UvA-DARE (Digital Academic Repository)

Collateral and the limits of debt capacity: theory and evidence

Giambona, E.; Mello, A.S.; Riddiough, T.

Publication date

2012

Document Version

Submitted manuscript

[Link to publication](#)

Citation for published version (APA):

Giambona, E., Mello, A. S., & Riddiough, T. (2012). *Collateral and the limits of debt capacity: theory and evidence*. Universiteit van Amsterdam.
http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2039253

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

Collateral and the Limits of Debt Capacity: Theory and Evidence*

Erasmus Giambona
University of Amsterdam
e.giambona@uva.nl

Antonio S. Mello
University of Wisconsin
amello@bus.wisc.edu

Timothy Riddiough
University of Wisconsin
triddiough@bus.wisc.edu

This version: April 12, 2012

Abstract

This paper considers how collateral is used to finance a going concern, and demonstrates with theory and evidence that there are effective limits to debt capacity and the kinds of claims that are issued to deploy that debt capacity. The theory shows that firms with (unobservably) better quality collateral optimally pledge an unused portion of that collateral to finance new investment opportunities with unsecured debt, while firms endowed with lower quality collateral use project-specific secured debt. Better quality firms must also commit to maintaining an equity cushion to separate themselves from lesser quality firms, implying lower relative leverage and greater uncommitted cash flow from operations with which to meet debt service requirements. The fundamental empirical prediction derived from our model is that a firm's financing choice, as it relates to asset quality, reveals information about firm value. To establish this link empirically, we rely on a natural experiment from the listed-property firm industry. Housing property-firms had access to Fannie Mae-Freddie Mac secured debt financing during the peak of the 1998 Russian crisis (but not other financing options), whereas Non-Housing firms were shut out of all financing channels. Empirical evidence indicates that, consistent with our theory, better quality Housing firms migrated from the unsecured debt market into the secured debt market during a time of high equity issuance costs, thus raising the average revealed asset quality of firms in the pool of secured debt issuers. We rely on a series of falsification tests to rule out alternative explanations for our empirical findings.

*Send correspondence to: Erasmus Giambona, Finance Group, University of Amsterdam, 1018 WB Amsterdam, The Netherlands. E-mail: e.giambona@uva.nl. Phone: +31 20 525 5321. We appreciate comments from Heitor Almeida, Murillo Campello, Piet Eichholtz, John Geanakoplos, John Harding, Jay Hartzell, Dwight Jaffee, Igor Makarov, Alan Moreira, Justin Murfin, Frank Nothaft, Joe Pagliari, Mark Parrell, Florian Peters, Adriano Rampini, Steve Ross, David Shulman, Matthew Spiegel, Bob Van Order, Nancy Wallace, Tony Yezer. We also thank seminar participants at Duisenberg School of Finance, European Central Bank, Federal Reserve Board, George Washington University, The Wharton School, University of Amsterdam, University of California at Irvine, University of Connecticut, University of Miami, University of Wisconsin at Madison, Warwick Business School, the Pre-WFA Summer Real Estate Symposium (2011), and FMA Meeting (2011). This paper was completed in part while the first author was visiting the International Center for Finance at Yale School of Management during fall 2011. An earlier version of the paper was circulated with the title "Collateral and Debt Capacity in the Optimal Capital Structure." Yno van Haster provided excellent research assistance. We are responsible for any remaining errors.

Collateral and the Limits of Debt Capacity: Theory and Evidence

Introduction

A large proportion of loans are backed by collateral. When lenders have limited ability to enforce repayment, pledging collateral is indispensable to ameliorate credit market frictions. Berger and Udell (1990), and Harhoff and Korting (1998), for example, find that nearly 70 per cent of commercial and industrial loans in the largest western economies are secured. Collateral also has important effects on the real economy. Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and more recently Chaney, Sraer, and Thesmar (2012) show that the value of collateral impacts firms' debt capacity, as well as lending as propagated through the credit channels, in turn affecting investment and output.

Although the recent financial crisis has led researchers and policymakers to think more carefully about the role of collateral in the real economy, there remain many unanswered questions about how collateral is used by firms to invest and issue different types of claims to finance investment. There are also important gaps in our understanding of how collateral affects debt capacity, which in turn helps govern the capital structure decision of firms. In this paper, we provide theory and evidence of the optimal leverage of going concerns that own real assets with significant debt capacity, focusing specifically on the limits to utilizing debt capacity in the presence of collateral.

As a first step in the analysis, a theoretical model is developed that is an extension of Bester (1985, 1987), and that also borrows directly from the work of Stulz and Johnson (1985) and Myers and Rajan (1998). In our model, firms are going concerns with collateralizable assets-in-place. The assets-in-place have productive qualities that vary across firms, and that are unobservable to outsiders. When a new project is available, firms consider alternatives for financing the investment. The firm has no available existing liquid resources (cash or cash equivalents) with which to finance the new project, but its real assets in place are potentially available as collateral. If real assets in place are offered as collateral to fund the new project, the new financing is denoted *unsecured* (that is, the

available real assets of the firm collateralize all of the debt of the firm). Otherwise, if only the new investment is offered to collateralize the new debt, the debt is *secured*.¹

We consider two basic questions in the model development. First, how should firms that are endowed with assets in place that have an unobservable value component optimally finance their investment? And second, how should creditors optimally screen firms in order to ascertain their true type?

We show that, conditional on the firm's identity being known to outside financiers, higher quality firms (firms endowed with more valuable assets-in-place) will prefer to finance themselves with unsecured debt and lower quality firms will prefer to finance themselves with secured debt. This result occurs because better quality firms, which possess more valuable assets-in-place, can improve issuance proceeds by cross-collateralizing their assets to finance new investment. Firms that hold lower quality assets, and who might consider using them to cross-collateralize unsecured debt, realize reduced proceeds relative to issuing secured debt. As a result, the lower quality firms finance the new investment with secured debt.

When there is uncertainty with respect to firm type, the lower quality firms would like to represent to outsiders that they are higher quality firms, as this would allow them to issue unsecured debt and increase issuance proceeds. Without some method to differentiate between firms, lenders will decide to pool all borrowers in the secured debt market. Competition between lenders will instead result in screening, which, in our model, is done by requiring firms that issue unsecured debt to also effectively commit to more conservative leverage ratios. Committing to low leverage is very costly for lower quality firms, as the risk and associated penalty of breaking the commitment is high. Consequently, screening is such that higher quality firms separate by issuing unsecured debt as well as committed equity in sufficient quantity so as to make it too expensive for lower quality firms to mimic them.

Thus, an important equilibrium in the model is that higher quality firms use less leverage, use a greater proportion of unsecured debt to finance new investment opportunities, and pay lower incremental costs of debt finance. In these circumstances the better quality firms will optimally choose *not* to exhaust their debt capacity, because doing so may lead to the inefficient assignment of

¹ We are interested in the cross-collateralization properties of unsecured debt relative to secured debt. Consequently, we limit recovery rights of secured debt to the value of a specified asset and unsecured debt to the combined value of all the firm's assets. There are other ways to characterize secured and unsecured debt. For example, Stulz and Johnson (1985) focus on priority of secured debt without liability being limited to the value of any specific asset. Boot, Thakor, and Udell (1991) also focus on priority, and simply assume that unsecured debt generates a zero payoff in default while secured debt generates a positive payoff.

collateral to individual debt issues.² In contrast, lower quality firms always issue secured debt, and therefore realize higher leverage ratios. Because, in our model, the higher quality firms issue lower risk unsecured debt and lower quality firms issue higher risk secured debt, we can explain why unsecured debt often has a lower credit spread than secured debt. This result is confirmed by the findings in Rauh and Sufi (2010).

There is an alternative equilibrium in our model that results when the cost of committed equity issuance is high. In this case, higher quality firms will also issue secured debt to finance investment, and hence migrate into the pool of secured borrowers to raise the average revealed asset quality. As a consequence, relative to regimes where equity issuance costs are low, a high equity issuance cost regime implies no issuance activity in the unsecured debt. Rather, all of the financing activity occurs in the secured debt market, with a pool of firms that exhibit relatively higher average asset and credit quality.

As a second step in the analysis, we empirically test the predictions of the model, noting that, in the majority of the countries, the most important form of collateral is real estate. A recent survey by the World Bank reports that in 58 emerging countries, real estate represents an average of 50 per cent of firm's collateral.³ Campello and Giambona (2012) find that the real-estate collateral is the single-most important determinant of leverage for non-financial firms in the U.S.⁴ Similarly, Gan (2007) finds that 70 per cent of secured loans in Japan were backed by land.

That real estate assets are an attractive form of collateral should not be a surprise, for real estate is durable and easily deployable to different ends when compared to other assets. And, unlike cash and other forms of direct liquidity, it is not easily diverted elsewhere. However, some of the results in our model could very well be attributed to alternative explanations for financing type and overall leverage choice. In order to abstract from the effects of other factors influencing financing decisions, such as taxes, rationales offered by the trade-off theory, the pecking order theory (Myers and Majluf (1984)) and by principal-agent/free cash flow models (Easterbrook (1984) and Jensen (1986)), we choose to undertake empirical tests of the model implications using panel data from listed property firms (Real Estate Investment Trusts – REITs). The incentives to employ debt relative to equity in the context of received theory are less compelling in the case of REITs, since these firms

² In a different context, Bolton and Scharfstein (1996) also model a firm that chooses to maintain slack in debt capacity in order to protect its deployment of collateral.

³ See World Bank Investment Climate Survey at <http://ireserach.worldbank.org/ics/jsp/index.jsp>.

⁴ Relatedly, the general role of collateral and asset liquidity in explaining variation in leverage and implied cost of capital is analyzed, respectively, in Rampini and Wiswanathan (2010) and Ortiz-Molina and Phillips (2010).

do not pay taxes at the firm level and are required to distribute a large percentage of operating profits as dividends (thus reducing managerial discretion to redeploy retained earnings and free cash flow).

In addition to asset-based and structural characteristics of listed property firms that make them attractive for empirical testing, there is another important aspect that relates to identification. Listed property firms can be categorized by their line of business, which includes a focus on office, industrial, retail, hotel, or multi-family apartment property. For our purposes, the latter property type can be referred to as having a Housing focus, while the other property types can in aggregate be referred to as having a Non-Housing focus. It turns out that Housing REITs have access to secured debt finance offered by the two prominent government-sponsored enterprises, Fannie Mae and Freddie Mac (collectively Fannie-Freddie), whereas Non-Housing firms do not have similar access. Rather, their access to finance comes exclusively through traditional capital market channels.

During the 1998 Russian financial crisis, which was a shock to financial markets that was unrelated to property market fundamentals in the U.S., there was a flight to quality that temporarily shut down standard capital market-funded finance. Critically for our purposes, Housing REITs continued to have access to government-backed Fannie-Freddie secured debt during the crisis. By exploiting the 1998 Russian financial crisis together with the varied effects that this crisis had on financing channels available to different types of listed property firms, we can establish and then evaluate a causal relation between financing decisions in relation to firm type and changes in firm value.

More specifically, the logic behind our identification strategy is as follows. During the Russian crisis all forms of financing suddenly became scarce and expensive. Housing REITs, however, could still access secured-debt financing through the Fannie-Freddie channel (which is unavailable to Non-Housing REITs). In fact, secured debt was the “only” form of financing available to Housing REITs during the crisis. Thus, as a result of an exogenous financial shock, and because of the role played by Fannie-Freddie in the financing of Housing REITs, the usual secured versus unsecured debt choice becomes muted in this sector.

Now, if secured-debt financing causes firm value to increase more inside the Russian crisis than outside the crisis, and firms can only finance with secured debt inside the crisis, it has to be the case that higher quality firms that would otherwise issue unsecured debt (according to our model) have “migrated” into the secured debt market to raise average revealed asset quality. This financial shock therefore provides a convenient setting to test whether a causative relation between financing choice and asset quality exists as revealed by changes in firm value. To identify this migration effect

we rely on a difference-in-differences specification that is briefly described below and in detail in the empirical section of the paper.

Using a panel populated with quarterly REIT data, and employing a simple OLS specification that controls for standard effects, we first document that a statistically significant negative relation exists between the use of secured debt and Tobin's q as measured by the ratio of a firm's asset market value to asset book value. For comparison purposes, we show that a similar negative relation exists using a broader sample of non-financial (COMPUSTAT) firms.

Then we move on to the primary test of our model. Using Housing REIT data, we design a difference-in-differences specification that is meant to isolate outcomes both inside and outside the Russian financial crisis. The key variable of interest is a dummy variable that equals 1 during the last two quarters of 1998 (Russian crisis quarters), which is interacted with another dummy variable that equals 1 for firms that increase their use of secured debt in any given quarter. After controlling for other effects, including the broader financial impact of the Russia crisis on q in addition to other possible factors that may affect the relation between choice of debt finance and q , we find that the coefficient on the interaction term is positive and highly significant. The interpretation of the result is that, consistent with the predictions of our model, during the crisis period higher quality firms (that would rely on unsecured debt financing during normal times according to our model) migrated into the secured debt financing market to raise the average asset quality of firms in the pool.

To assess the robustness of our results, we subject our sample and empirical model specification to a number of falsification tests. We start by re-estimating our difference-in-differences model for the Non-Housing REIT subsamples (e.g., office), as well as for the Non-Housing sample as a group. Because our identification strategy is centered on the exclusive role of Fannie-Freddie financing for Housing REITs during the Russian crisis, this logic should not operate outside of the Housing segment. In line with this expectation, we find that our difference-in-differences coefficient estimate of interest is never positively significant for the Non-Housing REIT subsamples or the Non-Housing sample collectively. Notably, we find a very similar pattern in the estimation results for Housing and Non-Housing during the more recent sub-prime crisis of late 2007, when again (as for the Russian crisis) the Fannie-Freddie secured mortgage debt financing channel remained open for Housing REITs while other financing channels became increasingly unavailable and expensive. Next, we re-estimate our model to assess the robustness of our results to the so-called "parallel-trend" assumption. This assumption is crucial in experimental designs similar to the one used in this study to exclude that the difference-in-differences estimate of interest is simply capturing a trend effect. Our tests show that a violation of the "parallel-trend" assumption cannot explain our findings.

Additional falsification tests are performed, where we note that altogether our “falsification-strategy” seems to uniformly support the robustness of our primary estimation results.

Finally, recall that our theory predicts that firms using unsecured debt (higher quality firms in our model) also commit to maintaining conservative leverage ratios. With this prediction in mind, we conduct a detailed analysis of debt covenants utilized by listed property firms, and find the prominent use of covenants that place limits on total leverage and ensuring excess cash flow availability for debt service, with much less prominence of covenants that restrict use of cash or investment. In a similar vein we also examine the use of restricted stock issuance to top management as an alternative for “committed equity” achieved through standard debt covenants, and find a strong relation between the quantity of restricted stock issuance and the use of unsecured debt relative to secured debt.

Summarizing, results show that firms that employ greater leverage and use a greater proportion of secured debt in their capital structure have lower q values. This simple relation suggests that, at a minimum, there are limits to pledging collateral as a means to ameliorate market frictions. But what are the factors that would lead to an outcome where, say, 40 percent total leverage with limits on secured debt outstanding is an optimal capital structure for firms whose assets offer significant collateral value? How do these factors relate to received wisdom suggesting that debt, and often secured debt, is an optimal contract?

Based on a review of the literature, the verdict is unclear. For example, Chan and Kanas (1985), Besanko and Thakor (1987), and Boot, Thakor, and Udell (1991) indicate that higher quality firms borrow more and pledge more collateral to signal their quality. On the other hand, Hart and Moore (1994) and Rajan and Winton (1995) show that creditors lend more and require less collateral from high quality firms. At an even more basic level, one might ask whether capital structure decisions are demand driven, as these papers appear to imply, or are determined by the menu of options available from the suppliers of funds, as Rauh and Sufi (2010) seem to find.

Given our analysis of the relationship between collateral and liquidity, we believe that we offer a way to reconcile these seemingly opposing findings and perspectives. Firms as going concerns will recognize and incorporate future investment opportunities into the current deployment of debt capacity, in which the value of retaining spare debt capacity increases with the quality of the assets in place as well as with the intensity of the capital market frictions. Firms with better collateral pledge less because they wish to maintain spare collateral capacity for use in funding future

investment opportunities, as necessary.⁵ Thus, the combination of pledging less collateral and maintaining a lower leverage ratio (i.e., maintaining a higher credit rating on the unsecured debt) makes it easier for the firm to refinance existing debt in order to pounce on investment opportunities as they arise.

In contrast, a low quality borrower will find it difficult to refinance existing collateralized loans, for it would have to do so at a great cost. Therefore, its best option is to use its debt and collateral capacity to the fullest extent. Whereas for high quality firms the collateral pledged is more valuable to them than to their lenders, for low quality firms the opposite is true. In equilibrium, both high quality and low quality firms pledge, but in very different ways: high quality firms pledge to maintain a lower degree of leverage in order to keep available collateral capacity, and low quality firms pledge by offering more collateral. This helps to explain the seemingly surprising results in Berger and Udell (1990) and John, Lynch, and Puri (2003), who find that interest rate increases with collateral. In contrast, Benmelech and Bergman (2009) show that, conditioning on the firm pledging collateral, better collateral carries lower interest rate, which is in line with our theory.⁶ Our paper thus helps clarify the commonly regarded "wrong" stylized fact associating secured debt with lower interest rates.

The rest of the paper is organized as follows. Section II presents our basic theoretical model and its empirical implications. An extension of the model is presented in the Appendix. Section III describes the sample and presents basic estimation results. Section IV describes our experimental design and presents our main findings. Section V concludes.

II A Theory of Collateral and Capital Structure Choice

II.A Model

A parsimonious model of the financing of firm investment is developed in this section. In this model competitive lenders screen firms as going concerns, with the only source of uncertainty being firm type as related to the value of assets-in-place. All agents are risk neutral and the risk-free rate is zero.

A firm possesses an asset-in-place, which is a project or homogeneous collection of projects denoted as ω . The value of the asset-in-place at time t_0 is A_ω . The project was launched sometime in

⁵ In a multi-period setting, Acharya, Almeida, and Campello (2007) show that spare debt capacity and cash play a distinct role in liquidity management in connection with future investment opportunities.

⁶ In a related setting, Acharya, Davydenko, and Strebulaev (2012) revisit the seemingly surprising positive relation between interest rate and cash holdings and show with theory and evidence that the sign of this relation becomes negative once the econometrician accounts for the endogeneity of the cash-level decision at the firm level.

the past, and was previously financed with debt. The debt is due at time t_I with a promised payoff of D_ω . When the project was launched, $D_\omega \leq A_\omega$.

The debt-in-place contains two covenants. The first covenant restricts the firm's ability to pledge the asset-in-place as security for any additional debt financing. The second covenant relaxes the first by allowing the firm to call the debt at no less than its face value, D_ω . Both types of covenants are commonly employed with debt financing, where they serve the purpose of reducing under-investment problems (Smith and Warner (1979), Stulz and Johnson (1985)).⁷ As will be apparent shortly, imposing these covenants also allows us to isolate critical aspects of subsequent financing decisions.

At time t_{0+} firm insiders learn that the value of the asset-in-place is either $A_\omega + \alpha$ or $A_\omega - \alpha$, $\alpha > 0$. Label the higher-value firm as G-firm and the lower value firm as B-firm. Further, suppose that $A_\omega - \alpha < D_\omega$ as a result of the arrival of the new information. This restriction simplifies the analysis by making the value of the B-firm's debt-in-place sensitive to the asset value. This restriction is not required for the analysis to carry through, however. The arrival of this information is unanticipated by outside agents, implying there was no prior contracting to address this contingency.

We model the firm as a going concern rather than a one-off project investment. To capture the going concern feature in a simple way, assume that contemporaneous with the arrival of new asset value information is a new investment opportunity, u . The cost of investment is B_u , where its value, A_u , is publicly known and is equal to B_u . The restriction of $A_u = B_u$ is made to isolate financing implications associated with the asset-in-place, ω , from the new investment, u .⁸ In Appendix A, Section A.I, as an extension to this model we consider the implications of $A_u > B_u$,⁹ allowing for variation to exist in growth opportunities as well as the value of assets-in-place. Inside equityholders possess investment and financing decision rights, with the objective of maximizing equity value.

Now consider the financing of the new investment. Assume that stand-alone equity is expensive to issue, implying that debt is unconditionally an optimal contract. The high cost of sourcing outside equity can be motivated in several ways, including the fact that unrestricted equity

⁷ Because equityholders hold investment-financing control rights within the firm, these covenants can be seen as incentive compatibility constraints applied to inside equityholders that also assure participation of existing outside debtholders. In this sense these covenants are closely related to Diamond's (1993) notion of control rents.

⁸ At the time of launching the new project there is no difference between its value to insiders and outsiders, with both attaching an average value to it. With time, insiders may learn whether the project is good or bad.

⁹ The assumption that $A_u = B_u$ is useful to simplify the description of the problem in the basic version of the model presented in this section, but it might introduce a concern with debt overhang. This concern is mitigated in the extended model presented in the Appendix, where we release the restriction that $A_u = B_u$.

is fungible and thus lacks commitment value. Outside debt is available, where competitive lenders expect to make zero profits. Debt matures at t_I .

The firm has two options available to debt-finance the investment. The first debt financing option is to issue secured non-recourse debt in the amount of B_u . This option leaves the existing debt in place and completely isolates it from the financing effects of the new investment. The second financing option is to issue unsecured debt. This financing option requires calling the existing debt at a cost of D_ω , together with a pledge to cross-collateralize the new debt with the asset-in-place as well as the new investment.¹⁰

It is impossible for the firm to costlessly communicate to potential creditors the true value of the asset-in-place. Unsecured lenders realize they do not know the true value of the asset-in-place, but they do know that B- and G-firms exist in equal proportion to one another, and are thus concerned about lending to the B-firm.

The firm is financially constrained, in the sense that there is shadow value to issuance proceeds in excess of the required investment. That is, there is an unsatisfied demand for liquidity at the firm level. Denote the shadow value associated with excess issuance proceeds as γ , which is positive as well as increasing and concave in excess issuance proceeds. We will have more to say about the nature of this shadow value shortly. To retain the unconditional optimality of debt finance relative to equity, for now we will restrict this shadow value to be less than the cost of outside equity issuance that would generate such proceeds.¹¹ Recall that secured debt financing generates no excess proceeds, so this option fails to relax financial constraints. Unsecured debt financing is, however, capable of generating excess proceeds for the G-firm, as well as the B-firm, under certain circumstances.

To see how proceeds are determined, and to begin to establish the logic for determining equilibrium outcomes for the financing of investment, consider first the counterfactual case in which creditors know the identity of the firm. Given each firm's objective of maximizing issuance proceeds subject to participation by the creditor (who expects to earn a competitive return on debt investment), gross unsecured debt issuance proceeds to the G-firm are $A_\omega + \alpha + B_u$ when both the asset-in-place and

¹⁰ Another option could be to call the existing debt and separately finance the two assets with secured non-recourse debt. In the presence of the new investment, as shown in the appendix, this option is dominated by unsecured debt issuance when shocks to asset values have an idiosyncratic component.

¹¹ At a fundamental level, being financially constrained means being unable to source outside capital at a "fair price" relative to the benefits of deploying that capital. There may be times, however, when the marginal value of outside equity is very high relative to the cost of acquiring that equity. But, in the context of the model analyzed in this section, stand-alone equity issuance would be quite expensive to begin to generate excess proceeds above the cost of investment, so the marginal shadow value of excess proceeds would need to be extremely high to satisfy the stated restriction.

the new investment cross-collateralize the debt. Gross proceeds are then used to call the debt-in-place, D_ω , and fund the new investment, B_u , resulting in net proceeds of $\Delta_G = A_\omega + \alpha - D_\omega > 0$. These net proceeds relax financial constraints to result in a positive shadow value to the firm of γ_{Δ_G} . The existence of a positive shadow value creates a clear preference for the G-firm to issue unsecured debt over secured debt when its identity is known to outsiders.

Gross proceeds to the B-firm when its identity is known to unsecured creditors are $A_\omega - \alpha + B_u$. This quantity is negative after calling in the debt-in-place and funding the new investment. Negative proceeds result because unsecured debt issuance requires the B-firm to pay the put option value of $D_\omega - (A_\omega - \alpha)$ to call the debt-in-place. In comparison, secured debt financing allows the B-firm to retain the put value, therefore creating a preference for secured debt over unsecured debt issuance.

Thus, conditional on type being known to outsiders, the G-firm prefers to finance with unsecured debt and the B-firm prefers to finance with secured debt. Unsecured debt allows the G-firm to unlock latent value from the asset-in-place, while secured debt financing allows the B-firm to retain its valuable put option on the debt-in-place. Given full information, superior collateral value therefore provides the G-firm greater access to liquidity, suggesting that collateral and liquidity are isomorphic (Holmstrom and Tirole (2011)). The B-firm is highly (100%) levered in market value terms, while the G-firm is less levered due to the excess proceeds and shadow value associated with those proceeds. Cash proceeds relax financial constraints because they can be profitably deployed either inside the firm or are available to be distributed to inside equityholders who themselves can profitably redeploy the proceeds.

Now consider the possibility of pooling in unsecured debt when type is unknown to outsiders. Given that G- and B-firms are in equal proportion, the unsecured creditor is willing to fund up to $A_\omega + B_u$, knowing that the B-firm will default on the debt and repay only the liquidation value of the firm, $A_\omega - \alpha + B_u$. This possibility causes the lender to incorporate a credit spread in the unsecured loan rate, with $A_\omega + \alpha + B_u$ due at maturity.

For both firm types unsecured debt generates net proceeds of $\Delta = A_\omega - D_\omega \geq 0$, with shadow value γ_Δ . The B-firm prefers unsecured debt over secured debt issuance in this case, since excess proceeds are realized and the firm retains its put option value associated with defaulting on the debt. For the G-firm, it too realizes benefits of γ_Δ associated with excess proceeds from unsecured debt issuance. But it must subsidize the B-firm in the amount of α as required in the credit spread on the debt. The question then is whether the shadow value of excess proceeds exceeds the subsidy cost.

The following lemma shows that the answer is no, given that the shadow value is bounded from above at a 100 percent return.

Lemma 1: *Net proceeds, Δ , from a pooled unsecured debt issuance are less than α , the amount of the subsidy required by the G-firm going to the B-firm. Consequently, unless the return (shadow value) exceeds 100 percent of net proceeds, the G-firm will prefer to finance with secured debt over pooled unsecured debt. Given that this preference holds, only secured debt is offered by creditors in equilibrium.*

Proof: *Recall that $\Delta = A_\omega - D_\omega$ and that $A_\omega - \alpha < D_\omega$. From these two relations it immediately follows that $\Delta < \alpha$. If the shadow value associated with net proceeds is less than the net proceeds themselves – i.e., if $\gamma_\Delta \leq \Delta$ – the costs of issuing secured debt by the G-firm exceeds the benefits. Given that the costs of issuing unsecured debt exceed the benefits, the G-firm prefers to finance with secured debt. If the G-firm chooses secured debt, pooling in the unsecured debt market will not occur and the B-firm will finance with secured debt, since financing with unsecured debt would reveal its type and result in a shortfall in issuance proceeds to fund the new investment.*

We will assume that the maximum 100 percent return restriction on excess proceeds holds going forward.

Because there are benefits to cash proceeds for the G-firm and pooling across firm types is inefficient, a competitive lending market will search for a superior financing structure that produces a separating equilibrium. The simplest mechanism to induce separation is for the lender to screen through the use of an inside equity commitment, which in effect requires the borrower to guarantee full debt repayment at loan maturity.

We will refer to this guarantee as *committed equity*, structured as follows. The unsecured lender states that it is willing to fund $A_\omega + \alpha + B_u$ in an unsecured debt offering, with the stipulation that the firm provides a guarantee, made at the time of issuance, of 2α to be paid at time t_l should any shortfall occur due to low liquidated collateral value. Other than the cost of generating this guarantee, which is denoted as κ , it is costless for the G-firm to issue the guarantee since the liquidated asset values are sufficient to fund full debt repayment. In contrast, issuing this guarantee creates a liability of 2α for the B-firm, in addition to the cost of issuing the guarantee. A critical aspect to committed equity is that it is an inside pledge that is inseparable from an unsecured debt issuance. In the following section we equate the committed equity to covenants that commit firms to maintain a strong balance sheet into the future.

The question, which is answered in the following proposition, is whether the B-firm will nevertheless have an incentive to mimic the G-firm in an attempt to generate excess proceeds used to relax financial constraints.

Proposition 1: *If the cost the committed equity guarantee, κ , is less than the shadow value of excess proceeds from unsecured debt issuance, γ_{Δ_G} , screening by the unsecured creditor successfully identifies firm type. As a result, the G-firm finances with unsecured debt together with committed equity whereas the B-firm finances with secured debt only. Otherwise, if $\kappa > \gamma_{\Delta_G}$, only secured debt is issued in equilibrium.*

Proof: *If $\gamma_{\Delta_G} > \kappa$, it is beneficial for the G-firm to issue unsecured debt together with committed equity. The cost of issuing unsecured debt and committed equity for the B-firm is $2\alpha + \kappa$, with benefits of γ_{Δ_G} due the generation of excess proceeds. Recall that $\Delta_G = A_\omega + \alpha - D_\omega$. If the B-firm has an incentive to mimic the G-firm, the unsecured creditor will recognize this incentive and pool. But, as with the result shown in lemma 1, $A_\omega + \alpha - D_\omega < 2\alpha$, implying that a greater than 100 percent return on excess proceeds is required for the B-firm to have an incentive to mimic the G-firm. A return of this magnitude has previously been ruled out by assumption. Consequently, because it is unable to successfully mimic the G-firm in the unsecured debt market, and because unsecured debt issuance results in a funding shortfall when its identity is known to the unsecured lender, the B-firm issues secured debt. Alternatively, if $\gamma_{\Delta_G} < \kappa$, committed equity is costly relative to the benefits and the G-firm does not participate in the unsecured debt market. From lemma 1, both firms then issue secured debt.*

Note that when screening is feasible, a guarantee of 2α is actually more than is required to induce separation. Instead, the unsecured lender could simply require an amount β , $0 < \beta < 2\alpha$, such that $\beta + \kappa$ (the cost of issuing unsecured debt for the B-firm) is just greater than γ_{Δ_G} (the shadow value of excess proceeds).

In summary, when the conditions for effective screening are met, unsecured creditors identify firms by requiring committed equity in conjunction with an unsecured debt issuance. The equilibrium outcome is fully revealing and incentive compatible.

The intuition for this result is that, because unsecured debt is cross-collateralized with assets of uncertain value to outsiders, it is more information-sensitive than secured debt. Uncertain collateral asset value consequently requires an additional pledge of committed equity to mitigate information sensitivity. The G-firm is willing to incur the cost of providing this commitment because doing so generates valuable additional liquidity. In contrast, in equilibrium the B-firm offers only real collateral—but no commitment collateral—by assigning particular assets to stand-alone secured debt financing arrangements. It does this because the commitment requirement is too costly relative to the benefits associated with excess cash proceeds.

II.B Discussion

In our model firms demand liquidity because they are financially constrained. But they are not credit constrained *per se*, since they can always fund new investment with reasonably priced secured debt. The innovation in our model is the use of committed equity by high quality firms to maintain a strong balance sheet. The bundling of committed equity with unsecured debt in an asymmetric information setting changes the standard interpretation that unsecured debt is associated with a lesser pledge of collateral than secured debt. Rather, unsecured debt together with committed equity represents a different pledge of firm resources (commitment collateral as well as real collateral), where measurement of commitment collateral have generally been ignored in the empirical literature. Our approach thus resurrects asymmetric information as an explanation as to why higher credit risks tend to be associated with secured debt issuances in the data (Berger and Udell (1990)).

The going concern aspect to our model is critical in terms of generating our results, as it requires that high quality firms pledge sufficient resources so as to mitigate credit risk concerns of unsecured creditors. This equilibrium outcome therefore suggests that for some firms there is a significant wedge between *available* debt capacity and *utilized* debt capacity, even when firms are otherwise financially constrained.

Committed equity is modeled stylistically as a contingent claim that pays off in the future given a low-value state of the world. How should this claim be interpreted in practice? First, it can be characterized as an endogenous response by competitive lenders to sort firms by their going concern value. Second, it is a forward-looking commitment by firm insiders not to misrepresent themselves as a high-valued firm when in fact they are a lower-valued firm. That is, committed equity discourages false reporting and otherwise engaging in behavior that destroys value for unsecured bondholders. A common way of delivering such commitment is to maintain a strong balance sheet by capping debt and by imposing explicit covenants that limit net borrowings to earnings.

From this perspective, committed equity in our model can be interpreted as unsecured bond provisions that limit total leverage and claims on current operating cash flows, but do not explicitly place restrictions on cash stocks that may be very costly to monitor and more productively employed elsewhere. Committed equity is, in effect, contractual provisions that commit firms to maintaining financial slack. Unused collateral from assets-in-place is retained for future projects, and is combined with committed equity to insure unsecured bondholders against adverse shocks to firm value.

The link between collateral and liquidity in our model is more complicated and interesting than usually portrayed. We show that firms may intentionally underutilize their collateral-based debt capacity in order to increase liquidity provision as going concerns. And as noted above, a commitment to insure creditors against adverse asset value shocks offers an explanation on why unsecured debt, which is generally considered a lower priority claim than non-recourse secured debt, can actually be the lower risk claim.

Similar to Myers and Rajan (1998), our simple model isolates differences between collateralizable assets, cash, and committed inside equity in the form of constraints on leverage. But, we do so by establishing clear boundaries on the collateral available to secure the debt. Cash has value to the firm because it is financially constrained, but cash has no commitment value related to sourcing low-cost debt. This is because cash is fungible and easily redeployable. Loan covenants can substitute for cash by forcing firm insiders to credibly commit to relatively low leverage, thereby insuring the unsecured creditor against default. Secured debt requires no such guarantee, since the collateral securing the debt is isolated from going concern risks.¹²

In an asymmetric information setting, Bester (1985, 1987) shows that a firm with a higher valued asset is willing to post collateral to separate itself from a firm with a lower valued asset. This results from outside financier concerns of possible underinvestment in assets by higher quality firms. In contrast, Boot, Thakor, and Udell (1991), among others, show that in a moral hazard setting with incomplete contracting, potentially lazy firms will offer collateral as a commitment device to increase productivity and thus gain access to lower-cost debt finance. This results from outsider concerns over possible underinvestment in effort and overinvestment in real assets by lower quality firms.

Our model addresses both types of potential inefficiencies in a unified manner. The higher quality firm is willing to commit resources by pledging existing high-value assets as security in an unsecured debt financing, and simultaneously commit to maintain slack vis-à-vis inside equity. The ability to provide additional collateral for future investment opportunities is possible because the firm deliberately retains spare debt capacity until a later stage, and then uses that spare capacity. Collateral pooling (using multiple assets, ω and u) and the use of committed equity (covenants that limit leverage related ratios) reduce the information sensitivity of the newly issued debt while increasing information sensitivity to insiders (equityholders). Lower quality firms do not find it optimal to shift information sensitivity from outside debtholders to inside equityholders, in part because doing so

¹² Empirically, the relation between industry distress, firm default, and debt structure is analyzed in Acharya, Bharath, and Srinivasan (2007).

would require sacrificing the put option value on existing debt. Consequently, these firms employ greater leverage and use secured debt as predicted in the literature due to outside financier concerns regarding overinvestment and risk-shifting.

For the G-firm to maintain excess debt capacity as it invests over time, as a practical matter it will have to issue standard equity as necessary. It will do so when the shadow value of cash is particularly high, so as to offset equity issuance costs. In this case the shadow value of cash can be interpreted as the existence of other meaningfully positive NPV projects (broadly defined). At other times when the cost of equity issuance is high relative to the shadow value of cash, as suggested by the model and as shown in proposition 1, investment by G-firms may actually be funded with secured debt to the extent that any existing bond covenants are not violated.

II.C Empirical Implications

We consider a setting in which firms with an unobserved asset value component choose between secured and unsecured debt issuance. The most important empirical implication of our model is that higher quality firms (firms that are endowed with an unobserved higher-valued asset component) generally find it advantageous to issue unsecured debt and commit to maintain financial slack vis-à-vis equity, and therefore operate with less leverage. Specifically, we predict an inverse relation between changes in secured debt outstanding and leverage, as it reveals firm quality, and changes in firm value.

Unconditionally, our model generates predictions that are seemingly consistent with the pecking order theory, in which undifferentiated (pooled) firms are predicted to issue the least informationally sensitive claim—secured debt—to fund investment. On a conditional basis, however, where screening by lenders is applied to differentiate between firms, higher quality firms issue what are usually characterized as informationally sensitive securities (unsecured debt and committed equity) whereas lower quality firms issue “less sensitive” claims in an attempt to contain costs associated with revelation of type. But unsecured debt in combination with committed equity actually produces a less informationally sensitive *set of claims* than the exclusive use of secured debt by lower quality firms.

When committed equity issuance costs are high, however, in our model we show that higher quality firms pool in equilibrium to issue secured debt along with lower quality firms. This implies that there will be certain times when secured debt choice does not signal low firm quality. As a result, we should find that time-varying cost of external finance has an impact on the population of borrowers that choose a particular form of debt financing. In particular, an important implication of

our model is that in times of higher equity issuance costs, the pool of firms using secured debt *ceteris paribus* improves.

Committed equity in our model (a commitment to maintain a strong balance sheet) is required by unsecured creditors for higher quality borrowers to realize an investment grade credit rating. Perhaps the most important mechanism employed in practice to establish commitment is the use of unsecured debt covenants that limit total leverage and that require sufficiently high cash flow coverage so as to minimize risk related to meeting ongoing debt repayment obligations. Bond provisions thus develop endogenously as a substitute for reserves set aside to guarantee repayment, since opportunity costs to hold such reserves are high for the financially constrained firm.¹³

III Data and Preliminary Estimation Results

III.A Sample Selection

Our theory highlights the role of collateral as a mechanism to generate liquidity with which to finance new investment. With this feature in mind, we would like to examine firm-level data for which collateral plays an important role in financing-investment decisions. Testing our theory also requires specifying an empirical relation with causation going from financing decisions of firms that vary in unobserved asset quality to changes in firm value. Consequently, we would like to identify an instrument or natural experiment that allows us to isolate whether the posited financing-firm value channel exists as hypothesized.

This leads us to analyze data from the listed commercial real estate market, where the relevant firms are commonly known as Real Estate Investment Trusts (REITs). REITs are publicly traded firms that hold ownership interests in commercial real estate assets for the purpose of providing space-related rental services. In return for space provision, rental income is generated that is the basis for determining an asset value. Commercial real estate (land and building) is highly durable and redeployable, with an active and relatively liquid market for the sale and purchase of new and used real assets. These features suggest that commercial real estate provides collateral-based liquidity with significant debt capacity. It is well known, in fact, that most stabilized cash flow producing commercial real estate assets can support up to 70 to 75 percent secured mortgage debt relative to asset value (and oftentimes more), with debt maturities that are generally in the 10 year range.

¹³ A somewhat different but complementary rationale is presented in Demoroglu and James (2010), who state that “Good quality firms may select tight covenants because they expect the cost of violating tightly set covenants to be low.”

Several other prominent features of REITs make them an attractive natural laboratory for testing our model. First, REITs do not pay taxes at the firm level, which reduces complications associated with non-tax-centric empirical tests of capital structure choice. Second, in order to retain their tax status, REITs are required to distribute at least 90 percent of their net taxable income as dividends. This implies that all firms in the sector are relatively cash-poor, thus simplifying firm sample selection as related to our model structure and implications. Third, these firms have been shown to empirically produce relatively accurate measures of marginal q (see, e.g., Hartzell, Sun, and Titman (2006), Gentry and Mayer (2008) and Riddiough and Wu (2009) for further discussion and analysis of this issue). Well measured q is important to our analysis, since we will use empirical estimates of q to measure scaled changes in firm-level value as a function of financing choice

Finally, using data from the REIT industry allows us to design a unique identification strategy. This strategy is centered on the exclusive ability of a specific line-of-business – Housing REITs – to access secured debt financing through the well-known government sponsored enterprises, Fannie Mae and Freddie Mac, during the peak of the Russian crisis of 1998. We describe our empirical identification strategy in detail in Section IV.

Our sample consists of quarterly REIT data identified from the SNL Datasource database.¹⁴ The sample period starts in the 2nd quarter of 1992 (the first year data for our main variables are available in the SNL database) and ends in the 3rd quarter of 2010. We exclude firm-year observations for which the value of a firm’s total assets is less than \$1 million. We also winsorize all variables (dependent and independent) at the 5th and 95th percentiles to mitigate the effect of outliers and errors.

The start of our sample period coincides with the beginning of the “modern REIT era,” which was a period of sustained growth as a large number of private firms went public in a move away from traditional capital sources that had shut down as a result of the Savings & Loan crisis of the 1980s. Our sample period covers almost 20 years over which there was significant variation in firm share prices in response to changes in property market fundamentals. The sample period also includes two major shocks to financial markets—the Russian crisis of 1998 and the financial market meltdown of 2007-08—which will be crucial for the identification strategy that we will discuss below.

Table I reports summary statistics for the variables used in empirical model estimation. Tobin’s q is our scaled measure of firm value as it depends on other variables, including most importantly financing choice. Following the literature, q is measured as the ratio of market value of

¹⁴ The SNL Datasource database is the most comprehensive database on property firms, and is the equivalent of the COMPUSTAT database.

total assets (SNL item #132264 – item #132384 + item #133859×1000) to book value of total assets (SNL item #132264). Empirical estimates of q in our sample are relatively low as compared to non-financial firms. This is in large part because asset values of property firms (the denominator in the q ratio) are well measured by the book value of the firms' assets (as dominated by depreciable cash flow producing commercial real estate).

Table I Here

Our model predicts that the secured-unsecured debt choice simultaneously affects total leverage due to the committed equity component of unsecured debt financing. Consequently, we would like to create a single variable that jointly measures the simultaneous secured-unsecured debt/total leverage decision. The measure we employ is *SecuredLeverage* (market and book), which is defined as the ratio of secured plus mezzanine debt (SNL item #132307 + item #132379) to the value of total assets (market and book).¹⁵ We develop this measure using both market and book values, since each has its own set of advantages and disadvantages. *SecuredLeverage* is a composite of the ratio of secured plus mezzanine debt to total debt (the secured-unsecured debt financing decision) and the ratio of total debt to total assets (the total leverage decision). Summary statistics on the *SecuredLeverage* variable indicate the common use of secured debt by the commercial property firms in our sample, along with significant variation in this measure across firms. Table I also reports the component pieces of *Secured Leverage*, which as noted is *SecuredDebt*, the ratio of secured plus mezzanine debt to total liabilities plus mezzanine debt (SNL item #132367 + item #132379), and *Leverage* (market and book), the ratio of total liabilities plus mezzanine debt to total assets.

In our q regression estimations (to be discussed below), we also include a set of control variables that are commonly used when q is specified as a dependent variable to measure firm value (see, e.g., Lang and Stulz (1994), Berger and Ofek (1995, 1996), Rajan, Servaes, and Zingales (2000), Lamont and Polk (2002), Villalonga (2004)). In particular, our set of control variables includes *Size*, the book value of total assets; *Profitability*, the ratio of earnings before interest, taxes, depreciation, and amortization (SNL item #132773) to the book value of total assets; and *Earnings Volatility*, the ratio of the standard deviation of earnings before interest, taxes, depreciation and amortization using three years of consecutive quarterly observations to the average book value of total assets estimated over the same time horizon.

We also report sample statistics for two additional variables that will be relevant for some of the empirical analysis discussed in the paper. These variables are *Securable Land&Building* and

¹⁵ Mezzanine debt is long-term secured debt that is junior to other long-term secured debt, and is typically collateralized by a particular real estate asset.

UPREIT Equity. *Securable Land&Building* is the ratio of land and buildings in use for business activities (SNL item #132112) to the book value of total assets. This variable provides a measure of total debt capacity as it varies across firms in our sample. The other variable, *UPREIT Equity*, recognizes a form of equity available to REITs in which partnership units can be issued in exchange for equity ownership interests in real property. Some view upreit equity as a low-cost form of standard equity, which might in turn affect measured debt capacity. We measure *UPREIT Equity* as the ratio of upreit equity (SNL item #132036 – item #133859) to total equity value (SNL item #132036).

Our theory emphasizes the choice between types of external debt finance as it depends on the unobserved component of firms' asset value. It is therefore important that we identify the various types of secured and unsecured debt utilized by firms in our sample. For this purpose, we partition total debt in three main categories: 1) Secured debt, 2) Unsecured debt, and 3) Subordinated claims & other liabilities. We then identify the different types of debt that exist within each main category. "Secured Debt" is composed of first mortgages, mezzanine debt and secured bank lines of credit. "Unsecured Debt" is composed of entity-level debt that carries a bond rating and unsecured bank lines of credit. Finally, "Subordinated Debt and Other Liabilities" is a catch-all category that includes other non-equity claims that are not otherwise classifiable as secured debt or unsecured debt.

Table II, Panel A reports descriptive statistics for each of the debt categories discussed.¹⁶ Results show that longer-maturity first mortgages are the dominant form of secured debt, while shorter-term secured bank lines of credit are only about 3 percent of total debt. In the unsecured debt category, longer-term corporate-level debt represents almost 80 percent of the total unsecured debt outstanding.

Table II Here

Table II, Panel B reports the percentage of firms utilizing a certain combination of debt types. Some interesting facts emerge where, for instance, approximately three-quarters of REITs do not use (short-term) secured bank lines to finance themselves, thus alleviating concerns that bank monitoring and debt maturity exert disproportionate influences on the debt-choice decision. We further find that 36.1% of firms use only secured mortgage debt to finance themselves, while only 0.5% percent of firms use entity-level unsecured debt without using secured mortgage debt to finance themselves. Importantly, our model predicts these outcomes. That is, model predictions are that good firms will

¹⁶ We note that the sum of these categories in Table III does not add up to 1.00 because mortgage debt and lines of credit information in the SNL database is only available from 2001, while the secured debt category that we report in the first row of Table III is available for the entire sample period starting from 1992.

finance themselves with secured debt when issuing committed equity is currently expensive (see Lemma 1 and Proposition 1), resulting in a mix of secured and unsecured debt in the capital structure. This is consistent with the latter finding which shows that exclusive use of unsecured debt financing is rare. In contrast, also consistent with model predictions, and given that perhaps one-half of all firms are of “lower quality,” the 36.1% finding implies that lower quality firms often exclusively financing themselves with secured mortgage debt because they are screened out of the unsecured debt market.

III.B Preliminary Estimation Results

The most important empirical implication of our model is that the choice between secured and unsecured debt issuance reveals information about firm value. Specifically, we predict an inverse relation between changes in secured debt outstanding, as it reveals firm quality, and changes in firm value. In this sub-section, preliminary estimation results are offered as a lead-in to our primary experiment-centered approach to identification. We note that the reader can skip this sub-section and go directly to Section IV for the main experimental results without any loss in continuity.

We start by estimating simple correlation coefficients between Tobin’s q and secured leverage. Consistent with our basic model predictions, Panel A of Table III shows that q is significantly negatively correlated with secured leverage (market and book) when calculated using our sample of REIT firms. For comparison, in Panel B we report correlations for non-financial from COMPUSTAT over a sample period from 1981 to 2010. We use annual data for COMPUSTAT firms because the secured debt item – Mortgage & Other Secured Debt (item dm) – is only reported in the annual files in COMPUSTAT starting from 1981. The COMPUSTAT sample produces similar relations.¹⁷

Table III Here

We now assess the robustness of these relations using a standard OLS regression framework that allows us to control for firm heterogeneity. Estimation results are reported in Table IV for both the REIT sample and the COMPUSTAT sample, where heteroskedastic consistent errors in the

¹⁷ We check how our measure of secured leverage for the COMPUSTAT sample compares to the measure of secured debt employed by Rauh and Sufi (2010). Their measure is constructed directly from annual report footnotes for a random sample of 305 rated firms over the sample period 1996 to 2006. We find minor definitional differences in the way COMPUSTAT and Rauh-Sufi define secured debt. For instance, the COMPUSTAT measure is only based on long-term secured debt and includes capitalized leases, while Rauh-Sufi exclude capitalized leases but include both short-term and long-term secured debt. Unsurprisingly, the two measures produce very similar results. Secured debt as a percentage of total debt plus equity is 13.3% over the sample period 1996 – 2006 using the COMPUSTAT data, which compares to the 13.8% in Rauh-Sufi’s Table 1 over the same time period.

regressions are adjusted for clustering at the firm-quarter level. The results indicate a robust negative relation between secured leverage and q for both REITs and non-financial firms from COMPUSTAT.

Table IV Here

The remaining control variables attract coefficients that are generally consistent with economic intuition and previous literature, but are not always statistically significant. Similar with the evidence reported by Berger and Ofek (1995) and Rajan, Servaes, and Zingales (2000), *LnSize* enters the q regression with a significantly positive coefficient for both REITs and non-financial firms. In line with the evidence reported by Berger and Ofek (1995), we find that *Profitability* enters the regression with a positively significant coefficient for REITs, but is insignificantly negative for non-financial firms, a finding that is also reported by Berger and Ofek (1995). Finally, *Earning Volatility* enters the q regression with a negatively significant coefficient for REITs, but alternates in sign for non-financial firms.

IV Identification Using the Russian Debt Crisis as a Natural Experiment

IV.A Institutional Setting and Preliminary Discussion

While the simple OLS estimation results reported in Table IV are consistent with predictions of our theory, identification remains a concern. There are two major considerations in relation to identification. First, it is unclear whether causation is going from financing choice to firm value, or vice versa. Second, it is unclear whether variation in the unobserved component to asset value is responsible for the negative relation between financing choice and the change in firm value (the channel posited in our theory), or if some other cause is responsible for the relation.

In this section of the paper we establish a direct causal link between secured leverage, collateral quality and firm value using quasi-experimental analysis. The instrument we are looking for is a shock to financial markets that is unrelated to the fundamentals of the asset market where our sample firms operate. The shock should affect financing choices for all firms, as well as affect how firms of varying asset quality make their financing choices.

The Russian debt crisis that occurred in the second half of 1998, in concert with the role that Fannie-Freddie played in the financing of Housing REITs, provides a natural experimental setting

that is useful for testing our theory.¹⁸ The crisis took place when the Russian government devalued the ruble and defaulted on its debt. International financial markets immediately felt the effects of Russia's actions. As the crisis deepened, capital markets bifurcated with increased demand for safe assets such as Treasury bonds and other government-backed debt. At the same time demand dried up for riskier securities.

The Russian crisis provides us with a financial shock that originated outside of the U.S., having nothing to do with the fundamental quality of commercial property assets held by listed U.S. property firms. But the shock had direct implications for how these firms could finance their investment opportunities, as all forms of non-government backed finance that originated from the broader capital markets suddenly became scarce and expensive.

Listed property firms tend to concentrate their asset holdings according to a particular property type. This means that, within the industry where these firms operate (SIC 6798), we are able to identify their exact line of business. As a consequence, our sample includes property firms with an investment focus on housing (multi-family apartment properties), which we label as Housing REITs, and firms with a focus on office, retail, industrial and hotel properties, which we collectively label as Non-Housing REITs.

This line of business distinction is crucial for our identification, in that one sector within our sample was less affected by the Russian crisis. Housing REITs had continued access to secured mortgage debt offered by the Government Sponsored Enterprises, Fannie Mae and Freddie Mac.¹⁹ Because of the flight-to-quality effects of the Russian crisis, and because Fannie-Freddie were considered to own a credit guarantee backed by the U.S. government, the cost and availability of secured debt finance for Housing REITs was relatively unaffected by the crisis.²⁰ Other forms of finance were, however, severely affected, resulting in market conditions that correspond with the

¹⁸ Other studies have relied on the Russian crisis for the purpose of identification, including Fahlenbrach, Prilmeier, and Stulz (2012), Schnabl (2012), and Chava and Purnanandam (2011).

¹⁹ Residential mortgages are suitable for sale to Fannie Mae or Freddie Mac as long as they are conform to the guidelines set by these Government Sponsored Enterprises (GSEs) concerning maximum loan amount, borrower credit and income requirements, down payment and other elements (so called "conforming loans"). These guidelines are generally publicly known for residential mortgages made to households, but are not publicly disclosed with respect to apartment units owned by property firms. Our understanding from discussing this issue with several professional insiders is that Fannie-Freddie have significant discretion in making mortgages to property firms focused on apartment ownership.

²⁰ In a different setting, Adelino, Schoar, and Severino (2012) rely on the role of Fannie-Freddie conforming loans to study the effect of access to credit on house prices.

secured-only debt financing equilibrium described in proposition 1 of the theory section of the paper. As a consequence, we will focus on the Housing REIT segment for our main tests of the model.²¹

The commercial mortgage-backed securities (CMBS) market, which was the private-label secured mortgage debt market available to all other REIT types (office, retail, industrial, and hotel), froze as a result of the crisis. That market froze because of the failures of the largest issuer at the time (Nomura), the largest below investment-grade securities buyer (Citi Mae, which was a private firm and not a GSE), the failure of Long-Term Capital Management (which held large positions in higher-rated CMBS), and because of capital calls and restricted availability of repo debt financing offered by investment banking firms to securities purchasers. Importantly, the markets for unsecured debt and equity were also negatively affected, and effectively shut down as well in the latter part of 1998.

Figure 1 displays the spreads of BBB-rated REIT (unsecured) bond²² and Fannie-Freddie mortgage rates (the type of mortgages available to Housing REITs) during a one-year period that brackets the Russian crisis. First note that unsecured bond yields were lower than Fannie-Freddie mortgage rates prior to the onset of the crisis. The BBB-rated bond spreads (data based on secondary market trading, not new issuances) are then seen to increase significantly during the crisis period and remain well above Fannie-Freddie spreads. In comparison, there are only slight increases in Fannie-Freddie spreads from August onward, which is consistent with the “flight-to-quality” characterization of the Russian crisis.

Figure 1 Here

Figure 2 displays secured debt issuance, unsecured debt issuance and investment by Housing REITs from Q1 1998 to Q2 1999. In Q1 and Q2 1998, on average across all Housing REIT firms, investment exceeds 4.0% of assets and looks to be financed with a mixture of secured and unsecured debt. The Russian crisis hit in the latter half of Q3 1998. The data show that there is little immediate impact, likely due to lags between commitment and issuance of debt finance to fund investment. The full force of the Russian crisis in financial markets is apparent in Q4 1998, where unsecured debt markets are effectively shut down and financing took place exclusively through the Fannie-Freddie secured debt channel. Q1 and Q2 1999 together show the dramatic lagged effects of the Russian crisis on investment, with unsecured debt issuance remaining anemic while Fannie-Freddie funded secured debt picked up the slack.

²¹ We replicate our main tests for each of the Non-Housing REIT categories. Because these alternative REIT regimes do not have access to Fannie-Freddie financing, the logic of our identification strategy should not operate for them. Therefore, these groups can serve as a natural reference for a series of falsification experiments that can be used to validate our main approach, and will be discussed in the robustness section.

²² We focus on BBB-REIT spread because the majority of REITs have bond ratings in the BBB range category.

Figure 2 Here

Figure 3 shows that, as a result of the Russian crisis, and based on a Herfindahl index measure of property-type ownership, there was no migration of Non-Housing REIT firms into the Housing REIT sector. In fact, Figure 3 shows that Non-Housing REITs modestly increased their focus in their non-housing property specialty during the year of the Russian crisis and the year after. This is important to note because the experimental design presumes that the sample of Housing firms that exists before the crisis remains uncontaminated by entry of Non-Housing REIT firms either during or after the crisis.

Figure 3 Here

The empirical identification strategy that we have in mind works as follows. Suppose that we are outside the Russian crisis (or some other exogenous shock to financial markets), and we notice that firms which increase their use of secured debt experience a significantly lower change in q than firms that increase their use of unsecured debt. This is suggestive that firms which increase secured debt usage are revealed as lower quality firms. But it is unclear whether financing choice caused the change in asset value or vice versa, and whether some factor other than unobserved asset quality could have motivated the financing decision.²³

The Russian crisis in combination with government-sponsored financing of Housing REITs can be exploited for purpose of identification. During the Russian crisis all Housing REITs had to use secured debt to fund investment, which is supported by Figure 1 and especially Figure 2. Importantly, this outcome is consistent with an equilibrium in our model when outside (committed) equity is expensive. Thus, as a result of an exogenous financial shock, and because of the role played by Fannie-Freddie in the financing of Housing REITs, the usual secured versus unsecured debt choice becomes muted in this sector. This eliminates causality going from a change in q back to financing decisions.

Now, *ceteris paribus*, if secured debt financing causes q to increase more inside the Russian crisis than outside the crisis, and firms can only finance with secured debt inside the crisis, it must be the case that higher quality firms that would otherwise issue unsecured debt have migrated into the

²³ One might wonder if there is an unobserved asset value component to firms that hold commercial real estate, since it could appear relatively straightforward to estimate the value of this asset type. We note that despite a relatively liquid secondary market for commercial real estate assets, there is significant divergence among stock analysts on the value estimates of REIT property portfolios (the assets-in-place). Using data from analyst reports available in the SNL Datasource database from 2001, we find that the range (high – low) of the asset value estimates across analysts is about 30% of the mean value of these estimates. Variation of this magnitude has persisted over time.

secured debt market to raise average revealed asset quality.²⁴ This financial shock therefore provides a convenient setting to test whether a causative relation between financing choice and asset quality exists as revealed by changes in firm value.

IV.B Empirical Model Specification and Estimation Results

The discussion in Section IV.A leads to a difference-in-differences estimation approach. Specifically, the change in Tobin's q is regressed on an interaction term that equals one for the experimental group (here, Housing REITs that increase secured leverage) during the Russian crisis quarters (1998 Q3 and Q4), and zero otherwise. The regression also includes the Russian crisis dummy and the secured leverage increasing dummy (to be defined in the next paragraph) on their own in order to measure, respectively, the general effect of the crisis and the effect of secured leverage on the overall Housing REIT segment. A set of control variables is also specified, including upreit equity, firm size, profitability and volatility of earnings (all in changes) to control for firm heterogeneity.

Our particular variable of interest is the interaction term, which measures the change in q during the Russian crisis for our experimental group (Housing REITs increasing secured leverage), relative to non-secured leverage increasing firms. In the formal test, we follow a two-step approach that is designed to account for potential variation in debt capacity across firms. The first step consists of estimating secured debt capacity, defined as the predicted value from a regression of secured leverage on "securable" land and buildings, firm size, profitability, earnings' volatility, and upreit equity. Using these predicted values, we measure the difference between actual secured leverage and estimated secured leverage capacity (used-secured leverage capacity) in order to assess the extent to which firms have exhausted their debt capacity. Based on this estimate, we define an indicator variable equal to 1 if used-secured leverage capacity is higher in the current quarter than in the previous quarter – *SecuredLeverageIncrease* (market and book) – and use this variable interacted

²⁴ The acquisition process of real estate properties (investment) consists of three-basic distinct phases. First, firms identify a property suitable for acquisition. In the second phase, an accepted offer to purchase occurs, which triggers firms to work to lock in secured debt financing. In the third phase the actual acquisition of the property takes place, as financed by the secured-debt loan that was pre-arranged in the second phase. This process inevitably creates a lag in reported investment-financing (phase 3) in relation to events transpiring during phases 1 and 2 of the investment-financing process, which explains the pattern documented in Figure 2. Importantly, the nature of this investment-financing process is conducive to our identification strategy because it suggests that it is not easy for firms to terminate a deal once an offer to purchase has been accepted. As a result, firms that were planning to cover the acquisition costs (in full or in part) from the unsecured debt market needed to migrate to the secured debt market when unsecured debt became too expensive or unavailable, as was the case during the Russian crisis.

with the Russian crisis dummy (1998 Q3 and Q4) – *RussianCrisis* – in our difference-in-differences second-step q regression estimations.

First-step secured leverage capacity regression estimates are reported in Table V. Regressions are estimated with heteroskedasticity-consistent errors clustered by firm-quarter and include firm- as well as time-specific fixed-effects (Petersen, 2009). As expected, *Securable Land&Building* enters the secured leverage regression with a positive and highly statistically significant coefficient. Relative to measures of securable assets commonly used in capital structure studies comprising all sources of tangible assets, the SNL Datasource database provides detailed information on the portfolio of properties of the real-estate firms in our sample. In particular, it is possible to identify land and buildings in use (currently rented), properties under development, and properties held for sale. In our estimations, we classify land and buildings in use as the most “securable” partition of tangible assets, since assets held for development and for sale offer much less secure collateral.

Table V Here

The remaining variables in Table V generally attract the correct sign but are not always statistically significant. *LnSize* enters the secured leverage regression with a negative but statistically insignificant coefficient. *Profitability* has a negative effect on secured leverage using market values, a result that is commonly rationalized with Myers’ (1984) pecking order theory. *Earnings Volatility* enters the secured leverage regressions with the “wrong” sign, but is statistically insignificant. *UPREIT Equity* is positively related to secured leverage, implying that this unique and potentially less expensive form of equity increases the debt capacity of real estate firms.

Estimation results from our difference-in-differences q regressions are reported in Table VI.²⁵ The interaction term (our variable of interest) enters the regression with a significantly positive coefficient, with both the market and the book secured-leverage increasing dummies. We note that the effect is also economically sizable. The coefficient of 0.035 in column 1 compares with the average change in q of 0.045 that is measured conditional on all firms experiencing a positive change in q in any given quarter over the entire sample period. The effect is smaller but still sizable when, as seen in column 2, the book value version of the secured-leverage variable is used.

Thus, in line with our predictions, this result indicates that higher-quality Housing REITs (which in our theory would otherwise rely on unsecured debt outside of the Russian crisis) migrated

²⁵ In each reported estimation, as an alternative dependent variable we use Tobin’s q in excess of the average Tobin’s q of the property segment in which the sample firm operates. All of these results (unreported) remain qualitatively unchanged relative to the reported results.

to the Fannie-Freddie secured-debt market during the Russian crisis to raise the average revealed quality of firms in that market.

Table VI Here

We move next to the discussion of the estimation results on the *RussianCrisis* dummy and the *SecuredLeverageIncreasing* dummy. The Russian crisis by itself is seen to have a negative and significant effect on q . This variable measures the effect of the Russian crisis on the overall Housing-REIT segment, as related to the higher cost and limited availability of most forms of external finance. The *SecuredLeverageIncrease* dummy is negative and significant in the market-leverage specification, but insignificant and economically small in the specification with book leverage. Together the results indicate that, consistent with the evidence discussed in Section III.B, an increase in secured-leverage results in a smaller than average increase in q .²⁶

IV.C Robustness Tests

In this section we discuss tests conducted to assess the robustness of our empirical model specification and estimation results. To start, recall that our identification strategy is centered on a natural experiment in which Housing REITs have exclusive access to Fannie-Freddie financing. This financing option became quite valuable when other financing sources (private label secured debt, unsecured debt and equity) became expensive and essentially unavailable during the Russian crisis.

If the logic of our identification strategy is correct, we should not observe the migration of higher quality Non-Housing firms into the secured debt market. This follows because Non-Housing firm specialties (office, retail, industrial, and hotel) did not have access to reasonably priced Fannie-Freddie secured debt finance during the Russian crisis. Therefore, we can rely on the Non-Housing segments to build a series of falsification tests. These consist of re-estimating the results in Table VI *as if* the REIT specialty connected to Fannie-Freddie was respectively office, retail, industrial, and hotel. If our identification is correct, we should not find the interaction term between the *RussianCrisis* dummy and the *SecuredLeverageIncrease* (market and book) dummy to be positively significant in the estimations for each of the Non-Housing categories.

We report results from these estimations in Table VII. In order to focus on the main results, we only display the coefficient estimate on the interaction terms. For comparability, in the first row of Table VII we also report the coefficient on the interaction term for the Housing REIT sample from Table VI. The evidence in Table VII shows that, for the Non-Housing segment as a group and for

²⁶ In the interest of brevity, we refer the reader to our discussion in Section III.B of the control variables used in the q regression specification.

each of the Non-Housing categories, the coefficient on the interaction term is never positively significant. Overall, these findings contribute to validate the logic of our identification strategy, where the migration effect that we have described occurs only for Housing REITs.

Table VII Here

It could also be possible that, for secured-debt increasing REITs, q was following an increasing trend prior to the Russian crisis that became sizable when the crisis hit. This problem – known as a violation of the “parallel–trend” assumption in quasi-experimental design – could invalidate our difference-in-differences approach. That is, our difference-in-differences specification is centered on the idea that q values for the experimental group (secured-debt increasing firms) and the reference group are moving in parallel prior to the shock caused by the Russian crisis. It is therefore important that we check the robustness of our estimations to the parallel–trend assumption. To assess this effect, we re-estimate the results in Table VI by including in our regressions an interaction term between a trend variable and the secured-leverage increasing dummy. Our estimations (unreported) show that the coefficients on the interaction term of interest (*RussianCrisis* × *SecuredLeverageIncrease*) remain very similar to those reported in Table VI in terms of sign, magnitude, and statistical significance. This suggests that violation of the parallel–trend assumption cannot explain our results.

The Russian crisis was not the only flight-to-quality financial shock that occurred during our sample period—the residential sub-prime mortgage crisis that started in the second half of 2007 was another large shock that had repercussions for commercial property markets.²⁷ And, as with the Russian crisis, the Fannie-Freddie secured mortgage debt financing channel remained open for Housing REITs during the sub-prime crisis while other financing channels became increasingly unavailable and expensive. We would therefore expect similar equilibrium outcomes to occur as per Proposition 1 of our model, with similar empirical implications and estimation results.

Table VIII displays our findings. The results from the sub-prime crisis are remarkably similar to estimation results from the Russian crisis, where coefficients associated with the sub-prime crisis interaction term are even larger than those obtained with the Russian crisis interaction term. In addition, as with the Russian crisis tests, the coefficient is statistically insignificant for the Non-Housing group. We note, however, that unlike the Russian crisis, which was plausibly orthogonal to the U.S. commercial property market, the sub-prime crisis has an important real-estate connotation

²⁷ Notably, Fahlenbrach, Prilmeier, and Stulz (2012) identify an empirical link between the Russian crisis of 1998 and the more recent sub-prime crisis. This link operates through the banking system, where banks that operated poorly during the 1998 crisis are found to operate poorly as well during the sub-prime crisis.

that complicates the causal interpretation of the results in Table VIII. The reader should therefore bear this caveat in mind when interpreting these results.

Table VIII Here

As an additional test, recall that in our model there is no commitment value associated with cash as a source of financing for new investment, as cash is assumed to be in short supply and better diverted by insiders to serve other productive purposes. Lenders recognize this effect, and therefore do not attempt to restrict the way firms utilize free cash flow. This implies that our main results reported in Table VI should not be affected by the inclusion of cash holdings as a control variable. This is precisely what we find in the data. The coefficient estimates on the interaction term (untabulated) remain basically unchanged relative to the estimations reported in Table VI when we control for cash holdings.

Finally, we check whether our results are robust across different sub-periods. This test allows us to rule out the possibility that the migration effect that is at the heart of our identification strategy is period specific. To check for this possibility we run the following experiment. Our sample period is split into two non-overlapping sub-periods: 1992 Q2 to 1998 Q2 and 1999 Q1 to 2010 Q3. In each of the two sub-periods, we then also include the firm-quarter observations relative to 1998 Q3 and Q4 (the quarters of the Russian crisis). We then estimate the model reported in Table VI for each of the sub-periods. The results (unreported) show that the coefficient estimates on the interaction term of interest is positive and significant for the two sub-periods for the Housing REIT segment, but always insignificant for the Non-Housing group. This helps mitigate any concern that our results are period specific.

All in all, our main analysis and falsification tests support the validity of our identification strategy. In the next section, we discuss tests related to additional aspects of our theory.

IV.D Committed Equity: The Role of Debt Covenants and Restricted Shares

One of the key implications of our model is that committed equity (a commitment to maintain a strong balance sheet) is required by unsecured creditors to be considered a higher quality firm. One possible commitment mechanism would be to set aside cash reserves to guarantee debt repayment. But firms (and their lenders) recognize that the opportunity costs of setting aside such reserves are high, particularly in the presence of financial constraints. One of the most important mechanisms employed in practice to commit to maintain a strong balance sheet is the use of unsecured debt covenants that limit total leverage and that require sufficiently high cash flow coverage so as to minimize the risk of being unable to meet ongoing debt repayment obligations.

Tight covenant provisions are costly for lower quality firms because they are more likely to violate provisions and be penalized as a result.

To assess this implication of our model, we hand-collect covenant information on REIT unsecured debt issuances (the type of debt used by higher quality firms in our model) found on the SEC Edgar database. In line with model predictions, our data show that more than 95% of the firms filing an unsecured debt issuance prospectus use covenants that commit the firm to restrict leverage as well as interest coverage.²⁸ Total leverage restrictions range between 45 and 65 percent of assets in place, with about 80 percent of the firms “committing” to a total leverage ratio of 60 percent or less. Notably, these restrictions appear conservative relative to private firms operating in the commercial-real estate industry, which often carry total leverage ratios of between 70 and 90 percent. Interest coverage ratio restrictions range from 1.25 to 2.00, with about 80% of firms “committing” to an interest coverage ratio of at least 1.50. Covenants that restrict dividend payouts or investment are much less common in the data, which is also consistent with our story.

Bond covenants are not, however, the only mechanism available to establish credible (equity) commitment by firm insiders. A complementary or alternative mechanism could be for the firm to issue restricted stocks or some other similar type of deferred compensation that binds insiders to the longer-term performance of the firm. To explore this possibility, we hand-collect from annual reports information on the value of restricted shares awarded to the firm CEO in a given year. We then calculate the ratio of restricted shares to total assets and separate sample firms into two groups: the above median group (with larger committed equity) and the below median group (with lower committed equity).

Evidence reported in Table IX shows that firms in the above median group experience an economically larger and statistically significant increase in q following the award of restricted shares to their CEOs relative to firms in the below median group. We also find that firms in the above median group rely significantly less on secured debt (market and book) relative to firms in the below median group. Overall, these findings are consistent with model predictions that higher quality firms rely more on inside (committed) equity in order to separate themselves from lower quality firms.

Table IX Here

²⁸ Billet, Kim, and Mauer (2007) report that about 30% of non-financial firms use covenants to restrict leverage levels. The more widespread use of covenants to restrict leverage in the commercial real estate industry should be expected, as the significant debt capacity of real estate makes it easier for firms to stretch their collateral to achieve high debt levels.

V Conclusion

This paper has considered how collateral is used to finance a going concern, making a clear distinction between real collateral and commitment collateral as they affect debt capacity and financing decisions. Firms with better quality collateral are shown to substitute commitment collateral for real collateral, thereby maintaining a strong balance sheet and debt capacity that is available if necessary to fund future investment opportunities. In contrast, lower quality firms exhaust their debt capacity by pledging real collateral, since the commitment to maintain a strong balance sheet is simply too expensive. Having exhausted their spare debt capacity, these firms reduce their financing options going forward as they will find it difficult to refinance their existing debt.

The model is tested empirically using the 1998 Russian financial crisis as a natural experiment that aids in identification. Based on a sample of U.S. property firms that held housing assets, and who therefore had access to Fannie Mae-Freddie Mac mortgage financing inside as well as outside the crisis, we find that, consistent with an equilibrium in our model that shows that good firms tap secured debt as necessary during adverse financial market conditions, the better quality firms migrated to the secured debt market during the height of the crisis. A similar effect occurred during the more recent financial crisis. We rely on a series of falsification tests to rule out alternative explanations for our empirical findings.

Given our sample of property firms, it is hard to square our findings with other theories of capital structure or financing choice. For example, dividend payout requirements that are imposed to allow these firms to avoid taxation at the firm level reduce the power of pecking order or free cash flow rationales for financing choice. Perhaps the most direct alternative model of financing choice to our model is the moral hazard approach to explaining secured debt choice, where the stylized empirical fact is that secured debt (and therefore the act of pledging collateral) carries a higher interest rate than unsecured debt. Moral hazard models then focus on the association of pledged real collateral with borrower quality, and have offered contradictory explanations for why lower quality borrowers pledge more collateral to finance investment. Our model in contrast offers a unified perspective that reconciles seemingly contradictory effects. That is, we show that lower quality firms pledge more *real* collateral (which is what is measured empirically) and pay higher rates of interest, while higher quality firms pledge less *real* collateral, but commit to have lower leverage ratios, a form of *financial* collateral.

Our study contributes to the ongoing debate on capital structure (e.g., Lemmon, Roberts, and Zender (2008)) by offering a tentative rationalization to the issue of debt priority and the limits of using different debt contracts. Future research ought to consider carefully the limits of using debt

capacity in connection with its implications for future growth and investment. The role of these limits, for example, is routinely debated in relation to the recent financial crisis.

References

- Acharya, V., H. Almeida, and M. Campello, 2007, "Is Cash Negative Debt? A Hedging Perspective on Corporate Financial Policies," *Journal of Financial Intermediation* 16, 515-554.
- Acharya, V., S. Bharath, and A. Srinivasan, 2007, "Does Industry-wide Distress Affect Defaulted Firms? Evidence from Creditor Recoveries," *Journal of Financial Economics* 85, 787-821.
- Acharya, V., S. Davydenko, and I. Strebulaev, 2012, "Cash Holdings and Credit Risk," Working Paper, New York University, University of Toronto, and Stanford University.
- Adelino, M., A. Schoar, and F. Severino, 2012, "Credit Supply and House Prices: Evidence from Mortgage Market Segmentation," Working Paper, MIT and Dartmouth College.
- Benmelech, E., and N. Bergman, 2009, "Collateral Pricing," *Journal of Financial Economics* 91, 339-360.
- Bernanke, B., and M. Gertler, 1989, "Agency Costs, Net Worth, and Business Fluctuations," *American Economic Review* 79, 14-31.
- Berger, P., and E. Ofek, 1995, "Diversification's Effect on Firm Value," *Journal of Financial Economics* 37, 39-66.
- Berger, P., and E. Ofek, 1996, "Bust-up Takeovers of Value-Destroying Diversified Firms," *Journal of Finance* 51, 1175-1200.
- Berger, A., and G. Udell, 1990, "Collateral, Loan Quality and Bank Risk," *Journal of Monetary Economics* 25, 21-42.
- Besanko, D., and A. Thakor, 1987, "Collateral and Rationing Sorting Equilibria in Monopolistic and Competitive Credit Markets," *International Economic Review* 28, 671-689.
- Bester, H., 1985, "Screening vs. Rationing in Credit Markets with Imperfect Information," *American Economic Review* 75, 850-855.
- Bester, H., 1987, "The Role of Collateral in Credit Markets with Imperfect Information," *European Economic Review* 31, 887-899.
- Billett, M., T. King, and D. Mauer, 2007, "Growth Opportunities and the Choice of Leverage, Debt Maturity, and Covenants," *Journal of Finance* 62, 697-730.
- Bolton, P., and D. Scharfstein, 1996, "Optimal Debt Structure and the Number of Creditors," *Journal of Political Economy* 104, 1-25.
- Boot, A., A. Thakor, and G. Udell, 1991, "Secured Lending and Default Risk: Equilibrium Analysis, Policy Implications and Empirical Results," *Economic Journal* 101, 458-72.

- Campello, M., and E. Giambona, 2012, "Capital Structure and the Redeployability of Tangible Assets," Working Paper, Cornell University and University of Amsterdam.
- Chan, Y., and G. Kanatas, 1985, "Asymmetric Valuations and the Role of Collateral in Loan Agreements," *Journal of Money, Credit and Banking* 17, 84-95.
- Chaney, T., D. Sraer, and D. Thesmar, 2012, "The Collateral Channel: How Real Estate Shocks Affect Corporate Investment," forthcoming, *American Economic Review*.
- Chava, S., and A. Purnanandam, 2011, "The Effect of Banking Crisis on Bank-Dependent Borrowers," *Journal of Financial Economics* 99, 116-135.
- Diamond, D., 1993, "Seniority and Maturity of Debt Contracts," *Journal of Financial Economics* 33, 341-368.
- Demiroglu, C., and C. James, 2010, "The Information Content of Bank Loan Covenants," *Review of Financial Studies* 23, 3700-3737.
- Easterbrook, F., 1984, "Two Agency-Cost Explanations of Dividends," *American Economic Review* 74, 650-659.
- Fahlenbrach, R., R. Prilmeier, and R. Stulz, 2012, "This Time is the Same: Using Bank Performance in 1998 to Explain Bank Performance During the Recent Financial Crisis," forthcoming, *Journal of Finance*.
- Gan, J., 2007, "Collateral, Debt Capacity, and Corporate Investment: Evidence from a Natural Experiment," *Journal of Financial Economics* 85, 709-734.
- Gentry, W., and C. Mayer, 2008, "What Can We Learn about the Sensitivity of Investment to Stock Prices with a Better Measure of Tobin's q ?" Working Paper, Columbia University.
- Harhoff, D., T. Korting, 1998, "Lending Relationship in Germany – Empirical Evidence from Survey Data," *Journal of Banking and Finance* 22, 1317-1353.
- Hart, O., and J. Moore, 1994, "A Theory of Debt Based on the Inalienability of Human Capital," *Quarterly Journal of Economics*, 109, 841-879.
- Hartzell, J., L. Sun, and S. Titman, 2006, "The Effect of Corporate Governance on Investment: Evidence from Real Estate Investment Trusts," *Real Estate Economics* 34, 343-376.
- Holmstrom, B., and J. Tirole, 2011, *Inside and Outside Liquidity*, Cambridge, MA: MIT Press.
- Jensen, M., 1986, "Agency Cost of Free Cash Flow, Corporate Finance and Takeovers," *American Economic Review* 76, 323-329.
- John, K., A. Lynch, M. Puri, 2003, "Credit Rating, Collateral and Loan Characteristics: Implications for Yield," *Journal of Business* 76, 371-409.

- Kiyotaki, N., and J. Moore, 1997, "Credit Cycles," *Journal of Political Economy* 105, 211-48.
- Lamont, O., and C. Polk, 2002, "Does Diversification Destroy Value? Evidence from the Industry Shocks," *Journal of Financial Economics* 63, 51-77.
- Lemmon, M., M. Roberts, and J. Zender, 2008, "Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure," *Journal of Finance* 63, 1575-1608.
- Lang, L., and R. Stulz, 1994, "Tobin's Q, Corporate Diversification, and Firm Performance," *Journal of Political Economy* 102, 1248-1280.
- Myers, S., 1984, "The Capital Structure Puzzle," *Journal of Finance* 39, 575-592.
- Myers, S., and N. Majluf, 1984, "Corporate Financing and Investment Decisions when Firms Have Information that Investors Do Not Have," *Journal of Financial Economics* 13, 187-221.
- Myers, S., and R. Rajan, 1998, "The Paradox of Liquidity," *Quarterly Journal of Economics* 113, 733-771.
- Ortiz-Molina, H., and G. Phillips, 2009, "Asset Liquidity and the Cost of Capital," Working Paper, University of British Columbia and University of Maryland.
- Petersen, M., 2009, "Estimating Standard Errors in Finance Panel Data Sets: Comparing Approaches," *Review of Financial Studies* 22, 435-480.
- Rajan, R., H. Servaes, and L. Zingales, 2000, "The Cost of Diversity: Diversification Discount and Inefficient Investment," *Journal of Finance* 55, 35-80.
- Rajan, R., and A. Winton, 1995, "Covenants and Collateral as Incentives to Monitor," *Journal of Finance* 50, 1113-1146.
- Rampini, A., and S. Viswanathan, 2010, "Collateral and Capital Structure," Working Paper, Duke University.
- Rauh, J., and A. Sufi, 2010, "Capital Structure and Debt Structure," *Review of Financial Studies* 23, 4242-4280.
- Riddiough, T., and Z. Wu, 2009, "Financial Constraints, Liquidity Management, and Investment," *Real Estate Economics* 37, 447-471.
- Schnabl, P., 2012, "The International Transmission of Bank Liquidity Shocks: Evidence from an Emerging Market," forthcoming, *Journal of Finance*.
- Smith, C., and J. Warner, 1979, "On Financial Contracting – An Analysis of Bond Covenants," *Journal of Financial Economics* 7, 117-161.
- Stulz, R., and H. Johnson, 1985, "An Analysis of Secured Debt," *Journal of Financial Economics* 14, 501-522.

Villalonga, B., 2004, “Does Diversification Cause the Diversification Discount?” *Financial Management* 33, 5-27.

World Bank, Investment Climate Survey at <http://iresearch.worldbank.org/ics/jsp/index.jsp>.

Appendix

A.I Extension to Baseline Model

In this section we relax the restriction that new project values are equal across firms, recognizing that G-firms may have higher-valued investment opportunities as well as higher-valued assets in place. With this characterization we can label the G-firm as a “high-growth” firm and the B-firm as a “low-growth” firm. Specifically, in this extension all model structure is as previously described, with the one modification that G-firms undertake investment such that $A_u^G > B_u$. B-firms invest as previously described with $A_u^B = B_u$. Firms in this extension are thus characterized by the asset value pairing $\{A_\omega + \alpha, A_u^G\}$, $\{A_\omega - \alpha, A_u^B\}$, which is unobservable to outsiders *ex ante*.

The screening equilibrium will be affected by the G-firm’s demand for excess cash proceeds and the unsecured creditor’s willingness to supply this liquidity as it depends on A_u^G . To see these effects, consider two polar cases. First suppose that proceeds from an unsecured debt issuance remain as in the baseline model. In this case gross proceeds of $A_\omega + \alpha + B_u$ go to the G-firm together with its commitment to issue inside equity of (up to) 2α . For committed equity cost κ sufficiently small, this design remains sufficient to screen out the B-firm from the unsecured market. But now, because the G-firm’s new project is worth that $A_u^G > B_u$, there is collateral value in excess of the promised debt repayment obligation. Given that this extra debt capacity remains untapped, it might be used to relax certain elements of the committed equity obligation (e.g., relatively less restrictive unsecured debt covenants) in order to provide the G-firm greater flexibility in adjusting to future circumstances.

Now consider the second polar case. Given that the G-firm values additional cash proceeds that might be generated by the higher asset value, A_u^G , and given that unsecured creditors are willing to supply the additional liquidity, gross proceeds of up to $A_\omega + \alpha + A_u^G$ can be generated from an unsecured debt issuance. But now, because greater proceeds associated with unsecured debt issuance creates stronger incentives for the B-firm to mimic the G-firm, the amount of committed equity (e.g., restrictive unsecured debt covenants) may have to be adjusted upward to successfully screen out the B-firm.

This extension thus produces the following implications. First, it shows that the basic screening equilibrium relations generated from the baseline model are robust to the case where there is an unobservable component not only with the assets-in-place but also with new investment

opportunities. Results further suggest that increased demand for liquidity requires greater amounts of committed equity (monitoring through bond covenants that restrict discretion in the future) to offset the current demand for cash. This applies to the B-firm's demand for liquidity, as it in turn depends on the G-firm's demand for cash in relation to its ability to make value-added investment (a pledgable income effect). Then, after controlling for cash proceeds, and to the extent that there is cross-sectional variation in G-firms' value-added investments, firms that produce greater value for their shareholders are subject to less restrictive unsecured debt covenants due to the existence of excess debt capacity (a debt capacity-related substitution effect).

Lastly, we note that when higher quality firms (in terms of their assets in place) also create more value for their owners through new investment, they can be characterized as "high-growth" firms. For these high-growth firms, changes in firm value realized through financing decisions are negatively related to leverage, with the opposite relation holding for lower quality "low-growth" firms.

A.II Model With Uncertainty in Firm Type and Future Asset Prices

A.II.A Preliminary Model With Uncertainty in Future Asset Prices Only

In this sub-section, to establish a benchmark, we assume that the assets-in-place do not have an unobservable component. These assets, denoted as ω , generate an aggregate payoff in one period that is either high, ω^H , or low, ω^L . For simplicity, the binary outcomes are assumed to be equally likely. Given that all agents are risk neutral and that the risk-free rate is zero, the resulting value of the assets-in-place is $A_\omega = \frac{\omega^H + \omega^L}{2}$.

Current time is t_0 . The assets-in-place were launched sometime in the past, say time t_{-1} . Assume the firm previously issued debt to finance the assets-in-place. The debt matures at time t_1 , with D_ω due at that time. The debt is risky, in the sense that $\omega^L < D_\omega < \omega^H$. In a low value realization the debtholder recovers ω^L in lieu of D_ω as promised. We assume that $D_\omega < A_\omega$ so as to eliminate the possibility of violating net worth covenants that might otherwise cause liquidation of the firm or strategic default at t_0 . At t_0 , $B_\omega = \frac{D_\omega + \omega^L}{2}$, and the equity value is $E_\omega = \frac{\omega^H - D_\omega}{2}$.

As with the model presented in the main body of the paper, the debt-in-place has two covenants. The first covenant does not allow the assets-in-place, ω , to be pledged to secure additional debt financing. The second covenant allows the firm to call the debt at its current market value.

At time t_{0+} the firm has the opportunity to invest in another project, u . Payoffs to the project will not depend on firm type, and will be realized at t_1 . These payoffs are binary outcomes, either

high or low, with equal probability. To simplify the analysis and notation, we will assume the new project is identical in scale to the assets-in-place. This scaling assumption does not affect any of our results, and facilitates the analysis. Although otherwise identical, projects may differ in how joint payoffs are realized. Specifically, we will assume that the payoffs to the projects are independent; that is, $\omega \otimes u = 0$, implying fully idiosyncratic asset value shocks. This zero correlation assumption is also not necessary to generate our results as long as payoffs are not perfectly correlated.

Assume the cost to invest in the new project is B_u , where $B_u \leq \frac{u^H + u^L}{2}$. The project is thus a (weakly) positive NPV investment. Unconditionally, the new project u is optimally financed with debt, since outside equity issuance is costly. There are two options available to the firm to debt finance the new investment: secured or unsecured debt issuance. Inside equityholders hold control rights with respect to investment and financing choices, and make decisions in their own interests. Financial markets are assumed to be perfectly competitive.

A new secured debt issuance generates issuance proceeds (just) sufficient to fund the cost of investment, B_u . The debt is non-recourse to the assets-in-place, so existing secured debtholders are completely unaffected by the new secured debt issuance. This feature allows inside equityholders to fully internalize the benefits of investment, thus mitigating a possible underinvestment problem (Stulz and Johnson (1985)). Equity value associated with the new investment is thus $E_u = A_u - B_u \geq 0$

The new secured debt issuance is risky, in the sense that $u^L < B_u$. Given recovery of u^L to the secured lender in a low value state, the promised debt payoff at t_1 is $D_u = 2B_u - u^L < u^H$. The market value balance sheet of the firm immediately after the investment at t_{0+} shows $A_\omega + A_u$ in assets, secured debt liabilities of $B_\omega + B_u$, and inside equity value of $E_\omega + E_u$.

Now consider the unsecured debt financing option. Under this option the firm will issue debt that is collateralized by both the assets-in-place and the new investment. Recall, however, that a covenant on the secured debt restricts pledging the assets-in-place as collateral. Hence, financing the new investment with unsecured debt will require the firm to call the debt-in-place at its market value, B_ω .

We will assume maximum unsecured bond issuance proceeds are such that the firm only defaults when both assets simultaneously realize a low-value outcome. This implies a maximum promised debt payoff at t_1 of $D_{UN} = \omega^H + u^L = u^H + \omega^L$ given that the two projects supply identical payoffs. Because the unsecured lender realizes the contractually specified payoff of D_{UN} in the H-H, H-L and L-H states of the world, respectively, and a recovery of $\omega^L + u^L$ in the L-L state of the world, unsecured debt issuance proceeds are $B_{UN} = \frac{3D_{UN} + \omega^L + u^L}{4}$.

The question we ask next is whether unsecured debt issuance proceeds are sufficient to fund the new investment plus the cost to call the debt-in-place. The following lemma provides an affirmative answer to this question.

Lemma A.1: *Maximum net proceeds from an unsecured debt issuance exceed those from a secured debt issuance.*

Proof: *As specified previously, proceeds from a secured debt issuance are just sufficient to fund the cost of investment, equaling $B_u \leq \frac{u^H + u^L}{2}$. Recall that the market value of the debt-in-place is $B_\omega = \frac{D_\omega + \omega^L}{2}$, where $D_\omega < \frac{\omega^H + \omega^L}{2}$, and that maximum proceeds from an unsecured debt issuance are $B_{UN} = \frac{3D_{UN} + \omega^L + u^L}{4}$. To show that maximum net unsecured debt issuance proceeds exceed those from a secured debt issuance, we need to show that $B_{UN} > B_\omega + B_u$. Recalling that $D_{UN} = \omega^H + u^L = u^H + \omega^L$, and the above inequalities as they apply to D_ω and B_u , the result follows immediately. QED*

The promised unsecured debt payment of D_{UN} , due at time t_1 , equals the market value of the new investment *plus* the market value of the assets-in-place. This implies that the net unsecured debt proceeds (after calling the debt-in-place) exceed the cost of the new investment. An unsecured debt issuance thus allows the firm to tap available debt capacity associated with the assets-in-place. This “excess proceeds” result may at first seem unintuitive, since an unsecured debt issuance carries with it lower credit risk than a new secured debt issuance. But it is the combination of accessing excess debt capacity and asset diversification benefits realized through cross-collateralization that drive the result.

Secured as well as unsecured debt issuance proceeds are thus sufficient to fund new investment. Is one or the other preferred by the firm given the current model structure? The answer is no. When there is no realized benefit to the generation of excess cash proceeds from an unsecured debt issuance, the excess proceeds are exactly offset by the increased size of the unsecured debt financing liability relative to the secured debt liability, implying that the firm is indifferent between the two financing options. This result highlights the Modigliani-Miller indifference proposition under perfect capital markets.

The indifference result isolates the economic effects of the debt covenants that limit the firm’s ability to pledge the assets-in-place as security for a new financing and which allow the debt to be called at its market value. To see the effects, assume that neither covenant was in place. That is, assume that the debt was not callable and that the assets-in-place could be pledged as security in an

unsecured debt financing, as long as existing secured debtholders retained seniority on the assets in place with additional collateral backing provided by the new investment. Then, as pointed out by Stulz and Johnson (1985), the firm would not issue unsecured debt, since doing so would result in a wealth transfer from inside equityholders to the existing debtholders. To the extent that there might be distortions in the cost or availability of secured debt going forward, significant underinvestment could result. Thus, these stated bond covenants can be seen as a mechanism to shift surplus benefits to agents that control the firm as a going concern, while also securing participation by the initial debtholders.

Now, with the two covenants in place as posited, suppose that equityholders of the firm are financially constrained so that there is positive value to generating excess cash proceeds from an unsecured debt issuance. Denote this shadow value as $\gamma > 0$, with γ increasing in the quantity of excess proceeds. With this shadow value, the firm clearly will prefer the maximum unsecured debt issuance since inside equity value increases by $\gamma \Delta$, $\Delta = B_{UN} - B_u - B_\omega$.

A.II.B Full Model With Uncertainty As To Firm Type

Suppose that just prior to being presented with the new investment opportunity, u , the firm (and only the firm) learns its type. In particular, the firm learns that it is either a G -firm or a B -firm depending on the value of assets in place. The arrival of this information was unanticipated by creditors when contracting occurred to finance the assets-in-place.

The difference between firms is specifically determined by the payoff to assets-in-place in an L-state of the world, where the G -firm pays off $\omega^L + \alpha$ and the B -firm pays off $\omega^L - \alpha$.²⁹ The payoff to both types remains at ω^H in an H-state of the world. This implies that firm value has either increased or decreased by $\frac{\alpha}{2}$ just prior to investment, depending on realized type. The size of α is restricted so that the debt-in-place remains risky in the case of the G -firm ($\omega^L + \alpha < D_\omega$), and the value of assets-in-place of the B -firm still exceeds the promised secured debt payoff ($D_\omega < A_\omega - \frac{\alpha}{2}$).³⁰

The firm will consider implications of the change in going concern value when evaluating its financing options with respect to the new investment opportunity. Due to non-recourse that isolates collateral asset value, and because the new investment opportunity has identical expected value to either firm type, the secured debt financing option remains as analyzed when there is no uncertainty

²⁹ This distinction in effect posits relatively lower bankruptcy costs for the G -firm.

³⁰ These restrictions are not necessary for our results to carry through, but are made only to streamline the analysis.

as to firm type.³¹ But it is immediately clear that inside equityholders of the G -firm would, if possible, like to internalize the increase in going concern value for themselves, thus creating an additional incentive to consider an alternative financing option.

Consider now the possibility of financing with unsecured debt. Unsecured creditors are aware that an unanticipated change in going concern value has occurred, but are unable to identify firm type without imposing additional screening mechanism designs. As a result, without an additional screen to assure that it meets stated credit standards, the unsecured creditor pools. As in the full information case considered previously, the promised payoff to the unsecured creditor in one period is $D_{UN} = \omega^H + u^L = u^H + \omega^L$. Table A.I displays the joint payoffs conditional on the four possible realized states of the world at time t_1 .

Table A.I

Payoffs to Unsecured Creditors as a Function of Firm Type and State Outcome

Firm Type	Project State Outcome Combination (ω, u)			
	(H,H)	(H,L)	(L,H)	(L,L)
G	D_{UN}	D_{UN}	D_{UN}	$\omega^L + u^L + \alpha$
B	D_{UN}	D_{UN}	$\omega^L + u^H - \alpha$	$\omega^L + u^L - \alpha$

As seen in the table, credit risk associated with unsecured debt issuance increases with the B -firm since the probability of default goes from $1/4$ to $1/2$ and loss recovery given default decreases by α relative to the case with no difference in firm type.

The cost of calling the secured debt is B_ω , as specified previously. The following lemma establishes conditions under which net proceeds from a pooled unsecured debt issuance are positive, and when gross proceeds equal B_{UN} , which are proceeds realized in the full information case with identical firm types.

Lemma A.2: Assume a contractually specified payoff of $D_{UN} = \omega^H + u^L = u^H + \omega^L$. If the proportion of G -firms in the population equals at least $2/3$, gross unsecured debt proceeds under pooling equal or exceed B_{UN} . Net proceeds are positive if the proportion of G -firms equals or exceeds $1/2$.

³¹ It is assumed that type is reflected in the assets in place but not in the new project. Perhaps the firm has learned through experience about its ability to manage the assets in place, but is not certain how it might succeed in the new project.

Proof: Let π denote the proportion of G -firms in the population. In order for gross unsecured issuance proceeds to equal or exceed B_{UN} , it must be that $\pi[(3/4)(\omega^H + \omega^L) + (1/4)(2\omega^L + \alpha)] + (1-\pi)[(1/2)(\omega^H + \omega^L) + (1/4)(\omega^H + \omega^L - \alpha) + (1/4)(2\omega^L - \alpha)] \geq (3/4)(\omega^H + \omega^L) + (1/4)(2\omega^L) = B_{UN}$. Algebraic manipulation of this expression confirms the stated relation with $\pi \geq 2/3$. To show that net proceeds are positive for $\pi \geq 1/2$, follow the logic as presented in Lemma 1 with the revised restriction that $D_\omega < A_\omega - \frac{\alpha}{2}$. QED

For the analysis that follows, we will assume that $\pi = 2/3$. Restricting $\pi = 2/3$ is not necessary, and is imposed as a threshold value to simplify the analysis. What is necessary is that the cost of unsecured debt under pooling is sufficiently low so that the B -firm prefers it to secured debt after having to pay a premium to call the existing secured debt. A lower cost of calling the secured debt-in-place will also support an analysis with $\pi < 2/3$, as will a sufficiently high shadow value to cash proceeds from a pooled unsecured debt issuance. Otherwise, if the B -firm does not prefer unsecured debt with pooling to secured debt, the equilibrium outcome will be a straightforward separation of G -firms issuing unsecured debt and B -firms issuing secured debt with no role for committed equity as a screening mechanism.

With $\pi = 2/3$, proceeds in the unsecured pooling case under asymmetric information exactly equal those realized with unsecured debt issuance in the one type-full information case. A comparison of market value balance sheets conditional on pooled unsecured debt issuance reveals firm preferences for financing alternatives. Specifically, the G -firm has collateralized assets of $A_\omega + A_u + \frac{\alpha}{2}$ plus excess cash proceeds of $\Delta = B_{UN} - B_\omega - B_u$. The market value of the unsecured debt liability is $B_{UN} + \frac{\alpha}{4}$, with inside equity value equaling $E_\omega + E_u + \frac{\alpha}{4}$. This accounting reveals that the G -firm shares equally the gain in going concern value with the unsecured lender. Although the G -firm would prefer to internalize the entire gain, the positive increase in equity value nonetheless creates a preference for unsecured debt financing over secured debt financing.

In contrast, the B -firm has collateralized assets of $A_\omega + A_u - \frac{\alpha}{2}$ together with excess cash proceeds of $\Delta = B_{UN} - B_\omega - B_u$. The entire decrease in going concern value of $\frac{\alpha}{2}$ is absorbed by the unsecured lender in this case, leaving unsecured debt value of $B_{UN} - \frac{\alpha}{2}$ and inside equity value equaling $E_\omega + E_u$. Without any benefit accruing to excess cash proceeds, the B -firm is indifferent between a secured and a pooled unsecured debt issuance, which could create instability in a pooled unsecured debt equilibrium. If there is positive shadow value to cash, however, both firm types will prefer the pooled unsecured debt issuance outcome.

Assume there is in fact positive shadow value to the excess cash proceeds of Δ , which is denoted as γ_{Δ} as before. A competitive unsecured lending market will cause creditors to consider additional screening mechanisms in an attempt to identify firms by their type, as the credit risk of the B-firm fails to satisfy the credit quality standard required for unsecured debt issuance.

To begin this analysis, and given a debt contract with D_{UN} due at time t_1 , payoffs and values conditional on firm type being known can be calculated. Relative to the pooling outcome, the G-firm pays less for the unsecured debt and the B-firm pays more. This in turn increases cash proceeds and inside equity value for the G-firm while decreasing cash proceeds and inside equity value for the B-firm. Table A.II displays the balance sheets of the firms conditional on the unsecured creditor knowing type.

Note that cash proceeds increase by $\frac{\alpha}{4}$ for the G-firm relative to the pooling outcome, and that inside equity value increases by $\frac{\alpha}{2}$ plus the incremental shadow value of cash associated with the increase in proceeds, $\gamma_{\Delta+\alpha/4}-\gamma_{\Delta}$. Thus, unsecured debt with revealed type is preferred over both the secured debt and pooled unsecured debt outcomes by the G-firm, with secured debt being the least preferred. In contrast, as previously noted, pooled unsecured debt creates greater cash proceeds and higher equity value for the B-firm relative to the other two outcomes. The B-firm's preference for secured debt versus unsecured debt given known type depends, however, on the shadow value of cash proceeds relative to the increase in unsecured debt cost due to its higher revealed credit risk.

Table A.II

Market Value Balance Sheets of Firms Given Unsecured Debt Financing with Known Type

	<u>G-Firm</u>	<u>B-Firm</u>
Collateralized Assets:	$A_{\omega}+A_u+\frac{\alpha}{2}$	$A_{\omega}+A_u-\frac{\alpha}{2}$
Cash Proceeds:	$\Delta+\frac{\alpha}{4}$	$\Delta-\frac{\alpha}{2}^*$
Shadow Value of Cash Proceeds:	$\gamma_{\Delta+\alpha/4}$	$\gamma_{\Delta-\alpha/2}$
Unsecured Debt:	$B_{UN}+\frac{\alpha}{4}$	$B_{UN}-\frac{\alpha}{2}$
Inside Equity:	$E_{\omega}+E_u+\frac{\alpha}{2}+\gamma_{\Delta+\alpha/4}$	$E_{\omega}+E_u-\frac{\alpha}{2}+\gamma_{\Delta-\alpha/2}$

* If positive. If this quantity is not positive the B -firm will not consider the unsecured debt financing option under these conditions.

Specifically, conditional on revealed type, if the shadow value to cash proceeds $\gamma_{\Delta-\alpha/2}$ is less than $\frac{\alpha}{2}$, secured debt issuance is preferred by the B -firm over separated unsecured debt issuance.

The following proposition summarizes these relations.

Proposition A.1: Assume that a firm, after being presented a profitable investment project, u , is motivated to undertake the investment based on maximizing inside equity value inclusive of the shadow value of excess cash proceeds. Conditional on firm type being known to the lender, the G -quality firm will prefer to finance project u with unsecured debt. A “moderate” credit quality B -firm, or one that is highly financially constrained (with smaller α relative to the value of cash proceeds $\gamma_{\Delta-\alpha/2}$), will also prefer to finance the project with unsecured debt. A “low” credit quality B -firm (with larger α relative to the value of cash proceeds $\gamma_{\Delta-\alpha/2}$) will prefer to finance project u with secured debt. Debt issuance proceeds are always greater for the G -firm.

Proof: Straightforward. See Figure 2 and previous analysis.

Results stated in the above proposition assume that u creditors can identify firm type prior to debt issuance. Creditors cannot, in fact, differentiate between firms at time t_0 . However, they do know that, conditional on firm identity being known at the time of issuance, a G -firm would prefer to finance investment in u with unsecured debt and generate higher issuance proceeds than a B -firm. Creditors also know that a B -firm would like to mimic the G -firm to obtain the same terms. Consequently, without some way to screen firms, unsecured debt to finance project u will not be offered to any firm at terms available to the known G -firm. This will cause financiers and the G -firm to explore mechanisms capable of revealing type.

The critical aspect of a potential screening mechanism is that it excludes unsecured lending to a low credit-rated firm through a commitment requirement. That is, in the context of the model, consider a credible and enforceable guarantee that ensures a full payoff of D_{UN} to the unsecured creditor in the H-H, H-L and L-H states of the world, and that ensures a minimum recovery of $\omega^L + u^L$ in a L-L state of the world. This requirement imposes no liability on the G -firm, since it already has assets in place of sufficient credit quality to meet the requirement.

Let κ be the cost of issuing the inside equity-based contingent claim. The following proposition establishes the threshold condition under which screening is feasible.

Proposition A.2: *If $\kappa < \frac{\alpha}{4} + (\gamma_{\Delta+\alpha/2} - \gamma_{\Delta})$, unsecured creditors will consider screening firms by requiring committed equity. Otherwise, if $\kappa \geq \frac{\alpha}{4} + (\gamma_{\Delta+\alpha/2} - \gamma_{\Delta})$, unsecured creditors pool by offering unsecured debt with proceeds B_{UN} with no equity issuance requirement.*

Proof: *Follows directly from the difference in equity value to the G-firm conditioned on separated versus pooled unsecured debt issuance, as well as the B-firm's preference for pooled unsecured debt.*

A screening separating equilibrium occurs when the cost of maintaining low leverage for the G-firm (in terms of committed equity) is less than the shadow value of cash generated from an increase in proceeds. The cost of committed equity for the B-firm is high, since it requires funding a payoff to the unsecured creditor in low-value states of the world. In particular, funded payoffs of α are required to supplement shortfalls in collateral value in L-H and L-L states of the world, resulting in a contingent liability with current value of $\frac{\alpha}{2}$ at the time of unsecured debt issuance. Clearly, if the cost of committing equity increases with the amount of committed equity necessary, mimicking the G-firm becomes harder and the screening separating equilibrium will more likely obtain.

Table I – Sample Descriptive Statistics

This table reports summary statistics for the main variables used in the paper's empirical estimations. All REIT-level data are from the SNL Datasource quarterly database. The sample includes listed-property firms with an investment focus on housing, office, retail, industrial, and hotel property types. The sample period is chosen on the basis of data availability in the SNL database and ranges from 2nd quarter of 1992 to the 3rd quarter of 2010. *q* is the ratio of market value of total assets (or SNL item #132264 – item #132384 + item#133859×1000) to book value of total assets (or SNL item #132264). *SecuredMarketLeverage* is the ratio of secured plus mezzanine debt (SNL item #132307 + item #132379) to the market value of total assets. *SecuredBookLeverage* is the ratio of secured plus mezzanine debt (SNL item #132307 + item #132379) to the book value of total assets. *SecuredDebt* is the ratio of secured plus mezzanine debt to total liabilities plus mezzanine debt (SNL item #132367 + item #132379). *MarketLeverage* is the ratio of total liabilities plus mezzanine debt to the market value of total assets. *BookLeverage* is the ratio of total liabilities plus mezzanine debt to the book value of total assets. *Size* is the book value of total assets. *Profitability* is the ratio of earnings before interest, taxes, depreciation, and amortization (item #132773) to the book value of total assets. *Earnings Volatility* is the ratio of the standard deviation of earnings before interest, taxes, depreciation and amortization using three years of consecutive quarterly observations to the average book value of total assets estimated over the same time horizon. *Securable Land&Building* is the ratio of land and buildings in use for business activities (item #132112) to the book value of total assets. *UPREIT Equity* is the ratio of upreit equity (item #132036 – item #133859) to total equity value (item #132036).

Variable	Sample Statistics					Obs.
	Mean	Median	St. Dev.	25th Pct.	75th Pct.	
<i>q</i>	1.208	1.179	0.246	1.048	1.328	6,360
<i>SecuredMarketLeverage</i>	0.321	0.305	0.205	0.151	0.479	6,264
<i>SecuredBookLeverage</i>	0.374	0.361	0.227	0.189	0.548	6,636
<i>SecuredDebt</i>	0.628	0.727	0.310	0.367	0.916	6,636
<i>MarketLeverage</i>	0.482	0.484	0.171	0.383	0.590	6,356
<i>BookLeverage</i>	0.563	0.582	0.186	0.472	0.684	6,735
<i>Size</i> (\$ Billion)	1.837	0.780	2.856	0.273	2.332	6,749
<i>Profitability</i>	0.023	0.0237	0.008	0.019	0.027	6,613
<i>Earnings Volatility</i>	0.009	0.007	0.008	0.003	0.011	7,557
<i>Securable Land&Building</i>	0.829	0.872	0.159	0.799	0.921	6,737
<i>UPREIT Equity</i>	0.080	0.032	0.103	0.000	0.127	6,479

Table II – Components of Secured and Unsecured Debt

This table reports summary statistics for the different components of secured and unsecured debt. All REIT-level data are from the SNL Datasource quarterly database. The samples period ranges from the 2nd quarter of 1992 (the first year data are available in the SNL database) to the 3rd quarter of 2010. The exceptions are the mortgage and lines of credit data, which are available in SNL Datasource from 2001. *MortgageDebt* is the ratio of mortgage debt (item #134161) to total liabilities plus mezzanine debt (item #132367 + item #132379). *SecuredLinesCredit* is the ratio of secured lines of credit drawn (item #132307 – item #134161) to total liabilities plus mezzanine debt. *MezzanineDebt* is the ratio of mezzanine debt to total liabilities plus mezzanine debt. *CorporateDebt* is the ratio of unsecured debt (item #132316) minus unsecured lines of credit drawn (item #134163 – (item #132307 – item #134161)) to total liabilities plus mezzanine debt. *UnsecuredLinesCredit* is the ratio of unsecured lines of credit drawn to total liabilities plus mezzanine debt. *Subordinated & OtherLiabilities* is the ratio of total liabilities plus mezzanine debt minus *SecuredDebt* and *UnsecuredDebt* to total liabilities plus mezzanine debt. This category includes junior debt and other liabilities, such as accrued expenses.

<i>Panel A</i>	Sample Statistics					Obs.
	Mean	Median	St. Dev.	25th Pct.	75th Pct.	
<i>SecuredDebt</i>	0.628	0.727	0.310	0.367	0.916	6,636
<i>MortgageDebt</i>	0.507	0.532	0.283	0.250	0.772	2,039
<i>MezzanineDebt</i>	0.072	0.027	0.113	0.000	0.109	6,735
<i>SecuredLinesCredit</i>	0.033	0.000	0.095	0.000	0.000	2,036
<i>Unsecured Debt</i>	0.298	0.212	0.289	0.000	0.576	2,025
<i>CorporateDebt</i>	0.234	0.092	0.264	0.000	0.484	2,025
<i>UnsecuredLinesCredit</i>	0.064	0.000	0.106	0.000	0.100	2,025
<i>Subordinated & Other Liabilities</i>	0.108	0.082	0.133	0.062	0.108	2,025
<i>Panel B</i>						
<i>Firms with No SecuredLinesCredit</i>	0.745					
<i>Firms with No Unsecured BankLinesCredit</i>	0.414					
<i>Firms with No CorporateDebt</i>	0.391					
<i>Firms with MortgageDebt but No CorporateDebt</i>	0.361					
<i>Firms with CorporateDebt but No MortgageDebt</i>	0.005					

Table III – Correlation between q and Secured Leverage

This table reports pair-wise correlation coefficients between q , *SecuredMarketLeverage* and *SecuredBookLeverage* for REITs (SIC code 6798) and non-financial firms (all industries, excluding SIC codes 6000-6999). All REIT-level data are from the SNL Datasource quarterly database. Data for non-financial firms are from the COMPUSTAT annual database. The samples period ranges from the 2nd quarter of 1992 (the first year data are available in the SNL database) to the 3rd quarter of 2010 for the REIT sample and from 1981 to 2010 for the COMPUSTAT sample. We use annual data for COMPUSTAT firms because the secured debt item (“Mortgage & Other Secured Debt”) is only reported in the annual files in COMPUSTAT. Refer to Table I for detailed variable definitions and sample description.

Panel A: REIT Sample			
	q	<i>SecuredMarketLeverage</i>	<i>SecuredBookLeverage</i>
q	1		
<i>SecuredMarketLeverage</i>	-0.386***	1	
<i>SecuredBookLeverage</i>	-0.172***	0.956***	1
Panel B: CAMPUSTAT Sample			
	q	<i>SecuredMarketLeverage</i>	<i>SecuredBookLeverage</i>
q	1		
<i>SecuredMarketLeverage</i>	-0.275***	1	
<i>SecuredBookLeverage</i>	-0.175***	0.943***	1

Note: *** indicates statistical significance at the 1% (two-tail) test level.

Table IV – q and Secured Leverage

This table reports results from OLS regression-estimation results of q on secured leverage (market and book) and control variables for REITs (SIC code 6798) and non-financial firms (all industries, excluding SIC codes 6000-6999). All REIT-level data are from the SNL Datasource quarterly database. Data for non-financial firms are from the COMPUSTAT annual database. The samples period ranges from the 2nd quarter of 1992 (the first year data are available in the SNL database) to the 3rd quarter of 2010 for the REIT firms and from 1981 to 2010 for the COMPUSTAT firms. We use annual data for COMPUSTAT firms because the secured debt item (“Mortgage & Other Secured Debt”) is only reported in the annual files in COMPUSTAT starting from 1981. Refer to Table I for detailed variable definitions and sample description. We report standardized coefficients to make them more easily comparable across the quarterly SNL database and the annual COMPUSTAT database. For instance, the coefficient of -0.106 for *Secured Market Leverage* is obtained as the product between the raw OLS coefficient on *Secured Market Leverage* (0.390) times the difference between the 75th and the 25th percentiles for *Secured Market Leverage* (0.479 – 0.151) divided by the sample mean q of 1.208. Standard errors reported in parentheses are based on heteroskedastic consistent errors adjusted for clustering at the firm-quarter level.

	REIT Sample		COMPUSTAT Sample	
	(1)	(2)	(3)	(4)
<i>Secured Market Leverage</i>	-0.106*** (0.018)		-0.134*** (0.008)	
<i>Secured Book Leverage</i>		-0.044** (0.021)		-0.088*** (0.007)
<i>LnSize</i>	0.032** (0.015)	0.048*** (0.015)	0.026** (0.013)	0.040*** (0.013)
<i>Profitability</i>	0.070*** (0.012)	0.061*** (0.011)	-0.009 (0.012)	-0.010 (0.011)
<i>EarningsVolatility</i>	-0.021* (0.011)	-0.023* (0.012)	0.188*** (0.012)	0.200*** (0.012)
<i>Obs.</i>	5,615	5,615	100,813	100,813
<i>Adj.-R²</i>	0.256	0.172	0.159	0.126

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% (two-tail) test levels, respectively.

Table V – Determinants of Secured Debt Capacity

This table reports results from the estimation of secured leverage regression models in levels. All REIT-level data are from the SNL Datasource quarterly database. The samples period ranges from the 2nd quarter of 1992 (the first year data are available in the SNL database) to the 3rd quarter of 2010. Refer to Table I for detailed variable definitions and sample description. Estimations also include firm- and quarter-fixed effects. Standard errors reported in parentheses are based on heteroskedastic consistent errors adjusted for clustering by firm-quarter.

	Secured Market Leverage	Secured Book Leverage
<i>Securable Land&Building</i>	0.265*** (0.065)	0.353*** (0.072)
<i>LnSize</i>	-0.015 (0.017)	-0.017 (0.017)
<i>Profitability</i>	-1.051** (0.489)	-0.012 (0.466)
<i>Earnings Volatility</i>	0.075 (0.898)	0.133 (1.072)
<i>UPREIT Equity</i>	0.717*** (0.120)	0.898*** (0.128)
Obs.	5,881	5,995
Adj.-R ²	0.280	0.300

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% (two-tail) test levels, respectively.

Table VI – “Shocks” to the Secured Debt Market and q : Fannie-Freddie Financing for Housing REITs During the Russian Crisis

This table reports results from the estimation of q regression models in changes. *RussianCrisis* is a dummy variable that takes a value of 1 for the 3rd and 4th quarter of the year 1998 and zero otherwise. *SecuredLeverageIncrease* (market and book) is a dummy variable that takes a value of 1 if the firm increases the use of its secured leverage capacity in the current quarter relative to the prior quarter, where used secured leverage capacity is the difference between observed secured leverage and secured debt capacity predicted from the estimation of secured debt regressions reported in Table V. Housing REITs are listed-property firms with an investment focus on housing properties (multi-family units) and access to Fannie-Freddie (backed) secured debt financing. Our regressor of interest is the double-interaction term, which captures the difference-in-differences effect. All REIT-level data are from the SNL Datasource quarterly database. The samples period ranges from the 2nd quarter of 1992 (the first year data are available in the SNL database) to the 3rd quarter of 2010. Refer to Table I for detailed variable definitions and sample description. Standard errors reported in parentheses are based on heteroskedastic consistent errors adjusted for clustering at the firm-quarter level.

	(1)	(2)
<i>RussianCrisis</i> × <i>SecuredMarketLeverageIncrease</i>	0.035*** (0.006)	
<i>RussianCrisis</i> × <i>SecuredBookLeverageIncrease</i>		0.012*** (0.004)
<i>RussianCrisis</i>	-0.044*** (0.005)	-0.032*** (0.004)
<i>SecuredMarketLeverageIncrease</i>	-0.026*** (0.006)	
<i>SecuredBookLeverageIncrease</i>		0.006 (0.004)
<i>UPREIT Equity</i>	-0.051 (0.082)	0.034 (0.075)
<i>LnSize</i>	-0.185*** (0.034)	-0.203*** (0.034)
<i>Profitability</i>	0.034 (0.600)	-0.037 (0.592)
<i>EarningsVolatility</i>	0.008 (1.234)	0.230 (1.215)
<i>Obs.</i>	1,451	1,451
<i>Adj.-R²</i>	0.123	0.090

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% (two-tail) test levels, respectively.

Table VII – “Shocks” to the Secured Debt Market and q : Falsification Tests

This table reports results from the estimation of q regression models in changes. In the interest of space, we only report the coefficient estimate on the double interaction term, which captures the difference-in-differences effect. See Table VI for variable definitions. Housing REITs are listed-property firms with an investment focus on housing properties (multi-family units) and access to Fannie-Freddie (backed) secured debt financing. Non-Housing REITs are listed-property firms with an investment focus on office, retail, industrial, hotel property types. We report results for the Non-Housing sample as a group and for each of the property-type sub-samples separately. For comparability, in the first row we also report the coefficients on the double interaction term for the Housing sample from Table VI. All REIT-level data are from the SNL Datasource quarterly database. The samples period ranges from the 2nd quarter of 1992 (the first year data are available in the SNL database) to the 3rd quarter of 2010. Refer to Table I for detailed variable definitions and sample description. Standard errors reported in parentheses are based on heteroskedastic consistent errors adjusted for clustering at the firm-quarter level.

	Increase Secured Market Leverage	Increase Secured Book Leverage	Obs.
Housing and Non-Housing Financing During the Russian Crisis			
Housing: <i>RussianCrisis×SecuredLeverageIncrease</i>	0.035*** (0.006)	0.012*** (0.004)	1,451
Non-Housing: <i>RussianCrisis×SecuredLeverageIncrease</i>	-0.019 (0.015)	0.003 (0.007)	4,164
Office: <i>RussianCrisis×SecuredLeverageIncrease</i>	-0.012 (0.009)	0.007 (0.010)	1,546
Retail: <i>RussianCrisis×SecuredLeverageIncrease</i>	-0.019* (0.010)	-0.003 (0.012)	1,380
Industrial: <i>RussianCrisis×SecuredLeverageIncrease</i>	0.007 (0.017)	-0.015 (0.013)	492
Hotel: <i>RussianCrisis×SecuredLeverageIncrease</i>	-0.038 (0.024)	-0.021 (0.031)	746

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% (two-tail) test levels, respectively.

Table VIII – “Shocks” to the Secured Debt Market and q : Fannie-Freddie Financing During the Subprime Crisis

This table reports results from the estimation of q regression models in changes. *SubprimeCrisis* is a dummy variable that takes a value of 1 for the 3rd and 4th quarter of the year 2007 and zero otherwise. *SecuredLeverageIncrease* (market and book) is a dummy variable that takes a value of 1 if the firm increases the use of its secured leverage capacity in the current quarter relative to the prior quarter, where used secured leverage capacity is the difference between observed secured leverage and secured debt capacity predicted from the estimation of secured debt regressions reported in Table V. Housing REITs are listed-property firms with an investment focus on housing properties (multi-family units) and access to Fannie-Freddie (backed) secured debt financing. Non-Housing REITs are listed-property firms with an investment focus on office, retail, industrial, and hotel property types. Our regressor of interest is the double-interaction term, which captures the difference-in-differences effect. All REIT-level data are from the SNL Datasource quarterly database. The samples period ranges from the 2nd quarter of 1992 (the first year data are available in the SNL database) to the 3rd quarter of 2010. Refer to Table I for detailed variable definitions and sample description. Standard errors reported in parentheses are based on heteroskedastic consistent errors adjusted for clustering at the firm-quarter level.

	Housing REITs		Non-Housing REITs	
	(1)	(2)	(3)	(4)
<i>SubprimeCrisis</i> × <i>SecuredMarketLeverageIncrease</i>	0.048*** (0.017)		-0.004 (0.015)	
<i>SubprimeCrisis</i> × <i>SecuredBookLeverageIncrease</i>		0.069** (0.031)		0.017 (0.014)
<i>SubprimeCrisis</i>	-0.124*** (0.035)	-0.139*** (0.015)	-0.057** (0.026)	-0.060*** (0.025)
<i>SecuredMarketLeverageIncrease</i>	-0.025*** (0.006)		-0.024*** (0.005)	
<i>SecuredBookLeverageIncrease</i>		0.006 (0.004)		-0.001 (0.004)
<i>UPREIT Equity</i>	-0.035 (0.083)	0.054 (0.076)	-0.201 (0.150)	-0.186 (0.157)
<i>LnSize</i>	-0.195*** (0.033)	-0.215*** (0.033)	-0.112*** (0.023)	-0.122*** (0.024)
<i>Profitability</i>	-0.071 (0.586)	-0.481 (0.569)	-0.303 (0.420)	-0.603 (0.417)
<i>EarningsVolatility</i>	0.178 (1.215)	0.442 (1.173)	-0.214 (0.433)	-0.211 (0.438)
<i>Obs.</i>	1,451	1,451	4,164	4,164
<i>Adj.-R²</i>	0.148	0.120	0.076	0.053

Note: ***, ** and * indicate statistical significance at the 1%, 5% and 10% (two-tail) test levels, respectively.

Table IX – q and Secured Leverage by Inside Equity Groups

This table reports mean comparison tests for Change in q , Change in *SecuredMarketLeverage* and Change in *SecuredBookLeverage* by restricted shares groups. Change in q is the change in Tobin's q from the previous year. Change in *SecuredMarketLeverage* is the ratio of secured debt issuance in the current year to the market value of the firm at the end of the previous year. Change in *SecuredBookLeverage* is defined similarly. The results are based on a simple mean comparison test between the above and below median groups based on restricted equity, where restricted equity is defined as the ratio of restricted shares awarded to the CEO in a given year to total assets. "Above Median" firms are those with restricted shares above the industry segment median. "Below Median" firms are those with restricted equity below the industry segment median. Restricted shares data are hand-collected from annual reports. All remaining firm level data are from SNL Datasource. Refer to Table I for detailed variable definitions and sample description.

	Restricted Shares Groups		Difference Above – Below Median
	Above Median	Below Median	
Change in q	0.058	-0.001	0.057***
Change in <i>SecuredMarketLeverage</i>	0.031	0.069	-0.049***
Change in <i>SecuredBookLeverage</i>	0.040	0.078	-0.038***

Note: *** indicates statistical significance at the 1% (two-tail) test levels, respectively.

Figure 1 – BBB Housing REIT Bonds and Housing Mortgage Spreads During the Russian Crisis

This figure displays the spreads of BBB REIT bond yields and Freddie-Mac rates (Housing Mortgage) over the 10-year and the 30-year Treasury bond yields respectively. The bond yield data is from Datastream. Freddie-Mac rates are obtained from the webpage of the Federal Reserve Board.

Figure 2 – Secured Debt Issuance, Unsecured Debt Issuance, and Investment for Housing REITs During the Russian Crisis

This figure displays net secured debt issuance, net unsecured debt issuance, and investment as a percentage of total assets for Housing REITs in the period surrounding the peak of the Russian crisis, which we identify as the 3rd and 4th quarters of 1998. The data is from the SNL Datasource quarterly database.

Figure 3 – Line of Business Focus

This figure displays the average Herfindhal index (HHI) of business concentration for Housing and Non-Housing REITs. The HHI index is based on the number of properties that firms have in each different property type, including housing (multi-family units), office, retail, industrial, and hotel. For example, a Housing REIT with an HHI index of 90% has 90% of its properties concentrated in the housing business. The data are from the SNL Datasource annual database.