback	0.153	0.000	0.000	0.000	0.000
Avg. Bond Maturity	8.309	7.000	5.000	7.000	10.000
Coupon Rate	6.427	6.477	4.559	6.477	7.973
Credit Spread (bps)	188.017	145.000	95.000	145.000	237.500
Underwriter Fee	0.786	0.650	0.566	0.650	0.781
St. Dev Maturity Dates	2.940	1.414	0.000	1.414	5.200
Maturity Wall	0.470	0.000	0.000	0.000	1.000

Table 2: Summary Statistics: By Maturity Wall

	Maturity Wall		No Maturity Wall	
	Mean	Median	Mean	Median
Mkt Value ($M)	4,816.259	1,915.511	24118.004	10154.285
Size ($M)	3,785.147	1,864.891	18202.942	8,656.835
Age	18.530	13.000	36.312	32.000
Q	1.553	1.324	1.759	1.480
Market Leverage	0.392	0.357	0.299	0.247
Profit	0.126	0.122	0.141	0.137
Tangibility	0.359	0.296	0.339	0.281
Profit Volatility	0.042	0.028	0.031	0.022
Interest Coverage Ratio	5.954	2.728	8.467	5.345
Debt and Interest Coverage Ratio	4.317	1.926	5.313	2.814
Cash	0.068	0.043	0.067	0.045
Pays Dividend	0.596	1.000	0.809	1.000
Equity Issuance	0.021	0.002	0.011	0.003
Prob. Default	0.070	0.000	0.023	0.000
Number of Bonds Outstanding	1.828	1.000	8.618	6.000
Bond Debt to Bank + Bond Debt Fraction	0.811	1.000	0.927	1.000
Bond Debt to Total Debt Fraction	0.518	0.494	0.649	0.681
Bond Debt Issued ($M)	361.311	250.000	1,206.201	600.000
Bond Debt Outstanding ($M)	362.220	244.111	2,663.186	1,384.966
Bond Buyback	0.126	0.000	0.177	0.000
Avg. Bond Maturity	6.439	6.000	9.390	8.387
Coupon Rate	8.158	8.000	5.688	5.750
Credit Spread (bps)	273.126	245.000	175.137	138.760
Underwriter Fee	1.212	0.750	0.720	0.650
St. Dev Maturity Dates	0.127	0.000	5.436	4.805

Table 3: Maturity Walls and Firm Characteristics

	Maturity Wall (1)	(2)
Market Leverage (Bonds)	-0.142***	-0.117***
	(0.011)	(0.011)
Size	-0.236***	-0.171***
	(0.015)	(0.026)
Age	-0.043***	-0.152***
	(0.010)	(0.042)
Q	-0.036***	-0.041***
	(0.012)	(0.013)
Revenue	0.022*	0.042**
	(0.012)	(0.018)
Cash	-0.008	0.011
	(0.009)	(0.009)
Avg. Bond Maturity	-0.050***	-0.013
	(0.010)	(0.010)
Credit Rating	-0.041***	-0.018***
	(0.005)	(0.005)
Observations	8986	8930
R^2	0.413	0.701
Fixed Effects	Industry & Year	Firm & Year

Table 4: Maturity Walls and Firm Outcomes

	P(Default) (1)	Credit Spread (2)
Market Leverage (Bonds)	3.110***	21.909***
	(0.287)	(5.751)
Maturity Wall	0.969***	33.560***
	(0.335)	(7.466)
Avg. Bond Maturity	0.130	-1.430
	(0.126)	(2.396)
Observations	10184	1791
R^2	0.411	0.785
Fixed Effects	Credit Rating Industry × Year	Credit Rating Industry × Year

Table 5: Fixed Cost of Issuing Corporate Bonds

	Underwriter Fee		
	(1)	(2)	(3)
Fixed Cost	2.369**	2.367**	2.005*
	(1.193)	(1.202)	(1.201)
Issue	0.008***	0.010***	0.008***
	(0.001)	(0.001)	(0.001)
$Issue^2$	0.000**	0.000**	0.000**
	(0.000)	(0.000)	(0.000)
Size	-0.198	-0.245*	-0.139
	(0.144)	(0.148)	(0.146)
Age	-0.015***	-0.015***	-0.015***
	(0.005)	(0.005)	(0.005)
Leverage	0.398	0.280	0.561
	(0.787)	(0.754)	(0.774)
$Issue^3$		0.000*	
		(0.000)	
No. Issue			-0.105***
			(0.036)
Observations	2083	2083	2083
R^2	0.823	0.824	0.824
FEs	Yes	Yes	Yes

Table 6: Repayment Schedule Concentration and Cash Holdings

	Cash Holdings	Cash Holdings	Cash Holdings	Cash Holdings	Cash Holdings	Cash Holdings
% Debt Due in 1 Year	0.002**	0.000	0.001	-0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 2 Years	0.002*	-0.001	-0.000	-0.001	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 3 Years	0.001	-0.001	0.000	-0.000	0.001	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 4 Years	-0.000	-0.003***	-0.001	-0.002	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 5 Years	-0.001	-0.005***	-0.002	-0.002*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 6 Years	-0.001	-0.005***	-0.001	-0.002	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
% Debt Due in 7 Years	-0.002	-0.006***	-0.002	-0.003*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
% Debt Due in 8 Years	-0.001	-0.004***	-0.002	-0.002*	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 9 Years	-0.001	-0.005***	-0.002*	-0.003**	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 10 Years	0.000	-0.003**	-0.000	-0.002	0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Book Leverage (Bonds)	0.006***	0.000	0.005***	0.000	0.005***	-0.000
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)
Size		-0.016***		-0.047***		-0.053***
		(0.003)		(0.005)		(0.006)
Q		0.038***		0.010**		0.008*
		(0.004)		(0.004)		(0.004)
Profit		-0.016***		-0.012***		-0.004
		(0.004)		(0.004)		(0.003)
Observations	11926	10901	11932	10894	11763	10717
R^2	0.188	0.234	0.618	0.637	0.668	0.688
Fixed Effects	Ind & Year	Ind & Year	Firm & Year	Firm & Year	Firm & Ind $\times Year$	Firm & Ind $\times Year$

Table 7: Repayment Schedule Concentration and Investment

	Investment	Investment	Investment	Investment	Investment	Investment
% Debt Due in 1 Year	0.001	-0.000	-0.001**	-0.002***	-0.001	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 2 Years	0.001	-0.000	-0.001	-0.002**	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 3 Years	0.001	-0.001	-0.002**	-0.003***	-0.001	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 4 Years	0.002	0.000	-0.002*	-0.002**	-0.001	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 5 Years	0.002*	0.001	-0.002	-0.002**	-0.001	-0.002*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 6 Years	0.004***	0.002	-0.001	-0.001	-0.000	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 7 Years	0.004***	0.002	-0.001	-0.002	-0.000	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 8 Years	0.004***	0.003**	0.000	-0.001	0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 9 Years	0.006***	0.004***	0.002*	0.001	0.002*	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
% Debt Due in 10 Years	0.008***	0.006***	0.004***	0.002*	0.003***	0.002*
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
Book Leverage (Bonds)	0.007***	0.004***	0.001	-0.001	0.002*	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size		-0.011***		-0.031***		-0.034***
		(0.003)		(0.004)		(0.005)
Q		0.018***		0.024***		0.023***
		(0.004)		(0.004)		(0.004)
Profit		0.013***		0.019***		0.012**
		(0.005)		(0.005)		(0.005)
Observations	12045	11009	12060	11012	11882	10826
R^2	0.373	0.400	0.714	0.738	0.758	0.777
Fixed Effects	Ind & Year	Ind & Year	Firm & Year	Firm & Year	Firm & Ind $\times Year$	Firm & Ind $\times Year$

Table 8: Estimated Parameters

Parameter	Description	Value	SE	Target/Reference	Data	Model
Externally Calibrated						
β	Discount factor	0.960	–	4% Annual Risk Free Rate	–	–
ς	Per-period coupon payment	$1/\beta - 1$	–	Risk free debt issued at par	–	–
τ	Corporate tax rate	0.300	–	Hennessy & Whited (2007)	–	–
ρ_y	Persistence: income shock	0.660	–	Auto-correlation of log sales	0.66	0.66
σ_y	St. dev: income shock	0.310	–	Log sales volatility	0.31	0.31
$1/\lambda$	Average Maturity of debt	8.300	–	Avg. debt maturity	8.30	8.30
Internally Estimated						
c_f	Fixed cost of production	0.967	0.244	Default rate (%)	1.13	1.20
α	Convex equity issuance cost	0.011	0.002	Avg. debt to income	2.22	2.22
σ_ε	St. dev: pref. shock	0.001	0.000	St. dev debt to income	5.36	5.34
χ	Lender recovery fraction	0.093	0.040	Avg. credit spread	1.87	1.70
c_I	Fixed debt issuance cost	0.003	0.001	Avg. dispersion maturity dates	2.61	2.62
				Avg. underwriter fee (%)	0.79	0.75

Table 9: External Validation
Maturity Wall Predictors

	Maturity Wall Data	Maturity Wall Model
Maturity Wall$_{t-1}$	0.569	0.856
Leverage	-0.094	-0.106
Revenue	0.052	0.043
Large Debt Payment (η)	-0.042	-0.180
Additional Firm Controls	Yes	—

Table 10: External Validation
Credit Spreads & Maturity Walls

	Credit Spread (bps)	
	Data	Model
Leverage	29.250	82.354
Revenue	-32.940	-62.790
Maturity Wall	23.287	34.884
Additional Firm Controls	Yes	—

Table 11: Counterfactual equilibrium: No maturity walls

	Baseline	No maturity walls
Share of debt held in b_D	18.6%	100%
Book leverage	21.0%	36.9%
Market leverage	15.6%	25.0%
Credit spread on b_D	1.4%	2.4%
Credit spread on b_C	1.7%	—
Average credit spread	1.7%	2.4%
Firm default rate	1.2%	2.0%
Δ Market value	—	-6.8%