Going-Concern Debt of Financial Intermediaries*

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Abstract

We study asset composition and debt composition of US financial intermediaries, in particular bank holding companies. We find that the collateral value of discrete assets accounts for about 60% of total assets in aggregate, and the share is larger among small institutions. Meanwhile, capital market debt against firm going-concern value accounts for around 10% to 15% of total assets in aggregate, about the same as debt against discrete assets, and the share is smaller among small institutions. Financial institutions, especially large institutions, are not just about holding discrete collateralizable assets; services and going-concern value are important, and debt against going-concern value is prevalent. We also find that financial institutions' debt against going-concern value has weak monitoring, relative to similar types of debt of comparable non-financial firms.

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1 Introduction

What is the nature of financial intermediaries' debt? What are the similarities and differences with non-financial firms?

Among non-financial firms, there are two common approaches to debt enforcement. One is lending against the liquidation value of discrete, separable assets, such as real estate, equipment, and inventory ("asset-based debt"); creditors rely on the intrinsic value of these particular assets (even if the firm ceases to exist). Another is to lend against the going-concern cash flow value of the firm ("cash flow-based debt"); creditors rely on the value of the business and the verifiability of cash flows. For non-financial firms, recent work documents the prevalence of debt based on going-concern cash flows (Lian and Ma, 2019; Ivashina, Laeven, and Moral-Benito, 2019). For financial intermediaries, existing studies mostly focus on asset-based debt (such as repurchase agreements, asset-backed securities, etc.), or on demandable deposits used for liquidity management.

In this paper, we study the asset composition and debt composition of financial intermediaries (in particular, bank holding companies) to investigate the importance of lending against discrete assets versus against going-concern firm value. We also compare the similarities and differences with non-financial firms. Our main findings are as follows.

First, we find that the collateral value of discrete assets accounts for about 60% of total assets in aggregate. By discrete assets, we mean assets that can be separated and repossessed on a standalone basis, which include for instance securities, mortgages and other loans, and real estate in the case of financial intermediaries. This value is much larger than the value in non-financial firms, where the liquidation value of discrete assets is less than 25% of total assets in aggregate (Kermani and Ma, 2019a). Nonetheless, financial intermediaries do generate meaningful going-concern value from services (e.g., commercial banking, underwriting, trading and market making, brokerage, etc.).

There is substantial heterogeneity in financial intermediaries' asset features. In general, the share of services revenue is higher among large institutions, suggesting possible increasing returns to scale in the provision of services. Correspondingly, large institutions and institutions with high services revenue shares have a smaller share of collateral value of discrete assets in total assets. Furthermore, the size dependence of asset composition is much stronger among financial intermediaries than among non-financial firms, where asset features are largely tied to the industry. Financial intermediaries appear to have more scope for choice in asset composition.

Second, for the debt composition of financial intermediaries, we find that the value of going-concern debt is about 10% to 15% of total assets in aggregate, roughly similar to the value of asset-based debt. We treat deposits separately because their primary form of enforcement in the current US institutional environment is government regulation and deposit insurance, instead of private contracting. By asset-based debt, we refer to debt collateralized by discrete assets, such as repos and asset-backed securities. By going-concern debt, we refer to capital market debt that has claims against the firm as a whole rather than tied to discrete assets. This concept is analogous to cash flow-based debt of non-financial firms (Lian and Ma, 2019; Ivashina, Laeven, and Moral-Benito, 2019). Here we use the term "going-concern debt" instead, since the debt of financial intermediaries has less emphasis on borrowers' measurable cash flow value. While cash flow-based debt of non-financial firms includes both loans and bonds, as well as both secured and unsecured (or subordinated) debt, going-concern debt of financial intermediaries primarily takes the form of unsecured (or subordinated) bonds.

There is also substantial heterogeneity in the amount of going-concern debt among financial intermediaries. Its share (normalized by total assets) increases with size and services revenue share, and decreases with the share of collateral value of discrete assets in total assets. The share of asset-based debt has the opposite pattern. For the median financial intermediary in our sample, the amount of asset-based debt is 4.5 times the amount of going-concern debt (although in aggregate this ratio is around 1).

Finally, while cash flow-based debt of non-financial firms often emphasizes creditor monitoring and control of the borrower's actions, going-concern debt of financial institutions seems to have much weaker monitoring and control rights. Compared with non-financial firm of similar credit quality, there is a lower share in the form of loans, as well as a lower prevalence of covenants in both bonds and loans. Although in principle the possibility of government bailouts may substitute for creditor monitoring, and some research finds that bailouts reduce interest rates (Acharya, Anginer, and Warburton, 2016; Berndt, Duffie, and Zhu, 2019), we do not find much evidence that bailouts can fully explain the weak monitoring we observe (since it is present among smaller intermediaries too, not just "too-big-to-fail" institutions). The composition of short-term debt of financial institutions—mostly insured deposits and bankruptcy remote, non-recourse repos—seems to dampen the role of the Diamond and Rajan (2001) mechanism that monitoring by short-term debt holders could make monitoring by other creditors irrelevant. Also, the extensive use of measurable indicators in regulation suggests that, although standard measures among non-financial firms such as EBITDA (earnings before interest, taxes, depreciation, and amortization) are possibly less useful for financial intermediaries, there are measurable and contractible indicators that can be used for monitoring financial intermediaries. The most plausible explanation we find is the difficulty to orderly restructure financial intermediaries. If creditors were to accelerate payments after covenant violations, they cannot use bankruptcy as an effective threat (since their payoffs could be very small in that case) to make borrowers comply with their requests. This lack of credible threat diminishes the value of covenants and going-concern debt with strong creditor control (e.g., loans or senior secured debt with blanket liens).

After presenting the empirical findings, we provide a model to shed further light on the results. In the model, a financial intermediary can invest in two types of projects: 1) discrete, separable assets, and 2) other assets (which may generate services revenue etc.). It has an endowment of equity and deposits, and can finance the discrete assets with asset-based debt or finance assets in general with going-concern debt. We find that the heterogeneity in asset composition and debt composition, such as the pronounced size dependence, cannot be easily delivered by risk aversion. It is more likely that large institutions have an advantage in investing in other assets (such as services) or can obtain subsidies in down states.

Taken together, the data suggests that financial institutions, especially large institutions, are not just about holding discrete, collateralizable assets. Services and going-concern value are important. Correspondingly, debt against going-concern value is prevalent, especially among large institutions. However, the enforcement of going-concern debt is non-trivial. Unlike non-financial firms, monitoring and control by creditors might be challenging to implement among financial institutions, given the difficulty in the orderly restructuring of institutions that engage in liquidity provision.

Literature Review. There is a sizable literature on the funding of financial institutions. Since the financial crisis, many papers study the asset-based debt of financial intermediaries, such as repos and asset-backed commercial papers (Gorton and Metrick, 2012; Krishnamurthy, Nagel, and Orlov, 2014). Another prominent literature since Diamond and Dybvig (1983) studies liquidity provision through financial intermediaries' deposit liabilities (Gorton and Pennacchi, 1990; Kashyap, Rajan, and Stein, 2002; Hanson, Shleifer, Stein, and Vishny, 2015). We show that going-concern debt of financial intermediaries is also important, and its enforcement raises interesting questions. We also provide a systematic comparison of financial intermediaries with non-financial firms in asset composition, debt composition, and monitoring intensity to demonstrate the similarities and differences.

Many papers on financial intermediaries also focus on the issue of debt maturity (Brunnermeier and Oehmke, 2013; Bai, Krishnamurthy, and Weymuller, 2018). Maturity is not our primary focus, but it can relate to the form of debt enforcement in financial intermediaries. Asset-based debt of financial intermediaries often has liquidity and safety provision functions, so in addition to being bankruptcy remote, such debt is often very short-term to enhance its liquidity and safety. Nonetheless, some asset-based debt of financial intermediaries is not ultra short-term, like Federal Home Loan Bank advances against mortgage loans. On the other hand, going-concern debt of financial intermediaries is generally long-term, perhaps partly because going-concern value often derives from longer-term investments.

Finally, our work relates to empirical research on different approaches of debt enforcement, most of which concerns non-financial firms. Rampini and Viswanathan (2010, 2013) emphasize the importance of tangible, discrete assets. Roberts and Sufi (2009), Nini, Smith, and Sufi (2012), Kermani and Ma (2019b) focus on creditors' monitoring and control of borrowers' actions. Our paper provides evidence from financial intermediaries and shows the connection with results among non-financial firms.

The rest of the paper proceeds as follows. Section 2 describes the data and definitions. Sections 3, 4, and 5 present results on asset composition, debt composition, and monitoring intensity, respectively. Section A outlines the model. Section 7 concludes.

2 Data and Categorization

In this section, we describe the data and the construction of the main variables.

2.1 Asset Composition

For asset composition of financial intermediaries, we collect data on bank holding companies from FR Y-9C reports. The reporting institutions mainly include commercial banking groups before 2009, and some broker dealers after 2009 (e.g., Goldman Sachs and Morgan Stanley).

For each institution, we define discrete assets as standardized, transferable assets that can be separated and repossessed on a standalone basis, denoted by α_x. The institution may also have additional assets that generate revenue (e.g., networks, human capital, organizational capital, etc.), denoted by α_y. The firm can directly pledge the discrete assets α_x as collateral and borrow based on their liquidation value. We estimate the collateral value of the discrete assets, denoted by $\lambda\alpha_x$. Specifically, for each institution i in each year t, we construct $\lambda\alpha^i_{x,t} = \sum_j \lambda_j \alpha^i_{x,j,t}$, where λ_j is the liquidation recovery rate (one minus the haircut) of asset class j and $\alpha^i_{x,j,t}$ is the balance sheet amount of asset j held by institution i in year t. In our baseline analysis, we use a constant λ_j for each asset class. We also perform robustness checks that allow λ_j to vary over time, which show almost identical results.

In α_x, we include the following asset categories: a) securities (Treasuries, government and municipal securities, MBS, ABC, corporate debt; b) reverse repos (not including securities borrowed), which represent collateral received for repo loans that the lender may use to raise financing (through rehypothecation); c) mortgages and real estate loans; d) commercial and industrial loans; e) consumer loans; f) real estate and fixed assets.

For λ_j, we collect data for each asset class, summarized in Table 1: a) for securities, our baseline analyses use the average haircut reported by Bai, Krishnamurthy, and Weymuller (2018); b) for reverse repos, we assume an average λ of 80% as a proxy of the value allowed for rehypothecation; c) for mortgages, we follow advance rate guidelines in Federal Home Loan Banks' collateralized lending against mortgage assets: 80% for single family, 75% for multi family, 70% for commercial real estate, and 60% for other real estate loans (Federal Home Loan Banks System, 2018); d) for commercial and industrial (C&I) loans, we assume 60% of the balance sheet value of large commercial loans and 20% of the small business loans can be potentially used for collateralized debt; in practice C&I loans held by banks are not easy to be directly pledged for collateralized borrowing, since the drawn amount can be highly variable (e.g., firms can draw down and reborrow on credit lines) and banks may need to play an active monitoring role (e.g., lead banks in syndicated loans need to collect information on the borrower and organize renegotiations etc.), so our assumptions may overestimate the effective λ on C&I loans;[1] e) for consumer loans, we assume a 60% advance rate; f) for real estate and fixed assets, we also use a 60% advance rate, assuming that most of these assets are commercial real estate (e.g., office buildings, branch offices). One can also include cash and reserves in α_x with $\lambda = 1$. Our main results are similar with or without cash holdings. For securities, we can also obtain time series of λ_j using data

[1] These features apply to commercial loan tranches held by banks, and are less relevant to loan tranches sold to institutional investors. Loans sold to institutional investors are predominantly term loans instead of revolving lines of credit; they have periodic interest payments together with principal payments at maturity like bonds.

on tri-party repo haircuts from Krishnamurthy, Nagel, and Orlov (2014) and from the New York Fed. Our results are the same using such time-varying estimates of λ_j because the haircut variations in these datasets are small. In any case, our main analysis focuses on cross-sectional differences across institutions, and always controls for year fixed effects, so measurement of time-varying λ is not central.

For comparisons with non-financial firms, we measure $\lambda\alpha_x$ of non-financial firms using the liquidation value of their discrete assets (which mainly include property, plant, and equipment, inventory, and receivable) constructed by Kermani and Ma (2019a). These liquidation values are estimated orderly liquidation recovery rates provided by the liquidation analyses in bankruptcy filings, which can be used as an upper bound estimate of the collateral value. Lending guidelines generally specify advance rates (i.e., collateral value) which are roughly 80% to 90% of the orderly liquidation value.

2.2 Debt Composition

We also collect detailed data on the debt composition of financial intermediaries. In particular, we classify debt into three main categories.

The first category consists of debt against discrete assets, including repos, asset-backed and securitized debt; FHB advances (generally collateralized by mortgage loans); other debt against receivables, equipment, real estate, etc. This category is analogous to "asset-based debt" among non-financial firms studied in Lian and Ma (2019) and Kermani and Ma (2019b). Debt against discrete assets has high priority claims against the liquidation value of these particular assets, but not against the firm value in general. For financial institutions, such debt claims (e.g., repos) are often bankruptcy remote: they are separate from the bankruptcy estate and are paid solely by the liquidation value of the particular assets pledged to them.

The second category consists of debt against the going-concern value of the institution. In the context of US financial intermediaries, it typically takes the form of bonds or convertible securities, and we include (non asset-backed) commercial papers as well; in certain cases, it may also take the form of loans (which are much more common among non-financial firms). This category is analogous to "cash flow-based debt" among non-financial firms (Lian and Ma, 2019; Kermani and Ma, 2019b). In the context of financial intermediaries, we refer to this type of debt as "going-concern debt" instead of "cash flow-based debt"; this is because this type of debt has a much stronger emphasis on cash flow value among non-financial firms, whereas financial intermediaries' going-concern value may not always be well captured by cash flows, as we discuss more later.

The third category is deposits. We think of deposits as products mainly for transaction and liquidity purposes, and debt enforcement relies on redemption or government deposit insurance. Thus we separate deposits from capital market debt, which may utilize more contractual mechanisms for debt enforcement.

For the classification of capital market debt in the first two categories, we mainly rely on detailed debt-level data from CapitalIQ which is available starting in 2003 for most public firms. For deposits, we use information from FR Y-9C filings.

For both asset composition and debt composition, our primary measures are normalized by total book assets. Total book assets is a proxy of total costs of investment, and we study how they can funded in different ways.

2.3 Debt Covenants

Finally, we collect data on debt covenants when we study mechanisms of debt enforcement. We obtain covenants in loans from DealScan and covenants in bonds from Mergent's Fixed Income Securities Database (FISD).

2.4 Sample Description

As mentioned above, our analysis is focused on bank holding companies. We thus restrict to firms with SIC codes starting with 60 (depository institutions), 6211 (broker-dealers), and 6712 (other bank holding companies). After combining data on asset composition and debt composition, we have about 780 bank holding companies and 5,500 firm-year observations from 2003 to 2016. As we discuss further in Section 5, in December 2016, the Federal Reserve announced the total loss-absorbing capacity (TLAC) regulation that specifically requires global systematically important banks (GSIBs) to hold long-term unsecured debt as loss absorption buffer. The regulation was implemented starting in January 2019. Our sample period precedes this regulation, so the results are not simply a reflection of TLAC regulatory requirements. Table 2 provides summary statistics of the sample.[2]

[2] In the data, we observe book values of banks' assets and liabilities: the value α_x and the value of debt are book values rather than market values. Although banks are subject to fair value accounting, they do not always mark asset values to market (Laux and Leuz, 2010), so we may not be able to fully detect the

3 Asset Composition of Financial Intermediaries

In this section, we document the characteristics of assets of financial intermediaries. In particular, we are interested in the importance of the collateral value of discrete assets ($\lambda\alpha_x$). We study the aggregate composition in Section 3.1, firm-level composition in Section 3.2, and summarize a comparison with non-financial firms in Section 3.3.

3.1 Aggregate Composition

In the aggregate, we find that the collateral value of discrete assets, namely the total value of $\lambda\alpha_x$, is about 60% of total book assets. Figure 1 Panel A shows a time series plot of the aggregate share of $\lambda\alpha_x$, for commercial banking groups (red solid line) and broker dealers (blue dotted line). Panel B additionally includes the value of cash balances.

Figure 1 also includes a comparison with non-financial firms (green line with diamond). For non-financial firms, the collateral value of directly pledgeable assets ($\lambda\alpha_x$) is much lower at less than 25% of total assets: non-financial firms' assets are highly specific and the liquidation value of discrete assets is generally limited (Kermani and Ma, 2019a).

Overall, while financial intermediaries' assets are much more generic than non-financial firms' assets, there is still a sizable fraction of value in the aggregate beyond the collateral value of discrete assets. As we discuss below, institutions also generate value from services, networks, human capital, and organziational capital, which are not captured by the intrinsic value of discrete assets. For instance, institutions with a smaller share of $\lambda\alpha_x$ in asset value tend to be associated with indications of stronger services functions: they tend to have a larger share of non-interest income in total revenue, and have a larger share of commercial lending to non-financial borrowers with high asset specificity.

3.2 Firm-Level Composition

Figure 2 plots the histogram of $\lambda\alpha_x$ as a share of total assets among the financial intermediaries in our sample. The data shows a fair bit of dispersion among different institutions. The median ratio is about 0.67, which is larger than the aggregate ratio shown above.

Figure 3 and Table 3 show the relationship between the share of $\lambda\alpha_x$ in total assets as a function of several characteristics, including size and features of economic activities. Figure

cyclical variations in the market value of bank assets. In our main analyses below, we focus on cross-sectional variations (with time fixed effects) to analyze determinants of asset and debt composition.

3 Panel A and Table 3 column (1) show the ratio decreases significantly with size: for large intermediaries, $\lambda\alpha_x$ is a smaller share of total assets. Figure 3 Panel A and Table 3 column (2) show the ratio also decreases with the fraction of revenue from services (proxied by non-interest income). Table 3 column (3) shows that institutions with smaller ratios also tend to lend to non-financial borrowers with higher asset specificity, as reflected by the average borrower liquidation value in syndicated loans from DealScan data.[3] The idea is that loans to borrowers with higher asset specificity generally have much higher intensity of monitoring by lenders (Kermani and Ma, 2019b), which is a form of services. Finally, columns (4) and (5) show that there is some overlap in these metrics. Size and the importance of services are positively correlated, and the coefficient on each variable decreases somewhat when they are both included. Nonetheless, they still remain statistically significant and both account for variations in $\lambda\alpha_x$.

3.3 Comparison with Non-Financial Firms

As shown in Figure 1, compared to non-financial firms, financial institutions' assets are much more generic: the collateral value of discrete assets, $\lambda\alpha_x$, is a much higher fraction of total assets.

In addition, among non-financial firms, variations in the value of $\lambda\alpha_x$ is largely an industry characteristic. For instance, for variations in the ratio of $\lambda\alpha_x$ to assets, 2-digit SIC fixed effects account for 40% of R^2, and 4-digit SIC fixed effects account for 50% of R^2. Instead, the size effect is very weak compared to results in Table 3. Controlling for industry fixed effects, the coefficient on log book equity is about -0.001 and the incremental R^2 from size proxies is close to zero.

In sum, for non-financial firms, asset features are largely driven by the nature of production activities at the industry level (e.g., assets of airlines are much more generic than assets of electronic manufacturers). For financial intermediaries, the features of assets and economic activities have more variations within the commonly defined industry, and some institutions engage in more services-intensive activities (e.g., market making, derivatives trading, commercial lending) than others.

[3] Specifically, we calculate the borrower liquidation value (normalized by borrower book assets) using the procedure in Kermani and Ma (2019a,b). Then for each lender in each year, we take all the loan facilities the lender participates in, and calculate the average borrower liquidation value weighted by facility amount. Lower liquidation value is associated with higher asset specificity.

4 Debt Composition of Financial Intermediaries

In this section, we turn to the characteristics of debt of financial intermediaries. In particular, we are interested in the role of debt against discrete assets versus debt against going-concern value, as defined in Section 2.2. We study the aggregate composition in Section 4.1, firm-level composition in Section 4.2, and summarize a comparison with non-financial firms in Section 4.3.

4.1 Aggregate Composition

Figure 4 shows that the value of going-concern debt is almost as large as that of asset-based debt in aggregate. Going-concern debt as a share of total assets is about 25% among broker dealers (blue dashed line with circles) and about 10% among commercial banking groups (red solid line with circles). In comparison, asset-based debt (sum of repos, securitized debt, advances collateralized by loans, etc.) is about the same magnitude: about 20% of total assets among broker dealers, which falls sharply to slightly above 10% after around 2013 (green dashed line with diamonds), and about 10% of total assets among commercial banking groups (purple solid line with diamonds). Overall, the aggregate quantity of going-concern debt is sizable.

4.2 Firm-Level Composition

Figure 5 plots the histogram of going-concern debt as a share of book assets among the financial intermediaries in our sample. The distribution is fairly skewed. At the firm level, the median share is about 2%, much smaller than the share in aggregate.

Figure 6 and Table 4 show the relationship between the share of going-concern debt as a function of several characteristics. First, Figure 6 Panel A and Table 4 column (1) show there is a significant negative correlation between the amount of going-concern debt and the amount of $\lambda\alpha_x$: institutions with more generic, directly pledgeable discrete assets (higher $\lambda\alpha_x$) have less going-concern debt and vice versa. Second, Figure 6 Panel B and Table 4 column (2) show that there are again variations with size: larger institutions have more going-concern debt. Third, Figure 6 Panel C and Table 4 column (3) show that there are also variations with the role of services: institutions that have stronger services functions (larger share of revenue from non-interest income) have a larger amount of going-concern debt. Table 4 column (4) shows that there is overlap among these characteristics, so the coefficient on each variable decreases somewhat when the variables are included together, as would be expected based on findings in Section 3.2. Overall, the share of going-concern debt decreases with the amount of $\lambda\alpha_x$, but size still plays an additional role even controlling for $\lambda\alpha_x$.

Taken together, institutions with a smaller amount of value of directly collateralizable assets have more going-concern debt. On top of that, the use of going-concern debt is particularly pronounced among large institutions.

4.3 Comparison with Non-Financial Firms

For US non-financial firms, Lian and Ma (2019) document that in the aggregate cash flow-based debt is about 4 times the amount of asset-based debt. As shown above in Section 4.1, for financial intermediaries, in the aggregate going-concern debt has about the same value as asset-based debt. Consistent with financial intermediaries having a larger amount of generic assets than non-financial firms as shown in Section 3.1, they do have lower usage of debt based on going-concern relative to debt backed by discrete assets. For both non-financial firms and financial intermediaries, the share of going-concern debt in total assets decreases with $\lambda\alpha_x$, and increases with size.

The seniority structure also appears somewhat different for cash flow-based debt of non-financial firms and going-concern debt of financial intermediaries. Among cash flow-based debt of non-financial firms, about 15% of debt outstanding by value is senior secured (against the corporate entity), and around 5% is subordinated. Among going-concern debt of financial intermediaries, less than 1% of debt outstanding by value is senior secured, and around 20% is subordinated. For the cash flow-based debt of non-financial firms, taking seniority explicitly through having secured claims (against the firm as a whole) can be important for creditor control (Donaldson, Gromb, and Piacentino, 2019; Kermani and Ma, 2019b). Correspondingly, the absence of senior secured going-concern debt may be related to the weakness of creditor monitoring and control we discuss below in Section 5.

Another noticeable difference with non-financial firms is the determinants of debt capacity. For non-financial firms with substantial cash flow-based debt, total debt of the firm is typically benchmarked to operating earnings (specifically EBITDA, i.e., earnings before interest, tax, depreciation, and amortization) (Lian and Ma, 2019). When non-financial firms seek to issue debt, total debt is commonly restricted to a multiple of earnings. In addition, they may need to comply with financial covenants that set bounds of total debt or debt payments relative to earnings. For financial firms, however, bounds of total debt relative to earnings are rare, for either debt issuance or compliance. For instance, for financial institutions like JP Morgan, Goldman Sachs, and Morgan Stanley, the ratio of total debt (not including deposits) to earnings may exceed 10 or 20, which is much higher than the level permitted for non-financial firms (e.g., debt to EBITDA of 4 to 6). There are several possible reasons why the standard debt to earnings benchmarks among non-financial firms do not seem to apply to financial institutions. One possibility is that accounting earnings are less useful for assessing the performance of financial institutions. Most simply, EBITDA does not typically include capital gains and losses on assets or charge-offs. It also does not include interest expenses.[4] Finding other appropriate ways to measure earnings may not be straightforward. Another possibility is that government support creates value for financial institutions beyond their own earnings (Atkeson, d'Avernas, Eisfeldt, and Weill, 2019). For example, we find that the ratio of the market value of the firm to operating earnings to be substantially higher among financial institutions, and significantly increasing in size (in line with the possibility that large institutions benefit more from government support). On the other hand, this ratio decreases with size among non-financial firms.

5 Enforcement of Going-Concern Debt

Among non-financial firms, enforcement of debt against firms' going-concern cash flow value is commonly associated with covenants, i.e., legally binding contractual provisions that restrict borrowers' behavior. These covenants place restrictions on borrowers and provide creditors with contingent control rights (in the case of covenant violation) to mitigate agency problems (Chava and Roberts, 2008; Roberts and Sufi, 2009; Nini, Smith, and Sufi, 2012). In this section, we analyze the usage of covenants in financial intermediaries' going-concern debt. We first show that financial intermediaries appear to have fewer covenants than comparable non-financial firms. Financial intermediaries also have a substantially smaller share of such debt in the form of loans, which are commonly considered to have stronger moni-

[4] For non-financial firms, non-operating income like capital gains and losses are excluded from EBITDA because they are not part of the core business. The aim of excluding interest expenses is to avoid the impact of the debt tax shield and to make earnings more comparable regardless of capital structure. For financial firms, however, interest expenses are part of the core financial intermediation activity.

toring and stronger covenants. We then discuss potential explanations for these differences.

5.1 Monitoring Intensity

Figure 7 plots the fraction of bond issues (Panel A) and loan issues (Panel B) with financial covenants by issuer ratings, for non-financial firms and financial intermediaries in our sample. Bond financial covenants use data from FISD and loan financial covenants use data from DealScan.[5] Because loans are rare among banks (as discussed below), loan documentation and covenant information can be less well recorded for banks; with this caveat in mind, we treat the analysis using loan covenants as one of several tests on monitoring intensity. The shading of the bar color increases with the number of observations from financial intermediaries in each issuer ratings category. We see that financial intermediaries generally have a lower prevalence of covenants, except in some cases for non-investment grade issuers but there are few observations in those cases for financial intermediaries.

In addition, it is commonly observed that commercial loans generally have stronger covenants and more active monitoring compared to bonds (Diamond, 1984, 1991; Holmstrom and Tirole, 1997). Figures 8 shows that among financial intermediaries' going-concern debt, the share of loans is also much lower than comparable non-financial firms. This difference can further contribute to the weakness of covenants for financial intermediaries.

In all of the comparisons above, we condition on issuer ratings to control for credit quality. In other words, the observation that financial intermediaries have a lower prevalence of covenants is not driven by financial intermediaries having a higher credit quality. Even for the same issuer rating category, financial intermediaries have a lower prevalence of covenants than non-financial firms. Indeed, conditioning on issuer ratings is likely conservative, given that recent research indicates some financial intermediaries' ratings could have been inflated pre-crisis (Berndt, Duffie, and Zhu, 2019). Correspondingly, in each issuer ratings bin, the financial intermediaries could have lower credit quality than the non-financial firms, and if anything should have more—not less—covenants.

Table 5 Panel A shows corresponding regression results controlling for basic firm characteristics. We combine and compare non-financial firms and financial intermediaries. In column (1), the outcome variable is a dummy variable of having at least one financial

[5] We exclude medium term notes (MTNs) to be conservative since the documentation of covenants may not be comprehensive for medium term notes. For the bond sample, we also exclude foreign currency bonds and asset-backed bonds.

covenant in a given bond issue. In column (2), the outcome variable is a dummy variable of having at least one financial covenant in a given loan issue. In column (3), the outcome variable is the share of loans in going-concern debt (cash flow-based debt for non-financial firms). We use a linear model, and control for year fixed effects and issuer ratings fixed effects similar to the comparisons in Figure 7. In all three columns, we see a negative and significant coefficient on the dummy for financial intermediaries. For financial intermediaries in our sample, the fraction of debt issues with financial covenants is about 10 to 20 percentage points lower than that for non-financial firms. The share of loans in going-concern debt is about 25 percentage points lower.

5.2 Potential Explanations

Why are covenants and creditor control rights weaker among financial intermediaries? We discuss four classes of possible explanations.

The first set of explanations focuses on the role of government supervision in the case of financial intermediaries: regulations and bailouts may substitute for monitoring by creditors. Specifically, creditors' expected losses are driven the by probability of default and loss given default. For financial intermediaries, there are extensive government regulations aimed at decreasing the probability of default. Government bailout may also decrease both the probability of default and loss given default for creditors. Acharya et al. (2016) find that bond spreads are sensitive to measures of risk for medium and small financial institutions, but much less so among large financial institutions. Berndt, Duffie, and Zhu (2019) find that prior to the financial crisis, bond yields of large financial institutions indicate significant bailout subsidies. Government interventions may thus decrease the necessity of creditor monitoring.

We try to assess the role of government interventions in light creditor monitoring by comparing covenant prevalence among globally systematically important banks (GSIBS), which are generally subject to particularly heavy government interventions (regulations or bailouts), with covenant prevalence among large non-GSIB banks (top 20 by size) and other banks. Table 6 Panel A analyzes the prevalence of covenants among financial intermediaries' loan issues and bond issues, and tests its relationship with a dummy for GSIBs and a dummy for large banks. It shows that large banks in general have slightly fewer covenants, but GSIBs do not necessarily have much fewer covenants than other large banks. In addition,

Table 6 Panel B provides a placebo check using non-financial firms: large banks roughly correspond to top 2% firms by revenue and GSIBs roughly correspond to top 1% firms by revenue. If we add dummies for top 1% and top 2% size by revenue, we also find a lower prevalence of covenants among these largest non-financial firms all else equal. Finally, even after excluding the largest institutions (GSIBs and top 1% non-financial firms), we still find lower covenant prevalence among financial firms compared to non-financial firms as shown in Table 5 Panel B. Overall, we have not found strong evidence that government intervention provides a full account of the lower prevalence of covenants among financial intermediaries. In other words, while government interventions may affect the pricing (Acharya, Anginer, and Warburton, 2016) and quantity of financial firms' going-concern debt, especially for the largest institutions, we do not find that they fully explain weaker creditor monitoring (which applies not just to the largest institutions).

The second set of explanations draws on the observation of Diamond and Rajan (2001) that short-term debt may provide monitoring of financial intermediaries, and substitute monitoring of other creditors. For US financial intermediaries, short-term debt generally takes three forms: deposits, repos, and commercial papers. For deposits, in the US insured deposits are not very likely to have strong incentive to monitor (Egan, Hortaçsu, and Matvos, 2017). Even uninsured deposits are unlikely to be as sophisticated as the professional investors who hold non-financial firms' debt. For repos, most contracts are bankruptcy remote ("safe harbor") and non-recourse (Bolton and Oehmke, 2015). Thus creditors' payoffs are primarily determined by the value of repo collateral, rather than the performance and governance of the institution. Correspondingly, their monitoring incentives could also be weak. For commercial papers, the total value of commercial papers in liabilities is less than 2% of total assets, and their role might also be limited.

The third set of explanations is there may be fewer informative, contractible signals to use for covenants in the case of financial intermediaries. As discussed in Section 4.3, accounting earnings (such as EBITDA, the standard measure used among non-financial firms) may not be informative about financial institutions' performance, and do not appear to be used to assess debt capacity. In particular, some earnings metric like EBITDA generally does not include capital gains and losses or charge-offs, which are central to financial firms. EBITDA also does not include interest expenses, which are more substantial for financial institutions. Other earnings metric like net income does take these items into account, but banks can have substantial discretion in estimating and reporting capital gains and losses

(Laux and Leuz, 2010). Recent research also finds that major US banks delayed and underestimated loan losses leading up to the crisis (Bischof, Laux, and Leuz, 2019). However, measurable metrics are used extensively in banking regulation, which suggests that there are at least some informative measurable indicators. Therefore, even though covenants based on earnings may not be very useful among financial institutions, in principle covenants can utilize alternative metrics.

The fourth set of explanations is that creditors lack effective mechanisms to enforce covenants. First, creditors may not have credible threats in the case of financial intermediaries. In particular, when covenants are violated, creditors have the legal power to accelerate payments (i.e., make the debt due immediately), which they can use as threats during the renegotiation process to influence borrowers' financial and real decisions and implement their requests (Nini, Smith, and Sufi, 2012). Such threats are credible if creditors can expect to get reasonable payoffs if they actually accelerate payments (which likely result in the borrower filing for bankruptcy). Correspondingly, Kermani and Ma (2019b) find a positive correlation between the average enterprise value in Chapter 11 restructuring in an industry and indications of monitoring intensity, including both loan covenant tightness and the amount of cash flow-based loans. For financial intermediaries which engage in liquidity provision, orderly restructuring has been challenging. If creditors were to accelerate payments after covenant violation and trigger bankruptcy of the borrower, their payoffs could be very low, which limits the scope for creditor control. Second, in part due to the challenges for private restructuring of financial intermediaries, the government is generally actively involved in distress resolution of financial intermediaries (through the FDIC and various other regulators). The government may also restrict creditors' control rights.

Following this observation, one possible implication is that if orderly restructuring of financial intermediaries becomes more feasible with frameworks such as the clean holding company proposal, it may be possible to have more creditor governance from going-concern debt. Nonetheless, the current total loss-absorbing capacity (TLAC) requirements instead prohibit going-concern debt from having meaningful covenants and creditor control rights. As discussed above, this could reflect the government's preference to be actively involved in the distress resolution of financial intermediaries: the government still aims to be in control rather than relying on creditor control.

6 Simple Model

In Appendix A, we present a simple model to further understand the empirical relationships. In the model, a risk-averse entrepreneur (bank) has equity endowment e. The entrepreneur can invest in discrete assets α_x with random return x, or in other projects (e.g., services) α_y with random return y. We model the asset structure as a choice by the entrepreneur, which reflects the greater flexibility in selecting assets and business models among financial firms as suggested by Section 3 (in contrast, the asset structure of non-financial firms is largely determined by the industry). The entrepreneur can borrow against the collateral value of discrete assets $\lambda\alpha_x$ (asset-based debt) with non-recourse and rate of return r_p. The entrepreneur can also borrow against firm value in general (going-concern debt) of amount k with coupon c and expected rate of return R. Finally, the entrepreneur can obtain deposits up to an amount D, with return r and guarantee from the government.

In the model, we assume that investment returns x and y are observable and verifiable, so contracts can specify payments based on investment payoffs. Accordingly, the entrepreneur will not be able to repudiate payments when investment returns are high, or to steal output (unlike models where payoffs are not verifiable such as Hart and Moore (1994) and Hart and Moore (1998)). This assumption of payoff verifiability is natural in the US institutional environment, with generally strict financial auditing, SEC supervision, and effective courts, as well as additional government regulation in the case of financial institutions. The verifiability of payoffs is especially relevant for the value of going-concern debt k, in two respects. First, when the entrepreneur has good performance, k will be paid accordingly, instead of repudiated. Second, when the entrepreneur has poor performance and defaults, the court will assign payments to k based on realizations of investment payoffs. The value of k in bankruptcy is important among non-financial firms (Lian and Ma, 2019; Kermani and Ma, 2019b), since Chapter 11 restructuring is reasonably streamlined and payments to creditors in Chapter 11 are largely based on estimated enterprise value of the reorganized firm. The value of k in bankruptcy can be more limited among financial institutions, given the challenges of orderly restructuring, as discussed above.[6]

With constant absolute risk aversion of entrepreneur, one can show that heterogeneity such as the size dependence in asset composition documented in Section 3 is unlikely to come

[6] One could assume explicitly that the amount received by lenders of k when financial institutions default is depressed by a cost of restructuring. If the functional form of the restructuring cost is simple enough (e.g., linear in the deficiency) the implications of the model would not change.

from risk aversion. We show that one way to obtain such relationships is to postulate that y increases with equity endowment e. This can capture possible increasing returns to scale in the provision of services (e.g., service functions such as trading networks and commercial lending have fixed costs). Under certain plausible parameter restrictions, we can then obtain that the share of the collateral value of discrete assets in total assets, $\frac{\lambda\alpha_x}{\alpha_x+\alpha_y}$, is decreasing in size e. We provide a simple simulation to show that this approach can deliver $\frac{\lambda\alpha_x}{\alpha_x+\alpha_y}$ decreasing in $\log(e)$ and $\frac{k}{\alpha_x+\alpha_y}$ increasing in $\log(e)$, with magnitudes that are close to what we observe in Table 3 column (1) and Table 4 column (2).

7 Conclusion

We study asset composition and debt composition of US financial intermediaries, and compare them with results from non-financial firms. For asset composition of financial intermediaries, we find that the collateral value of discrete assets accounts for 50% to 60% of total assets in aggregate. The share decreases with size and increases with the importance of services functions. This share is substantially higher than non-financial firms (less than 25% as shown in Kermani and Ma (2019a,b)), but still indicates a significant role for activities other than holding discrete assets. For debt composition, we find that going-concern debt accounts for around 10% to 15% of total assets in aggregate, about the same as asset-based debt. The share increases with size and the importance of services functions. While the aggregate ratio of going-concern debt to asset-based debt in financial intermediaries (about 1:1) is smaller than the aggregate ratio of cash flow-based debt to asset-based debt in non-financial firms (about 4:1 as shown in Lian and Ma (2019)), the quantity of going-concern debt in the financial sector is still sizable. Furthermore, we find that going-concern debt of financial intermediaries has weak monitoring. The most likely explanation for the weakness of creditor control is the lack of credible threat due to the difficulty of restructuring financial intermediaries.

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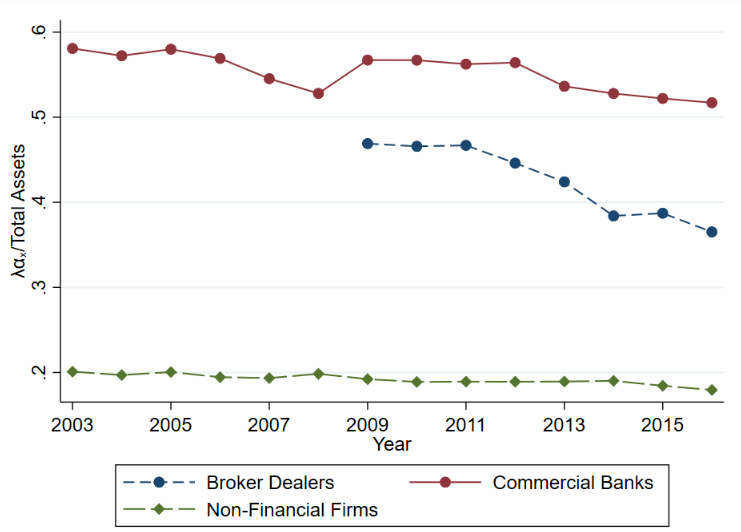
Main Figures and Tables

Figure 1: Aggregate $\lambda\alpha_x$/Assets

This figure shows aggregate total collateral value of discrete assets ($\lambda\alpha_x$), normalized by total book assets. The dashed line with circles represents broker dealers. The solid line with circles represents commercial banks. The dashed line with diamonds represents non-financial firms. Panel A shows $\lambda\alpha_x$ measured without cash holdings; Panel B shows the same plot with $\lambda\alpha_x$ plus cash holdings in the numerator.

Panel A. Total $\lambda\alpha_x$/Total Assets



Panel B. Total $\lambda\alpha_x$ (+ Cash)/Total Assets

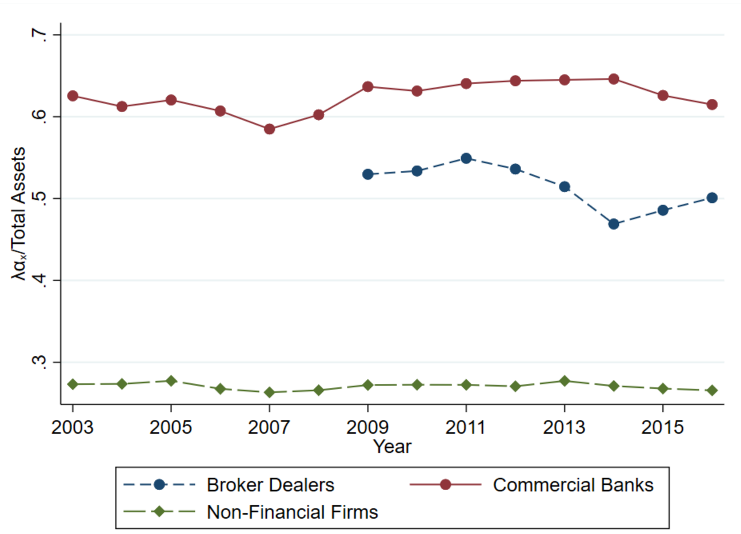


Figure 2: Distribution of $\lambda \alpha_x$/Assets

This figure shows the distribution of the firm-level collateral value of discrete assets ($\lambda \alpha_x$), normalized by book assets. All firm-years in our main financial intermediary sample are included.

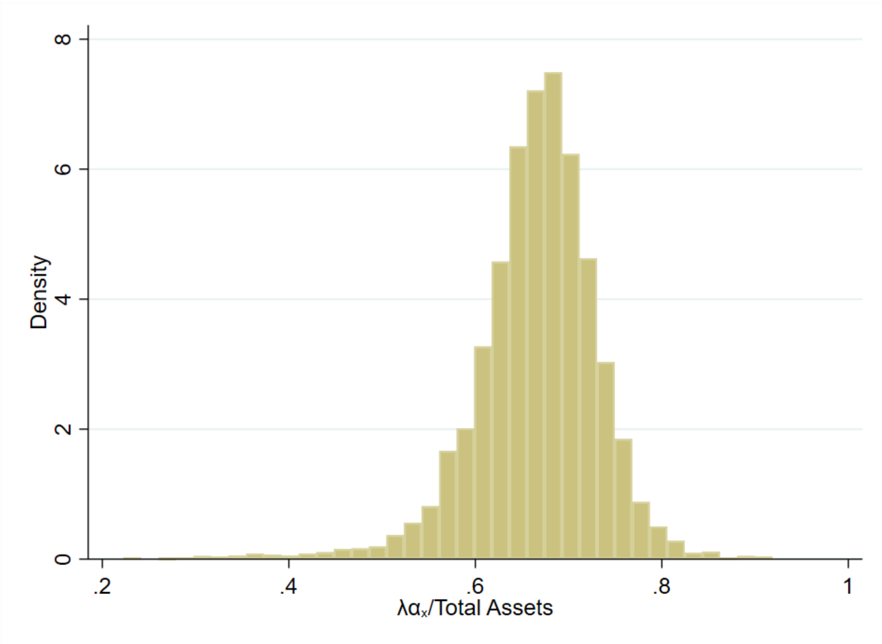
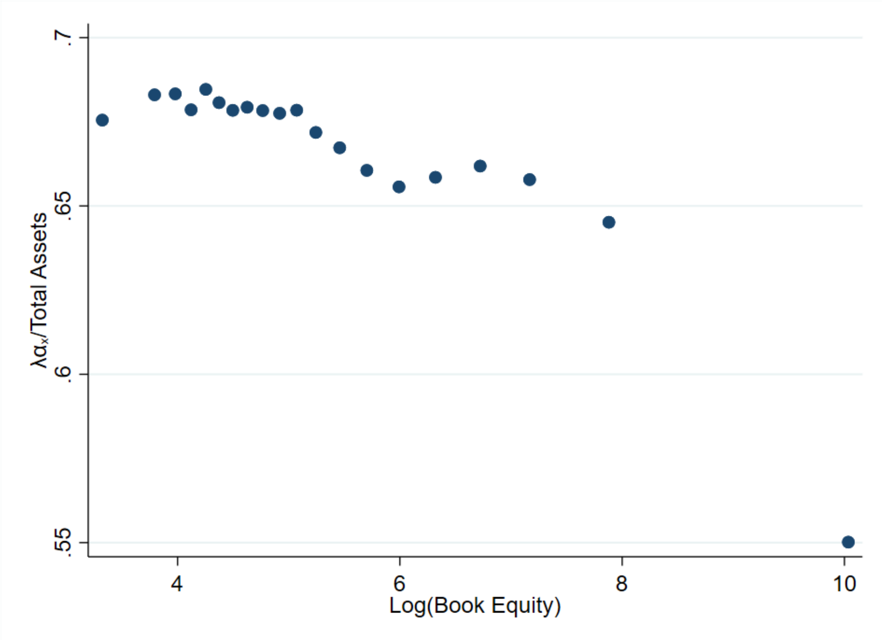


Figure 3: Variations of $\lambda\alpha_x$/Assets with Institution Characteristics

This figure shows bin-scatter plots of the relationship between the firm-level collateral value of discrete assets ($\lambda\alpha_x$) normalized by book assets (y-axis) and firm characteristics (x-axis). In Panel A, the bins are formed based on size (log book equity). In Panel B, the bins are formed based on the share of non-interest income in revenue. The average $\lambda\alpha_x$ in each bin is shown by the dots. The plots control for year fixed effects.

Panel A. Variations with Size



Panel B. Variations with Non-Interest Income

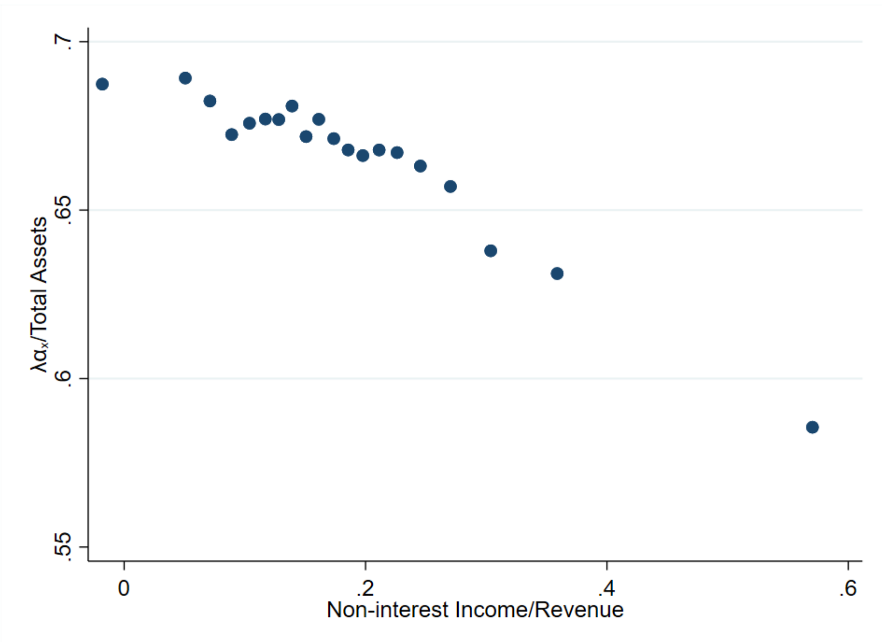


Figure 4: Aggregate Going-Concern Debt and Asset-Based Debt

This figure shows aggregate total going-concern debt (k) and asset-based debt (e.g., repos, securitized debt, FHB advances), normalized by total book assets. The dashed line with circles and diamonds represent going-concern debt and asset-based debt respectively for broker dealers. The solid line with circles and diamonds represent going-concern debt and asset-based debt respectively for commercial banks.

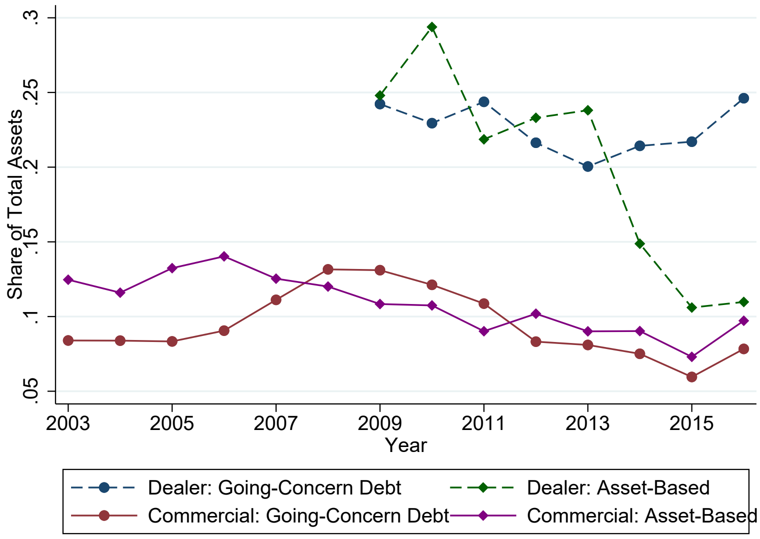


Figure 5: Distribution of Going-Concern Debt/Assets

This figure shows the distribution of the firm-level going-concern debt (k), normalized by book assets. All firm-years in our main financial intermediary sample are included.

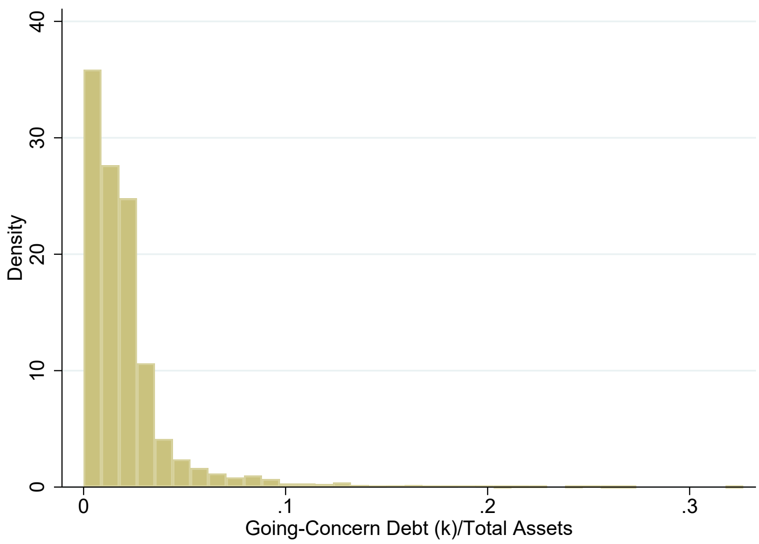
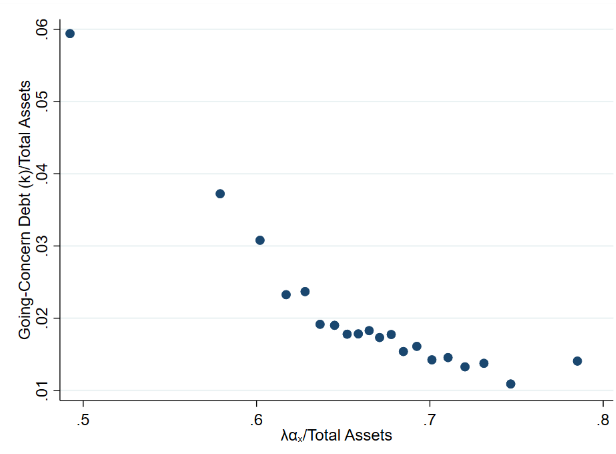


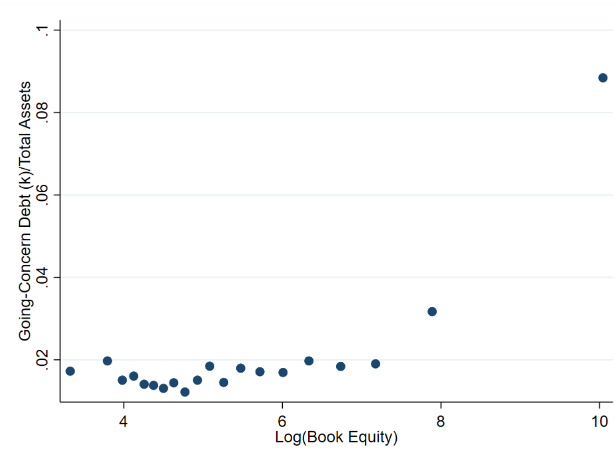
Figure 6: Variations of Going-Concern Debt with Institution Characteristics

This figure shows bin-scatter plots of the relationship between the firm-level going-concern debt (k) normalized by book assets (y-axis) and firm characteristics (x-axis). In Panel A, the bins are formed based on $\lambda\alpha_x$ in book assets. In Panel B, the bins are formed based on size (log book equity). In Panel C, the bins are formed based on the share of non-interest income in revenue. The average k in each bin is shown by the dots. The plots control for year fixed effects.

Panel A. Variations with $\lambda\alpha_x$



Panel B. Variations with Size



Panel C. Variations with Non-Interest Income

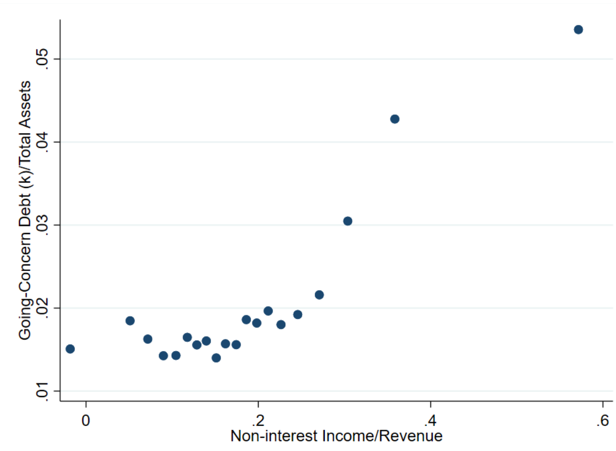
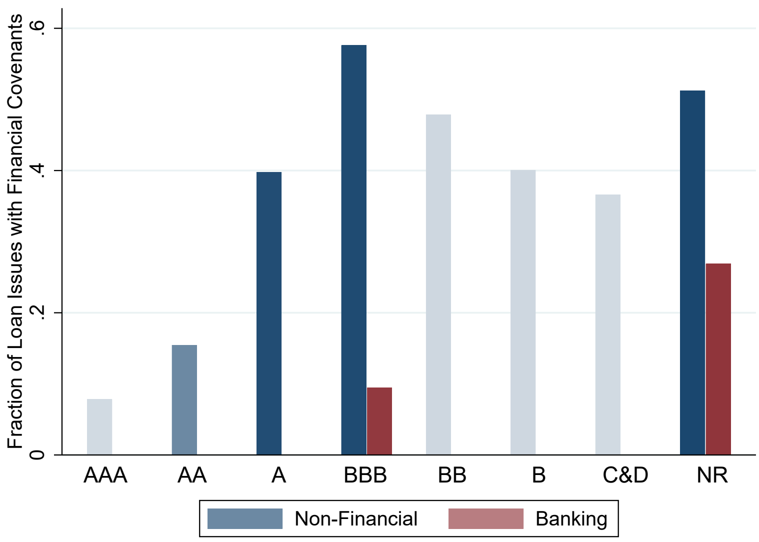


Figure 7: Prevalence of Financial Covenants among Financial Intermediaries' Going-Concern Debt

This figure shows the fraction of loan issues (Panel A) and bond issues (Panel B) that have financial covenants. The fractions are calculated for each issuer rating category. "Non-Financial" represents non-financial firms. "Banking" represents financial intermediaries in our main sample that are in the loan issue or bond issue datasets. Each observation is a debt issue. We exclude medium term notes in bond issues because their covenant information can be incomplete. The bar intensity increases with the share of observations from financial intermediaries that belong to each issuer rating category. The issues do not include debt that is collateralized by discrete assets (asset-based debt).

Panel A. Financial Covenants in Loan Issues



Panel B. Financial Covenants in Bond Issues

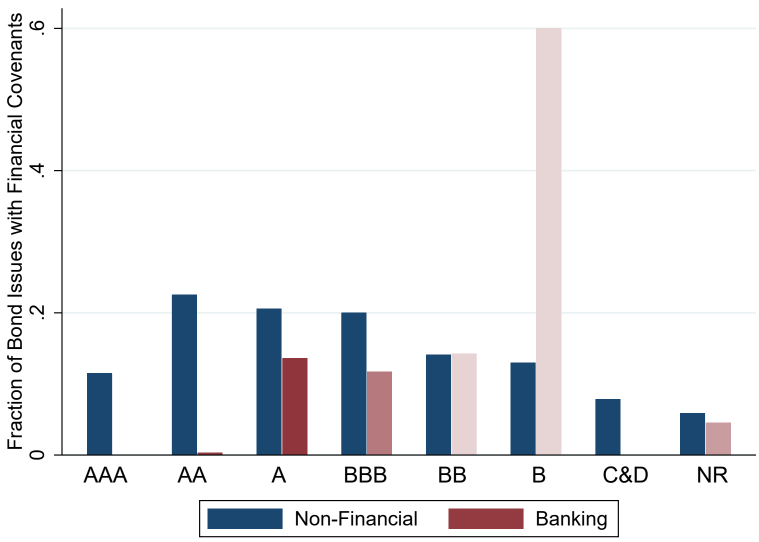


Figure 8: Prevalence of Loans among Financial Intermediaries' Going-Concern Debt

This figure shows the fraction of loans in going-concern debt for financial intermediaries. The fractions are calculated for each issuer rating category. "Non-Financial" represents non-financial firms. "Banking" represents financial intermediaries in our main sample. Each observation is a firm-year. The bar intensity increases with the share of observations from financial intermediaries that belong to each issuer rating category.

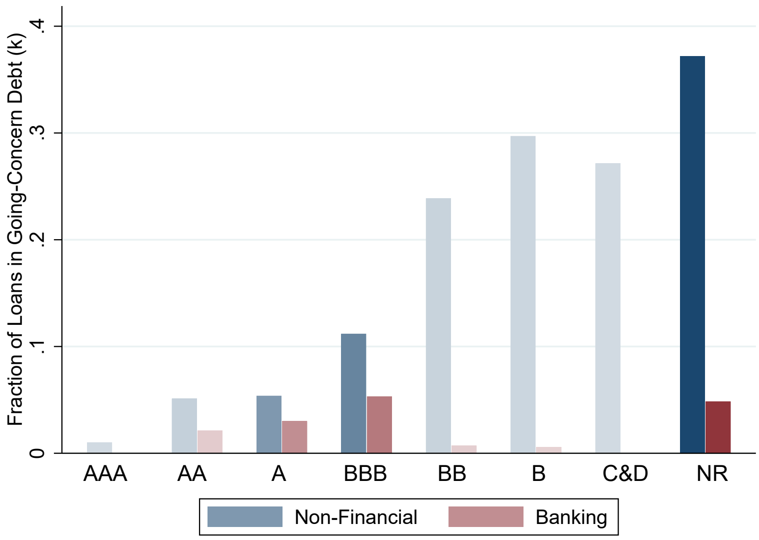


Table 1: Estimates of Collateral Value λ

This table summarizes the estimate of λ for each type of assets.

Securities
Treasuries: 0.98. Government obligations: 0.97. Agency MBS: 0.98. Non-agency MBS: 0.94. ABS: 0.94. Other debt securities: 0.95. Equities: 0.93. Reverse repo: 0.8.
Loans
Single family: 0.8. Multifamily: 0.75. Commercial real estate: 0.7. Other real estate: 0.6. Consumer: 0.6. C&I: 0.2.
Other Fixed Assets
Real estate and other fixed assets: 0.6.

Table 2: Summary Statistics

Summary statistics of financial institutions in the main sample. Mean, standard deviation, and selected percentiles are presented. Sample period is 2003 to 2016.

	Mean	SD	p10	p50	p90
Asset Composition					
Book assets	28,728.2	182,766.4	546.0	1,620.0	17,519.6
Enterprise value	31,550.6	189,887.7	566.4	1,872.4	20,122.9
Market value of equity	3,502.6	19,298.9	40.6	233.2	2,909.2
Enterprise value/book assets	1.04	0.07	0.96	1.03	1.12
Cash/assets	0.05	0.05	0.02	0.04	0.11
α_x/assets	0.88	0.08	0.80	0.90	0.95
$\lambda\alpha_x$/assets	0.66	0.07	0.59	0.67	0.74
Liability Composition					
Equity/assets	0.10	0.03	0.07	0.10	0.13
Deposits/assets	0.77	0.10	0.65	0.78	0.86
Asset-based debt/assets	0.10	0.08	0.02	0.09	0.20
Going-concern debt/assets	0.02	0.03	0.00	0.02	0.04

Table 3: Variations in Collateral Value of Discrete Assets $\lambda\alpha_x$

This table presents the relationship between $\lambda\alpha_x$ (normalized by book assets) and institution characteristics. Year fixed effects are included. Standard errors are double-clustered by firm and time.

	$\lambda\alpha_x$/Assets				
	(1)	(2)	(3)	(4)	(5)
Size (log book equity)	-0.016***			-0.012***	-0.015***
	(0.002)			(0.002)	(0.004)
Noninterest income/revenue		-0.162***		-0.107***	-0.276***
		(0.036)		(0.029)	(0.050)
Asset specificity of C&I loan borrowers			-0.199***		-0.087**
			(0.073)		(0.034)
Observations	5,480	5,486	295	5,474	295
R^2	0.15	0.12	0.05	0.19	0.62
Fixed effects	Year				

Table 4: Variations in Going-Concern Debt k

This table presents the relationship between going-concern debt k (normalized by book assets) and institution characteristics. Year fixed effects are included. Standard errors are double-clustered by firm and time.

	k/Assets			
	(1)	(2)	(3)	(4)
$\lambda\alpha_x$/assets	-0.151***			-0.076***
	(0.026)			(0.016)
Size (log book equity)		0.008***		0.006***
		(0.001)		(0.001)
Noninterest income/revenue			0.061***	0.019**
			(0.015)	(0.009)
Observations	5,422	5,411	5,416	5,405
R^2	0.14	0.24	0.10	0.29
Fixed effects	Year			

Table 5: Monitoring Intensity of Financial Intermediaries' Going-Concern Debt

In column (1), the outcome variable is a dummy that is equal to one if a bond issue has at least one financial covenant. In column (2), the outcome variable is a dummy that is equal to one if a loan issue has at least one financial covenant. In column (3), the outcome variable is the share of loans in going-concern debt. The debt issues do not include debt that is collateralized by discrete assets (asset-based debt). Bond issues also exclude medium term notes (MTNs). The sample includes both non-financial firms and financial intermediaries. The bank dummy is equal to one for financial intermediaries. Panel B excludes the largest firms (GSIBs and top 1% non-financial firms by revenue each year). Year and issuer ratings fixed effects are included. Standard errors are double-clustered by firm and time.

Panel A. All Firms

	Has Fin Cov (Bonds) (1)	Has Fin Cov (Loans) (2)	% Loans in Going-Concern Debt (3)
Bank dummy	-0.100**	-0.207***	-0.302***
	(0.043)	(0.038)	(0.019)
Bond size (log face value)	0.005		
	(0.004)		
Senior bond dummy	-0.016		
	(0.013)		
Convertible bond dummy	-0.085***		
	(0.030)		
Loan size (log face value)		0.060***	
		(0.008)	
$\lambda\alpha_x$/assets	0.007	-0.117**	0.008
	(0.039)	(0.059)	(0.045)
Firm size (log book equity)	-0.002	-0.047***	0.001
	(0.003)	(0.008)	(0.003)
EBITDA/l.assets	-0.001	0.077**	0.031***
	(0.020)	(0.038)	(0.005)
Observations	13,664	13,124	31,291
R^2	0.02	0.03	0.07
Fixed effects		Year, issuer ratings	

Panel B. Excluding Largest Firms

	Has Fin Cov (Bonds) (1)	Has Fin Cov (Loans) (2)	% Loans in Going-Concern Debt (3)
Bank dummy	-0.094***	-0.242***	-0.307***
	(0.032)	(0.044)	(0.020)
Bond size (log face value)	0.008*		
	(0.005)		
Senior bond dummy	-0.032**		
	(0.013)		
Convertible bond dummy	-0.092***		
	(0.030)		
Loan size (log face value)		0.057***	
		(0.008)	
$\lambda\alpha_x$/assets	-0.008	-0.125**	0.005
	(0.043)	(0.061)	(0.046)
Firm size (log book equity)	0.004	-0.039***	0.003
	(0.004)	(0.008)	(0.003)
EBITDA/l.assets	-0.011	0.075**	0.031***
	(0.018)	(0.037)	(0.005)
Observations	10,487	12,098	30,443
R^2	0.02	0.03	0.07
Fixed effects		Year, issuer ratings	

Table 6: Monitoring Intensity: Are Largest Institutions Special?

In column (1), the outcome variable is a dummy that is equal to one if a bond issue has at least one financial covenant. In column (2), the outcome variable is a dummy that is equal to one if a loan issue has at least one financial covenant. In column (3), the outcome variable is the share of loans in going-concern debt. The debt issues do not include debt that is collateralized by discrete assets (asset-based debt). Bond issues also exclude medium term notes (MTNs). In Panel A, the sample includes financial intermediaries. "GSIB" is a dummy for global systemically important banks. "Large non-GISB" is a dummy for top 20 US banks excluding GSIBs. In Panel B, the sample includes non-financial firms. "Top 1% (2%) non-financial" is a dummy for top 1% (2%) non-financial firms in a given year based on revenue. Year and issuer ratings fixed effects are included. Standard errors are double-clustered by firm and time.

Panel A. Financial Intermediaries

	Has Fin Cov (Bonds) (1)	Has Fin Cov (Loans) (2)	% Loans in Going-Concern Debt (3)
GSIB dummy	-0.009	-0.042	-0.045
	(0.039)	(0.076)	(0.034)
Large non-GSIB dummy	-0.071**	-0.022	0.033
	(0.035)	(0.071)	(0.033)
Bond size (log face value)	0.013*		
	(0.008)		
Senior bond dummy	0.137**		
	(0.061)		
Convertible bond dummy	-0.027		
	(0.030)		
Loan size (log face value)		-0.013	
		(0.027)	
$\lambda\alpha_x$/assets	0.242	-0.089	0.119
	(0.210)	(0.296)	(0.101)
Firm size (log book equity)	0.003	0.030	-0.004
	(0.005)	(0.024)	(0.004)
EBITDA/l.assets	-1.874*	1.901	0.767**
	(1.139)	(3.124)	(0.349)
Observations	1,083	204	4,272
R^2	0.11	0.02	0.00
GSIB+Large=0 (p-value)	0.03	0.34	0.52
Fixed effects		Year, issuer ratings	

Panel B. Non-Financial Firms (Placebo)

	Has Fin Cov (Bonds) (1)	Has Fin Cov (Loans) (2)	% Loans in Going-Concern Debt (3)
Top 1% non-financials dummy	-0.034**	-0.009	-0.005
	(0.016)	(0.031)	(0.012)
Top 2% non-financials dummy	0.011	-0.110***	-0.074***
	(0.012)	(0.025)	(0.010)
Bond size (log face value)	0.006		
	(0.004)		
Senior bond dummy	-0.051***		
	(0.017)		
Convert bond dummy	-0.092***		
	(0.032)		
Loan size (log face value)		0.063***	
		(0.008)	
$\lambda\alpha_x$/assets	-0.008	-0.116*	0.031
	(0.039)	(0.060)	(0.046)
Firm size (log book equity)	0.001	-0.036***	0.005*
	(0.004)	(0.008)	(0.003)
EBITDA/l.assets	-0.005	0.066*	0.031***
	(0.020)	(0.035)	(0.005)
Observations	12,581	12,920	27,019
R^2	0.01	0.03	0.01
Top 1%+Top 2%=0 (p-value)	0.17	0.00	0.00
Fixed effects		Year, issuer ratings	

A Model

A.1 Setup

A risk-averse entrepreneur (bank) has e dollars of equity, invests $\alpha_x \geq 0$ in discrete assets with random ex-post rate of return x, and invests $\alpha_y \geq 0$ in other projects with random ex-post rate of return y. The entrepreneur can obtain funding from the following sources. First, she can borrow against the liquidation value of the discrete assets (such as using repos). In this market, she pays $r_p > 1$ per dollar borrowed. If the entrepreneur has invested α_x in discrete assets, she can borrow any fraction $0 \leq \beta \leq 1$ of the maximum collateral value $\lambda\alpha_x$, $0 < \lambda < 1$. The fraction $(1 - \lambda)$ is the haircut. Borrowing against discrete assets (e.g., repos) is generally non-recourse, and sometimes bankruptcy remote (Bolton and Oehmke, 2015); accordingly, if an entrepreneur borrows $\beta\lambda\alpha_x$, her liability is $\min\{r_p\beta\lambda\alpha_x, \alpha_x x\}$. $\beta\lambda\alpha_x$ maps into asset-based debt, which lends against the value of the discrete assets. Second, the entrepreneur can also borrow k against income in general from risk-neutral lenders by paying a coupon c that produces an expected return to lenders that equals $R > r_p$.[7] k maps into going-concern debt, which lends against firm value as a whole. Third, the entrepreneur also has access to deposits up to an amount D. Deposits get a return $r \geq 1$ and are guaranteed by the government. The government insures deposits but charges a premium per unit of deposit that equals the expected loss L. Then:

$$\alpha_x + \alpha_y \leq \beta\lambda\alpha_x + k + e + d - dL, \tag{A1}$$

where $d \leq D$ is the amount of deposits the entrepreneur accepts.

The payoff to the entrepreneur is:

$$\max\{0, \alpha_x\beta \max\{0, x - \lambda r_p\} + \alpha_x(1 - \beta)x + \alpha_y y - ck - rd\}, \tag{A2}$$

where r is the rate of return paid on deposits, $r_p > r$ is the return on debt against discrete assets, and c is the coupon promised to lenders of k. To simplify matters we assume there are no other claimants to output so lenders of k receive the minimum between what they were promised and the total value of the firm (minus payments to deposits and debt against discrete assets). The required rate of return R must thus satisfy:

$$E\left[\min\left\{ck, \max\{0, \alpha_x\beta \max\{0, x - \lambda r_p\} + \alpha_x(1 - \beta)x + \alpha_y y - rd\}\right] = Rk. \tag{A3}$$

[7] Since the entrepreneur is risk-averse, the optimal contract with risk-neutral lenders would entail equity participation. Our focus on debt leads us to concentrate on debt contracts. Alternatively one could use the framework of Hébert (2017) where entrepreneurs are risk-neutral but discount future payoffs by more than lenders do. Hébert (2017) deals with financing of a single project so one would to make several extensions of the model to accommodate the entrepreneur's choice of a portfolio of assets and the different sources of capital that we consider.

In particular this implies that $c \geq R$ and if we assume that return on cash by the entrepreneur is not more than R, then inequality (A1) must hold with equality. Thus we get:

$$k = \alpha_x(1 - \beta\lambda) + \alpha_y - e - d + dL. \tag{A4}$$

If $\frac{r}{1-L} < R$, that is, deposits are cheaper than borrowing k even after taking into consideration the deposit insurance premium, then the payoff to the entrepreneur when d increases and k decreases would be higher in every state (x, y). This is because in states where the entrepreneur defaults on k her payoff is independent of the amount of deposits, whereas in other states she would benefit from cheaper financing. Accordingly, when $k > 0$ we may restrict ourselves to the case where $d = D$. Similarly, if $r_p < R$, we would obtain $\beta = 1$ when k is positive. In the data, β is close to 1 on average for liquid assets such as securities, especially for large institutions (for small institutions, there could be fixed costs of setting up repo networks). β is much smaller for illiquid assets such as commercial loans. This could come from over-estimation of λ for these assets, or from the illiquidity of these assets leading to an effectively higher r_p.

A.2 Four States

For simplicity of illustration and to obtain clear comparative statics, we consider an environment with four states, with probability π_i and returns x_i on α_x and y_i on α_y for each state $i \in \{1, 2, 3, 4\}$. In state 1, α_y has low returns and the returns on α_x is low enough so the entrepreneur defaults on debt. In addition, to simplify the calculation of the deposit insurance premium, we assume that the cost of default is large enough so that the deposit insurer receives zero payoff. In state 2, $y_2 \leq R$ but the returns on αx and the presence of equity and deposits compensate these losses so there is no default. In state 3, $x_3 < \lambda r_p$ but returns on α_y are enough to avoid default (in particular, $y_3 > \frac{R}{1-\pi_1}$). In state 4, both α_x and α_y yield high returns and, in particular, $x_4 \geq x_2$ and $y_4 > y_3$.

Competitive lenders of k will charge a coupon c such that:

$$(1 - \pi_1)ck = Rk \tag{A5}$$

where $k = \alpha_y + \alpha_x(1-\lambda) - e - (1-\pi_1)D$. The payoff of the entrepreneur in states $i = \{2, 3, 4\}$ is:

$$\begin{aligned} z_i &= \alpha_y y_i + \alpha_x \max\{x_i - \lambda r_p, 0\} - rD - ck \\ &= \alpha_y y_i + \alpha_x \max\{x_i - \lambda r_p, 0\} - rD - \frac{R}{1-\pi_1}k \end{aligned}$$

In an interior maximum, the FOCs are are:

$$\pi_2 u'(z_2)\left(x_2-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1}\right)+\pi_3 u'(z_3)\left(-(1-\lambda)\frac{R}{1-\pi_1}\right)$$
$$+\pi_4 u'(z_4)\left(x_4-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1}\right)=0$$
$$\pi_2 u'(z_2)\left(y_2-\frac{R}{1-\pi_1}\right)+\pi_3 u'(z_3)\left(y_3-\frac{R}{1-\pi_1}\right)$$
$$+\pi_4 u'(z_4)\left(y_4-\frac{R}{1-\pi_1}\right)=0$$

It is obvious from these FOC's that if u has constant absolute risk aversion then asset composition would be homogeneous among institutions. For example, there is no variation with respect to size of equity endowment: $\frac{\partial \alpha_x}{\partial e}=\frac{\partial \alpha_y}{\partial e}=0$. In the data, on the other hand, we do observe size effects in asset composition as shown in Section 3.

To understand the size dependence, we now assume that firms with more equity have better projects: more precisely, $y_i(e)=y_i+\theta e$. The example later shows that we may choose θ so that the assumptions about default in different states hold for e in an interval $[\underline{e},\bar{e}]$. Then for $i>1$

$$\frac{\partial z_i}{\partial e}=\frac{\alpha_y\theta}{1-\pi_1}>0.$$

From now on we assume a CARA utility function, $u(z)=1-\exp(-Az)$. We write F_{α_x} for the FOC with respect to α_x and F_{α_y} for the FOC with respect to α_y. Then,

$$F_{\alpha_x e} = 0 \tag{A6}$$
$$F_{\alpha_y,e} = \frac{\theta}{\prime}(e)1-\pi_1[\pi_2 u'(z_2(e))+\pi_3 u'(z_3(e))+\pi_4 u'(z_4(e))] \tag{A7}$$

.

Applying the implicit function theorem we obtain that: **an increase in e increases the position in α_y.**

We can derive the off-diagonal elements of the Jacobian matrix of derivatives of first order conditions:

$$\begin{aligned} F_{\alpha_y,\alpha_x} &= \pi_2 u''(z_2(e))\left(x_2-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1}\right)\left(y_2(e)-\frac{R}{1-\pi_1}\right)\\ &+ \pi_3 u''(z_3(e))\left(-(1-\lambda)\frac{R}{1-\pi_1}\right)\left(y_3(e)-\frac{R}{1-\pi_1}\right)\\ &+ \pi_4 u''(z_4(e))\left(x_4-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1}\right)\left(y_4(e)-\frac{R}{1-\pi_1}\right)\end{aligned}$$

Using the FOC on α_x we obtain

$$\begin{aligned} F_{\alpha_y,\alpha_x} &= \pi_2 u''(z_2(e))(x_2-\lambda r_p)\left(y_2(e)-\frac{R}{1-\pi_1}\right) \\ &+ \pi_4 u''(z_4(e))(x_4-\lambda r_p)\left(y_4(e)-\frac{R}{1-\pi_1}\right) \end{aligned}$$

When $x_4 = x_2$ we obtain

$$F_{\alpha_y,\alpha_x} = A\pi_3 u'(z_3(e))\left(y_3-\frac{R}{1-\pi_1}\right)(x_2-\lambda r_p) > 0 \tag{A8}$$

since $y_3 - \frac{R}{1-\pi_1} > 0$. Note that the result still holds if x_2 is close to x_4. Thus we have established that: ***if x_4 is close enough to x_2, then an increase in e increases the position on α_x.***

On the other hand since $x_4 \geq x_2$

$$\begin{aligned} -F_{\alpha_x,\alpha_x} &= A[\pi_2 u'(z_2(e))(x_2-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1})^2 \\ &+ \pi_3 u'(z_3(e))((1-\lambda)\frac{R}{1-\pi_1})^2 \\ &+ \pi_4 u'(z_4(e))(x_4-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1})^2] \\ &\geq A[\pi_2 u'(z_2)(x_2-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1})^2 \\ &+ \pi_3 u'(z_3)((1-\lambda)\frac{R}{1-\pi_1})^2 \\ &+ \pi_4 u'(z_4)(x_2-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1})(x_4-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1})] \\ &= A\pi_3 u'(z_3)(1-\lambda)\frac{R}{1-\pi_1}\left[(x_2-\lambda r_p-(1-\lambda)\frac{R}{1-\pi_1})+(1-\lambda)\frac{R}{1-\pi_1}\right] \\ &= A\pi_3 u'(z_3)(1-\lambda)\frac{R}{1-\pi_1}(x_2-\lambda r_p) \end{aligned}$$

Since whenever $x_4 \geq x_2$, $F_{\alpha_y,\alpha_x} \leq A\pi_3 u'(z_3(e))\left(y_3-\frac{R}{1-\pi_1}\right)(x_2-\lambda r_p)$, we have established that: ***if $(2-\lambda)\frac{R}{1-\pi_1} > y_3$ and $\alpha_x > \alpha_y$, then $\frac{\lambda\alpha_x}{\alpha_x+\alpha_y}$ decreases with e.***[8]

A.3 Simulation

We provide a simple simulation example below. We use the utility function: $u(z) = 1 - e^{-\gamma \cdot z}$ (CARA), and the following parameters:

- $\gamma = 3$.
- $\lambda = 0.9$. $r_p = 1.03$.

[8] Since in the data $\alpha_x \sim 3\alpha_y$ this condition can be weakened substantially.

- $D = 3.5$. $r = 1.03$.
- $x_2 = x_4 = 1.05$.
- $\theta = 0.01$. $y_2 = 1.055 + 0.01e$; $y_3 = 1.135 + 0.01e$; $y_4 = 1.185 + 0.01e$.
- $\pi_1 = 0.03$; $\pi_2 = 0.38$; $\pi_3 = 0.01$; $\pi_4 = 0.58$.
- $R = 1.06$. $c = \frac{R}{1-\pi_1} \approx 1.093$.

We obtain the following results. As Table A2 shows, the slope of the share of $\lambda\alpha_x$ in total assets with respect to $\log(e)$ is close to the findings in Table 3 column (1); the slope of k normalized by total assets with respect to $\log(e)$ is close to the findings in Table 4 column (2).

Table A1: Asset and Liability Composition for Different Levels of e

e	α_x	α_y	k	$\frac{\lambda\alpha_x}{\alpha_x+\alpha_y}$	$\frac{\alpha_y}{\alpha_x+\alpha_y}$	$\frac{k}{\alpha_x+\alpha_y}$	$\frac{D}{\alpha_x+\alpha_y}$	$\frac{D}{e}$
0.5	7.25	4.38	1.21	0.5611	0.3765	0.1041	0.3007	7
0.6	7.31	4.51	1.25	0.5565	0.3815	0.1054	0.2960	5.8
0.7	7.37	4.64	1.29	0.5521	0.3865	0.1070	0.2913	5
0.8	7.43	4.78	1.33	0.5476	0.3915	0.1089	0.2865	4.3

Table A2: Slope against $\log(e)$

e	$\log(e)$	$\frac{\lambda\alpha_x}{\alpha_x+\alpha_y}$	$\frac{k}{\alpha_x+\alpha_y}$
0.5	-0.6931	0.5611	0.1041
0.8	-0.2231	0.5476	0.1089
Δ	0.47	-0.135	0.0048
Slope		**-0.28**	**0.01**
Data		-0.02	0.01