Real estate prices and firm capital structure*

JOB MARKET PAPER

Dragana Cvijanović**
London School of Economics

This Draft: January 26, 2011

*I am most grateful to Christopher Polk and Jack Favilukis for invaluable advice, support and guidance. I thank Joao Cocco, Vicente Cunat and Daniel Ferreira for their insightful comments and suggestions. I would also like to thank Ulf Axelson, Sudipto Bhattacharya, Nelson Camanho, Claudia Custodio, Gabriela Domingues, Christian Julliard, Vojislav Maksimovic, Siti Parida, Albert Saiz, Amir Sufi, Andrea Vedolin, David Webb, Kathy Yuan, Konstantinos Zachariadis and participants at the LSE Lunchtime Workshop and Cass Finance Research Seminar. I gratefully acknowledge the support from the FSA and Department of Finance, LSE. All errors are of course my own.

**R409, Financial Markets Group - LSE, Houghton Street London, WC2A 2AE; Office: +44 (0)20 7852 3573; Mobile: +44 (0)789 433 6959; Email: d.cvijanovic@lse.ac.uk.

Abstract

This paper examines the impact of real estate prices on firm capital structure decisions. I find that for a typical US listed company, a one standard deviation increase in collateral value translates into a 2.1 percent increase in total leverage. My identification strategy employs a triple interaction of MSA level land supply elasticity, aggregate real estate price changes and a measure of a firm's real estate holdings as an exogenous source of variation in the value of firm collateral. I find that for every one percent increase in collateral value, a firm's annualized cost of long-term debt drops by four basis points. More financially constrained firms tilt their debt structure towards arm's length financing, less information-sensitive debt and longer-term debt maturities in response to collateral value appreciation. These results indicate the importance of collateral values in mitigating potential informational imperfections. More financially constrained firms use collateral-induced borrowing proceeds for financing new investment and for equity payouts.

Keywords: collateral, debt capacity, capital structure, real estate prices

1 Introduction

The collateral channel is at the heart of many mainstream macroeconomic models. In theory (Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and many others), asset market swings have a significant effect on firm investment as large declines in these markets adversely affect the value of pledgeable assets. These declines hurt a firm's credit-worthiness by reducing its debt capacity. A lower debt capacity, in turn, leads to reduced investment and output.

Since both firm investment and asset values are endogenous variables, recent empirical work attempts to link exogenous asset shocks to variation in firm investment. However, these papers do not characterize the microeconomic mechanism through which *collateral value changes* affect firm capital structure, payout policy, cost of finance, and the shape of financial contracts that firms enter into. This paper fills that gap.

In particular, I investigate how firms' capital structure and payout policy decisions respond to changes in value of an important pledgeable asset, real estate. Given that a large fraction of US corporations owned real estate in the late 1990s price boom, this variation provides a natural laboratory for testing the effect of large asset value swings on corporate capital structure decisions.

I examine the collateral channel's capital structure implications using a dataset containing the type, source, and priority of every balance-sheet debt instrument for a large sample of public firms. The debt structure dataset combines financial footnotes in firms' annual 10-K filings with information on pricing and covenants from three origination-based datasets: *DealScan*, *Mergent's Fixed Income Securities Database*, and *Thomson's SDC Platinum*.[1]

To identify the causal effect of real estate asset values on firm capital structure, I need an exogenous source of variation in local real estate price growth. Otherwise, variation in local real estate prices may be endogenous to firm capital structure decisions through local demand or firm investment, which could be jointly determined by an omitted time-varying factor, such as availability of credit or future growth prospects. To address this issue, I use land supply elasticity at the MSA[2] level interacted with changes in aggregate real estate prices and a measure of a firm's real estate holdings as an instrument for collateral value growth based on across-MSA and across-firm variation. According to Glaeser, Gyourko, and Saiz (2010), MSAs with elastic land supply should not experience significant real estate price appreciation in response to large shifts in aggregate real estate demand, since both the availability and

[1]See Rauh and Sufi (2010) and Nini, Smith and Sufi (2008).
[2]MSA - Metropolitan Statistical Area.

use of land is not constrained. However, inelastic land supply MSAs should witness large real estate price increases as a result of the same real estate demand growth. Interacting the topology-based measure of land supply elasticity of Saiz (2010) with changes in national real estate prices gives me the predicted changes in local real estate prices, as filtered through the respective differences in land supply elasticity. The subsequent interaction with a measure of firm's real estate holdings provides me with a much more precise estimate of exogenous source of variation in *collateral value growth at the firm level*, thus excluding potential MSA-wide real estate market spillover effects.

I document a significant effect of collateral value changes on firm capital structure. My preferred specification suggests that a one standard deviation increase in predicted real estate price growth translates into a 2.1 percent increase in total leverage for a typical US firm. In dollar terms, I show that firms borrow 29 cents for each additional dollar of exogenous increase in real estate equity.

I exploit this natural experiment to explore cross-sectional heterogeneity of firms' capital structure response that can be linked to firm-level measures of both financial constraints and real estate ownership. I find that financially-constrained firms (either firms with higher values of the Kaplan and Zingales (1997) (KZ) index or low-dividend payout firms) borrow more than the typical firm against increases in real estate collateral value. More interestingly, these firms tend to "spread" their debt structure by increasing their relative exposure to arm's length financing while substituting more expensive and more information sensitive types of debt with cheaper and more attractive alternatives. Thus, collateral values do not only seem to increase total firm leverage, but also serve to mitigate potential informational imperfections. Financially constrained firms tilt the term structure of their leverage towards longer-term maturities, and the sensitivity of their total leverage to the collateral value change is monotonically increasing in debt maturity. These effects are not present for the financially unconstrained firm subset (firms with lower values of the KZ index or high-dividend payout firms).

To measure the effect of collateral value shocks on alleviating financing inefficiencies, I first conduct a very simple test that allows me to gauge whether firms become less credit constrained or merely less credit rationed. If collateral indeed serves as a way of mitigating financing frictions, I would expect to see that the positive sensitivity of firm borrowing to collateral value appreciation is associated with firms getting access to cheaper sources of credit. My IV specification estimates a five basis point decline in a firm's average cost of long-term debt for a one-percent change in collateral value.

Second, by using a dataset containing detailed data on private credit agreements from

DealScan and *Edgar* I carefully examine the form of the financial contracts that firms enter into. In particular, I look for the effect of collateral value swings on the likelihood of lenders' imposing financial covenants and capital restrictions on firms' borrowing. Unconditionally, I find that, apart from being associated with a decline in convertible leverage, increases in collateral value result in firms entering into financial contracts that are less likely to contain new capital expenditure restrictions and have fewer covenants. In particular, I find a significant drop in the probability of debt-to-capitalization, net worth, and tangible net-worth covenants. Conditional on a firm previously having a capital expenditure restriction at some point in the sample, this likelihood drops even further. This result suggests that the standard *dynamic credit multiplier effect* of Campello and Hackbarth (2008) is amplified by the relaxation of capital expenditure restrictions via collateral appreciation, which in turn facilitates further investment. Furthermore, this evidence suggests that the ability of firms to collateralize and, in particular, positive shocks to the value of firm pledgeable assets can help reduce financial inefficiencies.

Moreover, I find that in total, this collateral-based borrowing sensitivity is significant for real estate owners (i.e. firms with capital leases) but largely disappears for real estate renters. By running a triple differences test, I find that a one standard deviation increase in predicted real estate price growth for financially constrained real estate owners translates into a total leverage increase of 3.13 percent.

Interdependence of capital structure and equity payout policies is a predominant factor in determining how firms build, preserve and enhance financial flexibility over time. By analyzing firm payout policy with respect to increased borrowing, I find that financially unconstrained firms employ collateral-based borrowing together with substantial cash to service equity payouts. Out of every dollar increase in the value of their collateral, financially unconstrained firms spend 23 percent on share re-purchases, 40 percent on common dividend payout, 14 percent on R&D expenses and 23 percent on capital investment. This means that financially unconstrained firms use almost 65 percent of their real estate equity for equity distributions.

For financially constrained firms, I find empirical support for the dynamic credit multiplier effect of Campello and Hackbarth (2008) and for the sensitivity of firm investment to collateral value changes as in Chaney et al.(2010).[3] For financially constrained firms, a one dollar increase in the value of collateral translates into a 45 cent increase in total debt on average, out of which financially constrained firms use 5 cents (11 percent) for share re-purchases, 19

[3] In contemporaneous work, Chaney, Sraer and Thesmar (2010) use a similar identification strategy to the one used in this paper to analyse the effect of real estate prices on firm investment.

cents (42 percent) for financing new investment, 8 cents (19 percent) for R&D expense, and 13 cents (28 percent) for paying common dividends. These results indicate that financially constrained firms borrow heavily against their collateral not only to finance new investment opportunities, but also, in the absence of profitable investment opportunities, seek to preempt any future investment distortions by transferring the benefits of collateral value increases to existing shareholders.

The rest of the study is organized as follows. Section 2 provides a brief overview of related research. Section 3 gives a set of stylized predictions about firm capital structure in the presence of collateral value shifts, based on Almeida and Campello (2007) investment-to-cash-flow-sensitivity model under financing frictions. Section 4 describes the data, and Section 5 details the empirical strategy and results. Section 6 presents the results of robustness checks, and Section 7 concludes.

2 Related research

The ideas presented in this paper constitute a part of the growing literature on collateral being the main determinant of capital structure. In this paper, I depart from the existing literature in that I investigate the role of shocks to asset prices that are orthogonal to firm financing decisions in determining capital structure choice, since these carry time-series and cross-sectional implications on firm financing behavior. Changes in real estate asset values directly impact the value of collateral and thus debt capacity of firms. The motivation for this paper comes from a related piece of research by Mian and Sufi (2010), who investigate how existing homeowners respond to rising value of their home equity, a channel which they call *home equity-based borrowing channel*. Using individual-level data on personal debt and defaults between 1997 and 2006, the authors find that homeowners' borrowing against the increase in home equity explains a significant fraction of the sharp rise in the US household leverage between 2002 and 2006.

Several strands of literature on capital structure decisions document a positive relationship *between asset tangibility* (measured as the fraction of property, plant, and equipment to total assets) *and firm borrowing* (e.g., Titman and Wessels (1988), Rajan and Zingales (1995), MacKay and Phillips (2005), Bharath, Pasquariello and Wu (2009), Faulkender and Petersen (2006)). This result is largely explained by the fact that tangible assets can be pledged as collateral to lenders and thus allow companies to raise debt. My findings provide empirical support for Rampini and Viswanathan (2010a), who argue that collateral determines the capital structure and develop a dynamic agency-based model of firm financing where collateral is used to secure payment obligations. In another paper (Rampini and Viswanathan (2010b)), they establish that collateral constraints imply that firm financing and risk management policies are fundamentally linked and that more constrained firms engage less in risk management and may exhaust their debt capacity sooner, becoming forced to scale down on their investment ex-post, due to their lower net worth ex-post. Campello and Giambona (2010) report empirical findings on the relationship between asset tangibility and capital structure, identifying when and how tangibility affects leverage. They find that *redeployability* of tangible assets is an important driver of leverage for financially constrained firms, especially during periods of credit contraction.[4]

The findings of this paper are also related to a recent paper Gatchev, Pulvino and Tarhan (2010). The authors argue that a firm's investment, financing and payout distribution decisions are related by an identity that states that sources of cash should equal uses of cash. They develop a system-of-equation model to examine the interdependence of investment-cash flow sensitivities and financing-cash flow sensitivities and find that financing-cash flow sensitivities dominate investment-cash flow sensitivities. This finding suggests that firms absorb cash inflows by changing net debt, not by changing real assets.

Faulkender and Petersen (2006) show that the source of capital may also affect leverage, in particular whether firms have access to the bond market. Almeida and Campello (2007) establish a differential interplay between asset tangibility and firm leverage for credit constrained and unconstrained firms. They show that only financially constrained firms experience increases in investment-cash flow sensitivities to asset tangibility. However, since they focus on the investment-cash flow sensitivity, only the impact on levels of investments is examined, not on the firm's capital structure. Eisfeldt and Rampini (2007) investigate the role of leasing on the debt capacity of firms. They show that compared to secured lending, leasing provides additional debt capacity, since repossessing leased assets is easier than seizing secured assets. Evidence presented in this paper confirms the intuition of Inderst and Müller (2006), who develop a theoretical framework in which collateral may improve arm's length financing. Collateral helps to mitigate inefficient credit decisions when soft information is critical, since it makes debt less sensitive to cash flow variations. Rajan and Winton (1995) develop a model that indicates that collateral, along with covenants, provides incentives to

[4]Another related strand of research aims at testing several capital structure theories. For instance, a series of recent studies reconsider the empirical relevance of the pecking order theory (e.g., Shyam-Sunder and Myers (1999), Fama and French (2002), Frank and Goyal (2003), and Lemmon and Zender (2007)). Titman and Wessels (1988) present evidence that smaller, more risky firms are more prone to use short-term debt, consistent with the pecking-order theory.

lenders to monitor borrowers to avoid default, since they enhance the value of intervention.

Despite a large body of evidence on the relationship between collateral tangibility and firm capital structure, there has been little empirical work that identifies the microeconomic mechanism through which shocks to collateral value affect firm capital structure decisions. This paper fills this gap. The idea of using exogenous variation in asset prices is not novel—it goes as far back as Veblen (1904) who described positive relationship *between asset prices and collateralized borrowing.* There is also a large body of literature on the macroeconomic implications of asset market spill-overs. Similarly to Greenwald and Stiglitz (1993), Bernanke and Gertler (1989) construct an overlapping generations model in which market imperfections cause temporary shocks in net worth to be amplified and to persist. The authors reason that generally the less of his own wealth the borrower contributes to finance his investment, the more his interests are going to diverge from those of his creditors. Kiyotaki and Moore (1997) argue that a model of debt that is based on asset control, rather than on the cost of verifying project returns, is more compelling. By looking at business cycle frequencies, shocks to net worth arise through changes in the values of firms' assets or liabilities. Asset prices reflect future market conditions. When the effects of a shock persist (as they do in Bernanke and Gertler), the cumulative impact on asset prices, and hence on net worth at the time of the shock, can become significant.

This paper is also related to a study by Korajczyk and Levy (2003), who provide evidence on the effect of macroeconomic conditions on capital structure. The authors find that leverage is counter-cyclical for relatively unconstrained firms, but pro-cyclical for relatively constrained firms. The authors find that time variation in macroeconomic conditions, for example changes in prices of different asset classes, can lead to firms making differential capital structure decisions at different times, other things being equal. Following the rationale of Leamer (2007), who argues that real estate *is* the business cycle, this allows me to investigate alternative capital structure models in the light of real estate market conditions and financing frictions.

The closest ideas to mine are contemporaneous papers on the impact of exogenous asset value shocks on investment. For instance, Chaney, Sraer and Thesmar (2010) analyze the impact of real estate prices on corporate investment. Through this collateral channel, shocks to the value of real estate can have a large impact on firm investment. Over the 1993-2007 period, the authors find that the representative US corporation invests six cents out of each additional dollar of collateral. Empirically, their identification strategy relies on the assumption that both land holding and non-land holding firms are affected in the same way by *local* real estate price shocks, thus including the spillover effect of local real estate price growth on firms that are not subject to the growth. If one is trying to uncover and quantify the effect of collateral channel, this assumption would need to relaxed. My identification strategy is based on a much weaker assumption: I assume that land holding and non-land holding firms are affected differently by local real estate price shocks and I quantify the difference in this effect between firms with high and low levels of real estate holdings. The contribution of this paper is complementary. Conceptually, I depart from their study in that by using a rich debt structure dataset, I pin down the exact mechanism through which firm collateral value (defined as the product of firm tangibility ratio and value of real estate assets) has the first-order importance in determining *firm capital structure*, *firm payout policy*, *cost of financing* and ways in which *collateral alleviates financing frictions*.

In a related paper, Gan (2006) studies the impact of collateral on corporate investments in Japan. The shock she considers is the land market collapse in 1990s. The channel through which losses in collateral value reduces debt capacity is the loss of banking relationships, which makes it harder for borrowers to obtain loans in the future. The identification strategy in Gan (2006) is that land holding firms were not differentially affected by the burst of the bubble when compared to non-land holding firms. This is another somewhat strong assumption that I relax in this paper.

3 Theoretical background

In the Miller—Modigliani world, the value of collateral is irrelevant. The amount and value of pledgable assets can affect firm credit rating but should not create additional value. However, in the presence of financial frictions such as risk-shifting (Jensen and Meckling (1976)), under-investment (Myers (1977)) and adverse selection (asymmetric information) collateralizable assets can be pledged to lenders in order to mitigate inefficiency costs. This will in turn increase the debt capacity of firms suffering from these costs—credit constrained firms. In the following section I present two empirical predictions that are easily derived from the investment-to-cash flow sensitivity model of Almeida and Campello (2007) to show that there is a positive relationship between leverage and collateral value, in the presence of financial frictions.

3.1 Empirical predictions

Giambona and Schweinbacher (2007) extend the model of Almeida and Campello (2007) to show that there is a positive relationship between the tangibility of a financially constrained firm's assets and its leverage, but that this relationship disappears if the firm is not financially constrained. Now, suppose that there is an exogenous change in the value of tangible assets. What is now going to be the cash-flow sensitivity of leverage?

The implications of a model presented in Giambona and Schweinbacher (2007) provide an intuitive answer and yield the following empirically testable prediction[5]:

Prediction: The collateral value sensitivity of leverage is:

a) *strictly positive for financially constrained firms;*

b) *equal to zero for financially unconstrained firms.*

The prediction states that in presence of financing frictions, when firms are not able to finance their investment entirely with debt, any increase in the value of collateral the firm can pledge to secure debt financing will result in increases in the leverage ratio. Moreover, the positive sensitivity of leverage to collateral value will be increasing in the tangibility ratio. The intuition for this positive relationship is akin to the credit multiplier argument in Kiyotaki and Moore (1997). It is also closely related to work by Henessy, Levy and Whited (2007), who show that firms which anticipate collateral constraints in the future benefit from investment in tangible assets, since it relaxes future financing constraints.

4 Data

The sampling universe consists of US listed firms that do not belong to: financial, real estate, construction and mining industries. I collect their accounting data from COMPUSTAT for the period 1996-2006, which gives me a total of 90,246 firm-year observations. I merge this dataset with data on US MSA-level land prices and data on debt structure of US listed companies.

4.1 Accounting data

I start with a sample of active COMPUSTAT firms in 1996. This provides me with a sample of 12,152 firms whose headquarters are located in the US across 269 MSAs. Apart from accounting variables commonly used in the corporate finance literature, I collect data on firms' real estate holdings, as measured by Property, Plant and Equipment Net Total, PPE Buildings Net Cost, PPE Land and Improvements Net Cost. In my regressions I use PPE Net Total as a proxy for firms' real estate holdings, due to the lack of data observations reported by PPE Land and Improvements Net Cost. Unfortunately, COMPUSTAT does not

[5] For details of derivation of the implications of Giambona and Schweinbacher (2007) see Appendix.

provide data on geographic location of each real estate holding owned by a firm, but it does report data on the firm headquarters location in terms of STATE, COUNTY and ZIP CODE. Under the assumption that firms' headquarters and production facilities are located in the same MSA and that they represent a significant fraction of companies' real estate assets, I proxy for the geographical location of firms' real estate assets using headquarter location. I discuss this assumption and its implications in further detail in Section 4.3.1. Finally, to ensure that my results are statistically robust, all variables defined as ratios are winsorized at the fifth percentile.

4.2 Debt structure data

By taking debt as uniform and not taking into account the heterogeneity of firm debt structure, one would miss a substantial variation in firm capital structure. To estimate the effect of collateral value change on firm capital structure, and different types, priorities and maturities of leverage in particular, I use a debt structure dataset that includes non-financial companies from COMPUSTAT. It contains detailed debt information on 305 firms giving in total 2,453 firm-year observations[6]. The size of the sample is affected by the lack of availability of detailed debt data for a larger sample of firms. Namely, fine debt structure data used in this paper is not freely and publicly available. The dataset consists of two sets: *balance sheet issue level* data and *origination issue level* data. Balance sheet issue level data is constructed by examining the debt financial footnotes in firms' annual reports of their 10-K SEC filings. Origination issue level data is obtained using *DealScan* for syndicated and sole-lender bank loans and *SDC Platinum* for private placements and public debt issues. This data set contains 2,184 new bank loans and 2,241 non-bank debt issues for a total of 4,425 issues by 303 of 305 sample firms. By employing these two datasets each debt issue discussed in the debt financial footnotes is classified into one of seven broad categories:

(1) Bank debt: Consists of two main categories:

(i) Revolving bank debt, which includes committed revolving credit facilities or lines of credit and

(ii) Term bank debt, which includes term loans, bank overdrafts, and borrowings on uncommitted lines of credit.

(2) Bonds: Consists of public debt issues, industrial revenue bonds, and Rule 144A private placements.

(3) Program debt: Consists of commercial paper, shelf registration debt, and medium term

[6] This dataset I obtained from Rauh and Sufi (2010).

notes (MTNs). These programs are often exempt from SEC registration requirements, and thus constitute "program" debt.

(4) Private placements: Consists of non-Rule 144A privately placed debt issues, and ambiguous notes or debentures which we cannot match to SDC Platinum.

(5) Mortgage or equipment debt: Consists of mortgage bonds, mortgage loans, equipment trust certificates, and other equipment-based debt.

(6) Convertible debt

(7) Other debt: Includes acquisition notes, capitalized leases, and unclassified debt.

4.3 Real estate prices and measurement

To measure real estate value changes I use MSA level data on land prices available from Land and Property Values in the US, Lincoln Institute of Land Policy (Davis and Palumbo (2007)). The data is available quarterly for 46 MSAs between 1984 and 2009. The choice to use land prices instead of commercial real estate prices is motivated by the fact that land prices reflect real estate value that is less depreciable than structures (e.g. buildings). Further, availability of reliable commercial real estate data at MSA level for the period in question is limited and not freely available. Namely, most publicly available sources report state prices indices for offices, excluding other types of commercial real estate[7]. Summary statistics are presented in Table 1 (Panel C). Since COMPUSTAT does not report firm headquarter location in terms of its MSA, I employ a matching algorithm that maps firms' STATE, COUNTY and ZIP CODE to MSA identifiers using a mapping table available from Moody's Analytics.

4.3.1 Measurement issues

As noted earlier, I assume that the majority of a firm's real estate holdings are located in the MSA where their headquarters are located. This assumption may pose an issue in case the majority of a firm's real estate holdings are actually located elsewhere. Since COMPUSTAT does not contain data on the location of each piece of firm's real state holdings, I test the validity of my assumption by conducting a small experiment. From my initial data universe, I randomly sample 200 firms with real estate holdings and manually retrieve their 10-K fillings from SEC EDGAR. To aid the search, I design a text-search algorithm that scans each company's Item 2 (Properties), of Part I in its 10-K filling. For each company the text parsing script produces company name, IRS identification number, address of principal

[7] Commercial real estate can be classified into: offices, retail, industrial and other properties.

executive offices and information contained in Item 2 (Properties). In the second pass, text contained in Item 2 (Properties) is parsed for the following keywords: *located, based, leases, owns, franchise, distribution, administrative, customer service, manufacturing, headquarters, operating, production, plant.* For each property listed in Item 2, I then retrieve property square footage and compute the market value of each lease using average land prices by state obtained from the Lincoln Institute of Land Policy. If a firm has more than 40 percent of its property lease market value consisting of real estate holdings located outside the state of the location of principal executive offices, it is classified as *geographically dispersed.* If a firm has less than 40 percent of its property lease market value consisting of real estate holdings located outside the state of the location of principal executive offices, it is classified as *geographically concentrated.* The results of this experiment show that out of 200 firms in my random sample, 167 firms, or 84 percent, are classified as geographically concentrated (that is, the majority of their real estate assets are located in the state where their headquarter is based).[8] This lends support to my assumption that the majority of firms' real estate assets are located in the same metro area as their headquarter. Of course, relaxing this assumption would require one to find an alternative source of data on firm production facilities location, which I will leave for future research.

Finally, I limit my final random sample obtained by merging the aforementioned datasets to firms with data for at least three consecutive years between 1996 and 2006, given that much of my analysis focuses on patterns within firms over time. This gives me a total of 2,185 firm-year observations for 305 firms. Summary statistics are presented in Table 1.

4.3.2 Land supply elasticity

As noted before, changes in real estate prices and corporate capital structure may be jointly determined by an omitted time-varying variable such as local demand shocks. Hence, proper identification of the effects of real estate prices on corporate capital structure calls for an exogenous source of variation in local real estate price growth. To address this issue, I use land supply elasticity at the MSA level[9] interacted with growth in aggregate (national) real estate prices as an instrument for local real estate price growth. The motivation is straightforward: MSAs with elastic land supply should experience small real estate price

[8] In unreported regressions, I sampled out the firms classified as geographically dispersed. I ran my baseline specification and obtained qualitatively similar results. This result calls for a design of a more refined text-search algorithm of a firm's 10-K filings, and also for further research that will look into the presence of collateral-effect under relaxed location assumption, that is, for geographically dispersed firms.

[9] Available from Saiz (2010).

appreciation in response to increases in aggreagate real estate demand, since land supply is relatively easy to expand. On the other hand, inelastic land supply MSAs should witness large real estate price appreciation in response to the same aggregate real estate demand shock (Glaeser, Gyourko, and Saiz (2010)). Two main factors restrict land supply: one, there may be topological constraints that impede real estate construction, such as steepness of terrain or presence of water bodies. Two, regulation plays an important role in restricting land development and new construction. Environmental regulation, urban planning, zoning are just a few issues that restrict the amount of land supply. Saiz (2010) estimates land supply elasticities for 269 MSAs by processing satellite-generated data on elevation and presence of water bodies. The land supply elasticity measure in Saiz (2010) varies from 0 to 4 (for the 46 MSAs in my sample) and is increasing in elasticity. I define land supply inelasticity IE^m as four minus land supply elasticity as defined by Saiz (2010). My measure is four minus the Saiz (2010) measure so that my measure increases in housing supply inelasticity. Figure 1 plots land price growth from 2002—2006 for 46 MSAs in my sample against land supply elasticity.

5 Real estate prices and firm capital structure

In this Section I empirically analyze the effect of real estate price changes on firms' leverage, their capital structure and cost of financing. The exact thought experiment that I implement using instruments for real estate price growth answers the following questions: Firstly: what is the effect of the increases in value of collateralizable assets on firm's capital structure decisions, all else being equal? Secondly: is this effect different for financially constrained and financially unconstrained firms? This experiment allows me to evaluate the magnitude of these financing constraints empirically and learn whether positive shocks to collateral value can indeed help alleviate these inefficiencies. Finally, I look at the real effects of collateral channel by analyzing what firms' do with their newly borrowed money.

5.1 Identification strategy

The existing studies highlight the importance of tangible assets as a determinant of capital structure[10]. Rampini and Viswanathan (2010) argue that collateral determines the capital structure. Surprisingly, to the best of my knowledge, there are no empirical studies that address the effect of exogenous changes in collateral valuation on corporate capital structure.

[10] See Rampini and Viswanathan (2010).

My empirical strategy is developed to estimate the effect of collateral value on firm capital structure, whereby collateral value is jointly determined by the amount of real estate holdings that can be pledged as collateral (tangibility) and real estate value changes. However, a potential concern with this experiment is that there are possibly time-varying macroeconomic factors that are driving both real estate prices and firm financing decisions, and in particular its borrowing behavior. The main reason that local real estate prices may be endogenous to firm borrowing is through local demand. Suppose there is a positive macroeconomic demand shock (e.g. local GDP shock, wage growth shock), which is accompanied by real estate price appreciation and provides a stimulus for the local economic activity. In order to meet increased product demand, a firm needs to increase product supply, which is achieved through increased investment. Increased investment is financed through increased borrowing.

To address these issues, my *first test* exploits variation in land supply elasticity across MSAs. The intuition behind this test is the following: for an equivalent aggregate real estate demand shock, as proxied by an increase in national real estate prices, the slope of the land supply curve determines the degree to which real estate prices rise in an area. This basic prediction holds under most models of real estate price growth. Glaeser, Gyourko, and Saiz (2010) present evidence that during the house price booms of the 1980s, price increases were higher in places where housing supply was more inelastic because of geographical constraints. At the same time, most elastic metro areas appear not to have experienced bubbles at all during the 1980s.

Hence, the full effect of a real estate demand changes on firm collateral value will be equal to the product of the amount of firm's pledgable real estate holdings and predicted change in local real estate prices, as instrumented by interacting local land supply elasticity with changes in aggregate real estate prices. This intuition suggest the following specification:

$$\Delta PRE^{m}_{t-1,t} = \lambda^{m} + \delta_t + \rho IE^{m} \times \Delta P^{US}_{t-1,t} + \gamma X^{i,m}_{t} + \varepsilon^{i,m}_{t} \qquad (1a)$$

$$Leverage^{i,m}_{t} = \alpha^{i} + \lambda^{m} + \delta_t + \theta X^{i,m}_{t} + \beta \Delta RE\widehat{Value}^{m}_{t-1,t} + u^{i,m}_{t} \qquad (1b)$$

where $\Delta RE\widehat{Value}^{m}_{t-1,t} = PPENT^{i}_{1996} \times \Delta P\widehat{RE}^{m}_{t-1,t}$.

Equation (1a) represents the first-stage and Equation (1b) the second stage regression.

$\Delta PRE^{m}_{t-1,t}$ represents real estate price growth in metro area m between year $t-1$ and year t, $Leverage^{i,m}_{t}$ is leverage for firm i, located in MSA m in time period t. The instrument in the first-stage regression is land supply inelasticity IE^{m} interacted with changes in aggregate US real estate prices between year $t-1$ and year t, as measured by the NCREIF US Property Index[11]. I control for the MSA-fixed effects λ^m and year-fixed effects δ_t, capturing macroeconomic conditions that I want to abstract from. The dependent variable in the second stage regression, $Leverage_t^{i,m}$, is defined as the ratio of total debt to market value of total assets: $Leverage_t^{i,m} = \frac{TD_t^{i,m}}{TA_t^{i,m}}$.

$PPENT_{1996}^i$measures firm i's real estate holdings (scaled by total assets) in the reference year and in the second-stage regression it is interacted with the instrumented real estate price growth to capture time-variation in the market value of firm i's real estate assets. The choice to use firm real estate assets in the reference year (instead of $PPENT_t^i$) is motivated by the trade off between possible endogeneity and measurement error. A potential concern with using a firm's time t real estate holdings $PPENT_t^i$ is that in response to real estate price growth firms may be buying up and increasing their real estate asset base, in which case my estimates would be overestimated. Hence, I opt for the former, in order to avoid any endogeneity issues. Therefore, coefficient β measures how a firm's leverage varies with each additional 1 percent increase in collateral value, and not to the general or local real estate shocks.

α^i captures firm fixed-effects and $X_t^{i,m}$ provides a set of firm level controls, namely: $Profitability$—defined as the ratio of Earnings Before Interest and Taxes (After Depreciation) and book capital (debt plus equity), M/B and $ln(Sales)$. Standard errors $u_t^{i,m}$ are double-clustered at the firm-year level. The choice to cluster standard errors along two dimensions: firm and year—is to allow for simultaneous correlation in residuals across time and across firms. This procedure[12] reduces coefficient bias by producing higher standard errors than typically used clustering along either firm or year dimension, thus reducing the corresponding t-statistics. This is appropriate for my data sample since the number of time periods is smaller than the number of firms, the regression residual include both time and firm component and independent variables contain significant time and firm component. Therefore, it is important to stress that in my empirical analysis I am using a fairly conservative standard error clustering procedure.

My initial intuition is confirmed in first stage results of the effect of aggregate real estate demand shifts on local real estate price growth, as filtered through land supply inelasticity, as shown in column 1 of Table 2. The magnitude of the estimated coefficient suggest that a one standard deviation increase in the interaction of MSA land supply inelasticity and aggregate

[11]The US NCREIF Property Index is a quarterly time series composite total rate of return measure of investment performance of a very large pool of individual commercial real estate properties.

[12]For details see Thompson (2009), Petersen (2008) and Cameron, Gelbach and Miller (2006).

real estate price growth translates into a one-eighth of a standard deviation increase in local (MSA level) real estate price growth. This effect is economically large and significant. High values of associated F-statistics (above 35) confirm that chosen instrument is strong. I conduct additional tests of the validity and relevance of my proposed instrument. I compute partial R-squared values: associated partial R-squared, as shown in Column 1 of Table 2 is 0.40 which is large, further confirming the strength of my instrument.

Columns 2-5 in Table 2 present results of the second stage estimation for total firm leverage (Column 2) and by leverage priority (Columns 3-5). The estimated sensitivity of firm total leverage with respect to predicted changes in real estate prices is 0.27[13], and it is driven mostly by secured leverage sensitivity (0.14) and subordinated leverage sensitivity (0.17)[14]. This evidence suggests that in response to collateral value appreciation, firms do not only borrow directly against their assets, but that they increase other forms of borrowing as well. This implies that the total effect of collateral value appreciation may be much larger than previously thought.

5.2 Leverage and financial constraints

Several existing theoretical studies (Giambona and Schweinbacher (2007)) have pointed out that pledgable assets are particularly useful in enhancing borrowing capacity of credit constrained firms but not of unconstrained ones. There is has been little empirical evidence that provides support for this argument. Moreover, there is little evidence on the variation of this effect across different leverage types and priorities. To address this issue I run a difference-in-difference estimation of my baseline regression.

In my definition of "constrained" and "unconstrained" firms, I take a slight departure from the standard empirical literature, namely the commonly used classification schemes of Almeida et al. (2004) and Erickson and Whited (2000). Instead of using payout ratio, firm size and bond rating for firm classification, I follow the approach of Lamont, Polk and Saa-Requejo (2001) and construct the KZ index of financial constraint for each firm in my sample[15]. KZ index is an attractive measure (although not uncontroversial), that relates a linear combination of firm accounting ratios to discrete categories of financial constraints, as defined in Kaplan and Zingales (1997). The accounting ratios are: cash flow to total capital,

[13] Estimated on the entire COMPUSTAT sample of 90,246 firm-year observations.

[14] Estimated on the sample of 2,185 firm-year observations.

[15] For additional robustness tests on my choice of measure of financial constraints, see Section 6. In Section 6 I show that my results are confirmed by using a different measure of financial constraints - the dividend payout ratio.

market to book, debt to total capital, dividends to total capital and cash holdings to total capital. The KZ index thus provides a continuous measure of financing constraints. The firms in the top 25 percent of all firms ranked on KZ index are denoted as “likely constrained” and the firms in the bottom 25 percent as “likely unconstrained”.[16]

My argument has a cross-sectional implication that allows me to implement a differences-in-differences-like test. As existing theoretical models suggest, I expect to see larger leverage-to-real estate price sensitivity for financially constrained than unconstrained firms. The cross-sectional heterogeneity of firms’ financial constraints allows me to define a treatment and a control group that are expected to have different responses to real estate price growth. In this test, the “treatment” group corresponds to firms with higher values of the KZ index (“likely constrained” firms), and the control group corresponds to firms with lower values of the KZ index (“likely unconstrained” firms). Predicted real estate price growth is an exogenous shock to the firms and I expect firms with different levels of financial constraints to be affected in different ways. Further, I expect that financially constrained firms increase their leverage more in response to real estate price growth. This rationale is formalized in the following way:

$$\Delta PRE^{m}_{t-1,t} = \lambda^m + \delta_t + \rho_1 IE^m \times \Delta P^{US}_{t-1,t} + \rho_2 IE^m \times \Delta P^{US}_{t-1,t} \times FC^i_{t-1} + \gamma X^{i,m}_t + \varepsilon^{i,m}_t, \tag{2a}$$

$$\begin{aligned} Leverage^{i,m}_t = {} & \alpha^i + \lambda^m + \delta_t + \theta X^{i,m}_t + \beta_0 FC^i_{t-1} + \beta_1 \Delta RE\widehat{Value}^m_{t-1,t} + \\ & + \beta_2 \Delta RE\widehat{Value}^m_{t-1,t} \times FC^i_{t-1} + u^{i,m}_t, \end{aligned} \tag{2b}$$

where FC^i_{t-1} represents the value of KZ index for firm i at time $t-1$.

As Equation 3 shows, the instruments in the first-stage are land supply inelasticity interacted with shifts in aggregate real estate prices and their interaction with the continuous measure of financial constraints, the KZ index. The coefficient of interest is β_2, defined to capture the sensitivity of financially constrained firms’s leverage to collateral value increase. I expect this sensitivity to be large and positive, implying that β_2 is expected to be positive. The results of this estimation are shown in Table 3. Panel A shows the estimates based on leverage priority and information sensitivity, while Panel B shows estimates by debt type, as a fraction of total debt. Hence, in Panel B I explore the variation in the debt structure of

[16] There may be a slight abuse of notation here by calling the top 25 percent of firms ranked on the KZ index “constrained” and the bottom 25 percent “unconstrained”. By "constrained" I do not mean constrained in absolute terms, but rather more constrained than the bottom 25 percent of firms ranked by the KZ index.

financially constrained firms explicitly. In Panel A, Column 1, the estimated coefficient on the interaction term is positive and significant (0.43), indicating that financially constrained firms increase its total leverage in response to increases in predicted collateral value changes. This increase is driven mostly by an increase in secured leverage (0.19), but also by an increase in unsecured leverage (0.02). Further, as shown in Panel B, positive coefficients on the interaction term suggest that financially constrained firms increase their mortgage related debt, bond holdings and private placement debt in the overall debt structure, while significantly decreasing convertible borrowing as a fraction of total debt. The observed decrease in convertible debt issuance in response to increases in collateral value is consistent with models that predict that collateral can mitigate informational asymmetries and agency problems, which reduces the need for alternative solutions, such as convertible debt and covenant restriction (the latter will be examined in detail in Section 5.6). Positive coefficients on the bond and private placement debt suggest that, constrained firms use collateral value appreciation to ease access to arm's length financing, consistent with the theoretical model of Inderst and Muller (2006).

A potential concern with the measure of financing constraints used above is that the KZ index may be capturing merely the tangibility of firms (i.e. their PPE), in which case my results would be biased. To address this issue, I define another measure of financial constraints that is orthogonal to firm tangibility by regressing KZ index values on firm PPENT and taking the KZ index innovations as a measure of financing constraints. Results of re-estimated Equation 3 are qualitatively similar to results reported in the main text[17].

5.3 Leverage and real estate ownership

In this Section I analyze whether the impact of the increase in collateral values on capital structure is different for firms that own their real estate than for those that rent it. However, empirical implementation of this idea is not straightforward, since based on COMPUSTAT data it is very difficult to distinguish whether a firm actually owns or rents its property. To solve this issue, I employ an idea from Tuzel (2007). Namely typically firms deploy their production assets through leasing. Accounting rules distinguish between an operating lease and a capital lease, the latter of which is similar to property ownership and it is therefore included in firm assets. Hence, to distinguish between real estate owners and renters, I construct a ratio of the rental expense from COMPUSTAT (which includes only rental payments for operating leases) to the gross PPE, and define firms that have less than

[17] The results of this regression can be found in internet appendix.

5 percent normalized rental expense as real estate owners. The choice of the 5% percent cut-off value is driven by the underlying distribution of the normalized rental expense.

If pledgeable assets are indeed used to increase firm borrowing capacity through securitization of new debt, we would expect to see a larger sensitivity of different types of leverage to predicted real estate prices for property owners, since renters by definition will not be able to capitalize on increases in collateral values. To test this intuition I implement a differences-in-differences test. I expect to see larger leverage to collateral value sensitivity for firms that own their real estate than for firms that rent it. The cross-sectional heterogeneity across firms in terms of real estate ownership allows me to define treatment and control groups that are expected to have different responses to real estate price growth. In this test, the treatment group corresponds to firms with normalized rental expense lower than 5 percent (*owners*), and the control group contains all other firms (*renters*). This rationale is formalized in the following way:

$$\Delta PRE^{m}_{t-1,t} = \lambda^{m} + \delta_t + \rho_1 IE^{m} \times \Delta P^{US}_{t-1,t} + \rho_2 IE^{m} \times \Delta P^{US}_{t-1,t} \times OWNER^{i}_{t-1} + \\ + \gamma X^{i,m}_{t} + \varepsilon^{i,m}_{t}, \tag{3a}$$

$$Leverage^{i,m}_{t} = \alpha^{i} + \lambda^{m} + \delta_t + \theta X^{i,m}_{t} + \beta_0 OWNER^{i}_{t-1} + \beta_1 \Delta RE\widehat{Value}^{m}_{t-1,t} + \\ + \beta_2 \Delta RE\widehat{Value}^{m}_{t-1,t} \times OWNER^{i}_{t-1} + u^{i,m}_{t}, \tag{3b}$$

where dummy variable $OWNER$ indicates whether a firm owns or leases its real estate assets. The coefficient of interest is β_2—it captures the effect of real estate price growth on firms that actually own their real estate assets. I expect the increase in leverage to be higher for real estate owners than for real estate renters and hence, β_2 is expected to be positive. The results of this estimation are shown in Table 4. Panel A shows the estimates based on leverage priority and information sensitivity, while Panel B shows estimates as a fraction of total debt, by debt type. Hence, in Panel B I explicitly explore the variation in the debt structure of real estate owners. In Panel A, the estimated coefficient on the interaction term is 0.48 for total leverage. The majority of the increase in total leverage is driven by an increase in secured leverage (the coefficient on the interaction term is 0.28). As shown in Panel B, the actual debt structure of real estate owning firms changes to a lesser extent, although there is an increase in percentage of the bond and mortgage-related debt.

Finally, I run a triple-differences (or differences-in-differences-in-differences) estimator which combines the two differences-in-differences estimations above. The formal specification now becomes:

$$
\begin{aligned}
\Delta PRE^{m}_{t-1,t} &= \lambda^{m} + \delta_{t} + \rho_{1} IE^{m} \times \Delta P^{US}_{t-1,t} + \rho_{2} IE^{m} \times \Delta P^{US}_{t-1,t} \times OWNER^{i}_{t-1} + \\
&+ \rho_{3} IE^{m} \times \Delta P^{US}_{t-1,t} \times FC^{i}_{t-1} + \rho_{4} IE^{m} \times \Delta P^{US}_{t-1,t} \times FCOWNER^{i}_{t-1} + \\
&+ \gamma X^{i,m}_{t} + \varepsilon^{i,m}_{t}, \qquad \text{(4a)} \\
Leverage^{i,m}_{t} &= \alpha^{i} + \lambda^{m} + \delta_{t} + \theta X^{i,m}_{t} + \beta_{0} OWNER^{i}_{t-1} + \beta_{1} FC^{i}_{t-1} + \\
&+ \beta_{2} FCOWNER^{i}_{t-1} + \beta_{3} \Delta RE\widehat{Value}^{m}_{t-1,t} + \\
&+ \beta_{4} \Delta RE\widehat{Value}^{m}_{t-1,t} \times OWNER^{i}_{t-1} + \beta_{5} \Delta RE\widehat{Value}^{m}_{t-1,t} \times FC^{i}_{t-1} + \\
&+ \beta_{6} \Delta RE\widehat{Value}^{m}_{t-1,t} \times FCOWNER^{i}_{t-1} + u^{i,m}_{t}, \qquad \text{(4b)}
\end{aligned}
$$

where $FCOWNER^{i}_{t-1} = FC^{i}_{t-1} \times OWNER^{i}_{t-1}$

In this specification, the coefficient of interest is β_6, which is expected to be positive, capturing the additional effect of collateral value increases for financially constrained firms that own their real estate. I report results for firm leverage by priority and information sensitivity in Table 5, while heterogeneity of debt structure is examined in Table 6. In Table 5, the estimated coefficient on the triple-interaction term is positive for total, secured, unsecured and public leverage. This finding also supports the argument that financially constrained firms spread their leverage structure in response to collateral value changes. Most importantly, we can see that they borrow not only against the collateral, but they also increase their public debt as well. This result quantifies the effect of collateral value appreciation on relaxation of financial constraints.

By examining the control variables, one can see that they mostly enter the regression specification with the expected sign. Consistent with Myers's (1984) pecking-order theory, more profitable firms use lower leverage. The coefficient on market-to-book ratio is mostly negative and significant, providing support for Myers'(1977) and Hart's (1993) prediction that firms with good growth prospects will reduce their leverage in order to avoid the under-investment problem. Firm size (proxied by sales turnover) enters with a positive sign

In Table 6 I investigate this argument in more detail in terms of the structure of firm debt holdings itself. In particular, coefficients on the triple-interaction term are positive for bond debt and private placement and negative for program and convertible debt share. These findings suggest that financially constrained real estate owners, in addition to borrowing heavily against their collateral, get access to arm's length financing: namely bonds and private placements. Negative coefficients on program and convertible debt share indicate that they reduce their short-term program debt, such as commercial paper, MTN and shelf debt. Reduction in convertible debt share indicates that firms opt for cheaper and less information-sensitive forms of debt as their collateral appreciates. By inspecting coefficients β_3 and β_4, we can see that the spreading of the debt structure (i.e. increase in bond share and private placement debt share and decrease in convertible debt share) is predominantly driven by the presence of financing constraints.

5.4 Collateral value and leverage maturity structure

If firms are adjusting their capital structure to benefit from collateral value appreciation, we should expect them to tilt their debt structure towards longer term maturities. The intuition is straight-forward: firms use an increase in value of their pledgeable assets to raise more debt secured against the value of collateral and negotiate debt contracts of longer duration. My intuition is confirmed in the data: as Table 7 shows, there is a monotonically increasing sensitivity of leverage maturity to predicted collateral value changes. Estimates of the baseline specification for financially constrained firms show that short-term leverage is not sensitive to collateral value movements, but longer-dated maturities are. In Figure 2 I visually compare the sensitivities of leverage maturities to collateral value changes for the full sample (control group), and the marginal effect for financially constrained firms (treatment group). The shape of the curve for financially constrained firms suggest a much larger sensitivity at the longer end of the curve. For a one-standard deviation increase in predicted collateral value changes, share of debt maturing in five years to firm total assets increases by 2.4%.

These results are related to evidence presented in Custodio, Ferreira and Laureano (2010). The authors empirically show a large decline in corporate debt maturity for small R&D intensive high-tech focused US firms, which have low tangibility. Results presented in Table 7 build on their story by pointing out that the highly tangible firms will experience an increase in their leverage maturity structure in response to collateral value appreciation.

5.5 Collateral value and cost of debt

The evidence presented in the above sections suggests that total firm leverage increases in response to increases in collateral value, but that this change is not homogenous across different debt priorities, types and maturities and that it varies in the cross-section. Moreover, less risky, more information-sensitive types of leverage and short-term leverage decline substantially. These findings raise another interesting question: how do firms benefit from collateral value increases? Do they simply get access to more credit at the same price—indicating less credit rationing by lenders—or do they renegotiate their existing obligations and issue new debt contracts at a cheaper price—indicating relaxing of credit constraints? If they merely became less rationed, one would expect to see no change in their cost of debt. If it were the latter, and firms indeed managed to obtain cheaper credit, one would expect to see a decrease in the observed cost of debt. To test these hypotheses, I run a modified version of my baseline IV specification:

$$\Delta PRE_{t-1,t}^{m} = \lambda^{m} + \delta_{t} + \rho IE^{m} \times \Delta P_{t-1,t}^{US} + \gamma X_{t}^{i,m} + \varepsilon_{t}^{i,m}, \tag{5a}$$

$$CostOfDebt_{t}^{i,m} = \alpha^{i} + \lambda^{m} + \delta_{t} + \theta X_{t}^{i,m} + \beta \Delta RE\widehat{Value}_{t-1,t}^{m} + u_{t}^{i,m}. \tag{5b}$$

To measure firm cost of debt I employ deal-level data from DealScan, which I match against my sample. For each deal and deal tranches, I obtain data on the loan amount, interest spread above LIBOR and deal maturity. The sample is restricted to non-financial, non-real estate firms with deals initiated between 1996 and 2006. To calculate firms' yearly average short- and long-term cost of debt, for each firm-year observation, I compute the average yearly interest rate as the mean value of quoted spread on all tranches for a specific firm with the same maturity. All deals with maturity up to a year are then denoted as short-term, while all deals with maturities are denoted as long term. Table 8 contains the results of this estimation. Panel A contains the results of the baseline specification without controlling for financial constraints or real estate ownership. The estimates suggest not only that firms are able to borrow more in response to collateral value appreciation, but also that the cost of their long-term borrowing drops by almost four basis points. However, in the short-term, we see no reduction in the cost of debt. The evidence presented in Panel B is more compelling—the cost of long-term finance for financially constrained real estate owning firms drops by eight basis points more, while we see no significant effect on the short-term cost of debt. These results indicate that collateral value shocks indeed help alleviate the financing frictions that financially constrained firms face in the market. Following an increase in the value of collateral, financially constrained firms are not only able to borrow more, but they are also able to borrow more cheaply.

5.6 Collateral value and risk-shifting

In this section I study the effects of the changes in collateral value on the presence of financial covenants in firm debt structure. If indeed collateral can be used to mitigate informational asymmetries and agency problems in securing financing, a firm's ability to collateralize would reflect the frictions it faces in raising external funds. Towards this end, one would expect to see the majority of firms facing upswings in their collateral value depart from employing the commonly used solutions to risk shifting problems, such as convertible debt issuance and the presence of debt covenants and expenditure restrictions. In previous sections I have shown that this is indeed the case for convertible debt holdings. In this section I present empirical evidence that suggests that firms exposed to increases in their collateral value in one period are less likely to face lenders imposing financial contracts with financial covenants and/or capital expenditure restrictions in the following period.

Existing theoretical models suggest that the use of capital expenditure restrictions and/or financial covenants is motivated by conflicts of interest between equity-holders and lenders. In their seminal paper, Jensen and Meckling (1976) show that equity-holders in a levered firm can take on excess risk that is not aligned with lenders' interests, by taking on risky investments that increase the value of their convex payoff structure. There are a couple of solutions to this wealth-transfer problem. One is the design of convertible debt contracts and the other the use of financial covenants that prevent the borrower from taking on risky investments.

"Financial covenants are accounting-based risk and performance hurdles that the borrower must meet to be in compliance with the loan agreement."[18] The breach of a financial covenant means that the borrower has defaulted on the loan, and that the lender has the right to demand immediate repayment of the entire loan. Banks typically utilize this right to initiate a renegotiation of the credit agreement which can lead to significant changes in interest spreads and loan amounts (Beneish and Press (1993), Beneish and Press (1995), Chen and Wei (1993), Smith (1993), Sweeney (1994), Dichev and Skinner (2002), Sufi (2007)).

5.6.1 Data description

My analysis focuses on a set of public firms' private credit contracts of public firms collected from the *SEC Edgar* filing system.[19] This dataset is matched with firm financial data from COMPUSTAT and deal-level data from *DealScan*. As before, I match this data with data on

[18] Nini et al (2009).
[19] Obtained from Nini et al (2009).

real estate prices and land supply elasticities. The *DealScan* loan sample includes deals made to non-financial firms, and I require that each deal has information on the loan amount, the interest spread of all tranches in the deal and whether the deal has a capital expenditure restriction or a financial covenant associated with it. The sample is restricted to deals initiated during the years 1996 through 2006 to ensure I cover the same time period as in the rest of my analysis.

Financial covenant data from *DealScan* are somewhat scarce. To obtain a more comprehensive measure of restrictions, Nini et al. (2009) use text-search algorithms to scan every 10-Q, 10-K, and 8-K filing in Edgar for loan contracts. More specifically, they match every firm in COMPUSTAT to its respective set of SEC filings based on the firm's tax identification number and then scan these filings. This process allows them to extract most original credit agreements and many of the major amendments and restatements of credit agreements that are contained in Edgar. Finally, DealScan and Edgar datasets are merged based on the date of the loan agreement and the name of the company.

Financial covenants are then grouped into six mutually exclusive groups: coverage ratio covenants (including interest coverage, fixed charge coverage, and debt service coverage covenants), debt to cash flow ratio covenants, net worth covenants, debt to balance sheet covenants (including debt to total capitalization and debt to net worth covenants), liquidity covenants (including current ratio, quick ratio, and working capital covenants), and minimum cash flow covenants. Furthermore, the dataset contains information on the capital expenditure restrictions contained in each agreement. Capital expenditure restrictions refer primarily to "cash" capital expenditures, and hence directly refer to investment. Capital expenditure restrictions typically cover cash capital expenditures as in a firm's cash flow statement plus capitalized value of new leases. Financial covenant data are missing for 3 percent of my sample (117 observations). Summary statistics for the loan deal characteristics for my sample are shown in Table 9.

5.6.2 Empirical strategy

In this section I analyze the average partial effect of appreciation of a borrower's collateral in one period on the likelihood of a financial covenant presence in the same borrower's loan agreement in the next period. My outcome of interest is the likelihood of a financial covenant presence, which is a discrete binary variable. I want to estimate coefficients from the general specification:

$$\Pr(covenant_{it} = 1 \mid X_{it}\beta, c_i) = G(X_{it}\beta, c_i)$$

Obtaining consistent estimates of the parameter vector β in a panel setting is the subject of a large body of econometric research (Arellano and Honore (2009); Chamberlain (1984), Fernandez-Val (2005), Bester and Hansen (2006). Following Nini et al. (2009) I estimate a probit model in which the function G takes the following form:

$$G(z) \equiv \Phi(z) \equiv \int_{-\infty}^{z} \phi(\nu)d\nu,$$

where ϕ is the standard normal density. The probit model has several desirable properties. However, it has the undesirable property that firm unobserved effects cannot be explicitly estimated given the incidental parameters problem. In other words, we cannot allow for arbitrary correlation between the unobserved effect and the covariates. To obtain average partial effects, I use an IV probit estimation which takes on the following form:

$$\Pr(covenant_{it} = 1 \mid X_{it}\beta) = \Phi(X_{it}\beta).$$

I estimate two different specifications of the above model: Panel A of Table 10 reports the results of the unconditional probit IV specification, while the results shown in Panel B refer to a probit IV specification conditional on the firm's having a capital expenditure restriction at some point during the sample period. As it can be seen in Panel A, there is a significant decrease in the likelihood of new capital expenditure restrictions, debt-to-capitalisation, net worth, shareholders' equity and tangible net worth covenants. Furthermore, there is a significant decrease in the number of covenants per deal for firms experiencing increases in collateral values. Moreover, as can be seen in Panel B, conditional on a firm's having a capital expenditure restriction at some point in the sample, that is conditional on a firm being "investment constrained", there is an even larger decrease in the likelihood that lenders impose new capital expenditure restrictions, or any of the above-mentioned covenants.

The results on the relationship between collateral value changes and capital expenditure restrictions are very interesting, particularly in the light of the dynamic credit multiplier effect. Restriction on firm investment are not assigned randomly: lenders impose restrictions into financing agreements when borrowers' credit quality deteriorates. Similarly, the evidence presented here suggests that lenders relax capital restrictions following increases in the market value of borrowers' pledgeable assets. This implies that there is a side effect on firm investment that comes not only through the *credit multiplier effect.* The standard credit multiplier effect states that the propagation of an increase in collateral value increases firm investment, which then helps relax firm financing constraints, which in turn increases firm investment, easing financing further, and so on. The results presented in Table 10 suggest that this multiplier effect is further amplified by lenders relaxing capital expenditure restrictions, thus facilitating further investment.

These results show that the firms' ability collateralize their assets is a good predictor of the future investment and credit constraints. Moreover, these results imply that collateral can be used as a tool for solving conflicts of interest between equity-holders and lenders. The evidence that firms substitute convertible debt for other cheaper forms of debt in response to collateral value shocks and that they are faced with a smaller number of covenants and investment restrictions indicates that collateral values indeed alleviate asymmetric information and agency problems. This points further to say that asset market spill-overs during economic booms not only have a positive effect on the real economy through increased investment, but also provide a possible solution to some of the imminent capital structure problems.

5.7 Real estate equity extraction—what do firms do with increased borrowing?

What do firms do with the increased borrowing against their real estate? The answer to this question will help us assess: firstly, if there is an economically significant corporate *collateral channel* (as suggested by Bernanke and Gertler (1990), Kiyotaki and Moore (1997) and others) and what its macroeconomic implications are. Secondly, it will help us establish the effect of collateral value shocks on firm payout policy decisions and, most importantly, it will help us disentangle the underlying motive for the observed increase in leverage in the cross-section. To answer these questions, I analyze firm payout policy for both financially constrained and unconstrained firms.

Using the KZ index as a measure of financial constraints, estimates in Table 11 indicate that financially constrained real estate owners use their borrowing proceeds to finance new capital investment, to finance R&D expenditures and for common dividend payouts and share repurchases. Furthermore, their cash holdings, as a percentage of total assets, drop. If one treats cash as negative debt, then this indicates an increase in firm net leverage.

Existing studies (Campello and Hackbarth (2008), Chaney et al. (2010)) predict that financially constrained firms will increase their investment spending in response to boosts in asset tangibility or positive shocks to collateral value. In the presence of financing imperfections there is going to be an endogenous relationship between firms' real and financing decisions. Campello and Hackbarth (2008) argue for the presence of firm-level dynamic credit multiplier effect, where investment fosters a feedback effect by increasing firm's capital base, in which investment (in tangible assets) helps relax financing constraints, which in turn fosters new investment, easing financing further etc. This mechanism is amplified by firm asset tangibility, which is not only tied to firm's investment process but also to firm's ability to raise external funds. Results presented in Table 11 provide evidence to support this credit multiplier argument. Financially constrained firms tend to increase their capital investment following collateral value increases—the results shown in Figure 3 indicate that around 61% of the real estate equity is used for financing new investment (either capital or R&D). However, the other 40% of the real estate equity is used for common dividend payout and equity re-purchase. In the absence of profitable investment opportunities, financially constrained firms choose to maintain their borrowing capacity by not choosing to stockpile the borrowing proceeds (and thus keep their internal funds limited) and make significant equity payouts. It is interesting also to note that consistent with Almeida, Campello and Weisbach (2009), there is a positive ratio between safe and risky investments for financially constrained firms: if one treats R&D as more risky investment than capital investment, results shown in Figure 3 indicate that this ratio is high and positive for financially constrained firms (1.63).

What are the implications in economic terms? Figure 3 shows the economic implications of this effect for financially constrained firms. A one dollar increase in the value of collateral translates into 45 cent increase in total debt on average, out which, financially constrained firms use 5 cents (11 percent) for share re-purchases, 19 cents (42 percent) for financing new investment, 8 cents (19 percent) for R&D expense and 13 cents (28 percent) are paid out as common dividends. It seems that financially constrained firms borrow heavily against their collateral not only to finance new investment opportunities, but in the absence of good investment opportunities, to adjust their capital structure so as to reach their leverage optimum and to transfer the benefits of collateral value increases to existing shareholders. Figure 4 shows the economic implications of this effect for financially unconstrained firms: each one dollar increase in the value of collateral translates into 19 cents increase in total debt, out which, 4 cents (23 percent) is used for share re-purchases, 4 cents (23 percent) is used for capital investment, 3 cents (14 percent) goes towards R&D expenses and 8 cents (40 percent) towards common dividend payout. This means that less financially constrained firms use around 65 percent of their real estate equity for equity payouts.

5.7.1 Economic implications

In Table 12, I present evidence of the effect of collateral value appreciation on firm borrowing in dollar units. The first-stage estimate shown in Column 1 indicates that for an equivalent aggregate real estate demand shift, a one standard deviation increase in land supply inelasticity yields a 50,887 dollar increase in real estate equity. Second stage regression estimates shown in Columns 2-5 suggest that firms borrow additional 29 cents on every dollar increase in the value of their real estate. Once again, we can see that the majority of this borrowing is financed through public debt— ten cents on every dollar increase in the value of their real estate are borrowed through bond issuance. Evidence presented in this table provides further support for a high degree of debt structure re-adjustment following collateral value changes.

6 Robustness tests

There are two major potential concerns with my empirical strategy employed above. The first one relates to the validity of land supply elasticity as an instrument for real estate price growth. The second one relates to the choice of measure of the level of firm financial constraints.

6.1 Testing exclusion restriction

My *first test* attempts to ascertain if the exclusion restriction is satisfied for land supply elasticity to be a valid instrument?[20] That is, could it be that different economic conditions in elastic and inelastic metro areas during the time period in question affect corporate capital structure decisions differently in elastic and inelastic MSAs, irrespective of the real estate price growth? In the following paragraphs I describe robustness of my findings to a series of control variables and tests, which mitigates this concern to an extent, but omitted factors not captured by my controls may still be a worry.

My main concern is that a non-real estate related differential increase in the demand for credit in inelastic MSAs is driving my results. To address this issue, I test the relationship between land supply elasticity and MSA level economic indicators: real GDP growth, per capita GDP growth, disposable personal income growth, per capita personal income growth and wage growth. The MSA level economic indicators data was obtained from Bureau of Economic Analysis (Regional Economic Accounts). My goal is to test if elastic and inelastic

[20] A related test on the validity of my first-stage instrument, as shown in the Appendix, tests for the heterogeneity in land supply elasticity over time.

metro areas were experiencing different economic trends that may have driven corporate borrowing and land price appreciation between 1996 and 2006. The evidence presented in Table 13 suggests that there is no differential growth in real GDP, per capita GDP, personal income or wages in inelastic MSAs. However, a proper empirical test does not only look at the level of income growth in one period. I want to try and gauge what is the response of total borrowing to changes in expected income growth. That is, I want to test whether there is a negative correlation between land supply elasticity and difference in growth rates between 2002-2006 and 1998-2002. The results presented in columns 6, 7 and 8 indicate that this is not the case, suggesting that the observed increase in borrowing is not driven by differences in local demand. In Section 5.3 (Table 4), I show results that provide further support for exclusion restriction: firms that rent their real estate holdings in inelastic areas do not significantly differently increase their leverage.

It is difficult to test the exclusion restriction explicitly. The evidence presented here, although not exhaustive, suggests that it is difficult to relate the observed increase in corporate leverage to other factors rather than real estate price appreciation.

6.2 Financially constrained vs. financially unconstrained firms revisited

The results presented in the previous section indicate that financially constrained firms do not only increase their total leverage, but also increase the variation in the structure of their debt holdings in response to collateral value increases. This collateral-induced debt heterogeneity is, however, absent for financially unconstrained firms. To ensure that my findings are not driven by the choice of financial constraint classification scheme (KZ measure of financing constraints), I also employ a standard *ex-ante* constraint classification scheme of Almeida (2004), based on firm dividend payout ratio: in every year of my sample period, I rank firms based on their dividend payout ratio. I assign to the *high dividend payout* group all firms that are ranked in the top three deciles of the annual payout distribution. Dividend payout ratio is computed as the ratio of total distributions (common dividends plus stock repurchases) to operating income. Following Fazzari et al. (1988), financially constrained firms have significantly lower payout ratios than unconstrained firms.

I split my sample into two—one for high-dividend payout ratio firms and one for low-dividend payout ratio firms—and I estimate regression Equation 4 on both sub-samples. The results of the estimation for leverage by priority structure are shown in Table 14, and for debt mix by debt type in Table 15. As can be seen from Table 14, the coefficient on the real estate ownership interaction term is positive and significant for total leverage for high-dividend payout firms, however there seems to be no variation in the leverage priority structure. On the other hand, we see an increase in total leverage, and an increase in both secured and unsecured leverage for low-dividend payout firms. This finding is consistent with the one presented earlier in Table 5. The results in Table 15 are striking: as can be seen from Panel A, high dividend payout firms do not seem to adjust their debt structure at all - none of the coefficients are significant. On the other hand, as shown in Panel B, low dividend payout firms exhibit a large degree in debt structure variation in response to collateral value changes: their bond debt share increases significantly, together with their mortgage-related debt share, while convertible and program debt share decrease significantly. Again these results confirm the ones presented in Table 4 and Table 6, providing further evidence of the robustness of my results to choice of financial constraint classification scheme. These results suggest that, contrary to existing literature, unconstrained firms do increase their leverage and that this result is independent of the constraint classification scheme. However, the extent of the increase is much lower than for the constrained firms, which adjust their debt structure significantly. These findings suggest that financially unconstrained firms may be just using the availability of credit under favorable conditions to lever up. If this is the case, it would be interesting to see how is this credit can be used further—I explore this question in detail next.

The results of real estate equity extraction based on the dividend-payout classification scheme, as shown in Table 16 build on the story presented in Section 5.5. As shown in Panel A, high-dividend payout firms use the borrowing proceeds predominantly for financing share buy-backs and for common dividend payouts. The remainder of the proceeds are used for financing risky types of investments - namely R&D. Again, cash holdings as a fraction of total assets drop, suggesting that high dividend payout firms use the borrowing proceeds and cash to payout current shareholders, either in terms of dividend payouts or, subsequently increase their future benefits by share repurchases. One possible interpretation of this results is that in order to preserve their reputation for generous equity distributions, and to reduce agency costs by limiting cash balances, unconstrained firms make substantial payouts to existing shareholders.

7 Conclusion

This paper shows that firms significantly increase their leverage in response to collateral value appreciation. Consequently, their cost of financing becomes lower and they issue debt at more favorable and attractive terms. This effect is more pronounced for firms that are likely to be financially constrained, which also experience a significant change in the composition of their debt mix. They get improved access to arm's length financing and they tilt their debt structure towards longer-term maturities.

The run up in US land prices from 1996 to 2006 provides a natural testing laboratory for identifying the exact mechanism through which asset market dynamics are reflected in a firm's balance sheet. Following large swings in the value of their collateral, financially constrained and financially unconstrained firms choose their capital structure differently.

By employing a triple interaction of MSA level land supply elasticity, aggregate real estate price changes and a measure of a firm's real estate holdings as an exogenous source of variation in the value of firm collateral, I find a significant effect of collateral value changes on firm capital structure: a typical US public company extracts 29 cents of real estate equity for every dollar increase in value of its collateral. The intuition behind using MSA level land supply elasticity intreacted with aggreagte changes in real estate prices as an instrument for local real estate price growth is straightforward: following Glaeser, Gyourko and Saiz (2010), MSAs with elastic land supply should not experience significant real estate price appreciation in response to large shifts in aggregate real estate demand, since the availability of land is not constrained (and there are no regulatory constraints). However, inelastic land supply MSAs should witness large real estate price increases as a result of the same real estate demand shift.

I explore the cross-sectional implications of the collateral-based capital structure effect in terms of the level of firm financial constraints and real estate ownership. By employing different classification schemes for the level of financial constraints, namely the KZ index and dividend payout ratio, I find evidence for the first-order importance of collateral value as a determinant of the capital structure. I find that financially constrained firms not only increase their total (net) leverage in response to collateral value appreciation, but they also tend to spread out their debt structure by improving access to arm's length financing and substituting more expensive and information-sensitive types of debt with more attractive alternatives. Concurrently, I find evidence that creditors will have less need to monitor and are less likely to impose new expenditure restrictions or financial covenants. The evidence of the less likely incidence of capital expenditure restrictions amplifies the dynamic credit multiplier effect through firms taking up investment projects that would have been foregone should have the capital restrictions have been in place. Evidence of an increased bond, mortgage-related and private placement debt share, and at the same time decreased convertible and program debt share, suggests that collateral indeed helps alleviate financing imperfections for the firms that are off their optimal leverage levels.

On the other hand, I find evidence that unconstrained firms also increase their leverage, but to a lesser extent than financially constrained firms. This effect, however, is not associated with any economically significant debt structure changes. Further, I find that in total, the effect of collateral on capital structure decisions is significant for real estate owners but largely disappears for real estate renters. By employing a triple-differences approach, I find that a one standard deviation increase in the predicted value of collateral translates into a one third of a standard deviation increase in total leverage for financially constrained real estate owning firms, with a substantial debt structure adjustment. Financially constrained firms tend to tilt the term-structure of their leverage more towards long-term maturities and the sensitivity of their leverage to collateral value changes is monotonically increasing in debt maturity. Subsequently, the cost of long-term debt for financially constrained firms drops by 8 basis points.

To uncover the main drivers for this differential capital structure effect between financially constrained and unconstrained firms, I study their payout policies. I find that financially unconstrained firms use 63 percent of their real estate equity proceeds for equity payouts (40 percent for common dividend payouts and 23 percent for share re-purchases). The remaining real estate equity is predominantly used for financing risky types of investments, namely R&D (14 percent) and capital investment (23 percent).

On the other hand, in case of financially constrained firms, I find empirical support for the *credit multiplier* effect: a one dollar increase in the value of collateral translates into 45 cent increase in total debt on average, out of which, financially constrained firms use 5 cents (11 percent) for share re-purchases, 19 cents (42 percent) for financing new investment, 8 cents (19 percent) for R&D expense and 13 cents (28 percent) for paying out as common dividends. These results indicate the presence of credit multiplier effect for firms with good investment prospects—61 percent of real estate equity is used for financing different types of investment. More importantly, this result indicates that in the absence of profitable investment opportunities financially constrained firms will not stockpile their cash, but they will transfer the benefits of collateral value increases to existing shareholders.

This paper contributes to the capital structure literature in that it gives simple evidence of an exogenous source of variation in firm capital structure decisions. The identification strategy used in this paper provides a natural laboratory for solving many existing corporate finance issues. In future research I explore the cross-sectional implications of firm payout policy in response to collateral value shocks. It will also be interesting to test the symmetry of the effect presented in this paper—by using the most recent post-2006 data, it will be interesting to see the significance of the decline in US real estate prices on firm capital structure in the cross-section. Most importantly, I will work on uncovering how well existing capital structure theories fare in explaining the observed evidence.

8 References

Almeida, H., and M. Campello, 2007, "Financial Constraints, Asset Tangibility, and Corporate Investment", Review of Financial Studies.

Almeida, H., Campello, M. and M.S. Weisbach, 2009, "Corporate Financial and Investment Policies when Future Financing is not Frictionless", Fisher College of Business Working Paper Series

Beneish, M., Press, E., 1993, "Costs of technical violation of accounting-based debt covenants",The Accounting Review 68, 233-257.

Beneish, M., Press, E., 1995, "The resolution of technical default", The Accounting Review 70, 337-353.

Benmelech, Efraim and Nittai Bergman, forthcoming, "Collateral Pricing", Journal of Financial Economics.

Bernanke, Benjamin and Mark Gertler, 1989, "Agency Costs, Net Worth and Business Fluctuations" American Economic Review, 79(1):14-34.

Bharath, S., Pasquariello, P., Wu, G., 2009. Does asymmetric information drive capital structure decisions? Review of Financial Studies 22, 3211-3243.

Cantillo, M., and J. Wright, 2000, "How Do Firms Choose Their Lenders? An Empirical Investigation", Review of Financial Studies 13, 155-189.

Campello, M. and D. Hackbarth, 2008, "Corporate financing and investment: The firm-level credit multiplier", Working Paper, University of Illinois at Urbana-Champaign.

Campello, M. and E. Giambona, 2010, "Capital Structure and the Redeployability of Tangible Assets", Working Paper.

Chaney, Thomas, David Sraer and David Thesmar, 2010, "The Collateral Channel: How Real Estate Shocks Affect Corporate Investment", NBER Working Paper 16060.

Custodio, Claudia, Miguel Ferreira and Luis Laureano, 2010, "Why are U.S. firms using more short-term debt?", Working Paper.

Dichev, I., Skinner, D., 2002, "Large sample evidence on the debt covenant hypothesis", Journal of Accounting Research 40, 1091-1123.

Eisfeldt, A.L., and A.A. Rampini, 2007, "Leasing, ability to repossess, and debt capacity," Working Paper.

Fama, E.F., and K.R. French, 2002, "Testing trade-off and pecking order predictions about dividends and debt," Review of Financial Studies 15, 1-33.

Faulkender, Michael and Mitchell A., Petersen, 2006, "Does the Source of Capital Affect Capital Structure?", Review of Financial Studies, 19 (1), 45-79.

Fazzari S., R. G. Hubbard, and B. Petersen, 1988, “Financing Constraints and Corporate Investment”, Brooking Papers on Economic Activity 1, 141-195.

Frank, M., and V. Goyal, 2003, “Testing the Pecking Order Theory of Capital Structure”, Journal of Financial Economics 67, 217—248.

Gan, Jie, 2006, "Collateral, Debt Capacity, and Corporate Investment: Evidence from a Natural Experiment", Journal of Financial Economics, 85:709-734.

Gatchev, A. Vladimir, Todd Pulvino and Vefa Tarhan, 2010, "The Interdependent and Intertemporal Nature of Financial Decisions: An Application to Cash Flow Sensitivities", Journal of Finance, forthcoming.

Glaeser, Edward, Joseph Gyourko and Albert Saiz, 2008, “Housing Supply and Housing Bubbles”, Harvard University, Working Paper.

Greenwald, Bruce, and Stiglitz, Joseph E. "Financial Market Imperfections and Business Cycles." Q.J.E. 108 (February 1993) : 77-1 14.

Hart, Oliver and John Moore, 1994, "A Theory of Debt Based on the Inalienability of Human Capital," The Quarterly Journal of Economics, 109(4):841-79.

Hennessy, C., Levy, A. and T. Whited, 2007, ”Testing Q Theory with Financing Frictions”, Journal of Financial Economics.

Houston, J., James, C., 1996, "Bank information monopolies and the mix of private and public debt claims", Journal of Finance 51, 1863-1889.

Inderst, R., and H.M. Muller, 2006, “A lender-based theory of collateral,” Journal of Financial Economics (forthcoming).

Jimenez, G., V. Salas, and J. Saurina, 2006, “Determinants of Collateral,” Journal of Financial Economics 81, pp. 255-281.

Kaplan, Steven N. and Luigi Zingales, 1997, "Do Investment-Cash Flow Sensitivities provide Useful Measures of Financing Constraints?. The Quarterly Journal of Economics, 112: 169- 215.

Kiyotaki, Nobuhiro, and John Moore, 1997, “Credit Cycles”, Journal of Political Economy, 105, 211-248.

Korajczyk, R., Levy, A., 2003, "Capital structure choice: macroeconomic conditions and financial constraints". Journal of Financial Economics 68, 75-109

Lamont, Oliver, Christopher Polk and Jesus Saa-Requejo, 2001, "Financial Constraints and Stock Returns", The Review of Finacial Studies, 14(2), 529-554

Leamer, Edward, 2007, "Housing IS the business cycle", NBER Working Paper No. 13428

Lemmon, M.L., and J.F. Zender, 2007, “Debt capacity and tests of capital structure theories”, Working paper.

Mackay, Peter, and Gordon G. Phillips, 2005, "How Does Industry Affect Financial Structure?", Review of Financial Studies, 18 (4), 1433-1466.

Mian, Atif and Amir Sufi, 2010, "House Prices, Home Equity-Based Borrowing, and the U.S. Household Leverage Crisis", Working Paper.

Nini, G., D. Smith, and A. Sufi, 2009, "Creditor Control Rights and Firm Investment Policy", Journal of Financial Economics 92(3):400-420.

Rajan, R.G., and L. Zingales, 1995, "What do we know about capital structure? Some evidence from international data," Journal of Finance 50 (5), 1421-1460.

Rajan, R., and A. Winton, 1995, "Covenants and Collateral as Incentives to Monitor," Journal of Finance 50 (4), 1113-1146.

Rampini, Adriano A., and S. Viswanathan, 2010a, "Collateral and capital structure", Working paper, Duke University.

Rampini, Adriano A., and S. Viswanathan, 2010b, "Collateral, risk management, and the distribution of debt capacity", Journal of Finance 65 (2010) forthcoming.

Saiz, Albert, 2010. "The geographic determinants of housing supply", Quarterly Journal of Economics, forthcoming.

Shleifer, Andrei, and Vishny, Robert W. "Liquidation Values and Debt Capacity: A Market Equilibrium Approach", Journal of Finance 47, 1343-66.

Shyam-Sunder, L., and S. C. Myers, 1999, "Testing Static Trade-off against Pecking Order Models of Capital Structure", Journal of Financial Economics 51, 219—244.

Smith, C., 1993, "A perspective on accounting-based debt covenant violations",The Accounting Review 68, 289-303.

Sweeney, A., 1994, "Debt covenant violations and managers' accounting responses", Journal of Accounting and Economics 17, 281-308.

Sufi, A., 2007, "Bank lines of credit in corporate finance: An empirical analysis", Review of Financial Studies, forthcoming.

Titman, S., and R. Wessels, 1988, "The determinants of capital structure choice," Journal of Finance 43 (1), 1-19.

Tuzel, Selale, 2007, "Corporate Real Estate Holdings and the Cross Section of Stock Returns", Working Paper.

Veblen, Thorstein, 1904, The Theory of Business Enterprise. New York: Scribner.

Whited, T., 1992, "Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data", Journal of Finance 47, 425-460.

9 Appendix I

The derivation presented in this Appendix depicts straightforward implications of Giambona and Schweinbacher's (2007) model. Firstly, I show the authors' derivation of the relationship between tangibility and leverage to aid the intuition and then provide a simple, yet explicit set of implications that relate changes to value of pledgeable assets to firms' leverage. The authors assume that firms have limited ability to pledge cash flows from new investments. This assumption is based on Hart and Moore's (1994) inalienability of human capital assumption, and it produces a simple and intuitive model.

9.1 Relation between collateral value and firm leverage

Suppose an economy has two dates, 0 and 1. Suppose at time 0 the firm invests I physical assets that generate output $f(I)$ at time 1. Assume that $f(I)$ satisfies standard functional assumptions and that if the project is abandoned, physical investment I stays in the firm. Also assume that some amount of external financing (in terms of debt B and/or equity E) may be needed to finance the investment. As in Hart and Moore (1994), assume that the creditors will lend only up to the expected value of the firm in liquidation. That is, they are going to lend the amount equal to the value of physical investment goods under their control. Assume creditors are risk-neutral and discount rate is equal to zero. Departing from the original model of Giambona and Schweinbacher (2007), suppose that, apart from the mixture of debt and equity on its asset side, the firm has generated internal funds from a collateralizable risk-free asset W. Suppose equity issuance cost is infinitely small, but it still makes the management strictly prefer issuing debt over equity. Let τ $(0 \leq \tau \leq 1)$ be a measure of asset tangibility. In case of liquidation, creditors can recover W plus the tangible fraction of of physical investment τI . Following Giambona and Schwienbacher (2007) I assume that τ is exogenous and independent of I. Hence, creditors lend to the firm up to the value of firm assets in liquidation:

$$B \leq W + \tau I$$

The firm maximizes the value of new investment I, that is the NPV of the project:

$$\max_{I} f(I) - I, \text{ s.t.}$$

$$I = E + B \text{ and } B \leq W + \tau I$$

The NPV of the project goes to existing equity holders (currently, the firm is 100% equity financed).

When the second condition is binding, we get: $I = E + B = E + W + \tau I \implies E = I(1-\tau) - W$, and internal funds W are fully pledged to creditors. The first-best level of investment I^{fb} is such that $f'(I^{fb}) = 1$. If the second condition is satisfied at I^{fb}, this means that the firm is financially unconstrained and that it should raise as much debt as possible, that is the amount I^{fb}. In case the amount of internal funds generated by the pledgable asset W is small (i.e. the value of the asset is low), or $\tau < 1$, the firm can borrow only $W + \tau I^{fb}$.

Hence, the general expression for optimal investment, as derived by Almeida and Campello (2007), becomes :

$$\begin{aligned} I(W,\tau) &= \frac{W}{1-\tau} \text{ if } \tau < \tau^*(W, I^{fb}) \\ &= I^{fb} \text{ if } \tau \geq \tau^*(W, I^{fb}). \end{aligned}$$

And, investment cash flow sensitivities are given by:

$$\begin{aligned} \frac{\partial}{\partial W} I(W,\tau) &= \frac{1}{1-\tau} \text{ if } \tau < \tau^*(W, I^{fb}) \\ &= 0 \text{ if } \tau \geq \tau^*(W, I^{fb}). \end{aligned}$$

Giambona and Schwienbacher (2007) establish the relationship between tangibility and leverage for financially constrained and financially unconstrained firms.

Case 1: *Financially unconstrained firm*

Financially unconstrained firm will make its financing decisions independently of its investment decisions. Moreover, it will choose to finance the new investment with no equity $E = 0$. In this case, Giambona and Schwienbacher (2007) show that:

$$B = I^{fb}$$
$$E = 0$$
$$E_0 = W + f(I^{fb}) - I^{fb} \Longrightarrow V = B + E + E_0 = W + f(I^{fb})$$

and the leverage ratio is given by:

$$LR = \frac{B}{V} = \frac{I^{fb}}{W + f(I^{fb})}$$

Next, I depart from Giambona and Schwienbacher (2007). Suppose now there is a positive shock which increases the value of W. The sensitivity of the leverage ratio to this shock is:

$$\frac{\partial}{\partial W} LR = \frac{\partial LR}{\partial I} \frac{\partial I}{\partial W} = 0$$

This result suggests that leverage changes are independent of changes to collateral value.

Case 2: *Financially constrained firm*

Financially constrained firm will not be able to finance the entire investment by issuing debt so $E > 0$. Fraction $W + \tau I^{fb}$ will be raised through debt, and the remaining $I^{fb}(1 - \tau) - W$ through equity. In this case, Giambona and Schwienbacher (2007) show that:

$$B = W + \tau I^{fb},$$
$$E = I^{fb}(1 - \tau) - W,$$
$$E_0 = W + f(I^{fb}) - I^{fb} \Longrightarrow V = B + E + E_0 = W + f(I^{fb})$$

and the leverage ratio is given by:

$$LR = \frac{B}{V} = \frac{W + \tau I^{fb}}{W + f(I^{fb})}.$$

Again, I depart from Giambona and Schwienbacher (2007). Sensitivity of leverage to changes in W then becomes:

$$\frac{\partial}{\partial W} LR = \frac{\partial LR}{\partial I} \frac{\partial I}{\partial W} = \frac{\tau[W + f(I^{fb})] - (W + \tau I^{fb}) f'(I^{fb})}{[W + f(I^{fb})]^2} \frac{1}{1 - \tau}.$$

Since $f'(I^{fb}) = 1$, the above expression simplifies to:

$$\frac{\partial}{\partial W} LR = \frac{W(\tau - 1) + \tau[f(I^{fb}) - I^{fb}]}{[W + f(I^{fb})]^2} \frac{1}{1 - \tau}$$

We know that $1 - \tau > 0$ and $[W + f(I^{fb})]^2 > 0$.The sign of the term in the numerator $W(\tau - 1) + \tau[f(I^{fb}) - I^{fb}]$ is going to be positive as long as $\tau[f(I^{fb}) - I^{fb}] \;\; > W(\tau - 1)$. This is always going to hold, since $0 \leq \tau \leq 1$.Hence

$$\frac{\partial}{\partial W} LR > 0.$$

This result suggests that leverage sensitivity to collateral value is strictly positive and increasing in the tangibility of assets for financially constrained firms.

10 Tables and figures

Table 1: **Summary Statistics**

Panel A presents summary statistics on debt structure for a sample of 305 firms for which I obtain accounting, detailed debt structure and real estate data. The sample covers firms for which I have data for at least three consecutive years between 1996 and 2006. Debt structure data has been obtained from Rauh and Sufi (2010). To ease the categorization, issue level data from DealScan and SDC Platinum has been used. Panel B shows summary statistics for land price data for 46 MSAs for period between 1996 and 2006 obtained from Lincoln Institute of Land Policy. Further, it contains data on land supply elasticities across the MSAs obtained from Saiz (2010).

Panel A	Mean share of total capital (D+E)
Equity (book value)	0.499
Total Debt, by Type	0.501
Bonds (non-program, non-convertible)	0.191
Public	0.078
Revenue bonds	0.008
144A private placements	0.105
Bank	0.133
Drawn revolvers	0.07
Term loans	0.062
Convertible bonds	0.053
Program debt	0.045
Commercial paper	0.015
Medium term notes	0.012
Shelf-registered debt	0.018
Private Placements (excl. 144A)	0.032
Mortgage debt and Equipment notes	0.022
Other debt	0.022
Acquisition notes	0.003
Capitalized leases	0.009
Unclassified	0.011
Total Debt, by priority	0.501
Secured Debt	0.148
Bank	0.094
Mortgage debt and Equipment notes	0.022
Bonds (non-convertible)	0.012
Senior Unsecured Debt	0.239
Subordinated Debt	0.112
Bonds (non-convertible)	0.058
Convertible Bonds	0.042
Observations	2185

(Table 1 contd.) Panel B	Mean	Median	SD	Min	Max	N
Total Assets ($MM)	1433.73	83.01	9558.08	0.00	797769.00	90246
Size	5.08	4.96	2.30	0.00	14.42	90246
M/B	12.70	1.47	939.47	0.04	222021.00	90246
EBIT	116.90	2.96	805.04	-11982.00	66290.00	90246
Sales/Turnover	1164.82	82.21	6507.23	0.00	425071.00	90246
PPE/Total Assets	0.31	0.23	0.25	0.00	1.67	90246
CAPEX/Total Assets	0.07	0.04	0.10	-0.68	8.00	90246
Cash/Total Assets	0.13	0.05	0.19	-0.53	23.05	90246
Financially Constrained	0.15	0.00	0.36	0.00	1.00	90246
Owners	0.20	0.00	0.41	0.00	1.00	79276
High Dividend Payout	0.84	1.00	0.37	0.00	1.00	90246

(Table 1 contd.) Panel C	Mean	Median	SD
Davis-Palumbo Land Price MSA/state level Data			
Land price growth 1996-2006, MSA level	2.155	2.082	1.505
Land price growth 1996-2006, state level	26.254	13.298	35.995
Saiz (2010) land supply elasticity measure, MSA level			
Land supply elasticity	2.537	2.259	1.433

Table 2: **Real estate prices and firm leverage**

This table shows results of the baseline IV specification. The instrument in the first-stage is land supply inelasticity interacted with changes in aggregate real estate prices and a firm's real estate holdings. The dependent variable is leverage, defined as total debt scaled by market value of total assets. The table shows results for total leverage and leverage structure by priority. Column 2 contains results of the first-stage regression. All regressions control for firm characteristics: profitability (defined as ratio of earnings before income and taxes (after depreciation) and book capital, M/B and size—define as ln(Sales). Specifications include firm-, MSA- and year-fixed effects and standard errors cluster along both firm and year dimension.

	$\Delta PRE_{t-1,t}$	Debt Type - Share of Total Assets			
		Total	By Priority		
			Secured	Senior Unsecured	Subordinated
Land Supply Inelasticity x $\Delta P^{US}_{t-1,t}$	0.091***				
	(3.30)				
$\Delta PRE_{t-1,t}$		0.270**	0.139**	0.023	0.271**
		(2.48)	(2.25)	(1.14)	(2.17)
Profitability		-0.688***	-0.063	-0.301**	-0.253***
		(-6.26)	(-1.05)	(-2.16)	(-2.75)
M/B		-0.015***	-0.005	-0.002	-0.009
		(-2.67)	(-0.90)	(-0.12)	(-0.80)
ln(Sales)		0.026**	0.008	0.005	0.012
		(2.05)	(1.11)	(0.50)	(1.03)
Year-Fixed Effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed Effect	Yes	Yes	Yes	Yes	Yes
Firm-Fixed effect		Yes	Yes	Yes	Yes
Observations	90246	90246	2178	2178	2178
R-squared	0.45	0.55	0.64	0.63	0.63
Partial R-squared	0.40				
Hausman F-test	39.82***				

Table 3: **Leverage and real estate prices: financially constrained vs unconstrained firms**

This table presents results of the differences-in-differences specification for likely financially constrained firms. The measure of financial constraints (FC) is the KZ index (for detailed description of construction see main text). In Panel A, the dependent variable is total leverage (defined as total debt scaled by market value of total assets), leverage by priority (secured, senior unsecured, subordinated) and leverage by information-sensitivity (public). In panel B, I explore the structure of the firm debt mix—the dependent variable is debt type scaled by total debt. t-stats are reported in brackets. Standard errors cluster along both firm and year dimension.

Panel A		Debt Type - Share of Total Assets			
	Total	Secured	Senior Unsecured	Subordinated	Public
Instr. $\Delta \text{PRE}_{t-1,t}$	0.296*	0.105*	0.019	0.174*	0.005
	(1.95)	(1.84)	(0.70)	(1.81)	(1.08)
FC x Instr. $\Delta \text{PRE}_{t-1,t}$	0.429***	0.189***	0.022**	0.113	0.189**
	(2.54)	(2.61)	(1.98)	(1.04)	(2.50)
Profitability	-0.538***	-0.004	-0.268***	-0.183*	-0.084
	(-4.41)	(-0.05)	(-3.24)	(-1.71)	(-1.55)
M/B	-0.007	-0.006	0.004	0.005	0.002
	(-0.62)	(-0.61)	(0.54)	(0.45)	(0.30)
ln(Sales)	0.025	0.015*	0.020	-0.010	-0.011
	(1.60)	(1.73)	(1.19)	(-0.88)	(-1.33)
FC	0.106**	0.101	0.108***	0.101	0.100**
	(2.42)	(1.15)	(2.79)	(1.32)	(2.18)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	90246	1897	1897	1897	1897
R-squared	0.36	0.51	0.64	0.48	0.55

Panel B	Debt Type - Share of Total Debt				
	Bonds	PPs	Program	Convertible	Mortgage
Instr. $\Delta \text{PRE}_{t-1,t}$	0.026**	0.015	-0.000	-0.007**	0.002*
	(2.12)	(1.06)	(-0.15)	(-2.11)	(1.70)
FC x Instr. $\Delta \text{PRE}_{t-1,t}$	0.099***	0.057**	0.056	-0.061**	0.065***
	(3.18)	(2.34)	(0.98)	(-2.30)	(2.83)
Profitability	-0.079	-0.078	-0.046	0.086	0.070***
	(-1.20)	(-0.74)	(-0.99)	(0.88)	(2.81)
M/B	-0.004	-0.003	-0.012*	-0.037**	0.004
	(-0.42)	(-0.39)	(-1.70)	(-2.34)	(0.86)
ln(Sales)	0.053***	0.008	0.013***	-0.016**	-0.016***
	(8.58)	(0.81)	(2.91)	(-2.07)	(-6.21)
FC	0.100**	0.102*	0.000	-0.000	0.001*
	(2.20)	(1.69)	(1.58)	(-1.24)	(1.74)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	1677	1677	1677	1677	1677
R-squared	0.69	0.58	0.64	0.69	0.70

Table 4: **Leverage and real estate prices: owners vs. renters**

This table presents evidence on the differential effect of real estate price growth on firm leverage for real estate owners and renters. Firm is defined as a real estate owner if its rental expense scaled by gross PPE is less than 5%, and as real estate renter otherwise. Dummy variable OWNER equals one if the firm owns its real estate and zero otherwise. In Panel A, the dependent variable is total leverage (defined as total debt scaled by market value of total assets), leverage by priority (secured, senior unsecured, subordinated) and leverage by information-sensitivity (public). In panel B, I explore the structure of the firm debt mix—the dependent variable is debt type scaled by total debt. t-stats are reported in brackets.Standard errors cluster along both firm and year dimension.

Panel A	Debt Type - Share of Total Assets				
	Total	Secured	Senior Unsecured	Subordinated	Public
Instr. $\Delta \text{PRE}_{t-1,t}$	0.228*	0.108**	0.102	0.138*	0.045
	(1.73)	(2.06)	(1.60)	(1.75)	(0.48)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.483**	0.280***	0.017**	0.164	0.013
	(2.19)	(2.76)	(2.03)	(0.94)	(1.14)
Profitability	-0.684***	-0.065	-0.324**	-0.223***	-0.081**
	(-5.76)	(-0.99)	(-2.41)	(-3.87)	(-2.52)
M/B	-0.012	-0.008**	-0.009	-0.007	-0.001
	(-0.59)	(-2.05)	(-0.55)	(-0.74)	(-0.29)
ln(Sales)	0.024	0.010	0.008	0.006	-0.004
	(1.62)	(1.45)	(0.66)	(0.53)	(-0.56)
OWNER	0.133**	0.138*	0.053	0.114*	0.104
	(2.19)	(1.92)	(1.67)	(1.77)	(1.09)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	79276	2178	2178	2178	2178
R-squared	0.49	0.62	0.35	0.45	0.66

Panel B	Debt Type - Share of Total Debt				
	Bonds	PPs	Program	Convertible	Mortgage
Instr. $\Delta \text{PRE}_{t-1,t}$	0.145**	0.096	0.048	-0.117	0.066*
	(2.22)	(1.01)	(0.61)	(-0.48)	(1.80)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.141***	0.077	0.007	-0.052	0.240**
	(2.65)	(1.56)	(0.09)	(-1.34)	(2.12)
Profitability	-0.118*	-0.016	-0.042	0.029	0.053***
	(-1.81)	(-0.26)	(-1.32)	(0.33)	(3.10)
M/B	-0.004	-0.001	0.000	-0.019	0.003
	(-0.50)	(-0.24)	(0.02)	(-1.42)	(0.84)
ln(Sales)	0.061***	0.004	0.014***	-0.012	-0.019***
	(5.69)	(0.94)	(3.38)	(-1.23)	(-4.79)
OWNER	0.095	0.026	0.109	0.010	0.009
	(1.07)	(1.48)	(1.42)	(0.18)	(1.27)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	2103	2103	2103	2103	2103
R-squared	0.63	0.37	0.75	0.63	0.69

Table 5: **Leverage and real estate prices: financially constrained real estate owners**

This tables shows results of the triple-differences specification for likely financially constrained real estate owners by debt priority and information sensitivity (as percentage of total assets). Dummy variable OWNER equals one if the firm owns its real estate and zero otherwise. Variable FC is a continuous measure of financing constraints (the KZ index). Variable FCOWNER is defined as an interaction: FCOWNER = OWNER x FC. t-stats are reported in brackets. Standard errors cluster along both firm and year dimension.

	Debt Type - Share of Total Assets				
	Total	Secured	Senior Unsecured	Subordinated	Public
Instrumented $\Delta \text{PRE}_{t-1,t}$	0.205**	0.109*	0.011	0.140	0.139**
	(2.12)	(1.83)	(1.45)	(1.28)	(2.32)
FC x Instr. $\Delta \text{PRE}_{t-1,t}$	0.325**	0.203**	0.022**	0.107	0.103**
	(2.21)	(2.40)	(2.05)	(1.88)	(2.19)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.387*	0.237*	0.019**	0.075	0.115
	(1.75)	(1.80)	(2.08)	(0.62)	(1.50)
FCOWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.553**	0.352*	0.103*	0.046	0.198**
	(2.16)	(1.74)	(1.89)	(1.06)	(2.56)
Profitability	-0.520***	0.025	-0.259***	-0.192	-0.082
	(-4.91)	(0.20)	(-2.74)	(-1.22)	(-1.56)
M/B	-0.005	-0.004	-0.007	-0.020	-0.003
	(-0.19)	(-0.54)	(-0.64)	(-0.78)	(-0.77)
ln(Sales)	0.017	0.015**	0.016	-0.014	-0.012
	(0.85)	(2.00)	(0.94)	(-1.25)	(-1.47)
FC	0.006***	0.002**	0.008***	0.000	0.000**
	(2.91)	(2.22)	(2.70)	(0.09)	(2.33)
OWNER	0.159	0.095	0.038	0.199	0.037
	(0.64)	(0.92)	(1.42)	(0.56)	(1.19)
FCOWNER	0.033*	0.013	0.031*	0.012	0.006
	(1.64)	(1.52)	(1.73)	(0.39)	(0.54)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	79276	1897	1897	1897	1897
R-squared	0.33	0.59	0.48	0.33	0.66

Table 6: **Leverage and real estate prices: financially constrained real estate owners**

This tables shows results of the triple-differences specification for financially constrained real estate owners by debt type (as percentage of total debt). Dummy variable OWNER equals one if the firm owns its real estate and zero otherwise. Variable FC is a continuous measure of financing constraints (the KZ index). Variable FCOWNER is defined as an interaction: FCOWNER = OWNER x FC. t-stats are reported in brackets. Standard errors cluster along both firm and year dimension.

	Debt Type - Share of Total Debt				
	Bonds	PPs	Program	Convertible	Mortgage
Instrumented $\Delta PRE_{t-1,t}$	0.168	0.025	-0.009	-0.014**	0.013
	(1.32)	(1.12)	(1.53)	(-2.07)	(1.62)
FC x Instr. $\Delta PRE_{t-1,t}$	0.087**	0.036**	-0.002	-0.026**	0.102**
	(2.22)	(2.19)	(-1.58)	(-2.52)	(2.47)
OWNER x Instr. $\Delta PRE_{t-1,t}$	0.099**	0.028	-0.015	-0.061*	0.198*
	(2.06)	(1.07)	(-1.61)	(-1.86)	(1.84)
FCOWNER x Instr. $\Delta PRE_{t-1,t}$	0.156**	0.091*	-0.025*	-0.071**	0.255***
	(2.01)	(1.75)	(-1.70)	(-2.02)	(2.87)
Profitability	-0.041	-0.078	-0.071	0.073	0.055
	(-0.39)	(-0.77)	(-1.24)	(0.81)	(1.17)
M/B	-0.002	-0.004	0.004	-0.043**	-0.001
	(-0.23)	(-0.21)	(0.31)	(-2.40)	(-0.31)
ln(Sales)	0.050***	0.007	0.013***	-0.015*	-0.016***
	(6.84)	(0.82)	(4.19)	(-1.73)	(-4.67)
FC	0.000	0.002*	-0.001	-0.000	0.001**
	(1.11)	(1.76)	(-1.21)	(-0.23)	(2.31)
OWNER	0.036	0.004	0.104	0.055	0.033
	(1.62)	(1.03)	(0.73)	(0.75)	(0.81)
FCOWNER	0.040*	0.023	0.009	-0.005	0.020*
	(1.94)	(1.08)	(0.56)	(-0.23)	(1.90)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	1897	1897	1897	1897	1897
R-squared	0.62	0.64	0.72	0.66	0.52

Table 7: **Leverage and real estate prices by debt maturity**

This table shows the effect of real estate prices on company leverage by debt maturity. The dependent variable is total debt maturing in years 1-5, as a fraction of market value of total assets. t-stats are reported in brackets.Standard errors cluster along both firm and year dimension.

	Debt Maturity - Share of Total Assets				
	1 yr	2 yr	3 yr	4 yr	5 yr
Instrumented $\Delta\text{PRE}_{t-1,t}$	-0.005	0.000	0.004	0.006***	0.014**
	(-0.34)	(1.23)	(0.86)	(2.64)	(2.41)
FC x Instr. $\Delta\text{PRE}_{t-1,t}$	0.001	0.005	0.006**	0.014**	0.024***
	(1.09)	(1.29)	(2.47)	(2.58)	(3.14)
Profitability	-0.035	-0.117	-0.003	0.030	-0.121
	(-0.74)	(-1.50)	(-0.05)	(0.59)	(-1.50)
M/B	-0.011***	-0.008	0.003	-0.008	0.001
	(-2.80)	(-0.56)	(0.22)	(-0.69)	(0.05)
ln(Sales)	-0.018**	-0.010	-0.056***	0.006	0.027
	(-2.34)	(-0.78)	(-3.31)	(0.38)	(1.52)
FC	0.001	-0.002	0.001**	0.001**	0.000
	(0.82)	(-1.15)	(2.04)	(1.97)	(0.01)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	54305	54305	54305	54305	54305
R-squared	0.29	0.22	0.06	0.08	0.08

Table 8: **Land prices and firm cost of debt**

This table presents evidence of the impact of real estate price growth on firm cost of debt. Average short term borrowing rate was obtained from COMPUSTAT, while average long term borrowing rate was obtained from detailed deal-level data from DealScan. In Panel A, I report results of the baseline IV specification, with the dependent variable being a firm's average long-term and short-term cost of debt. In panel B, I present evidence of this effect for likely financially constrained firms, as measured by the KZ index (variable FC). t-stats are reported in brackets.

Panel A	Avg LT borrowing rate	Avg ST borrowing rate
Instrumented $\Delta \text{PRE}_{t-1,t}$	-0.038**	-0.017
	(-2.10)	(-1.18)
Profitability	-0.072***	-0.002
	(-3.39)	(-0.64)
M/B	-0.405**	0.004
	(-2.38)	(0.62)
ln(Sales)	0.207	0.002
	(1.01)	(0.79)
Firm-Fixed effect	Yes	Yes
MSA-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
R-squared	0.80	0.75

Panel B	Avg LT borrowing rate	Avg ST borrowing rate
Instrumented $\Delta \text{PRE}_{t-1,t}$	-0.019**	-0.004
	(-2.32)	(-1.26)
FC x Instr. $\Delta \text{PRE}_{t-1,t}$	-0.023	-0.007
	(-1.52)	(-0.56)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	-0.060***	-0.005
	(-3.56)	(-0.69)
FCOWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	-0.078***	-0.022
	(-2.81)	(-0.91)
Profitability	0.156**	-0.174
	(2.12)	(-1.49)
M/B	0.008***	-0.871
	(5.34)	(-1.02)
ln(Sales)	-0.029***	0.734*
	(-5.23)	(1.75)
FC	-0.005***	-0.060
	(-5.12)	(-0.55)
OWNER	0.001	1.035
	(0.09)	(0.54)
FCOWNER	-0.004	-0.136
	(-0.24)	(-0.44)
Firm-Fixed effect	Yes	Yes
MSA-Fixed effect	Yes	Yes
Year-Fixed effect	Yes	Yes
R-squared	0.86	0.38

Table 9: **Summary statistics for financial covenants data**

This table presents summary statistics for a sample of private credit agreements to 3,078 public borrowers obtained from Nini et al.(2009), collected from the SEC's EDGAR electronic filing system over the period 1996-2005. Agreement amount includes total dollar proceeds available to the borrower. LIBOR is the London Interbank Offer Rate. Coverage ratio covenants include interest coverage, fixed charge coverage, and debt service coverage covenants. Debt to balance sheet covenants include debt to total capitalization and debt to net worth covenants. Liquidity covenants include current ratio, quick ratio, and working capital covenants. Credit ratings are from Standard & Poor's, and a rating lower than BBB is considered to be junk rated.

	Mean	Median	St. Dev.	N
Loan Amount (in $ millions)	415	190	850	3078
Loan Amount / Total Assets	0.278	0.212	0.296	3078
Interest rate spread (bp above LIBOR)	150.631	112.5	131.508	3078
Coverage ratio covenant (1,0)	0.776	1	0.418	3078
Debt to Cash Flow covenant (1,0)	0.557	1	0.498	3078
Net worth covenant (1,0)	0.374	0	0.485	3078
Debt to balance sheet covenant (1,0)	0.287	0	0.454	3078
Liquidity covenant (1,0)	0.086	0	0.281	3078
Minimum cash flow covenant (1,0)	0.069	0	0.254	3078
Financial covenant violation within past year (1,0)	0.028	0	0.166	3078
Credit rating (1 = AAA or AA, 2 = A, 3 = BBB . . .)	2.295	2	1.061	3078

Table 10: **Real estate prices and presence of financial covenants**

This table presents estimated coefficients from panel probit regressions that relate the probability of having a capital expenditure restriction or a financial covenant in a financial contract in one period to real estate price (thus collateral value) appreciation in the immediately preceding period. The dependent variable in all regressions is a dummy variable that equals one if the newly issued financial contract contains a covenant of a particular type (i.e. Debt/Capitalization, Net worth etc.). Panel A shows the results of the unconditional probit IV specification, while in Panel B I report estimates of the probit IV specification conditional on a firm having a capital expenditure restriction in at least one point during the sample period.

Panel A	Type of covenant					
Probit regressions - unconditional	New CAPX restriction	Debt/ Capitalisation	Net Worth	Shareholder's Equity	Tangible Net Worth	No. of covenants per deal
Instrumented $\Delta PRE_{t-1,t}$	-0.017***	-0.023***	-0.020***	-0.047***	-0.017**	-0.015*
	(-2.68)	(-3.21)	(-3.38)	(-2.61)	(-2.07)	(-1.77)
Profitability	-0.736	1.185	0.451	-1.097	-1.453**	-1.231
	(-0.63)	(1.53)	(0.51)	(-0.81)	(-2.17)	(-1.56)
M/B	-0.067	-0.052	-0.136	0.295***	-0.288*	-0.133
	(-0.73)	(-0.72)	(-1.50)	(3.33)	(-1.83)	(-0.66)
ln(Sales)	-0.124	-0.151*	-0.030	-0.065	-0.139**	0.102
	(-1.59)	(-1.94)	(-0.47)	(-0.48)	(-2.10)	(1.33)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3047	2954	2954	2954	2954	2954
R-squared	0.01	0.02	0.04	0.11	0.03	0.07

Panel B	Type of covenant					
Probit regressions - conditional on CAPX restriction	New CAPX restriction	Net Worth	Senior Debt / Cash Flow	Shareholder's Equity	Tangible Net Worth	No. of covenants per deal
Instrumented $\Delta PRE_{t-1,t}$	-0.018**	-0.044***	-0.023*	-0.046**	-0.029**	-0.030**
	(-2.18)	(-3.56)	(-1.85)	(-2.12)	(-2.51)	(-1.97)
Profitability	5.308**	5.050*	-1.665	2.734**	3.934*	-1.115
	(2.07)	(1.86)	(-1.21)	(2.57)	(1.81)	(-1.01)
M/B	-0.968**	0.074	0.238	-0.442*	-0.779**	-0.202
	(-2.00)	(0.22)	(0.90)	(-1.90)	(-2.32)	(-0.90)
ln(Sales)	0.134	-0.042	0.037	-0.065	-0.010	-0.142
	(1.21)	(-0.37)	(0.57)	(-1.03)	(-0.08)	(-1.49)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3047	2954	2954	2954	2954	2954
R-squared	0.01	0.02	0.04	0.11	0.03	0.07

Table 11: **Real estate equity extraction: financially constrained owners**

This table shows results of triple-differences analysis of firm spending with respect to increased borrowing for likely financially constrained real estate owning firms. I measure the level of financing constraints using the KZ index (variable FC), and the firm is defined as a real estate owner if its annual rental expense scaled by gross PPE is less then 5%. The table shows results for R&D expense, dividends, capital expenditure, cash, acquisitions and purchases of equity, scaled by firm total assets. Investment is defined as CAPEX scaled by total assets. t-statistics are reported in brackets. Standard errors cluster along both firm and year dimension.

	Share of Total Assets							
	R&D	Dividends (common)	Dividends (pref.)	Investment	Cash	Cash and ST investments	Acquisitions	Purchase of equity
Instrumented $\Delta\text{PRE}_{t-1,t}$	0.002	0.010*	0.016	0.014***	-0.117	-0.162**	0.098	0.013**
	(1.03)	(1.66)	(0.36)	(2.79)	(-1.13)	(-2.45)	(1.50)	(2.05)
FC x Instr. $\Delta\text{PRE}_{t-1,t}$	0.129*	0.012**	0.049	0.166***	-0.133	-0.172***	0.104	0.017**
	(1.65)	(2.38)	(1.10)	(2.93)	(-0.93)	(-2.82)	(1.23)	(2.09)
OWNER x Instr. $\Delta\text{PRE}_{t-1,t}$	0.061	0.016	0.023	0.302	-0.157	-0.207*	0.221	0.015**
	(1.39)	(1.05)	(0.93)	(1.43)	(-1.43)	(-1.89)	(1.47)	(2.13)
FCOWNER x Instr. $\Delta\text{PRE}_{t-1,t}$	0.215***	0.018**	0.039	0.303**	-0.251**	-0.219**	0.188	0.066***
	(2.61)	(2.38)	(1.54)	(2.43)	(-2.37)	(-2.46)	(1.57)	(2.65)
Profitability	-0.168***	0.019***	-0.016*	0.071	-0.078	-0.134*	-0.040	0.110**
	(-3.49)	(3.07)	(-1.66)	(1.44)	(-1.40)	(-1.68)	(-1.09)	(2.31)
M/B	0.010**	0.001*	0.002	0.018***	0.004	-0.011	-0.018*	0.005
	(2.26)	(1.89)	(0.92)	(3.43)	(0.49)	(-0.87)	(-1.76)	(0.69)
ln(Sales)	-0.007	-0.001	-0.001	-0.004	-0.023***	-0.048***	-0.009	0.002
	(-0.91)	(-0.71)	(-0.44)	(-0.90)	(-5.62)	(-6.87)	(-1.09)	(0.36)
FC	0.086*	0.013*	0.020	0.117	0.204*	0.451***	0.093	0.036
	(1.66)	(1.75)	(0.83)	(1.34)	(1.69)	(3.26)	(0.39)	(1.36)
OWNER	0.027*	0.014**	0.016	0.128***	0.121	0.157	0.174*	0.021
	(1.70)	(2.31)	(1.43)	(2.62)	(1.44)	(1.56)	(1.91)	(1.42)
FCOWNER	0.047**	0.020**	0.010	0.206***	0.085	-0.142	0.113	0.005**
	(2.00)	(2.32)	(0.50)	(2.85)	(0.80)	(-1.12)	(0.66)	(2.09)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33176	55052	43653	54731	54879	55201	53045	49305
R-squared	0.61	0.68	0.31	0.48	0.15	0.11	0.21	0.24

Table 12: **Real estate prices and firm debt: dollar for dollar changes**

This table shows the effect of real estate prices on firm debt by priority and type in terms of dollar-for-dollar changes. Column 2 reports the results from the first-stage regression. The dependent variable in the second stage is total debt, debt by priority and by type. All specifications control for firm-, MSA- and year-fixed effects and include a set of firm controls: profitability, market-to-book and size. t-statistics are reported in brackets. Standard errors cluster along both firm and year dimension.

	$\Delta \text{PRE}_{t-1,t}$	Debt								
		Total	By priority			By type				
			Secured	Unsecured	Subordinated	Bonds	PPs	Program	CV	Mortgage
Land Supply Inelasticity x $\Delta \text{P}^{US}_{t-1,t}$	35.586***									
	(5.16)									
Instrumented $\Delta \text{PRE}_{t-1,t}$		0.288**	0.377**	0.075	0.029*	0.103***	0.342*	-0.381**	-0.049**	0.027**
		(2.57)	(2.11)	(1.48)	(1.66)	(2.76)	(1.71)	(-2.06)	(-2.08)	(2.08)
Profitability		-0.032*	-0.286**	-0.732	-0.004*	-0.001*	0.542	-0.007**	0.003**	0.005
		(-1.70)	(-2.10)	(-1.48)	(-1.67)	(-1.74)	(1.55)	(-2.07)	(2.09)	(1.48)
M/B		-0.038***	-0.004	0.004	-0.003	-0.002	-0.003	-0.610***	-0.137*	0.112**
		(-3.58)	(-0.74)	(1.51)	(-0.65)	(-0.60)	(-1.09)	(-5.25)	(-1.83)	(2.01)
ln(Sales)		0.008***	0.013*	0.010*	0.019*	0.001	0.000	0.007	0.039***	0.031***
		(2.75)	(1.74)	(1.71)	(1.71)	(0.19)	(0.02)	(0.36)	(10.46)	(12.68)
Year-Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA-Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Fixed effect		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	90246	90246	2178	2178	2178	2178	2178	2178	2178	2178
R-squared	0.32	0.79	0.75	0.76	0.61	0.61	0.65	0.85	0.51	0.89

Table 13: **Testing exclusion restriction**

This table shows results of exclusion restriction tests for land supply elasticity as an instrument for real estate price growth. Personal Income, Per Capita Income and Wage Growth shocks are defined as the difference between 1998 to 2002 and 2002 to 2006 growth rates.

	Real GDP growth 2002-06	Per Capita GDP growth 2002-06	Personal Income Growth 2002-06	Per Capita Personal Income Growth 2002-06	Wage Growth 2002-06	Personal Income Growth Shock	Per Capita Income Growth Shock	Wage Growth Shock
Land Supply Inelasticity	-0.018	-0.011	-0.012	-0.008	-0.008	-0.005	-0.008	-0.001
	(-1.53)	(-1.29)	(-1.30)	(-1.26)	(-0.86)	(-0.73)	(-1.66)	(-0.09)
Constant	0.133***	0.087***	0.247***	0.195***	0.214***	0.039**	0.042***	0.021
	(4.99)	(4.47)	(13.88)	(12.86)	(11.57)	(2.34)	(3.81)	(0.96)
Observations	1232	1232	1232	1232	1232	1232	1232	1232
R-squared	0.07	0.04	0.04	0.03	0.01	0.01	0.04	0.00

Table 14: **High vs. low dividend payout firms**

This table presents results on the effect of collateral value changes on leverage priority structure for likely (low-dividend payout) vs. unlikely financially constrained (high-dividend payout) real estate owning firms. As a robustness check, I measure the level of financing constraints using an ex-ante clasification scheme based on dividend payout ratio. High-dividend payout sample consists of all firms that are ranked in the top 3 deciles of the total annual payout distribution (common dividends plus stock repurchases). t-statistics are shown in brackets. Standard errors cluster along both firm and year dimension.

	Debt Type - Share of Total Assets							
	High Dividend Payout				Low Dividend Payout			
	Total	Secured	Senior Unsecured	Subordinated	Total	Secured	Senior Unsecured	Subordinated
Instrumented $\Delta \text{PRE}_{t-1,t}$	0.351	0.363	-0.168	0.158**	0.577*	0.190*	0.465*	0.325**
	(1.58)	(1.08)	(-1.05)	(2.18)	(1.79)	(1.78)	(1.66)	(1.97)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.414*	0.265	0.094	0.055	0.851**	0.230**	0.273**	0.477
	(1.88)	(1.53)	(1.52)	(1.39)	(1.99)	(2.17)	(2.44)	(1.06)
Profitability	-0.234**	0.012	-0.206*	-0.040	-0.631***	-0.081	-0.260*	-0.282***
	(-2.00)	(0.08)	(-1.79)	(-0.67)	(-4.42)	(-1.43)	(-1.73)	(-5.20)
M/B	-0.000	-0.024	0.029	-0.005	-0.036	-0.001	0.039	-0.005
	(-0.01)	(-0.78)	(1.37)	(-0.67)	(-1.10)	(-0.11)	(1.54)	(-0.44)
ln(Sales)	0.053	0.058	0.019	-0.014	0.063***	0.004	0.037*	0.022**
	(0.94)	(0.88)	(0.58)	(-0.87)	(2.61)	(0.41)	(1.77)	(2.31)
OWNER	0.127	0.058	0.084	-0.015	0.251*	0.001	0.389	0.164
	(0.63)	(0.27)	(0.89)	(-0.21)	(1.82)	(1.02)	(1.24)	(1.05)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34600	747	747	747	44676	1370	1370	1370
R-squared	0.51	0.53	0.52	0.77	0.50	0.56	0.62	0.51

Table 15: **Debt structure: high vs low dividend payout firms**

This table presents results on the effect of collateral value changes on debt mix structure for likely (low-dividend payout) vs. unlikely financially constrained (high-dividend payout) real estate owning firms. As a robustness check, I measure the level of financing constraints using an ex-ante clasification scheme based on dividend payout ratio. High-dividend payout sample consists of all firms that are ranked in the top 3 deciles of the total annual payout distribution (common dividends plus stock repurchases). t-statistics are shown in brackets. Standard errors cluster along both firm and year dimension.

Panel A	Debt Type - Share of Total Debt				
	High Dividend Payout				
	Bonds	PPs	Program	Convertible	Mortgage
Instrumented $\Delta \text{PRE}_{t-1,t}$	0.028	-0.292	0.044	-0.064*	0.424
	(1.10)	(-1.23)	(1.16)	(-1.73)	(1.28)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.112	0.053	-0.127	0.131	-0.174
	(1.50)	(0.27)	(-1.14)	(0.49)	(-0.77)
Profitability	-0.129	-0.021	-0.025	0.087	0.011
	(-0.72)	(-0.31)	(-0.20)	(0.91)	(0.13)
M/B	-0.007	0.017	0.024	-0.000	-0.026
	(-0.27)	(1.47)	(1.22)	(-0.03)	(-0.79)
ln(Sales)	0.066	0.053**	0.004	0.012	-0.091
	(1.30)	(2.18)	(0.10)	(1.12)	(-1.63)
OWNER	0.185*	-0.060	0.171**	0.021	0.086
	(1.80)	(-0.57)	(2.19)	(0.97)	(0.43)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	726	726	726	726	726
R-squared	0.65	0.71	0.72	0.55	0.62

Panel B	Low Dividend Payout				
	Bonds	PPs	Program	Convertible	Mortgage
Instrumented $\Delta \text{PRE}_{t-1,t}$	0.160*	0.097	-0.084**	-0.016**	0.144**
	(1.86)	(1.65)	(2.19)	(-2.32)	(2.18)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.233**	0.198*	-0.279**	-0.133**	0.231**
	(2.16)	(1.92)	(-2.45)	(-2.42)	(2.69)
Profitability	-0.157***	-0.042	-0.048*	0.057	0.064
	(-2.90)	(-0.51)	(-1.76)	(0.63)	(1.12)
M/B	-0.012	-0.000	-0.000	-0.014	-0.007
	(-1.22)	(-0.03)	(-0.30)	(-0.64)	(-0.96)
ln(Sales)	0.062***	0.001	0.012**	-0.007	-0.030***
	(5.57)	(0.08)	(2.35)	(-0.35)	(-4.21)
OWNER	0.006	0.018	0.059	0.053	0.041**
	(1.10)	(1.28)	(1.34)	(1.62)	(2.44)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	1316	1316	1316	1316	1316
R-squared	0.37	0.43	0.61	0.62	0.68

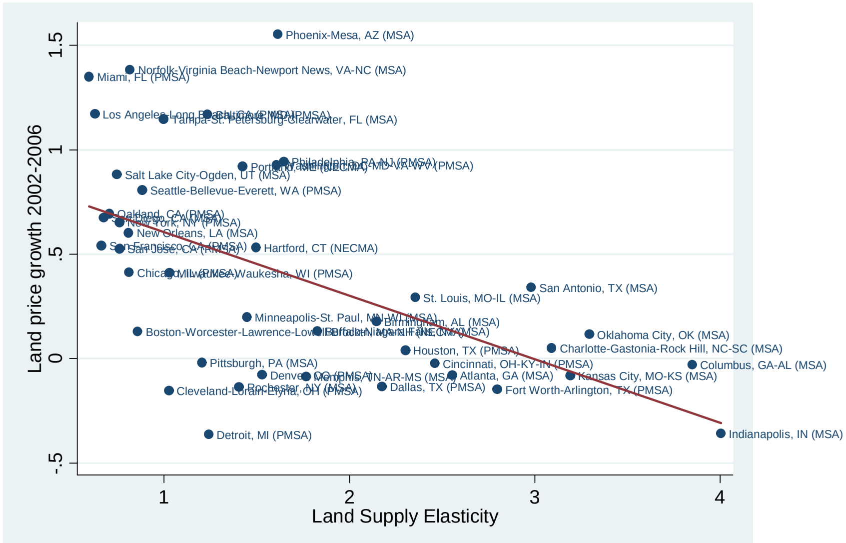
Table 16: **Real estate equity extraction: high vs. low dividend payout firms**

This table shows results of triple-differences analysis of firm spending with respect to increased borrowing for likely (low-dividend payout) vs. unlikely financially constrained (high-dividend payout) real estate owning firms. As a robustness check, I measure the level of financing constraints using an ex-ante clasification scheme based on dividend payout ratio. High-dividend payout sample consists of all firms that are ranked in the top 3 deciles of the total annual payout distribution (common dividends plus stock repurchases). The table shows results for R&D expense, dividends, capital expenditure, cash, acquisitions and purchases of equity, scaled by firm total assets. t-statistics are shown in brackets. Standard errors cluster along both firm and year dimension.

Panel A	Share of Total Assets					
	High Dividend Payout					
	R&D	Dividends (common)	Investment	Cash	Acquisitions	Purchase of equity
Instrumented $\Delta \text{PRE}_{t-1,t}$	0.019**	0.024	0.014	-0.041	0.118	0.025**
	(1.94)	(1.49)	(1.27)	(-0.31)	(1.21)	(2.11)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.021**	0.061**	0.035*	-0.052	0.026	0.034**
	(2.10)	(2.36)	(1.74)	(-1.41)	(1.22)	(2.20)
Profitability	0.114**	0.072***	0.073***	0.119**	0.025	0.440***
	(2.53)	(4.64)	(3.78)	(2.42)	(0.54)	(3.05)
M/B	-0.005	0.007**	0.001	0.001	-0.002	0.030
	(-0.72)	(2.24)	(0.16)	(0.06)	(-0.14)	(1.38)
ln(Sales)	-0.005	-0.003	0.011	-0.019	0.023	-0.050
	(-0.40)	(-0.60)	(1.16)	(-0.90)	(1.13)	(-1.30)
OWNER	0.030	0.015	0.023	-0.062	0.014	0.003
	(1.33)	(1.57)	(0.83)	(-1.13)	(0.27)	(1.05)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	34600	34600	34600	34600	34600	34600
R-squared	0.83	0.84	0.53	0.56	0.29	0.47

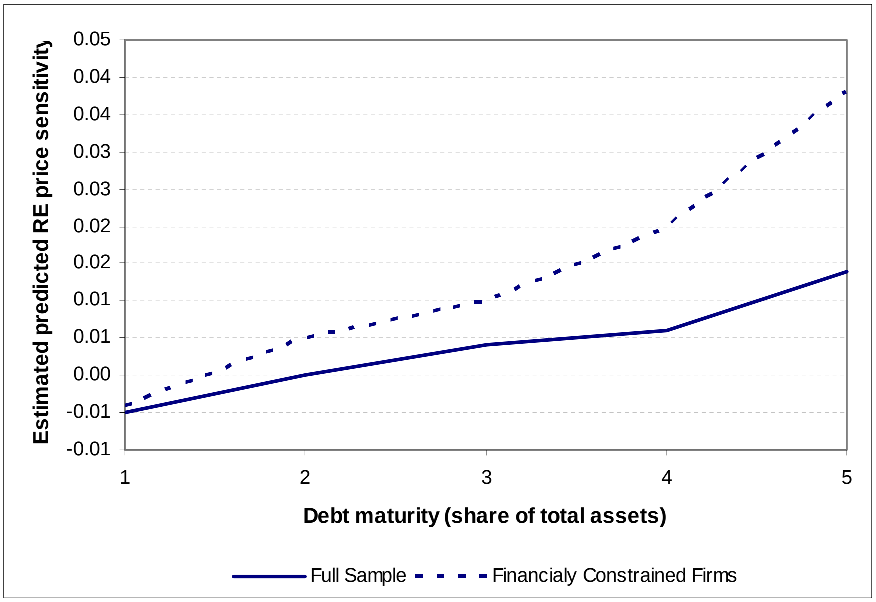
Panel B	Low Dividend Payout					
	R&D	Dividends (common)	Investment	Cash	Acquisitions	Purchase of equity
Instrumented $\Delta \text{PRE}_{t-1,t}$	0.134	0.209	0.114*	-0.186**	0.166*	0.024
	(1.26)	(1.51)	(1.62)	(-2.36)	(1.68)	(1.14)
OWNER x Instr. $\Delta \text{PRE}_{t-1,t}$	0.195**	0.296**	0.444**	-0.211**	0.182	0.119*
	(2.45)	(2.04)	(2.34)	(-2.59)	(1.36)	(1.79)
Profitability	-0.311***	-0.048	-0.076	-0.091**	-0.032	0.042
	(-5.66)	(-1.03)	(-1.00)	(-2.19)	(-0.88)	(1.04)
M/B	-0.022	-0.018	-0.024*	0.026	-0.012*	-0.001
	(-1.56)	(-0.94)	(-1.91)	(0.95)	(-1.75)	(-0.26)
ln(Sales)	0.013	0.010	0.018	-0.020	0.009	0.001
	(0.55)	(0.83)	(1.50)	(-1.10)	(0.74)	(0.28)
OWNER	0.067	0.055	0.093	0.065	0.092	0.025
	(1.30)	(1.41)	(1.51)	(0.42)	(1.20)	(1.37)
Firm-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
MSA-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year-Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Observations	44676	44676	44676	44676	44676	44676
R-squared	0.53	0.62	0.58	0.46	0.34	0.39

Figure 1: **Real estate price growth and land supply elasticity**



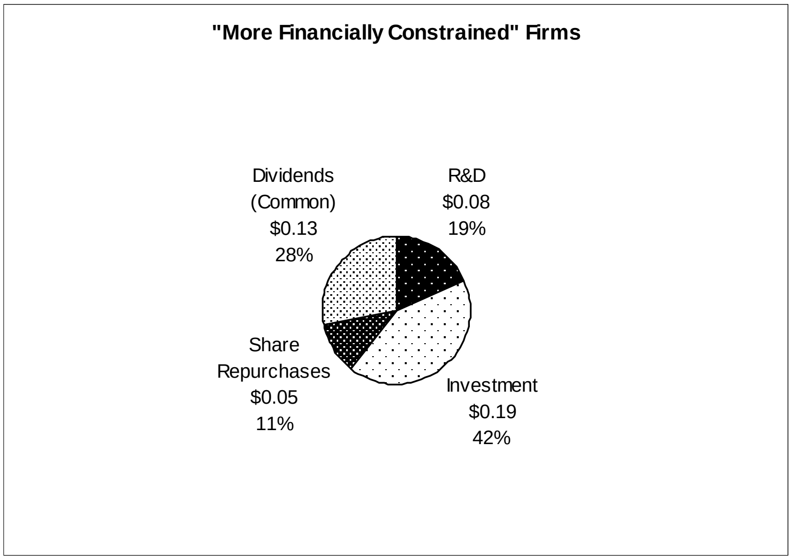
This figure plots land price growth from 2002 to 2006 against land supply elasticity, as measured by Saiz (2010) for the 46 MSAs in my sample.

Figure 2: **Sensitivity of leverage maturity to collateral value changes**



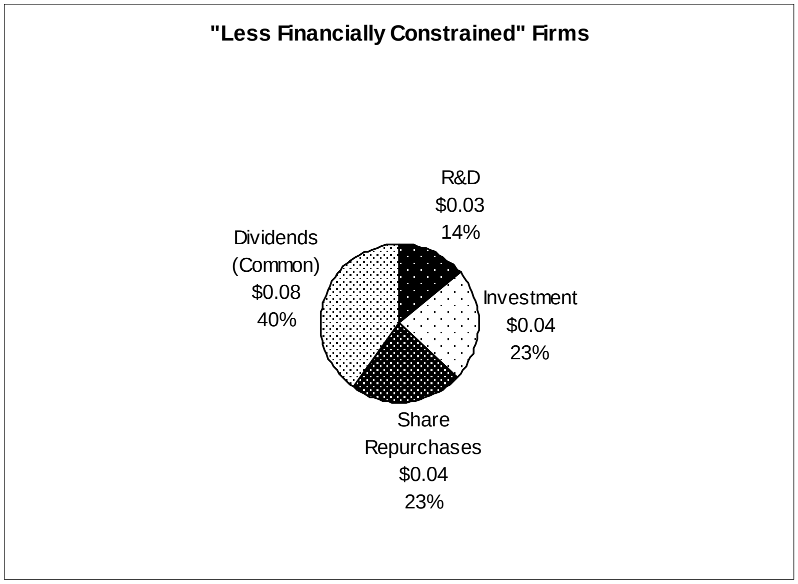
This figure plots the sensitivity of different debt maturities (as a fraction of total assets) to predicted real estate value changes.

Figure 3: **Estimated usage of $1 increase in value of firm collateral: more "financially constrained" firms.**



This figure shows the estimated real estate equity extraction for financially constrained firms. On every $1 increase in the value of their collateral, financially constrained firms borrow 45 cents.

Figure 4: **Estimated usage of $1 increase in value of firm collateral: financially unconstrained firms.**



This figure shows the estimated real estate equity extraction for financially unconstrained firms. On every $1 increase in the value of their collateral, financially unconstrained firms borrow 19 cents.