# Financial Flexibility and Debt Maturity Concentration[1]

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**Abstract**

We examine how firms' financial flexibility, shaped by shocks to the value of their real estate assets, affects corporate debt maturity structure. Our model predicts that increases in firms' asset values lead to greater debt maturity concentration. Using comprehensive data on corporate debt spanning nearly three decades, we find strong empirical support for this prediction. The effect is more pronounced for corporate bonds than for bank loans, for unsecured relative to secured debt, and is strongest among financially constrained firms and firms with low growth opportunities. The results also hold for newly issued debt. Finally, we document that maturity concentration comes at a cost, as it significantly reduces firm stability during financial crises. Our findings shed new light on how firms' asset values shape their debt maturity choices and the implications for firm stability.

**Keywords:** corporate debt structure, maturity concentration, financial flexibility, borrowing constraints, rollover risk, real estate

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# 1 Introduction

Survey evidence highlights the role of financial flexibility in managerial decision-making and corporate planning. Graham (2022) documents that financial flexibility is the most important consideration for Chief Financial Officers (CFOs) when determining corporate debt policy, identifying two key benefits as enabling the pursuit of investment opportunities and mitigating distress costs. This paper studies how firms' financial flexibility affects corporate debt maturity structure. Financial flexibility is defined as a firm's ability to secure debt financing and support investment projects. We utilize variations in real estate prices as exogenous shocks to firms' debt capacity and, consequently, to their financial flexibility.

Corporate debt maturity is inherently multidimensional; yet, much of the existing literature uses on a single dimension, namely, the average debt maturity, providing only a partial view on debt management strategies. In this paper, we focus on the distribution of debt maturities over time and examine how shocks to the value of firms' real estate assets influence the concentration of their debt maturity. A more concentrated maturity profile implies that firms have a maturity structure that is less spread out over time, leaving them more exposed to periods of heightened refinancing risk. While prior studies using real estate prices emphasize the positive effects of financial flexibility on firm policies, this paper highlights a potential adverse effect by examining the concentration of debt maturities. We provide evidence that higher asset values – while first inducing more concentrated maturity profiles – can have unintended consequences for firm stability, particularly during financial crises.

Most firms rely on real estate assets in their operation and must decide whether to own or lease these assets. A key characteristic of corporate real estate assets is that they can increase firms' ability to borrow and improve firms' access to secured debt (Cvijanović 2014). The value of corporate assets can also enhance firms' ability to raise unsecured debt by strengthening creditor protection. Even if these assets are not explicitly pledged as collateral, they increase expected recovery values in bankruptcy. As a result, real estate values can implicitly affect the value and availability of unsecured debt (Campello et al. 2022, Benmelech et al. 2025). This channel is particularly relevant given the growing importance of unsecured debt in corporate financing (Benmelech et al. 2024). Overall, shocks to corporate asset values influence firms' borrowing capacity and financial flexibility, and, in turn, can shape their debt maturity choices.

We first motivate our empirical analysis by a stylized theoretical model. We consider a firm with assets in place. The firm wants to finance an investment project with variable scale. First, we establish that an increase in the value of assets in place allows for more investment, which is in line with the Holmström & Tirole (1998) equity multiplier and the Kiyotaki & Moore

(1997) credit multiplier, and also with the empirical findings on the investment collateral channel established by Chaney et al. (2012). Further, we consider a choice between a concentrated and a dispersed maturity profile as in Choi et al. (2018). The key trade-off consists of balancing higher issuance costs for a dispersed maturity profile and the investment benefits for the dispersed firm. To analyze this trade-off, we extend Choi et al. (2018) and model a variable investment level. In their setting, increasing the firm's asset value or cash levels would not lead to higher investment. Rather, the firm would invest at the same level and reduce its debt level. We also show that this is what happens in our framework, once the firm has exhausted all projects with positive net present value (NPV) and invests at the first-best level. However, also empirically, constrained firms are those for which the collateral channel is most relevant.

We show that constrained firms first use the debt capacity brought by the additional asset value to borrow and invest more. As a dispersed firm faces lower rollover risk in the event of a debt market freeze at each future date, it can initially borrow and invest more than a concentrated firm, if assets in place are scarce. For higher assets in place, firms can invest sufficiently close to first-best. Then, the benefits of higher debt capacity required to maintain a dispersed maturity profile become less important relative to the issuance costs, and firms switch to a concentrated maturity profile. Thus, the main prediction of our model is that following an appreciation in asset value, firms increase their debt maturity concentration.

Our fundamental empirical analysis can be summarized in the following sets of results. First, we document the effects of financial flexibility on debt maturity concentration. We follow Choi et al. (2018) and use three alternative measures of maturity concentration: the Herfindahl index, a maturity-weighted Herfindahl index, and the distance measure between a firm's current maturity profile and its perfectly dispersed counterpart. Our results across all these measures indicate that an exogenous increase in financial flexibility (i.e., a positive shock to real estate prices), leads to a rise in the concentration of the debt maturity profile, which is in line with our theoretical prediction.

Next, we explore how financial flexibility affects different debt instruments. We categorize all debt in our sample into three groups: corporate bonds, bank loans, and other debt types. Our findings reveal that an increase in asset values leads to greater maturity concentration for corporate bonds and other debt types, but we find no significant effect for bank loans. The latter could be due to the fact that bank loans are typically offered in smaller amounts and involve lower issuance costs (Choi et al. 2021), and they are also frequently renegotiated (Roberts & Sufi 2009). Thus, issuing new debt or renegotiating existing debt is generally less costly for firms in the loan market than in the bond market. Rollover risk is therefore less relevant for bank loans, which may explain why firms do not adjust the maturity concentration of their bank debt.

Our theory also supports this interpretation, as we show that for sufficiently low issuance costs, we may not observe a policy switch in the maturity concentration.

We further examine the impact of financial flexibility on changes in maturity structure by debt security. An important question in the literature is whether only secured debt is truly asset-backed, or whether corporate asset values also matter for unsecured borrowing. Our analysis contributes to this debate by examining how firm real estate values influence the maturity structure of secured versus unsecured debt. We find that increases in the values of real estate assets significantly impact maturity concentration for both secured and unsecured debt, with the effect being notably stronger for unsecured debt. This pattern is particularly pronounced for corporate bonds, where the effect is driven primarily by unsecured bond issues. These results are consistent with Campello et al. (2022), who show that the increase in firms' borrowing following a rise in real estate prices are largely driven by unsecured debt. our results are also in line with Benmelech et al. (2025) findings, showing that unsecured debt is implicitly backed by firm assets.

In addition, we investigate whether firms adjust their debt concentration differently across maturities. Firms should generally be more concerned about concentration in the short end than in the long end, as long-term debt still allows refinancing before it matures (Xu 2018). Therefore, when firms can choose higher maturity concentration to save on issuance costs, we expect this to happen to a larger degree in the long end than in the short end. To test this, we split our sample into short term and long term debt, and find that the effect of financial flexibility on maturity concentration is particularly pronounced within the longer maturities. Again, the difference between the long end and the short end is even more pronounced for corporate bonds than for bank loans or other debt types.

We also explore how an increase in real estate prices influences newly issued debt. The results align with the predictions of our theoretical model, which posits that as asset values appreciate, firms trade off lower issuance costs against higher rollover risk. Consequently, we observe that firms issue fewer, but larger, debt tranches in response to an increase in asset value, thereby optimizing issuance costs. We further show that the same increase in maturity concentration also holds in a sample of newly issued debt, reinforcing our earlier results.

Another part of our analysis sheds light on how investment opportunities or growth options impact the effect of shocks to real estate values on maturity concentration. Our theoretical model predicts that the effect should be more pronounced for firms with less growth options. For such firms, the potential downside of maturity concentration, namely losing access to growth options, is less important, so they benefit more from saving issuance costs. Indeed, the prediction also finds strong support in our consequent empirical tests.

In the next analysis, we examine the implications of changing corporate asset values for firms' financial fragility. As the effects may vary across economic conditions, we analyze how changes in corporate real estate values impact firms' distance to default in normal times and during financial crises. We find that in normal times, a positive shock to real estate prices increases firms' distance to default. However, this stabilizing effect is attenuated during crisis periods, suggesting that the benefits of higher asset values are not uniform across economic conditions.

We further explore these dynamics by adding firm debt structure data. Specifically, we exploit variation in pre-crisis debt maturity concentrations to re-examine the effect of changing asset values on firms' financial fragility. The intuition is that firms could not anticipate the 2008–09 financial crisis when setting their debt maturities. Consequently, firms entering the crisis with highly concentrated debt faced an exogenous difference in refinancing risk. By dividing the sample into high and low pre-crisis maturity concentration groups, we uncover striking differences. Firms with highly concentrated debt entering the crisis show little benefit from real estate shocks in normal times but experience a strong negative effect during the crisis. In contrast, firms with low maturity concentration continue to benefit from positive asset shocks in normal times, and their vulnerability during the crisis is much less pronounced. These findings suggest that while rising asset values generally enhance firm stability, the structure of debt matters critically. High concentration of debt maturities can amplify financial fragility during adverse conditions, highlighting an important consequence of positive asset value shocks.

The final set of results is based on a cross-sectional analysis. Our theory model predicts that the effect of asset values on debt maturity should be strongest for financially constrained firms. These firms have largely exhausted their existing borrowing capacity and therefore have a greater demand for additional debt capacity, which can be unlocked by higher asset values. We examine whether the effect of higher real estate prices on maturity concentration varies across different degrees of financial constraint based on key observable characteristics: firm size, cash holdings, total payout, leverage, and profitability. Our findings suggest that the impact of positive shocks to asset values is more pronounced for firms with higher financial constraints across all classification measures, which is in line with the predictions from our theoretical model.

We address two potential endogeneity concerns that may affect our empirical analysis. First, there could be a presence of an omitted variable, for example, an unobserved local economic shock that could affect both the value of a firm's real estate assets and its debt maturity concentration at the same time. To address this endogeneity issue, we instrument local real estate prices using the interaction of long-term interest rates (mortgage rates) and local housing-supply elasticity, following the approach developed in Himmelberg et al. (2005) and Mian & Sufi (2011). This instrument predicts that depending upon the availability of developable land (due to geographical and regulatory constraints) in a given metropolitan statistical area (MSA), a decrease in interest rate (i.e., an increase in real estate demand) results into either higher real estate prices (in supply inelastic areas) or just higher construction volume (in supply elastic areas). Therefore, the instrument isolates a component of variation in real estate prices that is orthogonal to the potentially omitted local economic shock, and hence unrelated to firms' debt maturity concentration. One may criticize this instrument arguing that orthogonality condition might not be satisfied if there are reasons to believe that the supply elasticity of an area might be correlated with the local demand for real estate assets (Davidoff 2016). As suggested in Davidoff (2016), we address this concern by controlling for the interaction between the supply constraint and year dummies in both first- and second-stage IV specifications.

The second endogeneity concern is that a firm's debt maturity concentration and the decision to own real estate assets could be correlated with each other. To address this concern, we follow Chaney et al. (2012) and control for the observable determinants of real estate asset ownership decisions. Specifically, we use firms' initial characteristics (measured at the beginning of the sample, 1993) that may make a firm more or less likely to own real estate assets. These characteristics are firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. If these characteristics make firms more likely to own real estate and if these characteristics also make firms more sensitive to fluctuations in real estate prices, then controlling for the interaction between these five control variables and contemporaneous real estate prices allows us to separately identify the effect of shock to value of firms' real estate assets on their debt maturity concentration.

The rest of the paper is organized as follows. We review the literature in Section 2. Then, Section 3 sets up the model. In Section 4, we solve the model without growth options, while we introduce the latter in Section 5. Section 6 describes data and presents our empirical strategy. Section 7 presents our main results, showing the effect of shocks to firms' financial flexibility on debt maturity concentration. Additional results including the distinction of different types of debt, secured vs. unsecured debt, new debt issues, growth options, financial fragility, and heterogeneity tests regarding financial constraints are also presented in Section 7. Finally, Section 8 concludes.

# 2 Literature review

Our paper contributes to several strands of literature. First, we contribute to the literature on debt maturity structure and its management. The papers in this literature try to explain the firm-level determinants and time-series predictors of corporate debt maturity. Myers (1977) argues that a firm's optimal maturity choice is driven by aligning the maturities of its corporate assets and liabilities to avoid debt overhang. Diamond (1991, 1993) suggests that firms decide on debt maturity by balancing the favorable signaling properties of short-term debt against the increased risk of inefficient liquidation. Consistent with this theory, Guedes & Opler (1996) find that investment-grade firms issue both long-term and short-term debt, while speculative-grade borrowers typically issue debt in the middle maturity range. Barclay & Smith (1995) find that firms with few growth options, firms that are large, or are regulated have more long-term debt on their balance sheet.

Other studies document market conditions, such as interest rates, as important determinants for corporate maturity management (Baker et al. 2003, Faulkender 2005). Mian & Santos (2018) and Xu (2018) show how firms actively manage their maturity structures of loans and bonds, respectively, by early refinancing, rather than simply awaiting the rollover time when the original contracts mature.

More recent papers in this literature go beyond the focus on average debt maturity and instead take a closer look at the distribution across different debt contracts and its implications for the firm's maturity management. Choi et al. (2018, 2021) build a theoretical framework for analyzing the trade-offs when choosing a concentrated or dispersed maturity profile, which we relate to and extend when we analyze the effect of financial flexibility brought by higher asset value. Moreover, they introduce several empirical measures of debt maturity concentration, which we also apply in our empirical analysis.

Second, we contribute to the literature on debt structure in terms of specific debt types. Rauh & Sufi (2010) criticize traditional studies that treat debt as uniform, highlighting that rated public firms simultaneously use multiple debt types, including bank debt, bond debt, program debt, mortgage, and others. Using a more comprehensive database that includes both rated and unrated firms, Colla et al. (2013, 2020) find that the degree of debt type diversification varies across different types of firms. Large rated firms often diversify across multiple debt types, whereas small unrated firms typically specialize in fewer types. We follow this line of research by investigating maturity concentration not only for the entirety of the firm's debt, but also separately for individual debt types.

Finally, our paper contributes to the collateral channel literature. This strand of papers exploits empirically the idea that changes in real estate prices can be seen as exogenous shocks to the firm's collateral value. Thus, those studies analyze how different outcome variables are affected by such a shock. The first study in the field by Chaney et al. (2012) investigates the effect of collateral value on corporate investment. Further studies that make use of the collateral channel consider cash policy (Chen et al. 2017), payout policy (Kumar & Vergara-Alert 2020), employment (Ersahin & Irani 2020), and CEO compensation (Albuquerque et al. 2023), as outcome variables.

Cvijanović (2014) documents that firms significantly increase their leverage ratio following an increase in real estate prices. She also investigates the effect on firm leverage by debt maturity and finds (1) more long-term debt issues, but no evidence for increase of current debt, and (2) an increase of the share of long-term debt, but an – insignificant – decrease of current liabilities. She points out that both findings support existing theories, which predict an increase in debt maturity with liquidation value (Hart & Moore 1994, Shleifer & Vishny 1992). We go beyond Cvijanović (2014) by looking at the effect of shocks to real estate values on maturity structure, rather than only on the average maturity. We point out that higher real estate values do not only allow the firm to use more long-term debt, but also to choose a more concentrated maturity profile. In particular, we show that there is evidence for maturity concentration on both the short and long end.

We also show the effect of changes in asset value on maturity distribution by debt security. We find that maturity concentration increases both for secured and unsecured debt after a shocks to real estate values. Campello et al. (2022) show that the increase in firms' borrowing following a rise in real estate values is driven by unsecured debt. Further, they relate their findings to Lian & Ma (2021) and Kermani & Ma (2020), who show that firms borrow more against the value of their operating cash flows than against the liquidation value of their assets. In our model, we capture the interconnectedness of asset value and cash flows. A higher asset value allows for additional investment and creates additional future cash flows. This mechanics of the equity multiplier in the spirit of Holmström & Tirole (1998) does not rely on secured debt. Rather, also unsecured debt can benefit from the additional investment creating future cash flows that can serve the firm's debt. Thus, we see borrowing against cash flows or asset value rather as two sides of the same coin than a mutually exclusive choice, which is in line with the point by Benmelech et al. (2025) that "a corporation's debt is typically supported by both expected cash flows and assets, with the relative support varying with time and situation".

# 3 Model

In this section, we develop a simple model to illustrate the relation between a firm's asset value and its maturity dispersion. As far as possible, we follow Choi et al. (2018). As a crucial difference, we allow for variable investment, which will have important implications as we highlight below. Moreover, we focus on the variation of the firm's asset value as a measure of financial flexibility, which Choi et al. (2018) consider only indirectly and partially (see Footnote 4 below).

## 3.1 Setup

We consider an initially all-equity-financed firm over three periods. The firm has assets in place $A$. Moreover, it has access to a project that requires a capital outlay, $I \in [0, \infty)$, at time $t_0$.[1] The project generates a total repayment of $2\sqrt{I}$, which is spread out over intermediate cash flows $c\sqrt{I}$ at dates $t_1$ and $t_2$ and a final cash flow $2(1-c)\sqrt{I}$ at date $t_3$. The parameter $c \in [0, 1]$ thus determines the intertemporal distribution of the project cash flows. We can distinguish the following two extreme cases. For $c = 0$, the whole repayment occurs at the end of the project lifetime, whereas for $c = 1$, the final cash flow disappears, and all cash flows appear at the earlier two dates. From now on, we will use the notation $J = \sqrt{I}$. We further assume that the risk-free rate is zero.

We can state the total value of the firm in the absence of frictions ("unconstrained") depending on the number of possible growth options. We follow Choi et al. (2018) and assume that growth options occur at each of the two intermediate dates $t_1$ and $t_2$. Specifically, the firm can invest a fraction $f$ of its cash flow, i.e., an amount of $cfJ$, at each intermediate date, which yields an additional cash flow, $HJ$, at date $t_3$. [2] We assume that growth options have non-negative NPV, i.e., $H \geq cf \geq 0$.

First, for a firm without growth options ($H = f = 0$), we can verify that the value of the project's total repayment is $2cJ + 2(1-c)J = 2J$, and thus indeed independent of $c$ for an

[1] In Choi et al. (2018), the investment amount $I > A$ is fixed and exogenous. As our purpose is to analyze the effect of a change in $A$, such a model would not be useful. An increase in $A$ should have the first-order effect of a desire to increase investment, as long as the firm has positive-NPV projects available. In the first part of our analysis, we further abstract from the growth options modelled in Choi et al. (2018), as the effect of changes in asset value on maturity dispersion also appears without those growth options, as soon as we allow for variable investment.

[2] Deviating from Choi et al. (2018), not only the cash flows, but also the growth options are proportional to the square root of the initial investment level in our setting.

unconstrained firm. The unconstrained firm's value is is

$$V_{U,0GO}(J,A) = A + 2J - J^2, \tag{1}$$

consisting of the assets in place $A$ and the NPV of the new project $2J - J^2$, given an investment of $I = J^2$. Maximizing firm value leads to the optimal investment of

$$J^*_{0GO} = 1. \tag{2}$$

The intertemporal distribution of cash flows has no effect for unconstrained firms without growth options, neither for the firm's value nor for the optimal investment level. Later, we will show how constrained firms can benefit from more dispersed cash flows, also in the absence of growth options.

Second, in the case with growth options ($H > cf > 0$), a firm that can make use of two growth options for sure has a value of

$$V_{U,2GO}(J,A) = A + 2J(1 + H - cf) - J^2, \tag{3}$$

with the corresponding optimal investment of

$$J^*_{2GO} = 1 + H - cf. \tag{4}$$

Third, a firm that faces the risk of losing a growth option in the event of a market freeze (occuring with probability $\lambda$, as introduced below), and thus can make use of either one or two growth options, has a value of

$$V_{U,12GO}(J,A) = A + J(2 + (2 - \lambda)(H - cf)) - J^2, \tag{5}$$

with the corresponding optimal investment of

$$J^*_{12GO} = 1 + (1 - \lambda/2)(H - cf)). \tag{6}$$

We have $J^*_{12GO} < J^*_{2GO}$, as the risk of losing a growth option reduces the expected benefit of the initial investment, which is scaled up in the case of successful growth option exercise. Whether the firm actually faces the risk of losing a growth option depends on its financing conditions, which we introduce in the next section.

## 3.2 Debt financing and maturity structure

As we assume that the firm has no cash, it needs to borrow its desired investment amount by taking debt of $B = J^2$. As in Choi et al. (2018), we allow the firm to issue one- or two-period debt at time $t_0$. This implies that debt needs to be rolled over before time $t_3$. However, at times $t_1$ and $t_2$, the debt market may freeze with probability $\lambda$. In case of a market freeze, the firm is unable to refinance maturing debt and thus must repay the creditors out of the project's cash flow, or serve them from the assets that secure the debt. We consider two initial debt structures, a concentrated (firm $C$) and a dispersed (firm $D$) maturity profile. Firm $C$ issues debt with value $B$ and a single maturity (either $t_1$ or $t_2$) at time $t_0$, which then needs to be rolled over to time $t_3$. Note that firm $C$ is indifferent between the two possible initial maturities. Firm $D$ issues two debt claims with value $B/2$ each, one expiring at $t_1$ and the other one at $t_2$. Then, at each of the two future dates, the expiring debt claim is rolled over to $t_3$. Hence, firm $D$ has a perfectly dispersed debt maturity profile, while firm $C$'s debt maturity profile is not dispersed at all. We follow the implicit assumption in Choi et al. (2018) that only risk-free debt can be issued.[3] That is, we require that the firm must be able to repay the creditors out of the project's current-period cash flow $cJ$ and the asset value $A$. The maximum debt capacities for firms $C$ and $D$ are

$$B = J^2 \leq cJ + A \quad \text{and} \quad \frac{B}{2} = \frac{J^2}{2} \leq cJ + A,$$

respectively. Intuitively, as firm $D$ only needs to repay half of the debt in the event of a market freeze, it can borrow more initially and thus also invest more. Solving for the respective $J$ yields

$$\bar{J}_C(A) = \frac{1}{2}\left(\sqrt{4A + c^2} + c\right) \quad \text{and} \quad \bar{J}_D(A) = \sqrt{2A + c^2} + c \tag{7}$$

as the upper limits of how much each firm type can invest initially, with $\bar{J}_D(A) > \bar{J}_C(A)$. Relating to Lian & Ma (2021)'s discussion of asset-based vs. cash flow-based lending, our model features a combination of both. Borrowing constraints are determined both by asset value $A$ and cash flow $cJ$. However, as initial investment increases cash flow and thus borrowing capacity, we also incorporate the Kiyotaki & Moore (1997) credit multiplier. As a higher asset value allows for higher investment, it indirectly also increases the cash flows against which the firm can borrow. Still, a lower $c$ (more back-loaded cash flows from investment) means that firms have to rely more on asset-based rather than cash flow-based lending.

[3] We also investigated the effect of allowing default-risky debt. This makes the analysis more complicated, while the qualitative insights remain unchanged. Namely, debt capacity is higher for a firm with dispersed maturity profile.

A related question to the maximum feasible investment is whether firms are able to repay their debt and still invest in the growth option in the event of a market freeze. Here, the relevant conditions for firms $C$ and $D$ are

$$B = J^2 \leq (1-f)cJ + A \quad \text{and} \quad \frac{B}{2} = \frac{J^2}{2} \leq (1-f)cJ + A,$$

respectively. Analogous to (7), we get

$$\bar{\bar{J}}_C(A) = \frac{1}{2}\left(\sqrt{4A + ((1-f)c)^2} + (1-f)c\right) \quad \text{and} \tag{8}$$

$$\bar{\bar{J}}_D(A) = \sqrt{2A + ((1-f)c)^2} + (1-f)c, \tag{9}$$

with $\bar{\bar{J}}_D(A) > \bar{\bar{J}}_C(A)$. For investment levels below those critical ones, the firm can repay its debt by liquidating the asset value $A$ and using the fraction $(1-f)$ of its cash flow, while still having $fcJ$ available to invest in the growth option.[4]

Next, we identify the critical levels of asset value $A$ for which the firm reaches the first-best investment levels. Recall that these are dependent on whether the firm can make use of two growth options for sure, or it faces the risk of losing a growth option in the event of a market freeze.

First, for the case in which the firm can make use of two growth options for sure, the first-best investment level is $J^*_{2GO} = 1 + H - cf$ according to (4), and the applicable maximum investment levels that ensure that the growth options indeed are available for sure are given by (8) and (9). For the $C$ and $D$ firm, equating $J^*_{2GO}$ with $\bar{\bar{J}}_C(A)$ and $\bar{\bar{J}}_D(A)$, respectively, yields

$$\bar{\bar{A}}_C = (1+H-c)(1+H-cf) \quad \text{and} \tag{10}$$

$$\bar{\bar{A}}_D = \frac{1}{2}\left(c^2(2-f)f + (1+H)(1+H-2c)\right), \tag{11}$$

[4] Choi et al. (2018, p.486) state: "to avoid trivial solutions, $I - A > (1-f)c > (I-A)/2$. The latter assumption implies that an intermediate cash flow is insufficient to exercise the growth option and repay all of the externally funded investment spending, $I - A$, but an intermediate cash flow is sufficient to invest in the growth option and repay half of the externally funded investment spending." That is, they can restrict their attention to the two cases that a $C$ firm, having to repay the full debt in the event of a market freeze, will always lose its growth option at that date, whereas the $D$ firm, having to repay only half of the debt in the event of a market freeze, will always have both growth options available. More precisely, they deviate from the initial assumption and consider $B^C = I - A$ both exceeding and falling below $(1-f)c$, which allows them to consider also two different cases for the $C$ firm, dependent on the level of $B^C$ or $A$. Still, they do not consider the respective cases for the $D$ firm. In our setting, as we show in (8) and (9), the constraint arises endogenously from both firm types' initial investment choice. Both can choose to invest less initially, with the threshold for the $D$ firm being higher, $\bar{\bar{J}}_D(A) > \bar{\bar{J}}_C(A)$, at the benefit of ensuring the availability of both growth options later on.

as the thresholds of asset value $A$ at which the respective firm switches from the constrained to the unconstrained investment level.

Second, for the case in which the firm faces the risk of losing a growth option, the first-best investment level is $J^*_{12GO} = 1 + (1 - \lambda/2)(H - cf))$ according to (6), and the applicable maximum investment levels that ensure that the growth options indeed are available for sure are given by (7).

For the $C$ and $D$ firm, equating $J^*_{12GO}$ with $\bar{J}_C(A)$ and $\bar{J}_D(A)$, respectively, yields

$$\bar{A}_C = \frac{1}{4}(c(f(\lambda-2)-2) - H(\lambda-2)+2)(cf(\lambda-2) - H(\lambda-2)+2) \quad \text{and} \tag{12}$$

$$\bar{A}_D = \frac{1}{8}(c(f(\lambda-2)-4) - H(\lambda-2)+2)(cf(\lambda-2) - H(\lambda-2)+2). \tag{13}$$

These are the upper bounds of $A$ for each firm type, such that the firms invest at the constrained levels for lower $A$, and at the respective first-best investment level for higher levels of $A$. Given that firm $D$ can invest at a higher level for a given $A$, it is intuitive that it also reaches the respective first-best investment level for a lower critical $A$, i.e., $\bar{A}_D < \bar{A}_C$ and $\bar{\bar{A}}_D < \bar{\bar{A}}_C$. In the case without growth options ($H = f = 0$), we have $\bar{J}_C(A) = \bar{\bar{J}}_C(A)$ and $\bar{J}_D(A) = \bar{\bar{J}}_D(A)$, and further, both (10) & (12) and (11) & (13) simplify to

$$\bar{A}_C = \bar{\bar{A}}_C = 1 - c \quad \text{and} \quad \bar{A}_D = \bar{\bar{A}}_D = \frac{1}{2} - c. \tag{14}$$

The purpose of our model is to determine whether a firm prefers a concentrated or a dispersed maturity profile, depending on the level of asset value $A$. We extend the unconstrained firm values (3) and (5) to our two firm types $(C,D)$ and three possibilities regarding availability of growth options $(0GO, 12GO, 2GO)$ as

$$V_{C,xGO}(J,A) = V_{U,xGO}(J,A) - k \quad \text{and} \quad V_{D,xGO}(J,A) = V_{U,xGO}(J,A) - 2k,$$

motivated by a fixed cost $k$ with $0 \leq k < \frac{1}{3}$ per issue,[5] with $x \in \{0, 12, 2\}$. Firm $D$ has twice as many debt issues as firm $C$. Other than that, the values of the two firm types do not differ for a given investment level $J^2$ – however, firm $D$ has a higher debt capacity and thus can invest more in the constrained region. The trade-off that the firm faces in the choice between a concentrated or a dispersed maturity profile is thus the saving of issuance costs by debt concentration versus the higher debt and investment capacity by debt dispersion. Furthermore, we can analyze how the extent of firms' growth opportunities, which we measure by the final payoff of the growth option

[5]In Section 4.1, we will explain the upper limit of $k < \frac{1}{3}$.

$H$, influences the trade-off. For sufficiently high $A$, both types can invest at the unconstrained level and exploit all growth options. Here, there is no advantage of debt dispersion, whereas debt concentration saves on the issuance costs. Thus, the optimal choice is a concentrated maturity profile for high $A$. For low $A$, both types can only invest at the constrained level, which is higher for the dispersed firm, and they risk losing their future growth options. Next, we will analyze the case without growth options, and start with the extreme case of $A = 0$, i.e., the firm has no assets in place, but its assets only consist of the rights to the investment project.

# 4 Analysis without growth options

In this section, we restrict our attention to the case without growth options ($H = f = 0$), with an unconstrained firm value given by (1) and optimal investment level of $J^*_{0GO} = 1$, as stated in (2). This allows for a straightforward analysis of the model's main results. In Section 5, we will extend the analysis to the case with growth options ($H > cf > 0$).

## 4.1 Boundary case: no assets in place – pure cash flow-based lending

In the language of Lian & Ma (2021), the extreme case of $A = 0$ corresponds to a situation of pure cash flow-based lending, as the firm does not own any assets in place that could support asset-based lending. In this case, note that both firm types can still invest, as they can borrow against the cash flow $c$. The corresponding feasible investment levels from (7) simplify then to $\bar{J}_C(0) = c$ and $\bar{J}_D(0) = 2c$. The latter means that the dispersed firm can invest at $J = 1$ whenever $c \geq 1/2$ and does not benefit further from earlier cash flows. In contrast, the concentrated firm invests at $J^2 < 1$, and earlier cash flows (higher $c$) will improve its value, for all $c < 1$. The firm values given optimal investment are

$$V_C(\bar{J}_C(0), 0) = 2c - c^2 - k, \tag{15}$$

$$V_D(\min\{1, \bar{J}_D(0)\}, 0) = \begin{cases} 4c - 4c^2 - 2k & \text{if } c \leq 1/2, \\ 1 - 2k & \text{if } c > 1/2. \end{cases} \tag{16}$$

Next, we analyze which maturity structure leads to higher firm value. We define the difference in firm values between the two firm types as

$$\Delta V(A = 0) = V_D(\min\{1, \bar{J}_D(0)\}, 0) - V_C(\bar{J}_C(0), 0) = \begin{cases} 2c - 3c^2 - k & \text{if } c \leq 1/2, \\ 1 + c^2 - 2c - k & \text{if } c > 1/2. \end{cases} \tag{17}$$

Consequently, we define a critical

$$\hat{k}(c) = \begin{cases} 2c - 3c^2 & \text{if } c \leq 1/2, \\ 1 + c^2 - 2c & \text{if } c > 1/2, \end{cases} \tag{18}$$

which we illustrate in Figure 1, for which $\Delta V(A=0) = 0$ and the two firm types' values are equal. The figure illustrates that up to a cash flow level of $c = 1/3$, a marginal increase of $c$ (that is, moving the cash flow distribution from the final towards the intermediate dates) benefits the dispersed firm more than the concentrated firm. The reason is that the feasible investment level increases twice as much in $c$ for the dispersed firm as for the concentrated firm,[6] which is a huge advantage for the dispersed firm, as long as both types are severely constrained. However, as the dispersed firm moves much faster towards the unconstrained investment level, the benefits of being able to invest more become relatively less valuable for the dispersed firm. Therefore, for a sufficiently high level of early cash flows ($c > 1/3$), the concentrated firm benefits more from a marginal increase of $c$. The critical issuance cost level $\hat{k}$, which corresponds to the difference in investment benefits that makes the two firm values equal, thus also has its maximum of $\hat{k} = 1/3$ at $c = 1/3$.

[Place Figures 1 and 2 here]

In Figure 2, we show the firm values for $A = 0$ according to (15) and (16) for specific levels of issuance costs $k$. For the boundary cases of $c = 0$ and $c = 1$, both types invest the same, namely $J = 0$ for $c = 0$ and $J = 1$ for $c = 1$. Thus, without issuance costs, the two firms' values coincide at the boundaries. Once we consider positive issuance costs, the two firms' values at the boundaries differ exactly by the amount of the issuance costs $k$.[7]

For the interior, $0 < c < 1$, Panel 2a illustrates that without issuance costs, the dispersed firm always has higher value, which is due to its higher debt and investment capacity. Panels 2b and 2c show that for intermediate levels of issuance costs, there is an intermediate range of cash flow levels for which the dispersed firm's benefits of higher debt and investment capacity dominate. The qualitative difference between Panels 2b and 2c is whether the cash flow level of $c = 1/2$ at which firm $D$ starts investing at the level of 1 is within (Panel 2b) or outside that region (Panel 2c). Finally, Panel 2d shows that for sufficiently high issuance costs, the concentrated firm has higher value for all levels of $c$.

[6] As noted above, the feasible investment levels are $\bar{J}_C(0) = c$ and $\bar{J}_D(0) = 2c$.

[7] In the limit of $c \to 0$, neither firm can invest at all ($J \to 0$), but the dispersed firm still faces issuance costs being higher by $k$, as long as it issues debt. For $c = 0$, we would also have $J = 0$ and thus $B = 0$, so neither firm would face issuance costs, and firm values would jump up from $-2k$ and $-k$ to zero.

For late cash flows ($c \to 0$), also the dispersed firm can invest very little, and its advantages due to investment benefits cannot outweigh the higher issuance costs relative to the concentrateed firm, thus the latter is more valuable. Note that for $A = 0$, there is always a region in which late enough cash flows (low enough $c$) lead to negative firm values when $k > 0$. Here, the project's NPV cannot cover the debt issuance costs. Panel 2c shows that there can be a region in which for low $c$ (around $c = 0.2$ in the figure), the concentrated firm's value is positive and visibly exceeds the dispersed firm's value.

For early cash flows (high $c$), the concentrated firm value also exceeds the dispersed one. This is intuitive: when the project cash flows are very front-loaded, rollover risk is low. Then, the concentrated firm can borrow enough against the cash flow and get close enough to an investment of 1, such that the investment benefits of the dispersed firm are no longer sufficient to outweigh the higher issuance costs for the dispersed maturity profile. As noted above, the dispersed firm cannot further benefit from higher $c$, once $c > 1/2$, as it then can invest at the level of 1 anyway.

The critical $\hat{k}(c) \geq 0$ determines whether $V_D(\bar{J}_D(0), 0) > V_C(\bar{J}_C(0), 0)$, which is the case for $k < \hat{k}(c)$. Then, as we discuss below, the optimal choice is a dispersed maturity profile for low $A$, and the firm will optimally switch from a dispersed maturity profile to a concentrated maturity profile for sufficiently high $A$. Otherwise, i.e., for $k > \hat{k}(c)$, a concentrated maturity profile is preferable for all $A$, even the lowest (as illustrated in Panel 2d for $A = 0$), and we cannot discuss how a firm's asset value affects maturity dispersion. Going forward, we will make the following assumption:[8]

**Assumption 1.** *We assume that* $k < \hat{k}(c) \leq \frac{1}{3}$.

The assumption ensures that a dispersed maturity profile is optimal for sufficiently low asset value $A$.

## 4.2 Effect of assets in place and asset-based lending

We show in Appendix A.1 that there is a critical level of $A = A^*$, at which firm $C$ and $D$'s values are equal. The optimal policy switches from a dispersed maturity profile to a concentrated

[8] For the numerical example in Figure 3, we choose $k = 0.15$ and $c = 0.2$ or $c = 0.4$. The respective $\hat{k}$ are 0.28 and 0.32, so $k < \hat{k}(c)$ is satisfied (see also Figure 1). As is apparent from Figures 2 and 3, the dispersed firm value exceeds the concentrated one for both $c = 0.2$ and $c = 0.4$, when $A = 0$.

maturity profile, when $A$ increases and crosses $A^*$. We define

$$\Delta V(A) = \begin{cases} \bar{V}_D(A) - \bar{V}_C(A) & \text{if } A < \bar{A}_D = \frac{1}{2} - c, \\ V_D(1,A) - \bar{V}_C(A) & \text{if } \frac{1}{2} - c = \bar{A}_D \leq A < \bar{A}_C = 1 - c, \\ V_D(1,A) - V_C(1,A) & \text{if } A \geq \bar{A}_C = 1 - c \end{cases} \tag{19}$$

$$= \begin{cases} 2(1-c)\sqrt{2A+c^2} - \left(1 - \frac{c}{2}\right)\sqrt{4A+c^2} + \frac{1}{2}c\,(2-3c) - A - k & \text{if } A < \bar{A}_D, \\ A - \left(1 - \frac{c}{2}\right)\sqrt{4A+c^2} - \frac{c}{2}\,(2-c) + 1 - k & \text{if } \bar{A}_D \leq A < \bar{A}_C, \\ -k & \text{if } A \geq \bar{A}_C, \end{cases}$$

as the additional firm value of firm $D$ relative to firm $C$. Obviously, $V_C(1,A) > V_D(1,A)$. If both firms can invest at the level of 1, which is the case for $A > \bar{A}_C = 1 - c$ according to (14), then firm $C$ is more valuable, as it faces lower issuance costs. The interesting cases are therefore those in (19), when at least one of the firms invests at a constrained level ($A < \bar{A}_C$). For those cases, we check for which level of asset value $A$ we have $\Delta V = 0$ (see Appendix A.1). Thus, we derive the critical level of asset value $A^*$ above which firm $C$ is more valuable. The firm optimally chooses a dispersed profile for low $A < A^*$, and then, for $A > A^*$, switches to the concentrated profile. This leads to the following empirical implication.

**Implication 1.** *Debt maturity concentration increases with the value of assets in place.*

In the following empirical analysis, we test this implication.

[Place Figure 3 here]

There is a critical level of $c = \hat{c}(k)$ as derived in Appendix A.2, for which the intersection of firm $C$ and $D$'s values happens at $\bar{A}_D$. That is, for higher cash flows $c > \hat{c}(k)$, firm $D$ becomes unconstrained before the switch from $D$ to $C$. For lower cash flows $c \leq \hat{c}(k)$, the switch from $D$ to $C$ happens while both types still invest at a level below 1. Consequently, when comparing the values of firm $C$ and $D$ around the intersection point $A^*$, we have to distinguish two cases. First, for $c \leq \hat{c}(k)$, we compare firms $C$ and $D$ when both still invest at a level below 1. Second, for $c > \hat{c}(k)$, we compare the unconstrained value of firm $D$ (investing $I^* = 1$) with the value of firm $C$ investing at a level below 1.

Figure 3 illustrates the firm values and choices between a dispersed maturity profile and a concentrated maturity profile, as a function of the firm's asset value $A$. The cash flow levels are chosen such that $c \leq \hat{c}(k)$ in Panel 3a, meaning that both firms $C$ and $D$ still invest at a constrained level at the asset value $A^*$ where the switch happens. In contrast, $c > \hat{c}(k)$ in Panel 3b, meaning that firm $D$ already invests at the unconstrained level of 1 when the switch happens, while firm $C$ still invests at a constrained level. Moreover, we illustrate the optimal investment levels $J^2$ in Panels 3c and 3d. Investment increases in the firm's asset value $A$ until reaching the first-best investment level of 1. For higher asset value, the firm's investment remains constant at the first-best level. As stated before, this is apparent from (7). The investment increasing in the firm's asset value is in line with the previous findings in the literature (Holmström & Tirole 1998, Kiyotaki & Moore 1997, Chaney et al. 2012).

## 4.3 Effect of intertemporal distribution of project cash flows

The comparison of Panels 3a and 3b further illustrates how asset-based lending and cash flow-based lending substitute each other. In Panel 3b, cash flows become more front-loaded (higher $c$) and the firm thus can borrow against cash flows to a larger degree. In turn, switching to a concentrated maturity profile is optimal for lower asset value. This leads to the following empirical implication.

**Implication 2.** *The effect of the value of assets in place on debt maturity concentration is more pronounced for firms with more front-loaded cash flows, i.e., those that can rely more on cash flow-based lending rather than asset-based lending.*

In our empirical tests (see Section 7.4), we find support for this implication, as we see that the effect of real estate values on debt maturity concentration shows larger magnitude and higher significance levels for unsecured than for secured debt.

We can also directly look at the effect of varying the intertemporal distribution of project cash flows for fixed asset value, see Figure 4. For sufficiently low asset value, we have an intermediate region of $c$ for which firm $D$ has the higher value. This is true both for the case of no assets in place analyzed above (in Panel 4a, we replicate Panel 2b), and for low positive asset value (Panel 4b). The qualitative difference between Panels 4b and 4c is whether the point at which firm $D$ starts investing $I^* = 1$ is within (Panel 4b) or outside (Panel 4c) the region of cash flows for which firm $D$ has the higher value. In contrast, if the value of assets in place is sufficiently high, then firm $C$ has higher value than firm $D$ for all cash flow levels, as Panel 4d shows.

[Place Figure 4 here]

### 4.4 Effect of issuance costs

The effect of issuance costs $k$ is rather straightforward. The intuition is very similar to what we discussed for $A = 0$ in Section 4.1. For $k = 0$, it is advantageous to be a dispersed firm, unless either firm invests $I^* = 1$ and their values coincide. Then, the advantage of dispersion decreases linearly in issuance costs $k$, which leads to concentration being strictly preferable for sufficiently high issuance costs. For intermediate issuance costs, there is an area of low asset value $A$ and intermediate cash flows $c$ for which dispersion is preferable. Figure 5 illustrates the relation. The higher the issuance costs, the lower the critical $A$ needs to be (for given $c$) such that the firm optimally wants to switch from dispersed to a concentrated maturity profile. This leads to the following empirical implication.

**Implication 3.** *The effect of the value of assets in place on debt maturity concentration is more pronounced for firms with higher issuance costs.*

In our empirical tests (see Section 7.3), we find support for this implication, as we see that corporate bonds (facing higher issuance costs) are more sensitive to changes in real estate values than bank debt (facing lower issuance costs).

[Place Figure 5 here]

## 5 Analysis with growth options

In this section, we analyze the case with growth options ($H > cf > 0$). Here, we first shed light on the firm's trade-off between higher initial investment and the ability to withstand a market freeze due to lower debt levels. Figure 6 shows how firm values and investment levels of concentrated and dispersed firm change for a different payoff of growth options $H$, while we keep the investment $cf$ in the growth options fixed. Regarding investment levels, is is apparent for both the concentrated and dispersed firm that firms can choose a higher initial investment when they accept forgoing a growth option in the event of a future market freeze. Comparing firm values, we see that the optimal choice is still in most cases to invest less initially, as securing two growth options leads to higher firm value in those cases than investing more. Zooming into the low $A$ region, we see that for the very lowest $A$ it is beneficial to invest more initially, whereas the dispersed firm then optimally switches towards a strategy of investing less initially and securing the availability of both growth options. Also, for higher $A$ the well-known switch from dispersed to concentrated debt structure happens. Which switch happens first is dependent on the exact parametrization and not further analyzed here.

[Place Figures 6 and 7 here]

In Figure 7, we focus on the firm's optimal policy regarding the choice between higher initial investment and securing the availability of both growth options. Here, we highlight the finding that the higher the firm's value of growth options (measured by $H$), the higher is the critical asset value that makes the firm switch from dispersed to concentrated debt structure. It is apparent from comparing the two cases in Panels a and b, but we also show the relation between the critical $A$ and H explicitly in Panel c. This leads to the following empirical implication.

**Implication 4.** *The effect of the value of assets in place on debt maturity concentration is more pronounced for firms with less growth options.*

We test this implication empirically in Section 7.7 and find support for it.

# 6 Data and empirical methodology

To examine the effect of financial flexibility on debt maturity concentration, we use data on U.S. listed firms for the period 1993-2022. Accounting data is obtained from Compustat and debt structure data comes from S&P Capital IQ. We merge the accounting and debt structure data with real estate prices at the state and metropolitan statistical area (MSA) level using headquarter location of firms. We obtain residential real estate indices at the MSA level from the Federal Housing Finance Agency (FHFA). To tackle the endogeneity concerns, we use the local housing supply elasticities provided by Saiz (2010). As standard in the corporate finance literature, we exclude firms belonging to the finance, insurance, real estate, construction, and mining industries. To test whether shocks to firms' financial flexibility affect their debt maturity concentration according to our Implication 1, we estimate the following model:

$$\text{MatConc}_{it}^{l} = \beta_1 \times \text{FinFlex}_{it}^{l} + \beta_2 \times P_t^l + \text{Controls}_{it} + \alpha_i + \delta_t + \varepsilon_{it}, \tag{20}$$

where $i$ denotes a firm, $l$ represents the location (state or MSA), $t$ represents the year. $\text{MatConc}_{it}^{l}$ is the debt maturity concentration as defined later in this section. $\text{FinFlex}_{it}^{l}$ is the financial flexibility measured as the market value of firms' real estate assets scaled by lagged property, plant, and equipment (PPE)[9]. We control for firm fixed effects, $\alpha_i$, and time fixed effects, $\delta_t$. Finally, we include a set of firm level control variables, $\text{Controls}_{it}$, which includes (i) $RETA$, defined as the ratio of retained earnings to the book value of assets; (ii) *Leverage*,

[9] We follow the literature on the collateral channel (e.g., see Chaney et al. 2012, Cvijanović 2014, Kumar & Vergara-Alert 2020) to construct the measure of market value of firms' real estate assets.

defined as the sum of short- and long-term debt normalized by the book value of assets; (iii) *AGR* - asset growth ratio - defined as the difference in the current and lagged book values of assets divided by the lagged book value of assets; (iv) *Size*, defined as the log of book value of total assets; (v) *Market to Book*, defined as the ratio of the market value of equity plus the book value of assets minus the book value of equity, all divided by the book value of assets; (vi) *SGR* - sales growth ratio - defined as the ratio of the difference in the current and lagged values of sales divided by the lagged value of sales; (vii) *RoA* - return on assets - defined as the operating income before depreciation minus depreciation and amortization, all divided by the book value of assets; (viii) *Log Cash*, defined as the natural logarithm of cash and short-term securities; and (ix) *Age*, defined as the number of years since the firm first appeared in the Compustat database. Errors, $\varepsilon_{it}$, are clustered at the firm level.

We obtain data on corporate debt structures from Standard & Poor's Capital IQ database. Using Capital IQ allows us to distinguish between various types of debt, including term loans (TL), credit lines (DC), commercial paper (CP), medium-term notes (MTNs), senior secured bonds and notes (SBN), and subordinated bonds and notes (SUB). To ensure data quality, we exclude debt issues with missing or negative values for principal amounts or time to maturity. We categorize each debt issue into one of three groups. (i) Bank Debt: includes term loans, bank overdrafts, revolving credit facilities, and lines of credit. (ii) Bonds: includes public debt issues and notes. (iii) Other Debt: consists of program debt, private placements, mortgage or equipment debt, convertible debt, capitalized leases, and other borrowings.

We employ three alternative measures of debt maturity concentration, inspired by Choi et al. (2018), to examine the impact of financial flexibility on this important dimension of corporate debt. The first measure involves deriving the Herfindahl index from a firm's maturity structure, by calculating the concentration of debt maturities across different time buckets. For a given firm $i$, we define a maturity bucket $m$ by aggregating the debt maturities of firm $i$ into the nearest integer time bucket. Denote $P_m$ as the principal debt amounts of firm $i$ maturing in each maturity bucket $m$. We define the proportion of principal amounts maturing in each bucket as $w_m = P_m / \Sigma_m P_m$. The Herfindahl index on debt maturity of firm $i$ is then expressed as

$$HERF_i = \Sigma w_m^2 \tag{21}$$

$HERF_i$ reflects the concentration of maturity structure within firm $i$. If firm $i$ has a perfectly concentrated debt structure with only one debt issue outstanding, $HERF_i = 1$. Conversely, if firm $i$ increases its debt issuance to include an infinite number of maturity buckets, then $HERF_i$ would approach zero.

One limitation of the *HERF* measure is its inability to distinguish between the effects of short-term and long-term debt on maturity concentration. In practice, maturity concentrations in short-term debt present greater challenges compared to those in long-term debt, as firms have less time to manage risks associated with short-term obligations. Specifically, Xu (2018) finds that firms may first issue intermediate-term bonds and refinance them early to synthesize a long-term bond. Thus, firms still can manage maturity towers in the intermediate and long term, before those concentrations would actually have to be rolled over at the same time. Choi et al. (2018) therefore introduce a weighted Herfindahl measure that gives more weight to short maturities. The focus of our paper is different: Choi et al. (2018) investigate whether firms choose more *dispersed* maturities, and in particular at the long end, in response to a *negative* shock. In contrast, we ask how firms actively choose a higher level of debt maturity *concentration* due to increased real estate value (a *positive* shock). In line with the argument of concentration at the short end being more challenging for the firm going forward, we expect that firms will actively increase concentration in particular at the long end. To test this hypothesis, we adopt a time-weighted variant of the Herfindahl index, which assigns higher index values to firms with maturity towers in the long term.[10] To achieve this, the weighted Herfindahl index prioritizes longer maturities by introducing an additional weighting factor $x_m$ as follows:

$$x_m = \begin{cases} m/\sum_m m & \text{if } m > 1 \\ 0 & \text{otherwise} \end{cases}$$

The weighted Herfindahl measure is thus defined as

$$WHERF_i = \sum (x_m * w_m)^2 \tag{22}$$

The third measure of maturity concentration used in this paper accounts for the impact of a firm's maximum debt maturity on its dispersion decision. This measure quantifies the gap between a firm's current maturity structure and its perfectly dispersed counterpart. It is defined as the average of the squared differences between the observed proportion of principal amounts in each bucket of firm *i* and that of a perfectly dispersed maturity firm. To establish a perfectly dispersed maturity counterpart of firm *i*, we first identify the maximum debt maturity of the currently outstanding debt of firm *i* (at the issuance) , $t_i^{max}$, and then assume the proportion of principle amount in each maturity bucket to be $w_m^{perfectly-dispersed} = 1/t_i^{max}$.

The squared distance between the observed maturity of firm *i* and the perfectly dispersed

[10]We have also replicated the weighted Herfindahl measure from Choi et al. (2018), and our results are robust.

maturity profile is expressed as

$$Distance_i = (1/t_i^{max}) * \sum_{i=1}^{t_i^{max}} (w_{mi} - w_m^{perfectly-dispersed})^2$$

Our third maturity concentration measure in this analysis is then defined as follows

$$DIST_i = log(Distance_i) \tag{23}$$

Table 1 presents the summary statistics for our sample. For the average firm in the entire sample, the Herfindahl index of debt maturity proportions is 0.59, while the time-weighted Herfindahl index of debt maturity proportions is 0.26. For the median firm in the entire sample, the market value of real estate represents about 40% of the book value of Property, Plant, and Equipment, which suggests that real estate holdings are a significant fraction of a firm's tangible assets. The median market-to-book ratio in our sample is 1.49.

[Place Table 1 here]

When estimating the maturity dispersion regression as in (20), a source of endogeneity could be the presence of an omitted variable that affects real estate prices and the debt maturity dispersion of firms at the same time, such as an unobserved local economic shock. To address this endogeneity concern, we follow the literature (e.g., see (Himmelberg et al. (2005) and Mian & Sufi (2011)) and instrument real estate prices using the interaction of local housing supply elasticities at the MSA level and the nationwide real interest rate at which banks refinance their home loans. Specifically, we estimate the following first-stage regression:

$$P_t^l = \alpha^l + \delta_t + \gamma \times \text{ELASTICITY}^l \times \text{IR}_t + u_t^l, \tag{24}$$

$\alpha^l$ is a location (MSA) fixed effect and $\delta_t$ is the time fixed effect. ELASTICITY$^l$ is the housing supply elasticity for location $l$ and IR is the interest rate. Table III.1 in the Internet Appendix presents results from the first-stage regression. These results show that our instrument is a strong one.[11]

[11] As shown in the Internet Appendix Table III.1, Column [3], we find that due to the demand channel, a decrease in mortgage rate increases real estate prices strongly in land supply inelastic areas. But as we allow the land supply elasticity to increase, the effect of interest rate on real estate prices diminishes as a decrease in mortgage rate in such areas will result into more construction and hence minimal or no effect on real estate prices. One may argue that the orthogonality condition of supply of elasticity is unlikely to be satisfied because land availability and land-use regulations are likely to be correlated with local demand for real estate assets and, therefore, the instrument may not isolate the supply effects of real estate assets (see Davidoff 2016). As suggested by Davidoff (2016), we address this concern by controlling for the interaction of the supply constraint and year dummies.

We also address the endogeneity concern that the decision to own real estate assets could be correlated with the firms' debt maturity concentration. To tackle this issue, first we identify characteristics that may influence firms decisions to own versus lease real estate assets. Such characteristics are: firm size, age, RoA, industry to which firm belongs, and firm location (state). We measure these characteristics at the beginning of our sample period (1993) and name them as initial controls. Next, we interact these initial controls with real estate prices and use these interactions as additional controls in both our OLS and IV specifications. If these initial controls have potential to influence firms' decision to own real estate assets and if these initial controls also make firms more sensitive to movement in real estate prices, then controlling for their interactions allows us to separately identify the channel we are interested in.

According to our theoretical model, an increase in the value of assets in place allows for more investment. We therefore ensure that the empirical findings on the investment collateral channel established by Chaney et al. (2012) also hold for our sample. Table III.2 in the Internet Appendix shows that this is indeed the case. The coefficient of *RE value* on Investment is positive and significant.

# 7 Empirical analysis

In this section, we analyze how firms manage their maturity profiles in response to changes in financial flexibility. We empirically examine the model's prediction that firms respond to an increase in the value of real estate assets by concentrating their debt maturity structure.

## 7.1 Baseline results

Table 2 presents the regression results of different specifications of the baseline Equation (20), using the Herfindahl index (HERF) as a measure of debt maturity concentration. The Herfindahl index in this table is calculated using all debt instruments within a firm. Columns 1-3 use state-level residential price indices (*RE value* (state prices)), and columns 4-6 use MSA-level residential price indices (*RE value* (MSA prices)), to calculate the market value of real estate assets. Corporate debt structure varies over time (Colla et al. 2013, Xu 2018) and may also be influenced by unobservable firm characteristics, thus we control for both time fixed effects and firm fixed effects in all our regression specifications. The coefficients of *RE value* in all specifications of Table 2 are positive and significant, implying that an increase in firms' financial flexibility, driven by an appreciation in real estate value, leads to an increase in debt maturity concentration.

[Place Table 2 here]

The OLS regression results in column 1 indicate that the HERF concentration index increases by 0.034 for a one-unit increase in *RE value*, which is statistically significant at the 1% level. This change is also economically significant: for a one standard deviation increase in *RE value*, HERF increases by 16.6% of its standard deviation. In column 2, we include initial controls interacted with real estate prices to account for observed heterogeneity in the ownership decisions. Column 3 controls for the set of firm characteristics typically used in the literature. Column 4 replicates Column 3 but uses MSA-level residential indices to compute real estate value. We apply the IV strategy in Columns 5 and 6, where real estate prices are instrumented using the interaction between interest rates and local constraints on land supply. Column 6 further includes the interaction between supply constraints and year dummies to address concerns that our instrumental variable might be correlated with local demand for real estate assets, thus potentially failing to isolate the supply effects of these assets. By including the interaction between supply constraints and year, we ensure that our findings are not influenced by the time passage.

## 7.2 Alternative debt concentration measures

Second, we examine the impact of a shock to firms' real estate value using the maturity-weighted concentration measure, WHERF. This measure places more weight on longer debt maturities, enabling us to check whether the increase of concentration following higher real estate value value is particularly pronounced at the long end of firm's maturity structure. Table 3 provides the result of this test. The regression specifications in this table are the same as those in Table 2, except for the dependent variable. Columns 1-3 use state-level residential price indices, and columns 4-6 use MSA-level residential price indices to compute the market value of real estate assets. The coefficients of *RE value* are also positive and significant at the 1% confidence level across all specifications in Table 3. The magnitudes of the effect are very similar between Tables 2 and 3, with those for WHERF being slightly lower than those for HERF when using state-level residential price indices, while they are slightly higher when using MSA-level residential price indices. These results imply that firms increase not only concentration in general, but also their maturity-weighted concentration, following a shock to their real estate value.

[Place Table 3 here]

Our third proxy for maturity concentration is the distance between the observed maturity profile of a firm and its perfectly-dispersed maturity version, DIST. A perfectly dispersed firm allocates a constant fraction of its total debt to mature in each maturity bucket. This fraction is equal to the inverse of its maximum debt maturity at issuance. Table 4 reports the effect of a shock to real estate values on the DIST measure. The regression specifications are the same as in Table 3, except for the dependent variable. Consistent with the previous results, we find that the coefficients for *RE value* are also positive and highly significant across all specifications in Table 4. This means that also when we measure concentration as the distance to a perfectly-dispersed maturity profile, an increase in real estate value enables firms to increase concentration in terms of deviating more from the perfectly-dispersed profile.

[Place Table 4 here]

Overall, the results from using alternative debt concentration measures further confirm that an increase in financial flexibility, induced by a positive shock to real estate prices, leads to a greater concentration of debt maturity profiles.

## 7.3 Different types of debt instruments

In the subsequent set of analyses, we delve into how firms respond to changes in real estate value, focusing on different types of debt instruments. We construct concentration measures for distinct categories of corporate debt using data from the CAPITAL IQ database. Specifically, we categorize corporate debt into the following three groups: Corporate Bonds, Bank Debt, and Other Debt (including program debt, mortgage, private placements, convertible debt, etc). Tables 5, 6, and 7 present the results of this analysis for bonds, bank loans, and other debt, respectively.

[Place Tables 5, 6, and 7 here]

The results of Table 5 show that the coefficients of *RE value* are all significantly positive at the 1% confidence level for the bond-based concentration measures. Public debt such as corporate bonds typically incurs substantial issuance costs compared to private debt such as bank loans (Krishnaswami et al. 1999). Additionally, corporate bonds are subject to larger rollover frictions due to their dispersed ownership structure and market illiquidity (Choi et al. 2021). The results in Table 5 suggest that an improvement in firms' financial flexibility decreases concerns related to rollover risk. Consequently, firms choose to increase their corporate bond maturity concentration following a positive shock to real estate values.

Our empirical results support Implication 3 from our theoretical model, namely, that the effect of shocks to real estate values on debt maturity concentration is more pronounced for firms with higher issuance costs such as those relying mostly on corporate bonds, and less so for those financed primarily by bank debt, and thus facing lower issuance costs.

Indeed, in contrast with the bond market's result in Table 5, we do not find any significant effect of shocks to real estate values for bank debt, as reported by different concentration measures in Table 6. The absence of a significant effect on the loan market may be due to the fact that bank loans are generally issued in smaller amounts and incur lower issuance costs (Choi et al. 2021). Moreover, the close relationship between firms and banks allows for more frequent loan renegotiation (Roberts & Sufi 2009). This reduces the relevance of the rollover risk for loans compared to bonds, as firms can more easily adjust loan terms or secure additional financing through bank relationships. As a result, firms face fewer challenges when issuing new loans or renegotiating existing ones, which may explain why they do not adjust the maturity concentration of their bank loans in response to a shock to real estate values.

Furthermore, we find the impact of *RE value* to be significant (at lower levels) for the other debt types across all concentration measures, as indicated in Table 7.

## 7.4 Secured vs. unsecured debt

Campello et al. (2022) show that the increase in firms' borrowing following a rise in real estate values is driven by unsecured debt. Therefore, we split our sample and investigate maturity concentration separately for secured and unsecured debt. Table 8 shows these results.

Indeed, we find that maturity concentration is particularly pronounced for the unsecured part of firms' debt. When looking at all debt instruments (Panel A), the coefficient estimates on *RE value* show larger magnitude and higher significance levels for unsecured than for secured debt. Next, we focus on corporate bonds (Panel B), which we have shown in Section 7.3 to be the debt type that is most relevant for debt concentration. Here, we find even stronger evidence for the importance of unsecured instruments. For unsecured bonds, the coefficient estimates on *RE value* show both much larger magnitude (factor 2 or more) and much higher statistical significance than those for secured bonds.

Summarizing, we thus complement Campello et al. (2022) by showing that firms do not only rely more on unsecured than secured debt, when an increase in real estate value allows them to borrow more. Firms also make more use of their higher ability to concentrate debt maturities particularly in the unsecured part of their debt.

Our empirical results support Implication 2 from our theoretical model, namely, that the effect of shocks to real estate values on debt maturity concentration is more pronounced for firms with more front-loaded cash flows, i.e., those that can rely more on cash flow-based lending (unsecured debt) rather than asset-based lending (secured debt).

[Place Table 8 here]

We also show the results for bank debt and the other debt types in Panel C and Panel D of Table 8, respectively. Our previous findings were that the effects of shocks to real estate values on bank debt are small and insignificant. In line with this, we find that when distinguishing between secured and unsecured bank debt, there are no measurable effects in the two subsets either.

## 7.5 Debt concentration across maturities

As we discussed when introducing the weighted Herfindahl measure, firms should generally be more concerned about concentration in the short end than in the long end, as long-term debt still allows refinancing before it matures (Xu 2018). Therefore, we expect that when firms can choose more concentration to save on issuance costs, this would happen to a larger degree in the long end than in the short end. To test this hypothesis, we split our sample in debt maturing within four years and in five or more years. Table 9 shows the results. We find that maturity concentration is particularly pronounced within the longer maturities. When looking at all debt instruments (Panel A), the coefficient estimates on *RE value* show larger magnitude and higher significance for debt maturing in five or more years than for debt maturing within four years. In particular, the weighted Herfindahl measure shows that concentration is particularly pronounced towards the long maturities.

As we did in Section 7.4, we also investigate the subsample of corporate bonds (Panel B), which we have shown in Section 7.3 to be the debt type that is most relevant for debt concentration. Again, the difference between the long end and the short end becomes even more pronounced. Now, both of the Herfindahl coefficient estimates on *RE value* are insignificant at the short end, whereas they are still highly significant and of larger magnitude at the long end. We also report again the results for the two remaining debt types, bank debt and other debt, in Panels C and D of Table 9. In line with our previous findings, the effects of shocks to real estate values on bank debt and other debt are small and mostly insignificant.

Summarizing, we show that firms increase their concentration of debt maturity (in general, and especially of bond maturity) particularly in the long end, which suggests that they – despite the larger flexibility brought by increase in real estate value – still are more concerned about maturity towers in short term debt.

[Place Table 9 here]

## 7.6 New debt issues

We next investigate how an increase in financial flexibility influences newly issued debt. Now, in Panel A of Table 10, the dependent variables are the average size of newly issued debt scaled by lagged PPE, the natural logarithm of the number of new issues, and the total size of newly issued debt.

[Place Table 10 here]

The coefficient of *RE value* in Column 1 is 0.110, which is statistically significant at the 1% level, suggesting that a $1 increase in the value of real estate assets leads to an average increase of $0.11 in new debt issuance. The regression estimate in Column 2 indicates that a one-unit increase in *RE value* results into 6.3% decrease in the number of new debt issues. In Column 3, the coefficients estimate of *RE value* is positive and significant at the 1% level, suggesting that the total size of newly issued debt increases by $0.34 for a $1 increase in the value of real estate assets. Overall, the results in Table 10 align with the predictions of our theoretical model, which posits that as real estate values appreciate, firms trade off lower issuance costs against higher rollover risk. Consequently, we observe that firms issue fewer, but larger, debt tranches in response to an increase in (real estate value, thereby optimizing issuance costs.

In Panel B of Table 10, we dive deeper into the maturity concentration within the new debt issues. Here, we show that also when we only consider concentration within the new debt issues rather than the firm's overall debt profile, there is evidence for more concentration following an increase in real estate value.

## 7.7 Growth options

To investigate how investment opportunities or growth options influence the effect of shocks to real estate values on debt maturity concentration, we divide the sample into deciles of Tobin's Q. As Table 11 shows, the effect of real estate (RE) value is highly significant and shows larger coefficients for firms with low Tobin's Q (fewer investment opportunities). In contrast, firms with high Tobin's Q (more investment opportunities) show insignificant and small or even negative coefficients of RE value. This holds similarly for all three measures of debt maturity concentration, i.e., the HERF concentration index, maturity-weighted concentration measure, WHERF, and the distance from the perfect maturity dispersion (DIST).

[Place Table 11 here]

In our theoretical model, a low Tobin's Q can be identified with a low value of the parameter $H$, namely the payoff of a firm's growth options. We discuss those theoretical results in Section 5. The consequent Implication 4 that we state in that section, namely, that the effect of changes in asset value on debt maturity concentration is more pronounced for firms with less growth options, thus finds strong empirical support in the data.

## 7.8 Financial fragility

Next, we investigate the effects of shocks to real estate prices on firms' financial fragility, differentiating normal versus crisis times as well as different levels of pre-crisis maturity concentration.

Financial fragility is measured as a Merton (1974) style distance to default (*DD*), with an empirical approximation similar to Bharath & Shumway (2008). Asset value is approximated as the sum of the market value of equity and the book value of total debt, while asset volatility is proxied by the volatility of equity returns. The default threshold is defined as the book value of total debt. We choose *DD* measured at $t+1$ as the dependent variable for the following analysis. Hereby, we can evaluate how real estate shocks affect the firm's financial fragility (measured as distance to default in the following period) differently in normal versus crisis times. To identify the latter, we define a crisis stress dummy, which is an indicator variable that takes value 1 for the years 2008 and 2009, and 0 otherwise. We present the results in Table 12.

[Place Table 12 here]

The first two columns show the general relation between real estate shocks, crisis times, and firms' distance to default, without taking into account the effect of debt maturity concentration. In the first column, we show results for the full sample, i.e., without requiring that firms have information on debt maturity concentration available. For the second column, we only consider those firms that have such information available, thus constraining the sample similar to our preceding analysis. The results are consistent across the two columns. First, a positive shock to real estate value is associated with the firm achieving a higher distance to default, i.e., it becomes safer from the creditors' point of view. Further, the interaction with the crisis stress dummy is negative, with the total effect still being positive. That is, the positive effect of real estate value is mitigated in crisis times. For example, for the full sample, a positive shock to real estate value increases *DD* by 0.331. In the crisis years 2008 and 2009, the effect is diminished to $0.331-0.161=0.170$.

Our next step in the analysis is inspired by Almeida et al. (2012), who use an experiment-like design, employing firms' ex-ante variation in the proportion of long-term debt maturing right after August 2007. The reasoning is that firms could not foresee the financial crisis hitting when they chose their debt structures, so they experience an exogenous difference in refinancing problems during the crisis. We argue that firms' pre-crisis maturity concentration can be expected to have similar effects. Firms that were entering the financial crisis with a highly concentrated debt structure in 2007 are expected to be in relatively more trouble in the crisis years 2008-09. Consequently, we define "high (low) pre-crisis maturity concentration sample" as those firms that have above (below) median maturity concentration in the pre-crisis year (2007). As before, we report the results for all our three measures of debt maturity concentration, i.e., the Herfindahl index of debt maturity proportions (HERF), time-weighted Herfindahl index of debt maturity proportions (WHERF), and the logarithm of the squared distance from the perfect maturity dispersion (DIST).

The results are strikingly different for the two subsamples. For the high pre-crisis maturity concentration sample, we find limited evidence of the direct effect of shocks to real estate values, with only WHERF showing marginal significance. However, we observe a strong and significant negative effect in crisis years across all three alternative measures. This means that firms with high pre-crisis maturity concentration benefit less from real estate shocks in normal times, and especially important, suffer more from shocks to asset value shocks in crisis times (showing more financial fragility in terms of less distance to default). For the low pre-crisis maturity concentration sample, the direct effect of shocks to real estate values is highly significant and of similar magnitude as for the full sample. However, the differential effect in crisis years shows less significance and magnitude. This means that the financial fragility of firms with low pre-crisis maturity concentration does not respond differently to real estate shocks in crisis times than in normal times.

Overall, our results underscore the need to consider both asset values and debt maturity structure when assessing firm risk and designing policies aimed at mitigating vulnerability during financial crises.

## 7.9 Financial constraints

In the final part of our analysis, we examine how debt maturity concentration responds to shocks to real estate values across firms with varying degrees of financial constraint. To analyze this, we divide the sample into relatively more financially constrained and less financially constrained firms based on key observable characteristics: firm size, cash holdings, total payout, leverage, and profitability. Table 13 summarizes the results for these cross-sectional tests, categorized into the five classification schemes. In Panel A, firms are grouped by total assets, with those in the lowest three deciles of total assets designated as relatively more constrained. Panel B uses cash holdings to identify constraints, where firms in the bottom three deciles of cash holdings are considered more constrained. Panel C classifies firms based on total payout, which includes dividends and share repurchases, assigning firms in the bottom three deciles of the payout distribution to the more constrained category. Panel D classifies firms based on leverage, assigning firms in the top three deciles of the leverage distribution to the more constrained category. Panel E classifies firms based on profitability, assigning firms in the bottom three deciles of the profitability distribution to the more constrained category.

[Place Table 13 here]

As shown in Table 13, the coefficient of real estate (RE) value is consistently larger for more constrained firms than for less constrained firms across almost all classification measures. This finding suggests that the impact of real estate value appreciation is more pronounced for firms with higher financial constraints, as they are more exposed to financial frictions. These results support the notion that financially constrained firms are particularly sensitive to shocks to real estate values, which influences their debt maturity structure in ways that may help alleviate financing barriers. The findings are in line with our theoretical model. There, constrained firms are those that do not have sufficient debt capacity to invest at the first-best level. Constrained firms' investment thus is sensitive to an increase in real estate values, and we show that the benefits of debt maturity dispersion matter for constrained firms, as the increased debt capacity helps them to invest more.

# 8 Conclusion

We investigate both theoretically and empirically the effect of changes in firms' financial flexibility on debt maturity concentration. Our theoretical model predicts that debt maturity concentration increases in the value of assets in place. The key trade-off consists of balancing higher issuance costs for a dispersed maturity profile and the investment benefits for the dispersed firm.

In the empirical analysis, we utilize variations in real estate prices as exogenous shocks to firms' debt capacity and, thus, to their financial flexibility. Our theoretical prediction finds robust support in the data, for different measures of the firm's real estate value (estimated based on residential real estate prices at the metropolitan statistical area (MSA) and state levels) and debt maturity concentration (the Herfindahl index, a maturity-weighted Herfindahl index, and a distance measure between a firm's current maturity profile and its perfectly dispersed counterpart).

We further examine the effect for different types of corporate debt and for different firm characteristics. Our findings reveal that real estate value increases lead to higher maturity concentration in corporate bonds, but have no significant effect on bank loans. Moreover, the effect is stronger for unsecured than secured debt, which is in line with more recent evidence that firms raise their unsecured borrowings following an increase in real estate prices, rather than secured debt (Campello et al. 2022, Benmelech et al. 2025).

We also find that financially constrained firms are more likely to increase their maturity concentration in response to their asset value appreciations. This effect is particularly pronounced among smaller firms, firms with less cash holdings, lower payout ratios, higher leverage, and lower profitability. Also the effect is observed for newly issued debt; firms issue fewer, but larger, debt tranches in response to increases in real estate values, thereby optimizing issuance costs.

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# Appendix A Solutions for thresholds

## A.1 Threshold $A^*$

The value functions $\bar{V}_C(A)$ and $\bar{V}_D(A)$ can be stated as

$$\bar{V}_C(A) = \begin{cases} \left(1-\frac{c}{2}\right)\sqrt{4A+c^2}+\frac{c}{2}(2-c)-k, & A<1-c \\ A+1-k, & A\geq 1-c \end{cases} \tag{25}$$

and

$$\bar{V}_D(A) = \begin{cases} A-\left(\sqrt{2A+c^2}+c\right)^2+2\left(\sqrt{2A+c^2}+c\right)-2k, & A<\frac{1}{2}-c \\ A+1-2k, & A\geq \frac{1}{2}-c \end{cases} \tag{26}$$

So, we have to distinguish three different regions for the intersection points: First, for $A<\frac{1}{2}-c$, both firms invest at the constrained level, and we solve

$$\left(1-\frac{c}{2}\right)\sqrt{4A+c^2}+\frac{c}{2}(2-c)-k = A-\left(\sqrt{2A+c^2}+c\right)^2+2\left(\sqrt{2A+c^2}+c\right)-2k$$

numerically for $A$. In the second region, for $\frac{1}{2}-c\leq A<1-c$, Firm $D$ invests unconstrained, while Firm $C$ still invests constrained. Then, we solve

$$\left(1-\frac{c}{2}\right)\sqrt{4A+c^2}+\frac{c}{2}(2-c)-k = A+1-2k,$$

which has the solution[12]

$$A^* = 1-c+k-(2-c)\sqrt{k}. \tag{27}$$

Finally, for the third region $A\geq 1-c$, both both firms invest at the unconstrained level. Here,

$$A+1-k > A+1-2k,$$

so the $C$ firm is better off for all $A$, if $k>0$.

Even though we revert to a numerical solution for the intersection point in the first region, we can describe some analytical properties of the solution. We first establish that both $\bar{V}_C(A)$

[12] The equation also has a second solution, which, however, lies in the region $A>1-c$, in which also Firm $C$ invests at the unconstrained level, and thus the left-hand side of the equation is not applicable, but rather we are in the third region described next.

and $\bar{V}_D(A)$ in (25) and (26) are strictly increasing in $A$. The respective derivatives are

$$\frac{d\bar{V}_C(A)}{dA} = \frac{2-c}{\sqrt{4A+c^2}} \quad \text{and} \quad \frac{d\bar{V}_D(A)}{dA} = \frac{2-2c-\sqrt{2A+c^2}}{\sqrt{2A+c^2}},$$

which are both strictly positive for $c < 1$, and when both firms invest at the constrained level, i.e., $A < \frac{1}{2} - c$. Obviously, also the two respective firm values for the unconstrained investment level of 1, namely, $A + 1 - k$ and $A + 1 - 2k$, are increasing in $A$. We have established that for sufficiently high $A \geq \bar{A}_C = 1 - c$, both types can invest at the unconstrained level. Here, $V_C(1,A) > V_D(1,A)$ for $k > 0$. Moreover, for $A = 0$, and assuming that $k < \hat{k}(c)$, we have $V_D(\bar{J}_D(0),0) > V_C(\bar{J}_C(0),0)$. This together implies there is one intersection with $V_C(\bar{J}_C(A),A) = V_D(\min\{1,\bar{J}_D(A)\},A)$ for some $A \in [0,\bar{A}_C]$. However, we have to be careful whether the intersection happens before or after firm $D$'s switch to the unconstrained investment level.

## A.2 Threshold $\hat{c}(k)$

We first ensure that $A^*$ is decreasing in $c$. Taking the derivative of (27) with respect to $c$ yields $\sqrt{k} - 1$, which indeed is negative for $k < \hat{k}(c) \leq \frac{1}{3}$, see Assumption 1. For $k = 0$, we have $A^* = \bar{A}_C = 1 - c$. For $k = \frac{3}{2} - \sqrt{2} \simeq 0.086$, we have $A^* = \bar{A}_D = \frac{1}{2} - c$ at $c = 0$. For higher $k$, given the flatter decrease of $A^*$ than $\bar{A}_D$ (which has slope $-1$), this implies exactly one intersection of the two lines within $0 < c < 1$. This critical level $\hat{c}(k)$, for which the intersection of firm $C$ and $D$'s values happens at $\bar{A}_D$, is thus obtained by equating the critical level of collateral above which firm $C$ is more valuable, given that $c > \hat{c}(k)$ (so, we use that firm $D$ is unconstrained and invests at the level of 1), which is given by (27), and the level of $\bar{A}_D = \frac{1}{2} - c$ at which firm $D$ indeed becomes unconstrained. It is

$$\hat{c}(k) = 2 - \sqrt{k} - \frac{1}{2\sqrt{k}}. \tag{28}$$

Figure II.1 in the Internet Appendix shows in Panel II.1a, how the $A^*$ line for $k = 0.15 > \frac{3}{2} - \sqrt{2}$ intersects $\bar{A}_D$ at a level of $c = 0.32$. in Panel II.1b, we show the critical cash flow level $\hat{c}(k)$ according to (28). For our parameter choice of $k = 0.15$, we see again the critical cash flow level is approximately $\hat{c}(k) = 0.32$ (left vertical line).

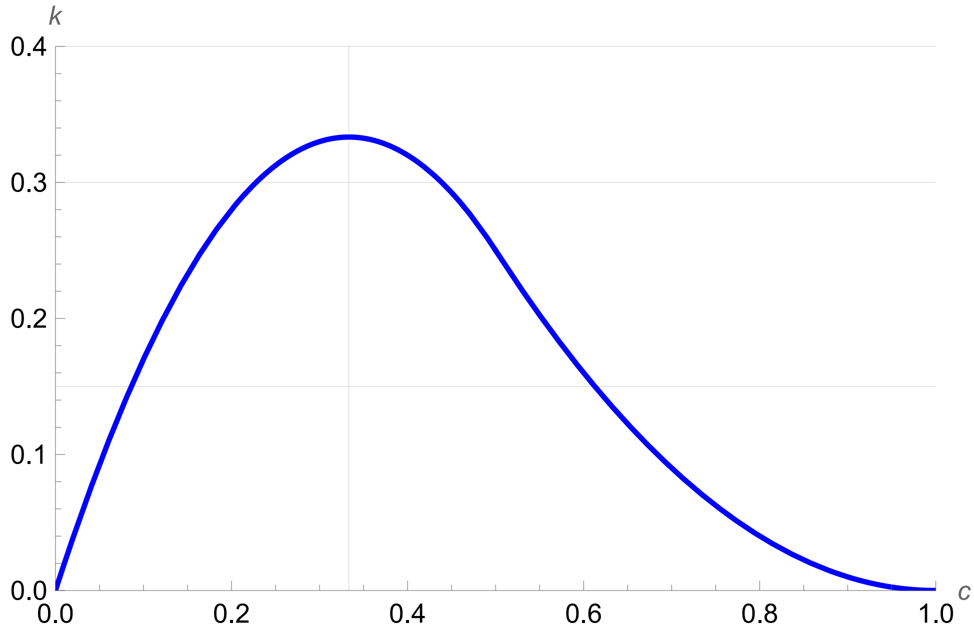
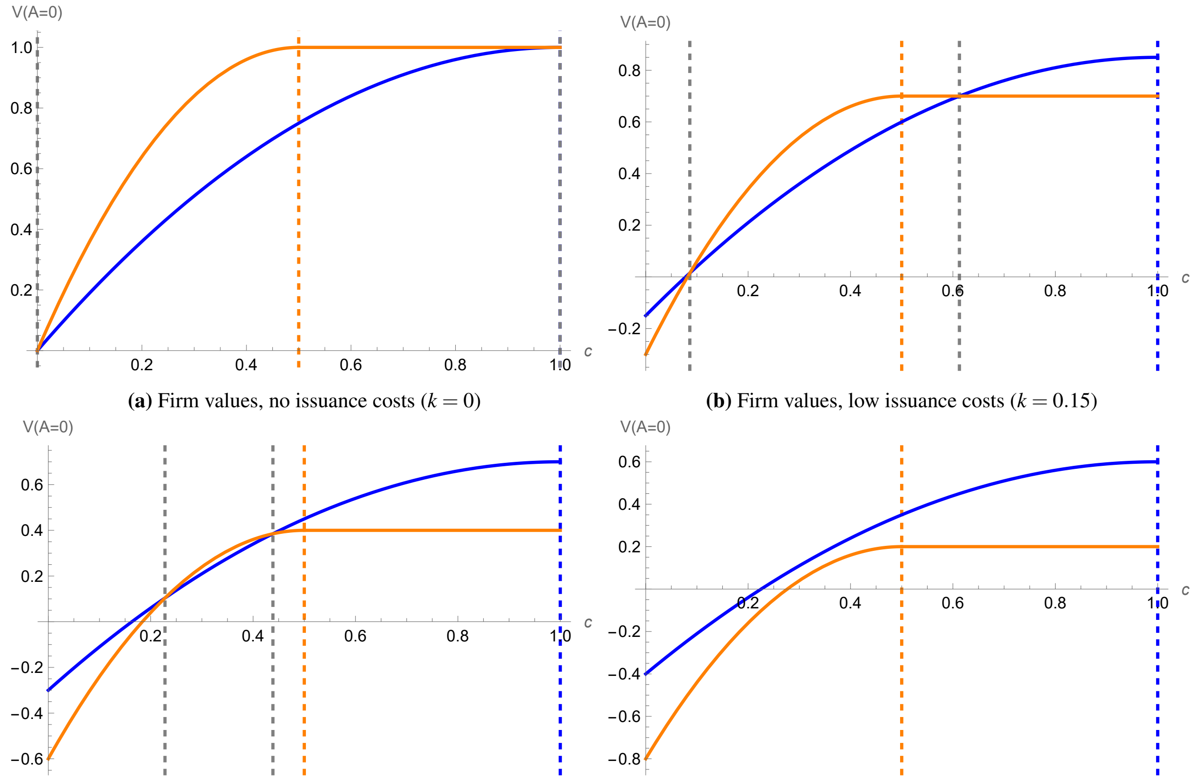



**Figure 1: Critical issuance cost level as function of cash flows $c$ for collateral value $A = 0$.** The illustration shows the critical issuance cost level $\hat{k}(c)$ according to (18). For sufficiently low issuance costs $k < \hat{k}(c)$, the dispersed firm's benefits of higher debt and investment capacity dominate, if there are no assets in place, $A = 0$. The vertical line indicates the cash flow level of $c = 1/3$ at which $\hat{k}(c)$ reaches its maximum. The horizontal lines indicate the specific values of $k$ chosen in Figure 2.



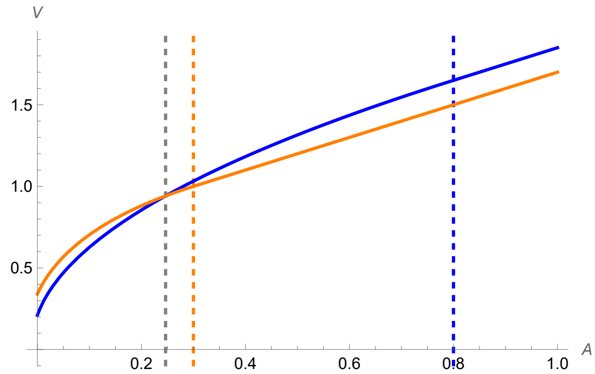

**(a)** Firm values, no issuance costs ($k = 0$)

**(b)** Firm values, low issuance costs ($k = 0.15$)

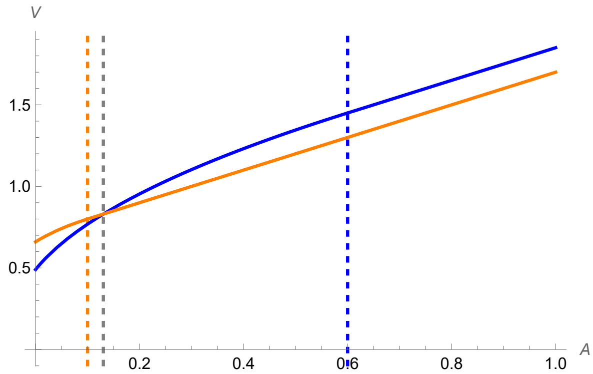
**(c)** Firm values, medium issuance costs ($k = 0.3$)

**(d)** Firm values, high issuance costs ($k = 0.4$)

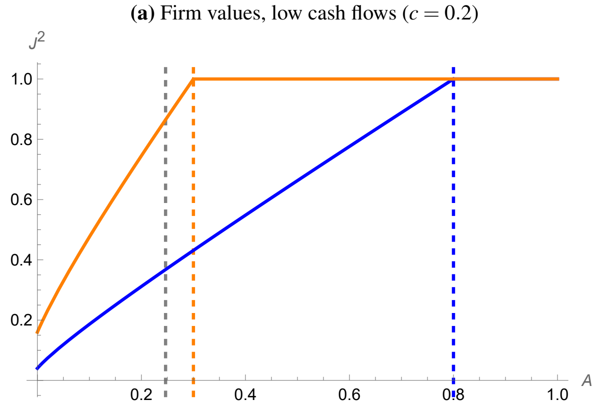
**Figure 2: Firm values of concentrated and dispersed firm as function of cash flows $c$ for different issuance costs $k$, given a collateral value $A = 0$.** The orange (blue) line indicates the value of firm $D$ ($C$). The dashed vertical lines indicate (in orange and blue for firm $D$ and $C$, respectively) the levels of $c = 1/2$ and $c = 1$, at which the firm starts investing $I^* = 1$ according to (14), as well as (in black) the points at which the firm optimally switches between $C$ and $D$.



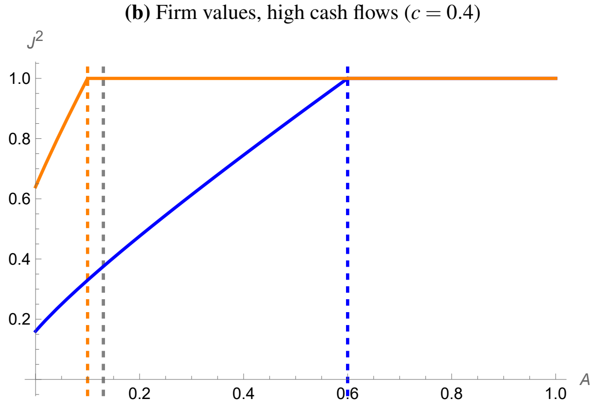

**(a)** Firm values, low cash flows ($c = 0.2$)




**(b)** Firm values, high cash flows ($c = 0.4$)

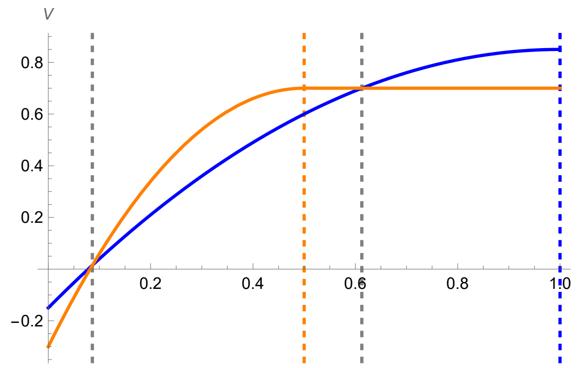



**(c)** Investment, low cash flows ($c = 0.2$)

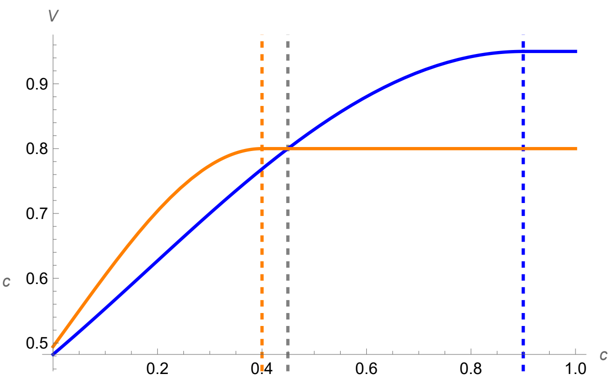



**(d)** Investment, high cash flows ($c = 0.4$)

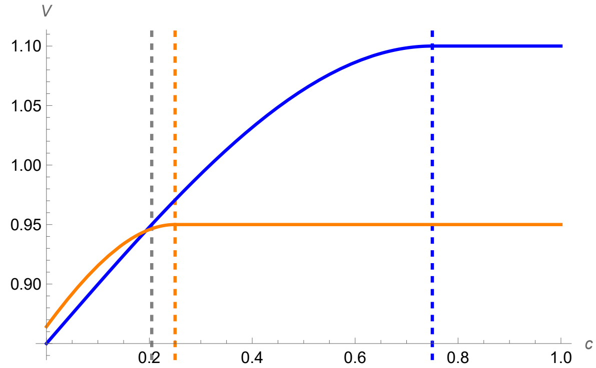
**Figure 3: Firm values and investment of concentrated and dispersed firm as function of collateral value $A$ for different cash flows $c$.** The illustration is based on the parameter value $k = 0.15$. The orange (blue) lines indicate the values (top panels) and investment levels (bottom panels) of firm $D$ ($C$). The dashed vertical lines indicate (in orange and blue for firm $D$ and $C$, respectively) the levels of $A$ at which the firm starts investing $I^* = 1$ according to (14), as well as (in black) the point at which the firm optimally switches from $D$ to $C$.



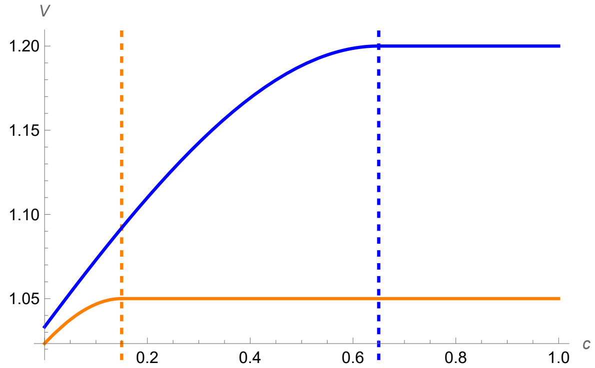

**(a)** No collateral value ($A = 0$)




**(b)** Low collateral value ($A = 0.1$)

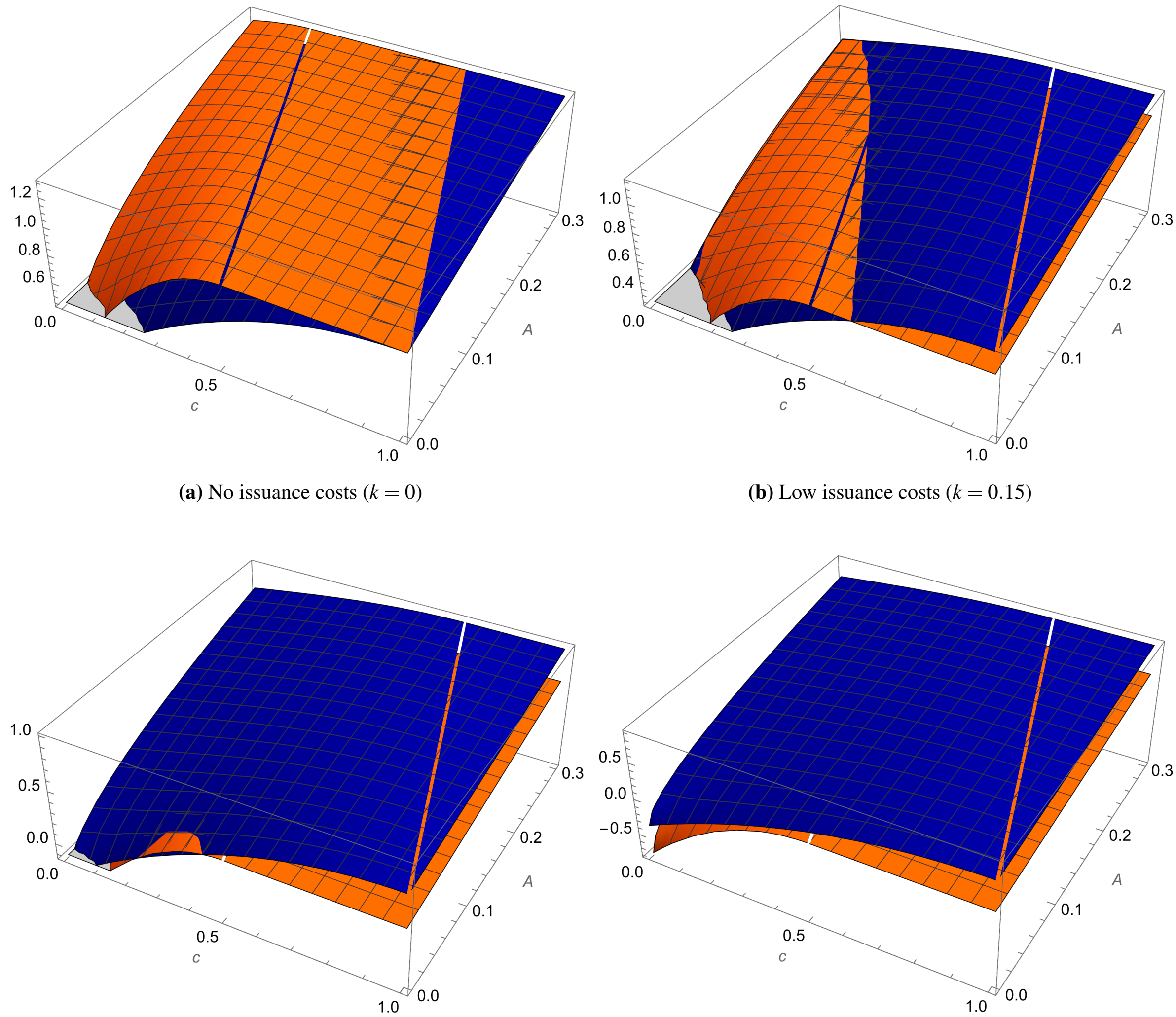



**(c)** Medium collateral value ($A = 0.25$)




**(d)** High collateral value ($A = 0.35$)

**Figure 4: Values of concentrated and dispersed firm as function of cash flows $c$ for different collateral value $A$.** The illustration is based on the parameter value $k = 0.15$. The solid orange (blue) line indicates the value of firm $D$ ($C$). The dashed vertical lines indicate (in orange and blue for firm $D$ and $C$, respectively) the levels of $c$ at which the firm starts investing $I^* = 1$ according to (14), as well as (in black) the points at which the firm optimally switches between $C$ and $D$.



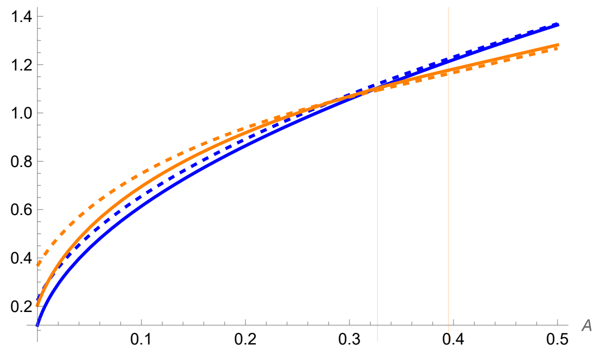

**(a)** No issuance costs ($k = 0$)

**(b)** Low issuance costs ($k = 0.15$)

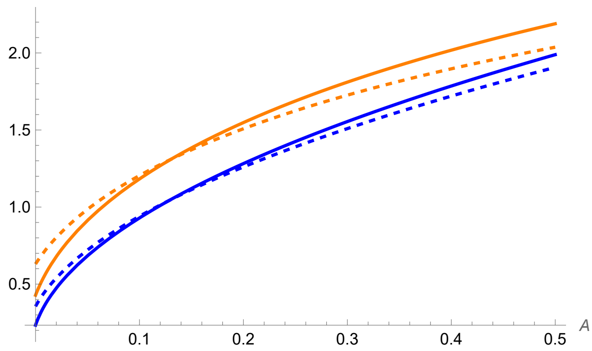
**(c)** Medium issuance costs ($k = 0.3$)

**(d)** High issuance costs ($k = 0.4$)

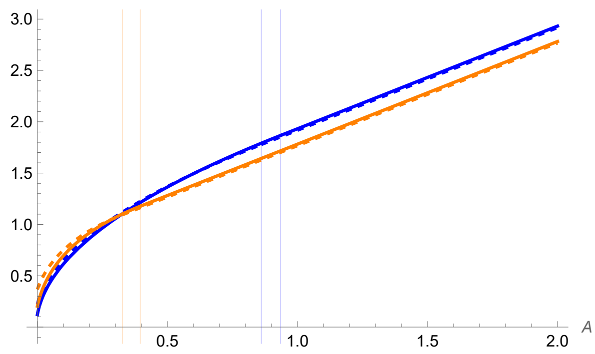
**Figure 5: Values of concentrated and dispersed firm as function of cash flows $c$ and collateral value $A$ for different issuance costs $k$.** The orange (blue) plane indicates the value of firm $D$ ($C$).



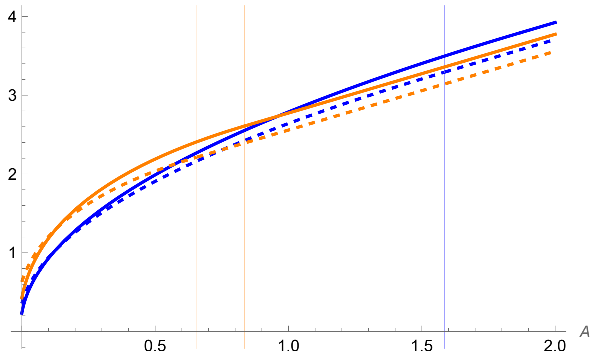
**(a)** Firm values, low growth option value ($H = 0.1$)



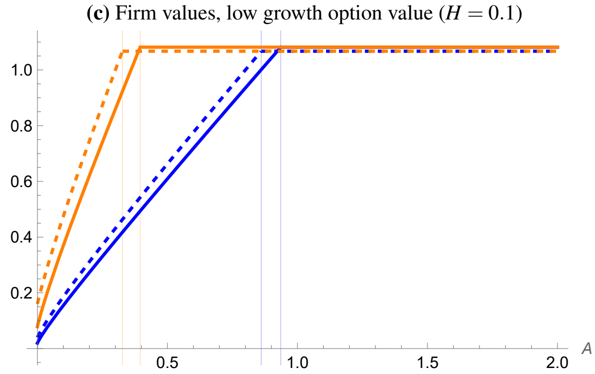
**(b)** Firm values, high growth option value ($H = 0.5$)



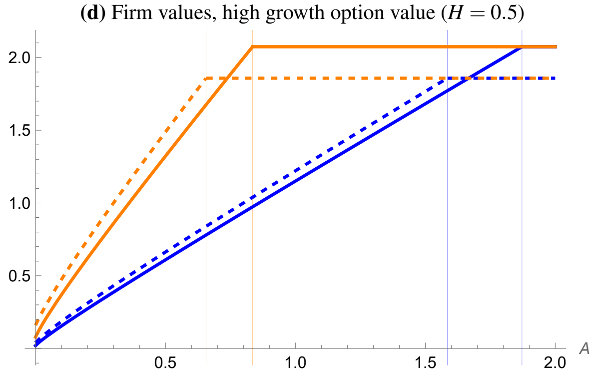
**(c)** Firm values, low growth option value ($H = 0.1$)



**(d)** Firm values, high growth option value ($H = 0.5$)

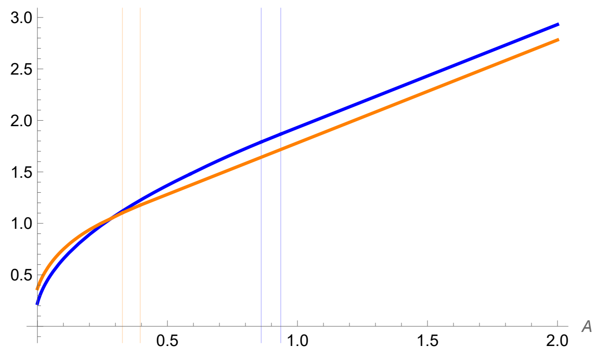


**(e)** Investment, low growth option value ($H = 0.1$)

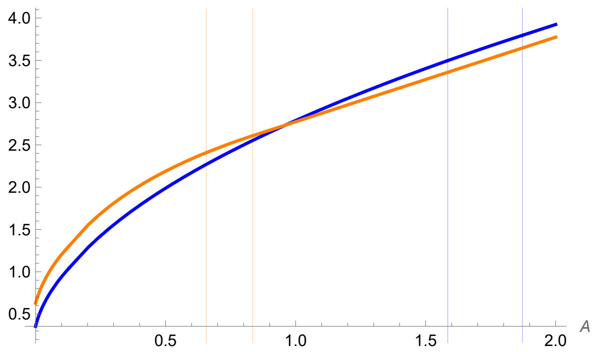


**(f)** Investment, high growth option value ($H = 0.5$)

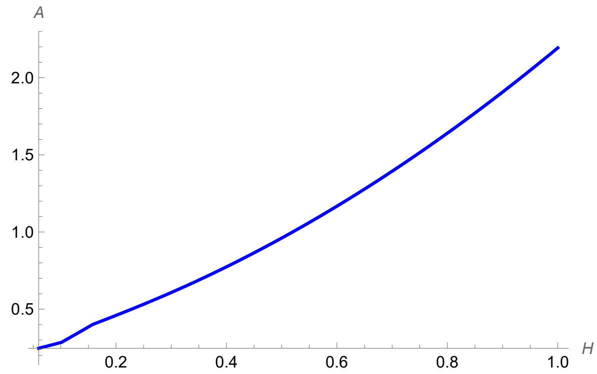
**Figure 6: Firm values and investment of concentrated and dispersed firm as function of collateral value $A$ for different payoff of growth options $H$.** The illustration is based on the parameter values $k = 0.15$, $c = 0.2$ and $f = 0.3$. The orange (blue) lines indicate the values (top four panels) and investment levels (bottom two panels) of firm $D$ ($C$). Here, solid (dashes) lines represent value and investment of firms that have two growth options for sure (possibly lose one growth option due to market freeze). The thin vertical lines indicate (in orange and blue for firm $D$ and $C$, respectively) the levels of $A$ at which the firm starts investing first-best according to (10), (11), (12), and (13).




**(a)** Firm values, low growth option value ($H = 0.1$)




**(b)** Firm values, high growth option value ($H = 0.5$)




**(c)** Critical $A$ over $H$ (starting from $cf = 0.06$)

**Figure 7: Values of concentrated and dispersed firm as function of collateral value $A$ for different payoff of growth options $H$.** The illustration is based on the parameter values $k = 0.15$, $c = 0.2$ and $f = 0.3$. The orange (blue) lines in Panels a and b indicate the values of firm $D$ ($C$). Here, we show the respective maximum level of the two values in Figure 6, Panels a and b. The thin vertical lines indicate (in orange and blue for firm $D$ and $C$, respectively) the levels of $A$ at which the firm starts investing first-best according to (10), (11), (12), and (13). Panel c shows the critical level of $A$ at which the firm optimally switches from the dispersed to the concentrated maturity profile as a function of $H$.

**Table 1: Summary Statistics.** The table reports descriptive statistics for our 1993-2022 merged sample of Compustat and Capital IQ firms. *HERF* is the Herfindahl index of debt maturity proportions, which shows the concentration of maturity structure of all debt instruments within a firm. *WHERF* is the time-weighted Herfindahl index of debt maturity proportions, which adjusts the Herfindahl index by assigning more weights on longer-maturity debt. *DIST* is defined as the logarithm of the squared distance from the perfect maturity dispersion. *State Price Index* and *MSA Price Index* are the state and metropolitan statistical area (MSA) level residential real estate prices, respectively, from the Federal Housing Finance Agency (FHFA). *RE value* (*State*) (*RE value* (*MSA*)) is the ratio of the market value of real estate using state (MSA) residential real estate prices, normalized by previous-year PPE. *Supply Elasticity* is the local housing supply elasticity in Saiz (2010). *RETA* is the ratio of retained earnings to the book value of assets. *Leverage* is the sum of short- and long-term debt normalized by the book value of assets. *AGR* is asset growth ratio defined as the difference in the current and lagged book values of assets divided by the lagged book value of assets. *Size* is defined as the log of book value of total assets. *Market to Book* is the ratio of the market value of equity plus the book value of assets minus the book value of equity, all divided by the book value of assets. *SGR* is sales growth ratio defined as the ratio of the difference in the current and lagged values of sales divided by the lagged value of sales. *RoA* is the operating income before depreciation minus depreciation and amortization, all divided by the book value of assets. *Log Cash* is the natural logarithm of cash and short-term securities. *Age* is the number of years since the firm first appeared in the Compustat database.

| | Mean | Median | SD | p25 | p75 | Obs. |
|---|---|---|---|---|---|---|
| HERF | 0.589 | 0.522 | 0.307 | 0.329 | 0.962 | 11,130 |
| WHERF | 0.262 | 0.056 | 0.379 | 0.010 | 0.324 | 10,803 |
| DIST | -3.670 | -3.414 | 1.663 | -4.440 | -2.541 | 11,128 |
| State Price Index | 0.578 | 0.572 | 0.142 | 0.480 | 0.652 | 11,130 |
| MSA Price Index | 0.572 | 0.568 | 0.155 | 0.457 | 0.677 | 9,677 |
| RE Value (State) | 1.050 | 0.458 | 1.500 | 0.021 | 1.325 | 11,130 |
| RE Value (MSA) | 0.927 | 0.404 | 1.239 | 0.007 | 1.250 | 9,673 |
| Supply Elasticity | 1.412 | 1.180 | 0.718 | 0.650 | 2.010 | 8,371 |
| RETA | -0.105 | 0.207 | 1.052 | -0.129 | 0.444 | 11,070 |
| Leverage | 0.312 | 0.254 | 0.312 | 0.125 | 0.397 | 11,103 |
| AGR | 0.061 | 0.030 | 0.258 | -0.049 | 0.118 | 11,055 |
| Log Firm Size | 6.504 | 6.701 | 2.419 | 4.909 | 8.101 | 11,123 |
| Market to Book | 1.916 | 1.489 | 1.335 | 1.117 | 2.179 | 10,478 |
| SGR | 0.171 | 0.045 | 4.622 | -0.037 | 0.134 | 10,980 |
| RoA | 0.032 | 0.073 | 0.217 | 0.022 | 0.119 | 11,119 |
| Log Cash | 3.719 | 4.002 | 2.690 | 2.044 | 5.563 | 11,032 |
| Age | 32.178 | 30.000 | 14.632 | 20.000 | 44.000 | 11,130 |

**Table 2: Financial Flexibility and Maturity Concentration using Herfindahl index for all debt instruments.** This table presents the results of the ordinary least squares (OLS) and instrumental variables (IV) estimates of the specifications in equations (20) - (24). The dependent variable in all the columns is Herfindahl index of debt maturity proportions (HERF), which shows the concentration of maturity structure of all debt instruments within a firm. Residential real estate prices at the metropolitan statistical area (MSA) and state levels are collected from the Federal Housing Finance Agency (FHFA). Columns 1-4 report the results of the ordinary least squares (OLS) specification. Columns 5-6 report the results of instrumental variables (IV) estimation. The instrument in the first stage is land supply elasticity interacted with the nationwide real interest rate. Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable: HERF** | OLS<br>[1] | OLS<br>[2] | OLS<br>[3] | OLS<br>[4] | IV<br>[5] | IV<br>[6] |
|---|---|---|---|---|---|---|
| *RE value* | 0.034*** | 0.031*** | 0.029*** | | | |
| (state prices) | (5.16) | (5.12) | (5.08) | | | |
| *RE value* | | | | 0.037*** | 0.036*** | 0.035*** |
| (MSA prices) | | | | (4.26) | (3.43) | (3.29) |
| *P_state* | −0.094 | 0.286 | 0.207 | | | |
| | (-1.02) | (0.88) | (0.65) | | | |
| *P_MSA* | | | | 0.235 | 0.016 | −6.317** |
| | | | | (0.65) | (0.02) | (-2.15) |
| Firm-level controls | No | No | Yes | Yes | Yes | Yes |
| Initial controls × state prices | No | Yes | Yes | No | No | No |
| Initial controls × MSA prices | No | No | No | Yes | Yes | Yes |
| Supply elasticity × year | No | No | No | No | No | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 11,098 | 10,996 | 10,187 | 8,826 | 7,637 | 7,637 |
| $R^2$ | 0.644 | 0.657 | 0.674 | 0.672 | 0.678 | 0.681 |

**Table 3: Financial Flexibility and Time-Weighted Herfindahl index for all debt instruments.** This table presents the results of both OLS and IV estimates of the specifications in equations (20) - (24). The dependent variable in all the columns is the time-weighted Herfindahl index of debt maturity proportions (WHERF), which adjusts the Herfindahl index by assigning more weights on longer-maturity debt. Residential real estate prices at the metropolitan statistical area (MSA) and state levels are collected from the Federal Housing Finance Agency (FHFA). Columns 1-4 report the results of the ordinary least squares (OLS) specification. Columns 5-6 report the results of instrumental variables (IV) estimation. The instrument in the first stage is land supply elasticity interacted with the nationwide real interest rate. Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable: WHERF** | OLS<br>[1] | OLS<br>[2] | OLS<br>[3] | OLS<br>[4] | IV<br>[5] | IV<br>[6] |
|---|---|---|---|---|---|---|
| *RE value* | 0.031*** | 0.030*** | 0.027*** | | | |
| (state prices) | (3.48) | (3.54) | (3.20) | | | |
| *RE value* | | | | 0.040*** | 0.041*** | 0.039*** |
| (MSA prices) | | | | (3.61) | (3.03) | (2.90) |
| *P_state* | −0.118 | −0.441 | −0.498 | | | |
| | (-0.94) | (-0.83) | (-0.91) | | | |
| *P_MSA* | | | | −0.838* | 0.021 | −0.408 |
| | | | | (-1.78) | (0.02) | (-0.12) |
| Firm-level controls | No | No | Yes | Yes | Yes | Yes |
| Initial controls × state prices | No | Yes | Yes | No | No | No |
| Initial controls × MSA prices | No | No | No | Yes | Yes | Yes |
| Supply elasticity × year | No | No | No | No | No | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 10,763 | 10,665 | 9,896 | 8,563 | 7,407 | 7,407 |
| $R^2$ | 0.524 | 0.540 | 0.561 | 0.555 | 0.557 | 0.559 |

**Table 4: Financial Flexibility and Distance from a Perfectly Dispersed Maturity Profile for all debt instruments.** This table presents the results of both OLS and IV estimates of the specifications in equations (20) - (24). The dependent variable in all the columns is the logarithm of the squared distance from the perfect maturity dispersion (DIST). Residential real estate prices at the metropolitan statistical area (MSA) and state levels are collected from the Federal Housing Finance Agency (FHFA). Columns 1-4 report the results of the ordinary least squares (OLS) specification. Columns 5-6 report the results of instrumental variables (IV) estimation. The instrument in the first stage is land supply elasticity interacted with the nationwide real interest rate. Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable: DIST** | OLS<br>[1] | OLS<br>[2] | OLS<br>[3] | OLS<br>[4] | IV<br>[5] | IV<br>[6] |
|---|---|---|---|---|---|---|
| *RE value* | $0.128^{***}$ | $0.131^{***}$ | $0.103^{***}$ | | | |
| (state prices) | (4.62) | (4.81) | (3.55) | | | |
| *RE value* | | | | $0.131^{***}$ | $0.182^{***}$ | $0.177^{***}$ |
| (MSA prices) | | | | (2.81) | (4.15) | (4.01) |
| *P_state* | $-0.186$ | $5.155^{***}$ | $4.578^{**}$ | | | |
| | (-0.36) | (2.68) | (2.21) | | | |
| *P_MSA* | | | | 1.724 | $-1.171$ | $-30.287^{**}$ |
| | | | | (0.88) | (-0.30) | (-2.06) |
| Firm-level controls | No | No | Yes | Yes | Yes | Yes |
| Initial controls × state prices | No | Yes | Yes | No | No | No |
| Initial controls × MSA prices | No | No | No | Yes | Yes | Yes |
| Supply elasticity × year | No | No | No | No | No | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 11,096 | 10,994 | 10,185 | 8,824 | 7,635 | 7,635 |
| $R^2$ | 0.500 | 0.518 | 0.545 | 0.542 | 0.554 | 0.556 |

**Table 5: Financial Flexibility and Maturity Concentration in Corporate Bonds.** This table reports the results of OLS estimates of specifications shown in Equation (20) focusing solely on corporate bond issues. The dependent variable in column 1 is the Herfindahl index (HERF), in column 2 is time-weighted Herfindahl index (WHERF), and in column 3 is the distance measure (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable:** | HERF | WHERF | DIST |
|---|---|---|---|
| | OLS | OLS | OLS |
| | [1] | [2] | [3] |
| *RE value* | $0.035^{***}$ | $0.043^{**}$ | $0.141^{**}$ |
| (MSA prices) | (2.63) | (2.53) | (2.52) |
| *P_MSA* | $-0.604$ | $-0.899$ | $-3.192$ |
| | (-1.12) | (-1.21) | (-1.34) |
| Firm-level controls | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes |
| Observations | 5,830 | 5,717 | 5,828 |
| $R^2$ | 0.723 | 0.643 | 0.713 |

**Table 6: Financial Flexibility and Maturity Concentration in Corporate Bank Debt.** This table reports the results of OLS estimates of specifications shown in Equation (20), using only firms' bank debt. The dependent variable in column 1 is the Herfindahl index (HERF), in column 2 is time-weighted Herfindahl index (WHERF), and in column 3 is the distance measure (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable:** | HERF | WHERF | DIST |
|---|---|---|---|
| | OLS | OLS | OLS |
| | [1] | [2] | [3] |
| *RE value* | 0.010 | 0.011 | 0.052 |
| (MSA prices) | (0.94) | (0.59) | (1.14) |
| *P_MSA* | 3.857*** | 6.377*** | 7.339*** |
| | (10.21) | (8.15) | (4.10) |
| Firm-level controls | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes |
| Observations | 6,788 | 6,204 | 6,787 |
| $R^2$ | 0.384 | 0.404 | 0.438 |

**Table 7: Financial Flexibility and Maturity Concentration in all Other Corporate Debt Types.** This table reports the results of OLS estimates of specifications shown in Equation (20), using all types of corporate debt except for bonds and bank loans. The dependent variable in column 1 is the Herfindahl index (HERF), in column 2 is the time-weighted Herfindahl index (WHERF), and in column 3 is the distance measure (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable:** | HERF | WHERF | DIST |
|---|---|---|---|
| | OLS | OLS | OLS |
| | [1] | [2] | [3] |
| *RE value* | 0.020* | 0.036* | 0.129*** |
| (MSA prices) | (1.96) | (1.86) | (3.56) |
| *P_MSA* | 0.865 | −1.591 | −2.501 |
| | (1.35) | (-0.72) | (-1.00) |
| Firm-level controls | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes |
| Observations | 4,705 | 4,024 | 4,705 |
| $R^2$ | 0.594 | 0.514 | 0.625 |

**Table 8: Financial Flexibility and Maturity Concentration: Secured Vs. Unsecured Debt.** This table presents estimations from maturity concentration regressions separately for secured and unsecured debt. Columns [1]-[3] use debt maturity concentration measures calculated for secured debt instruments and columns [4]-[6] use debt maturity concentration measures calculated for unsecured debt instruments. Panel A shows results for all debt instruments. Panel B shows results for corporate bonds. Panel C shows results for bank debt. Panel D shows results for other debt instruments. The dependent variable in column [1] and [4] is Herfindahl index of debt maturity proportions (HERF), which shows the concentration of maturity structure of all debt instruments within a firm. The dependent variable in column [2] and [5] is the time-weighted Herfindahl index of debt maturity proportions (WHERF), which adjusts the Herfindahl index by assigning more weights on longer-maturity debt. The dependent variable in column [3] and [6] is the logarithm of the squared distance from the perfect maturity dispersion (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| | Panel A: All Debt | | | | | |
|---|---|---|---|---|---|---|
| | Secured Debt | | | Unsecured Debt | | |
| **Dep. variable:** | HERF | WHERF | DIST | HERF | WHERF | DIST |
| | [1] | [2] | [3] | [4] | [5] | [6] |
| *RE value* | 0.026$^{**}$ | 0.040$^{**}$ | 0.122$^{***}$ | 0.043$^{***}$ | 0.074$^{***}$ | 0.152$^{***}$ |
| (MSA prices) | (2.24) | (2.03) | (3.76) | (2.62) | (2.99) | (3.13) |
| *P_MSA* | −0.531 | −0.688 | −1.852 | −1.904$^{**}$ | −3.554$^{**}$ | −2.706 |
| | (-1.17) | (-0.82) | (-1.46) | (-2.02) | (-2.42) | (-1.08) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 6,132 | 5,830 | 6,090 | 4,271 | 4,011 | 4,256 |
| $R^2$ | 0.481 | 0.493 | 0.656 | 0.687 | 0.637 | 0.807 |

| | Panel B: Corporate Bonds | | | | | |
|---|---|---|---|---|---|---|
| | Secured Bonds | | | Unsecured Bonds | | |
| *RE value* | 0.024$^{*}$ | 0.035 | 0.108$^{**}$ | 0.074$^{***}$ | 0.103$^{***}$ | 0.235$^{***}$ |
| (MSA prices) | (1.82) | (1.37) | (2.43) | (3.60) | (3.57) | (3.79) |
| *P_MSA* | −5.443$^{***}$ | −11.042$^{***}$ | −10.636$^{***}$ | −2.055$^{**}$ | −2.776$^{*}$ | −4.584$^{*}$ |
| | (-5.62) | (-5.51) | (-3.58) | (-2.05) | (-1.85) | (-1.65) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,652 | 1,533 | 1,648 | 3,077 | 2,965 | 3,075 |
| $R^2$ | 0.666 | 0.651 | 0.785 | 0.734 | 0.674 | 0.840 |

**Table 8 continued.**

| | Panel C: Bank Debt | | | | | |
|---|---|---|---|---|---|---|
| | Secured Bank Debt | | | Unsecured Bank Debt | | |
| **Dep. variable:** | HERF | WHERF | DIST | HERF | WHERF | DIST |
| | [1] | [2] | [3] | [4] | [5] | [6] |
| *RE value* | 0.007 | 0.004 | 0.089** | 0.006 | 0.010 | 0.157*** |
| (MSA prices) | (0.60) | (0.18) | (2.43) | (0.36) | (0.24) | (2.89) |
| *P_MSA* | 2.186*** | 4.310*** | 3.858*** | −0.702 | −3.435** | 0.394 |
| | (4.66) | (3.85) | (2.94) | (-1.11) | (-2.15) | (0.23) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,002 | 3,660 | 3,970 | 1,913 | 1,742 | 1,903 |
| $R^2$ | 0.430 | 0.444 | 0.641 | 0.419 | 0.471 | 0.719 |

| | Panel D: Other Debt | | | | | |
|---|---|---|---|---|---|---|
| | Secured Other Debt | | | Unsecured Other Debt | | |
| *RE value* | 0.022* | 0.040* | 0.104*** | 0.005 | −0.018 | 0.013 |
| (MSA prices) | (1.73) | (1.75) | (3.36) | (0.22) | (-0.36) | (0.18) |
| *P_MSA* | −0.860 | −2.968 | −0.731 | −2.571 | 13.475*** | −4.102 |
| | (-0.98) | (-1.55) | (-0.40) | (-1.59) | (2.93) | (-0.88) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,244 | 3,056 | 3,240 | 600 | 462 | 598 |
| $R^2$ | 0.449 | 0.483 | 0.738 | 0.487 | 0.648 | 0.830 |

**Table 9: Financial Flexibility and Maturity Concentration: Short Vs. Long Maturity Debt.** This table presents estimations from maturity concentration regressions separately for debt of short-term and long-term maturity. Columns [1]-[3] use debt maturity concentration measures calculated for debt instruments with maturities of less than 5 years and columns [4]-[6] use debt maturity concentration measures calculated for debt instruments with maturities more than or equal to 5 years. Panel A shows results for all debt instruments. Panel B shows results for corporate bonds. Panel C shows results for bank debt. Panel D shows results for other debt instruments. The dependent variable in column [1] and [4] is Herfindahl index of debt maturity proportions (HERF), which shows the concentration of maturity structure of all debt instruments within a firm. The dependent variable in column [2] and [5] is the time-weighted Herfindahl index of debt maturity proportions (WHERF), which adjusts the Herfindahl index by assigning more weights on longer-maturity debt. The dependent variable in column [3] and [6] is the logarithm of the squared distance from the perfect maturity dispersion (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| | Panel A: All Debt | | | | | |
|---|---|---|---|---|---|---|
| | Debt Maturity < 5 Years | | | Debt Maturity >= 5 Years | | |
| **Dep. variable:** | HERF | WHERF | DIST | HERF | WHERF | DIST |
| | [1] | [2] | [3] | [4] | [5] | [6] |
| *RE value* | 0.022** | 0.020 | 0.125*** | 0.038*** | 0.074*** | 0.149*** |
| (MSA prices) | (2.33) | (1.17) | (4.50) | (4.09) | (4.93) | (4.60) |
| *P_MSA* | 0.777* | 2.757*** | 1.129 | 0.050 | −1.192* | 2.497* |
| | (1.67) | (3.59) | (0.81) | (0.13) | (-1.85) | (1.79) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 6,261 | 5,422 | 6,170 | 7,613 | 7,564 | 7,613 |
| $R^2$ | 0.422 | 0.435 | 0.684 | 0.706 | 0.613 | 0.821 |

| | Panel B: Corporate Bonds | | | | | |
|---|---|---|---|---|---|---|
| | Bond Maturity < 5 Years | | | Bond Maturity >= 5 Years | | |
| *RE value* | 0.018 | 0.038 | 0.104** | 0.037*** | 0.051*** | 0.176*** |
| (MSA prices) | (0.96) | (1.21) | (2.07) | (2.74) | (2.76) | (3.71) |
| *P_MSA* | 1.457* | 4.795*** | −1.470 | −1.098* | −0.942 | −2.090 |
| | (1.72) | (3.48) | (-0.57) | (-1.91) | (-1.17) | (-1.11) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,325 | 2,774 | 3,306 | 5,130 | 5,094 | 5,130 |
| $R^2$ | 0.486 | 0.489 | 0.750 | 0.748 | 0.676 | 0.845 |

**Table 9 continued.**

| | Panel C: Bank Debt | | | | | |
|---|---|---|---|---|---|---|
| | Bank Debt Maturity < 5 Years | | | Bank Debt Maturity >= 5 Years | | |
| **Dep. variable:** | HERF | WHERF | DIST | HERF | WHERF | DIST |
| | [1] | [2] | [3] | [4] | [5] | [6] |
| *RE value* | 0.012 | 0.034* | 0.117*** | 0.004 | 0.009 | 0.095*** |
| (MSA prices) | (1.24) | (1.67) | (4.31) | (0.37) | (0.43) | (3.24) |
| *P_MSA* | 0.546 | 3.060*** | 0.933 | 3.816*** | 8.252*** | 7.213*** |
| | (0.90) | (2.62) | (0.55) | (7.04) | (6.84) | (5.13) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 3,926 | 3,100 | 3,863 | 4,587 | 4,514 | 4,587 |
| $R^2$ | 0.348 | 0.404 | 0.674 | 0.417 | 0.431 | 0.743 |

| | Panel D: Other Debt | | | | | |
|---|---|---|---|---|---|---|
| | Other Debt Maturity < 5 Years | | | Other Debt Maturity >= 5 Years | | |
| *RE value* | 0.001 | 0.003 | 0.087** | 0.011 | 0.012 | 0.083*** |
| (MSA prices) | (0.02) | (0.09) | (2.46) | (1.32) | (0.76) | (2.85) |
| *P_MSA* | 0.626 | 0.505 | 0.863 | −0.549 | −1.479 | −2.063 |
| | (0.90) | (0.26) | (0.43) | (-0.55) | (-0.70) | (-1.03) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 1,918 | 1,448 | 1,911 | 3,108 | 3,041 | 3,108 |
| $R^2$ | 0.403 | 0.496 | 0.804 | 0.526 | 0.565 | 0.830 |

**Table 10: Financial Flexibility and New Debt Issuance.** This table presents estimations from new debt issuance regressions. The dependent variables in panel A are the average size of newly issued debt scaled by lagged PPE, the natural logarithm of the number of new issues, and the total size of newly issued debt. The dependent variable in panel B, column 1 is the Herfindahl index (HERF), in column 2 is the time-weighted Herfindahl index (WHERF), and in column 3 is the distance measure (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. ***, **, and * denote statistical significance at the 1%, 5%, and 10% level, respectively.

| | Panel A: New Debt Issues | | |
|---|---|---|---|
| **Dep. variable:** | Average Size of Newly Issued Debt | Log of Number of New Debt Issues | Total Size of Newly Issued Debt |
| | [1] | [2] | [3] |
| *RE value* | 0.110*** | −0.063** | 0.340*** |
| (MSA prices) | (4.30) | (-2.25) | (3.95) |
| *P_MSA* | 0.171 | −4.646*** | −1.164 |
| | (0.19) | (-3.52) | (-0.40) |
| Firm-level controls | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes |
| Observations | 7,013 | 7,013 | 7,013 |
| $R^2$ | 0.673 | 0.510 | 0.605 |

| | Panel B: Maturity Concentration of New Debt Issues | | |
|---|---|---|---|
| **Dep. variable:** | HERF | WHERF | DIST |
| | [1] | [2] | [3] |
| *RE value* | 0.022** | 0.021 | 0.123*** |
| (MSA prices) | (2.12) | (1.45) | (3.44) |
| *P_MSA* | −0.152 | −0.054 | 0.829 |
| | (-0.31) | (-0.09) | (0.53) |
| Firm-level controls | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes |
| Observations | 7,011 | 6,693 | 6,926 |
| $R^2$ | 0.502 | 0.424 | 0.696 |

**Table 11: Financial Flexibility and Maturity Concentration: Availability of Investment Opportunities.** This table presents estimations from maturity concentration regressions, depending upon whether firms have fewer investment opportunities (bottom 3 deciles of Tobin's Q, columns [1]-[3]) or more investment opportunities (top 3 deciles of Tobin's Q, columns [4]-[6]). The dependent variable in column [1] and [4] is Herfindahl index of debt maturity proportions (HERF), which shows the concentration of maturity structure of all debt instruments within a firm. The dependent variable in column [2] and [5] is the time-weighted Herfindahl index of debt maturity proportions (WHERF), which adjusts the Herfindahl index by assigning more weights on longer-maturity debt. The dependent variable in column [3] and [6] is the logarithm of the squared distance from the perfect maturity dispersion (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| | All Debt | | | | | |
|---|---|---|---|---|---|---|
| | Firms with Fewer Investment Opportunities | | | Firms with More Investment Opportunities | | |
| **Dep. variable:** | HERF | WHERF | DIST | HERF | WHERF | DIST |
| | [1] | [2] | [3] | [4] | [5] | [6] |
| *RE value* | 0.040$^{***}$ | 0.053$^{***}$ | 0.202$^{***}$ | 0.001 | 0.028 | −0.029 |
| (MSA prices) | (3.07) | (3.00) | (4.57) | (0.06) | (0.96) | (-0.31) |
| *P_MSA* | −0.036 | 0.387 | −2.177 | −2.108 | −2.827$^{***}$ | −12.622 |
| | (-0.06) | (0.46) | (-0.96) | (-0.85) | (-3.21) | (-1.17) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,476 | 2,347 | 2,452 | 2,424 | 2,274 | 2,390 |
| $R^2$ | 0.638 | 0.535 | 0.750 | 0.678 | 0.504 | 0.797 |

**Table 12: Financial Fragility During Crisis Stress.** This table presents estimations from financial fragility regressions. Financial fragility is measured as Merton (1974) style Distance to Default (*DD*), where asset value is approximated as the sum of the market value of equity and the book value of total debt, while asset volatility is proxied by the volatility of equity returns. The default threshold is defined as the book value of total debt. The dependent variable in all the columns is *DD* measured at $t+1$. Crisis stress dummy is an indicator which takes value 1 for years 2008 and 2009, and 0 otherwise. Column [1] presents results using the full sample, while sample in column [2] is constrained by the availability of maturity concentration data. High Pre-Crisis Maturity Concentration sample in columns [3]-[5] includes firms with above median maturity concentration in the pre-crisis year (2007). Similarly, Low Pre-Crisis Maturity Concentration sample in columns [6]-[8] includes firms with below median maturity concentration in the pre-crisis year (2007). Maturity concentration in columns [3] and [6] is measured as Herfindahl index of debt maturity proportions (HERF), which shows the concentration of maturity structure of all debt instruments within a firm. Maturity concentration in columns [3] and [6] is measured as time-weighted Herfindahl index of debt maturity proportions (WHERF), which adjusts the Herfindahl index by assigning more weights on longer-maturity debt. Maturity concentration in columns [3] and [6] is measured as the logarithm of the squared distance from the perfect maturity dispersion (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable:** | Distance to Default | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Full Sample | Mat. Conc. Sample | High Pre-Crisis Maturity Concentration | | | Low Pre-Crisis Maturity Concentration | | |
| | | | HERF | WHERF | DIST | HERF | WHERF | DIST |
| | [1] | [2] | [3] | [4] | [5] | [6] | [7] | [8] |
| *RE value* × *Crisis Stress Dummy* | $-0.161^{**}$ | $-0.165^{***}$ | $-0.270^{***}$ | $-0.239^{***}$ | $-0.211^{**}$ | $-0.077$ | $-0.096$ | $-0.146^{*}$ |
| (MSA prices) | (-2.35) | (-2.63) | (-3.12) | (-2.77) | (-2.42) | (-1.00) | (-1.22) | (-1.88) |
| *RE value* | $0.331^{***}$ | $0.285^{***}$ | 0.258 | $0.319^{*}$ | 0.282 | $0.305^{**}$ | $0.334^{**}$ | $0.337^{***}$ |
| (MSA prices) | (4.53) | (2.65) | (1.22) | (1.70) | (1.33) | (2.57) | (2.37) | (2.98) |
| *Crisis Stress Dummy* | Absorbed | Absorbed | Absorbed | Absorbed | Absorbed | Absorbed | Absorbed | Absorbed |
| *P_MSA* | $-0.700$ | $-3.022$ | $17.525^{**}$ | 1.676 | $-36.321^{***}$ | 1.078 | $-8.724^{***}$ | $-3.278$ |
| | (-0.17) | (-0.66) | (2.54) | (0.39) | (-3.80) | (0.20) | (-2.94) | (-1.12) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 15,242 | 7,344 | 2,624 | 2,436 | 2,629 | 3,578 | 3,299 | 3,572 |
| $R^2$ | 0.771 | 0.808 | 0.782 | 0.789 | 0.776 | 0.861 | 0.858 | 0.866 |

**Table 13: Financial Flexibility and Maturity Concentration: Heterogeneity Tests.** This table presents estimations from maturity concentration regressions while splitting the sample based on firm size, cash holdings, total payout, leverage, and profitability. Columns [1]-[3] use firms in bottom 3 deciles of total assets (panel A), cash holdings (panel B), total payout (dividends + share repurchases) (panel C), leverage (panel D), and profitability (panel E). Columns [4]-[6] use firms in top 3 deciles of total assets (panel A), cash holdings (panel B), total payout (dividends + share repurchases) (panel C), leverage (panel D), and profitability (panel E). The dependent variable in column [1] and [4] is Herfindahl index of debt maturity proportions (HERF), which shows the concentration of maturity structure of all debt instruments within a firm. The dependent variable in column [2] and [5] is the time-weighted Herfindahl index of debt maturity proportions (WHERF), which adjusts the Herfindahl index by assigning more weights on longer-maturity debt. The dependent variable in column [3] and [6] is the logarithm of the squared distance from the perfect maturity dispersion (DIST). Firm-level controls includes ratio of retained earnings to total assets, leverage, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| | All Debt | | | | | |
|---|---|---|---|---|---|---|
| | Panel A | | | | | |
| | Small Firms | | | Big Firms | | |
| **Dep. variable:** | HERF | WHERF | DIST | HERF | WHERF | DIST |
| | [1] | [2] | [3] | [4] | [5] | [6] |
| *RE value* | 0.045$^{***}$ | 0.054$^{***}$ | 0.147$^{***}$ | 0.020 | 0.016 | 0.121$^{*}$ |
| (MSA prices) | (3.16) | (2.72) | (3.06) | (1.28) | (1.20) | (1.67) |
| *P_MSA* | −3.440$^{***}$ | −4.328$^{***}$ | −5.151 | −0.140 | −0.679 | 2.735 |
| | (-4.91) | (-2.87) | (-1.46) | (-0.13) | (-0.53) | (0.58) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,704 | 2,529 | 2,651 | 2,581 | 2,569 | 2,574 |
| $R^2$ | 0.529 | 0.546 | 0.534 | 0.661 | 0.506 | 0.769 |
| | Panel B | | | | | |
| | Less Cash Holdings | | | More Cash Holdings | | |
| *RE value* | 0.031$^{*}$ | 0.039$^{*}$ | 0.097$^{*}$ | 0.020 | 0.028$^{*}$ | 0.110$^{*}$ |
| (MSA prices) | (1.87) | (1.73) | (1.95) | (1.27) | (1.73) | (1.73) |
| *P_MSA* | −4.699$^{**}$ | −6.751 | −12.076$^{*}$ | −0.948 | −3.033$^{***}$ | −2.346 |
| | (-1.97) | (-1.64) | (-1.81) | (-0.92) | (-2.74) | (-0.61) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,610 | 2,465 | 2,571 | 2,597 | 2,562 | 2,585 |
| $R^2$ | 0.574 | 0.543 | 0.603 | 0.762 | 0.630 | 0.838 |

**Table 13 continued.**

| **Dep. variable:** | HERF | WHERF | DIST | HERF | WHERF | DIST |
|---|---|---|---|---|---|---|
| | Panel C | | | | | |
| | Low Payout | | | High Payout | | |
| *RE value* | 0.031** | 0.041** | 0.134*** | 0.019 | 0.023 | 0.095 |
| (MSA prices) | (1.99) | (2.08) | (3.11) | (1.27) | (1.39) | (1.45) |
| *P_MSA* | −1.654*** | −1.449 | −3.572* | −0.190 | −1.631 | 8.502** |
| | (-2.62) | (-1.47) | (-1.66) | (-0.17) | (-1.44) | (2.01) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,849 | 2,718 | 2,807 | 2,861 | 2,816 | 2,839 |
| $R^2$ | 0.634 | 0.596 | 0.700 | 0.764 | 0.645 | 0.842 |
| | Panel D | | | | | |
| | Low Leverage | | | High Leverage | | |
| *RE value* | 0.023 | 0.023 | 0.136*** | 0.052*** | 0.045** | 0.212*** |
| (MSA prices) | (1.63) | (0.99) | (2.97) | (2.99) | (2.13) | (3.14) |
| *P_MSA* | −3.605*** | −8.235*** | −15.738*** | −2.031** | −2.239** | −4.800* |
| | (-4.80) | (-8.46) | (-8.36) | (-2.41) | (-1.98) | (-1.87) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,618 | 2,432 | 2,554 | 2,376 | 2,345 | 2,371 |
| $R^2$ | 0.606 | 0.604 | 0.690 | 0.761 | 0.640 | 0.853 |
| | Panel E | | | | | |
| | Low Profitability | | | High Profitability | | |
| *RE value* | 0.039*** | 0.031 | 0.184*** | 0.021 | 0.043** | 0.061 |
| (MSA prices) | (2.61) | (1.48) | (3.90) | (1.13) | (2.06) | (0.84) |
| *P_MSA* | −2.893*** | 2.588* | −0.195 | 1.796 | 2.218 | 8.905** |
| | (-3.11) | (1.83) | (-0.07) | (1.59) | (1.41) | (2.27) |
| Firm-level controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Initial controls × MSA prices | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm fixed effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,513 | 2,396 | 2,480 | 2,613 | 2,538 | 2,580 |
| $R^2$ | 0.650 | 0.598 | 0.722 | 0.774 | 0.665 | 0.856 |

# Financial Flexibility and Debt Maturity Concentration

## Internet Appendix

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## List of Appendices

# Appendix I Definitions of debt concentration measures

- $HERF$: The concentration index of debt maturity structure

$$HERF_i = \Sigma w_m^2$$

with $w_m = P_m \,/\, \Sigma_m P_m$

- $WHERF$: time-weighted Herfindahl index, adjusts the Herfindahl index by assigning more weights on longer-maturity debt

$$WHERF_i = \sum (x_m * w_m)^2$$

with

$$x_m = \begin{cases} m/\sum_m m & \text{if } m > 1 \\ 0 & \text{otherwise} \end{cases}$$

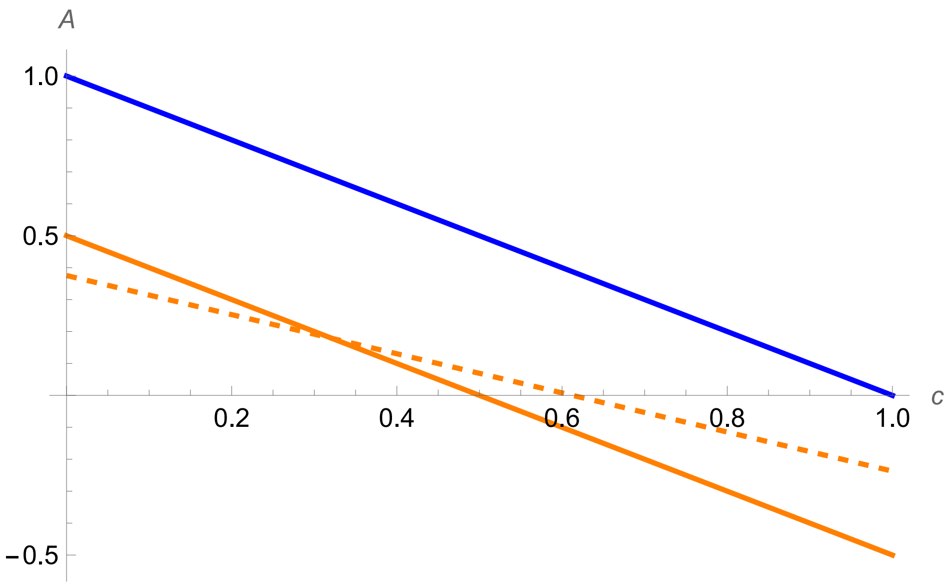
- $DIST$: the logarithm of the squared distance from perfect dispersion

$$DIST_i = log(Distance_i)$$

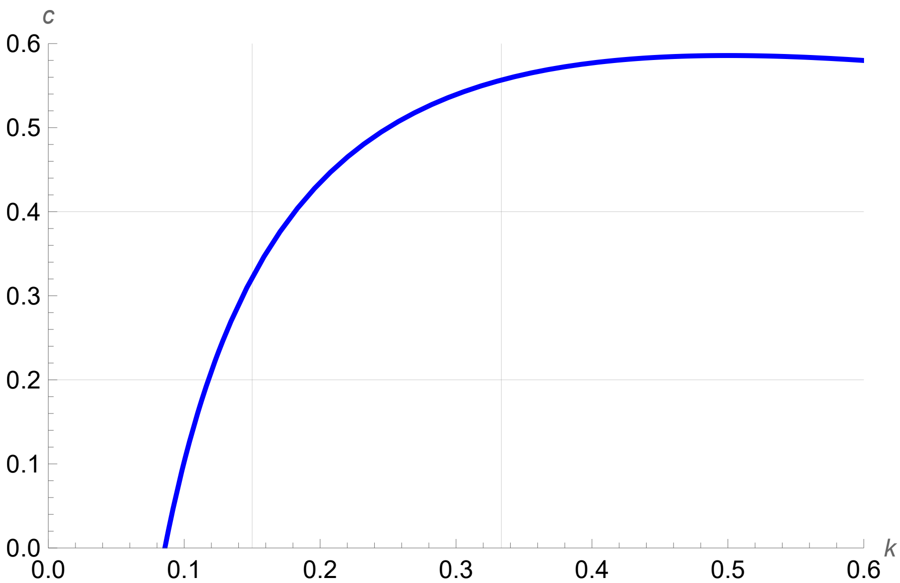
with the distance from a perfectly dispersed maturity profile being defined as

$$Distance_i = (1/t_i^{max}) * \sum_{i=1}^{t_i^{max}} (w_{mi} - w_m^{perfectly-dispersed})^2$$

# Appendix II Additional figures




**(a)** Intersection of collateral value levels




**(b)** Critical cash flow level $\hat{c}(k)$

**Figure II.1: Critical cash flow level.** Panel II.1a shows the collateral value levels $\bar{A}_C$ (blue), $\bar{A}_D$ (orange, solid), and $A^*$ (orange, dashed) according to (27), for $k = 0.15$. Panel II.1b shows the critical cash flow level $\hat{c}$ according to (28). The horizontal lines indicate the levels of $c = 0.2$ and $c = 0.4$ highlighted in Figure 3. The vertical lines indicate the levels of $k = 0.15$ used in most numerical examples (for which the critical cash flow level $\hat{c}$ falls in between $c = 0.2$ and $c = 0.4$), and $k = \frac{1}{3}$, above which a concentrated maturity profile is optimal for all $A$ (see Assumption 1).

# Appendix III Additional empirical results

**Table III.1: First-stage Results** This table shows results of the first stage regression of the IV specification, examining the impact of local housing supply elasticity interacted with mortgage rate on house prices. The dependent variable is the MSA residential house price index. All the regressions control for year and MSA fixed effects. Columns [2] and [4] also include Local housing supply elasticity × Year fixed effects. Standard errors are clustered at the MSA level. *t*-statistics are reported in parentheses. Statistical significance at the 1%, 5%, and 10% level is denoted by ***, **, and *, respectively.

| | [1] | [2] | [3] | [4] |
|---|---|---|---|---|
| Local housing supply elasticity × Mortgage rate | $0.006^{***}$ | $0.003^{***}$ | | |
| | (5.19) | (4.21) | | |
| First quartile of elasticity × Mortgage rate | | | $-0.014^{***}$ | $-0.008^{***}$ |
| | | | (-5.64) | (-3.56) |
| Second quartile of elasticity × Mortgage rate | | | $-0.005^{*}$ | $-0.003$ |
| | | | (-1.95) | (-1.33) |
| Third quartile of elasticity × Mortgage rate | | | $-0.002$ | $-0.002$ |
| | | | (-0.79) | (-1.38) |
| Local housing supply elasticity × Year FE | No | Yes | No | Yes |
| Year FE | Yes | Yes | Yes | Yes |
| MSA FE | Yes | Yes | Yes | Yes |
| Observations | 2,912 | 2,912 | 2,912 | 2,912 |
| $R^2$ | 0.914 | 0.923 | 0.914 | 0.926 |

**Table III.2: Financial Flexibility and Investment** This table presents estimations from investment regression. The dependent variables is capital expenditures scaled by lagged property, plant, and equipment (PPE). Firm-level controls includes ratio of retained earnings to total assets, asset growth ratio, firm size, market-to-book ratio, firm age, sales growth ratio, return on assets, and cash holdings. Initial controls (measured in 1993) include firm size, return on assets, firm age, firm geographical location (state), and 2-digit SIC codes. All the columns include firm and year fixed effects. Standard errors are clustered at the firm level. $^{***}$, $^{**}$, and $^{*}$ denote statistical significance at the 1%, 5%, and 10% level, respectively.

| **Dep. variable:** | Investment<br>[1] |
|---|---|
| *RE value* | 0.051$^{***}$ |
| (MSA prices) | (8.65) |
| | |
| *P_MSA* | 0.019 |
| | (0.08) |
| Firm-level controls | Yes |
| Initial controls × MSA prices | Yes |
| Year fixed effect | Yes |
| Firm fixed effect | Yes |
| Observations | 19,881 |
| $R^2$ | 0.414 |