# How Do Firms React to Balance Sheet Shocks ? Evidence From Land Holdings *

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**Abstract**

This paper is an empirical study of the effect of shocks to firms' collateral, with a focus on land holdings. We find evidence that firms are credit constrained. Firms invest $0.35 more per extra dollar of collateral, and they finance this additional investment by issuing more debt. They take on cheaper loans and increase their leverage; their debt is viewed less risky by investors. Such a relaxation of financing constraints allows firms to improve their performance, in particular in corporation where shareholders are powerful.

## 1 Introduction

Only the rich get richer. In the presence of financial frictions, the value of a firm's collateral plays a key role in determining the amount this firm can borrow, and the projects this firm can invest in. Barro (1976), Stliglitz and Weiss (1981) and more recently Kiyotaki and Moore (1997) point out that with either moral hazard or adverse selection, collateral will enhance a

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firm's ability to issue debt and to invest. Despite an important theoretical literature, there is scant evidence on the role of collateral in determining corporate investment. The existing literature instead has focused on the effect of cash on investment. Yet, cash holdings are not the only wealth that a firm can use to finance new investment.

This paper is an empirical study of the effect of shocks to firms' collateral, with a focus on land holdings. We find evidence that firms are credit constrained. Firms invest $0.35 more per extra dollar of collateral, and they finance this additional investment by issuing more debt. They take on cheaper loans and increase their leverage; their debt is viewed less risky by investors. Such a relaxation of financing constraints allows firms to improve their performance, in particular in corporation where shareholders are powerful.

We believe these results are important for at least two reasons. The first implication is positive: it suggests that large, exogenous shifts in the value of corporate equity - land in this case - have sizeable effects on corporate demand for equipment goods. Such a "corporate wealth effect" might explain how purely financial shocks generate persistent macroeconomic fluctuations, as argued in the macroeconomics literature since at least Bernanke and Gertler (1988). Our paper uncovers the micro foundations of such a macroeconomic model in a precise manner. The second implication of our analysis is normative. As positive shocks to land value alleviate financing constraints, holding real estate on the balance sheet may provide a useful corporate hedging mechanism. Following up on Holmstrom and Tirole (1998,2000), our analysis suggests that firms should benefit more from holding land when their returns are less correlated with their liquidity needs.

Because their effects are easy to measure, we focus on shocks on the value of land holdings of US firms. Our empirical strategy rests on computing triple differences. We look at states with above and below mean real estate inflation. Within those states, we compare *the evolution* of investment of firms who own land and firms who do not. The differences (among theses states, firms and years) measure the effect of collateral shock on investment strategy. Real estate is an appealing type of collateral to study credit constraints because it is a commonly used source of collateral, either in developed (Davydenko and Franks (2005)) or in developing economies (World Bank Survey (2005)). Besides, land price shocks are likely to be exogenous to investment opportunities for firms outside the finance, insurance, construction and real estate industries. Land price thus provides us with a very natural source of variation in collateral, although we believe that our analysis extends to other forms of capital, like foreign exchange denominated securities, or even trade credit. Nevertheless, it could be argued that real estate shocks proxy for local demand shocks that especially affect land holding firms, and this for reasons that are independent from land ownership. We treat such criticism seriously, and use various sources of land price variation that are credibly exogenous to local demand conditions.

The first half of our strategy is illustrated in figure 1, which looks at investment in California. The blue line shows real estate inflation, while excess investment growth for Californian firms owning real estate is drawn in pink. When real estate inflation in California is high, firms located there with significant land holdings have higher investment growth than firms with no land holdings. It is important, however, to stress that our empirical strategy does not only use this within-state comparison as a source of identification. We also take advantage of the heterogeneity in real estate prices variations amongst U.S. states. As figure 2 shows, such inter-state heterogeneity allows us to compare the behavior of land owning firms between states with high, and states with low, real estate inflation. This is our second source of identification.

Leaning on this strategy, we first report robust causal evidence that real estate inflation has a positive and significant impact on the investment behavior. The magnitude of this effect is not negligible. Overall, we find that when real estate prices increase by one standard deviation, firms with significant real estate ownership experience, relative to firms with no real estate assets, an increase in their level of capital expenditures, ranging from 3 to 6% of the standard deviation of investment. Put another way, firms invest \$0.35 more per additional dollar of collateral, other things equal. This effect is large compared to the existing literature. Investment to cash flow sensitivity coefficients typically give an additional \$0.10 investment per extra dollar of cash, whereas Rauh (2006) finds a decrease of \$0.60-\$0.70 in investment per dollar of mandatory contributions. Arguably, real estate assets are less liquid than cash. Still, it appears that firms are able to make use of such collateral to generate additional investments.

We then investigate the channel through which the increase in land holding value is converted into increased investment. We find that firms with significant land holdings in state with increased real estate prices significantly modify their capital structure. They do so by (1) increasing their long-term leverage and (2) decreasing their cost of debt. A one standard-deviation change in the real estate price index explains a change of 3% standard-deviation in leverage. We then look more precisely into debt contracts. We find that new debt contracts tend to be cheaper and viewed as less risky by both the market and private investors.

Third, we investigate the profitability of the investment made from this increased collateral value. As discussed by Blanchard, Lopez de Silanes and Shleifer (1994), investment may be sensitive to cash flows for two reasons: because of adverse selection on financial markets (Myers and Majluf, 1984) or because of managerial moral hazard (Jensen and Meckling, 1976). In the first case, a relief on financial constraints should increase value while in the second, it should decrease value. We find that firms with weak shareholders (as measured by various index from the corporate governance literature) experience a decrease in their operating profitability when confronted with a "collateral windfall". In contrast, the profitability of investor-friendly firms increases. Thus, the shocks in collateral that we expose in this paper also provides us with a good way to evaluate the extent of the shareholder - manager conflict.

While most of the existing theory relates investment to debt capacity, and debt capacity to collateral, the empirical literature has sought to show the effect of cash *flows* on investment (Fazzari, Hubbard, and Petersen (1988)). As cash flows are also a measure of profitability, recent papers identify cash flows shocks that are orthogonal to investment opportunies (Blanchard, Lopez-de-Silanes and Shleifer (1994), Lamont (1997), Rauh (2006)). Closer to the present paper, Almeida, Campello and Weisbach (2003) have focused on the role of cash *holdings*. They show that credit constrained firms tend to store cash on their balance sheet to avoid forgoing valuale investment opportunities in the future.

Rather than looking at cash (flows or stock), we focus on exogenous fluctuations in the value of collateral, in a large panel of firms. To our knowledge, the only existing papers on collateral shocks are Peek and Rosengreen (2000), Goyal and Yamada (2001) and Gan (2006). These contributions focus on corporate investment in the very specific context of the 1980s Japanese real estate bubble. Our paper is on US firms, and uses a more stringent identifying strategy - triple, instead of double, differences.

In addition, we make use of our focus on collateral to touch three issues that have been unexplored by most of the empirical literature. First, we investigate the effect of corporate wealth shocks on capital structure. This allows us to add to the literature on financing choices, which has so far mostly used endogenous and temporary shocks to corporate wealth (see for instance Myers and Shyam-Sunders, 1999). In response to an exogenous and permanent balance sheet shock, we ask if firms adjust their leverage and/or reduce their cost of capital. Our results complement the findings of Benmelech, Garmaise and Moskowitz (2005) that more liquid assets (or more "redeployable" assets) are financed with loans of longer maturities and durations, as well as lower interest rates. Second, we evaluate the profitability of constrained investment. This allows us to test if financing constraints originate in the agency cost of separation of ownership and control, or in asymmetric information on financial markets. Apart from Blanchard, Lopez de Silanes and Shleifer (1994), few papers have investigated this issue.

The rest of the paper is structured as followed. Section 2 presents the construction of the data as well as some summary statistics. Section 3 provides the main results on corporate investment and section 4 capital structure. Section 5 explores the link between corporate governance and investment performance. Section 6 concludes.

# 2 Data

We use accounting data of US listed firms, merged with real estate prices measured both at the level of the state (and the MSA), where these firm's headquarters are located. We complement this information with governance data from various sources, as well as data on land supply constraints.

## 2.1 Accounting and Governance Data

We begin with the entire sample of active COMPUSTAT firms between 1984 and 2004, with non-missing total assets (COMPUSTAT item #6). This provides us with a sample of 21,122 firms and a total of 185,300 firm-year observations. We then keep firms located in a U.S. state and exclude from the sample firms operating in the finance, insurance, real estate and construction industry as well as firms involved in a major takeover operation. This leaves us for our main dataset with a sample of 127,086 firm-year for a total of 14,553 firms.

### Land Holding Data

As mentioned in the introduction, our identification strategy relies on comparing firms with land holding and firms with no land holding. Land holding of a company is given by COMPUSTAT item #260, i.e. "PPE - Land and Improvements at Cost", that we normalize by the previous year capital stock (lagged item #8).[1] In 1984, the first year for which land holding data are available in COMPUSTAT, 38% of firms were reporting positive land holdings.[2] For those firms with positive land holding, real estate assets represented almost 10% of the total capital stock of the company. Real estate thus stand for a substantial part of a firm's balance sheets and is frequently owned.

If we have detailed information on the amount of land owned by firms, COMPUSTAT does not provide us with the geographic location of each specific piece of land owned by a firm. So we use the state and county code of the headquarters as provided by COMPUSTAT. We therefore implicitly assume that firms tend to own land in the state, or even the city, where their headquarters are located. Such an approximation adds noise to our measure of changes in real estate value, but this is as far as the data allow us to go. In addition, such measurement error is likely to bias our estimates downward, if anything.

Table 9, in appendix, provides summary statistics for the main accounting variable we use in the paper. As it turns out, land value at historical cost amounts, averaged among land holding and non-land holding firms, to about 5% of firms' fixed assets.

### Governance Data

We then merge this dataset with corporate governance data. We use three different sources, because the debate on which specific dimension of governance

[1]As we will see later on in the paper, we also use COMPUSTAT item #263, i.e. "PPE - Buildings at Cost", as another measure of land holding in one of the various robustness check we perform.

[2]It should be stress that in 1984, 45% of firms (i.e. 2,477) did not report item #260 in COMPUSTAT. We nevertheless chose to treat these firms as firms with no land holding. Indeed, among them, 1,544 did never report any land holding in the subsequent years while 660 firms did report 0 land holding at some point, comforting us in the idea that no report was similar to no land holding. Our results are, however, neither qualitatively, nor quantitatively influenced by this assumption.

actually matters is fierce. First, the IRRC corporate governance and directors dataset. This dataset provides us with commonly used proxies for corporate governance, namely, the fraction of independent directors, the number of directors sitting on the board and the fraction of former employees sitting on the board. These variables are available for the 1996-2001 period only, and mostly for large firms. Second, the increasingly popular Gompers, Ishii, and Metrick's (2003) (hereafter GIM) index of corporate governance, which compiles various corporate governance provisions included in the CEO's compensation package, in the corporate charter and the board structure. The GIM index is available for 1990, 1993, 1995, 1998 and 2001. In other years, we assume that it takes the value that it had in the most recent year when it was non missing. Third, we will also use the Bebchuk et al. (2004) Entrenchment Index. This index, available from 1990 to 2003, is based on six provisions - four constitutional provisions that prevent a majority of shareholders from having their way (staggered boards, limits to shareholder bylaw amendments, supermajority requirements for mergers, and supermajority requirements for charter amendments), and two takeover readiness provisions that boards put in place to prevent hostile takeovers (poison pills and golden parachutes). The merging process leaves us with a sample of 2,211 firms for which the GIM index is non-missing, 2,358 firms for which the Entrenchment index is non-missing and 1,281 firms for which board size is available.

Although it can be debated, we will, as their authors do, consider that a large value of these index indicates strong managers and weak owners. Thus, everything else equal, we expect such firms to maximize value to a lesser extent.

## 2.2 Real Estate Data

### 2.2.1 Real Estate Prices

Data for real estate prices come from the Office of Federal Housing Enterprise Oversight[3]. The O.F.H.E.O. is an independent entity within the Department of Housing and Urban Development, whose primary mission is "ensuring the capital adequacy and financial safety and soundness of two government-sponsored enterprises (GSEs) - the Federal National Mortgage Association (Fannie Mae) and the Federal Home Loan Mortgage Corporation (Freddie Mac)". The O.F.H.E.O. provides a Home Price Index (HPI), which

[3] `http://www.ofheo.gov/index.asp`

is a broad measure of the movement of single-family house prices. Because of the breadth of the sample, it provides more information than is available in other house price indexes. In particular, the HPI is available at the state level since 1975. It is also available for the 61 largest Metropolitan Statistical Areas, with a starting date between 1977 and 1987 depending on the MSA considered. We match the state level HPI with our accounting data using the state identifier from COMPUSTAT. To match the MSA level HPI, we aggregate FIPS codes from COMPUSTAT into MSA identifiers using a correspondence table available from the OFHEO website.

We use private household price data rather than commercial real estate data for two reasons. First and foremost, these are the only data freely available over such a period of time and at such a level of disaggregation. However, real estate property is a relatively homogeneous good, which makes private single-family a good proxy for real estate. Second, having in mind endogeneity issues, we are concerned about a potential correlation between local real estate prices and local business conditions that may affect the profitability of investment. In that respect, private single-family house prices are *a priori* less correlated with local investment opportunities, than commercial real estate.

### 2.2.2 Measuring Land Supply

We measure geographical restrictions to land supply using data from Rose (1989). Rose computes, for the 40 most populated MSAs in the US, measures of the availability of land for urban use. He takes the sum of weighted annular areas, except water, around the city center. The weights decrease exponentially to zero, at a rate determined by population density. These measures are then normalized by the hypothetical value they would take in the absence of water. Rose's index of land supply ranges from 1 in Atlanta and Phoenix (areas without water), to .521 in San Francisco and .561 in Chicago. Boston is somewhere in the middle, with an index of .797[4].

As recently argued by Glaeser, Gyourko and Saks (2005) and Green, Malpezzi and Mayo (2005), regulation also plays a key role in restricting the construction of new home, and therefore in limiting the expansion of land supply. First, regulation can affect the return to new homes and therefore

[4]In the regression analysis that follows, we use 1 minus the Rose measure instead of the Rose measure, so that it is increasing with land restrictions, and therefore homogenous with the other regulation measures we use.

affect the willingness of investors to build them, through, for instance, rent control (as in NYC, Boston and LA). Regulation issued at the state or at the city level can also directly impede the construction of new homes. At the state level, regulation usually take the form of environmental regulation (to protect the coast, to preserve wetlands), or planning (legislation for "new towns", comprehensive land planning etc.). At the city level, the key restriction is zoning (land devoted to commercial real estate, to single family homes, to multiple family homes etc.), as well as the ability for a household or a real estate developer to rezone a given residential subdivision, and obtain a building permit. Another city level restriction that matters is the adequacy of infrastructure, also this part may be more endogenous to the local economy.

We take such measures on rent control, state and city level regulation from Malpezzi (1996). These measures are available for the 56 largest MSAs in the United States, and have been shown to be strongly correlated with measures of land supply elasticities by Green, Malpezzi and Mayo (2005). Taking the MSA level measure of regulation, Malpezzi finds that the most regulated MSAs are San Francisco and Honolulu. The least regulated one is Chicago. Taking state regulation, the ordering of MSAs changes somewhat, but the correlation between these index is very high.

We then interact these measures of land supply restriction with a measure of interest rate. We take the "contract rate on 30 year, fixed rate conventional home mortgage commitments" from the Federal Reserve website, between 1977 and 2006. We take this variable as a proxy for the interest rate demanded by banks on home mortgage loans, since this is the rate at which they refinance. The interacted variable therefore varies across MSAs as well across years, and captures, once we control for year dummies, the differential impact, across MSAs, of a change in aggregate interest rates on local real estate market. As shown in Table 10 of the appendix, it is indeed the case that our measures of land supply restriction, interacted with interest rates, come out significantly negatively related with local house prices. A decline in interest rates causes a stronger increase in real estate prices in MSAs where regulation is the most stringent, and where land is scarce, due to the presence of water. This correlation is very strong and highly significant. The F-statistics of the interaction coefficient for all specifications is above 20, giving us confidence that our strategy really measures local shocks to real estate prices.

# 3 Real Estate Prices and Investment

## 3.1 Empirical Strategy

In this section, we explore the consequence for corporate investment of variations in real estate prices. More precisely, we are looking for the investment response in a 1 $ increase in local real estate prices. Our empirical procedure is a *triple* difference method: we compare firms in states with and without land price inflation, but within this set of firms, we further compare firms with and without land holdings. Our empirical methodology thus relies on two different identifying sources: (1) the difference in investment behavior for firms facing the same real estate shocks, but with different level of land holding and (2) the difference in investment behavior of firms with the same level of land holding but facing different real estate shocks.

This strategy can be easily implemented by looking at a modified version of a classical investment equation, such as:

$$INV_{it}^{s} = \alpha_{i}^{s} + \beta LAND_{it}^{s} + \gamma P_{t-1}^{s} + \delta LAND_{it}^{s} \times P_{t-1}^{s} + \mu Cash_{it}^{s} + \nu Q_{it}^{s} + \epsilon_{it}^{s}, \quad (1)$$

where $INV$ is the ratio of investment to previous year capital stock, $LAND$ is a dummy indicating significant land holding (i.e. firms with above median land holding to capital ratio), $P$ is the real estate index and $Cash$ and $Q$ are respectively Operating Cash Flows normalized by previous year capital stock and Market to Book ratio, an approximation of Tobin's $q$. Subscript $t$ is for year $t$, subscript $i$ is for firm $i$ and superscript $s$ is for state $s$. We should stress the fact that we use one year lagged real estate prices instead of contemporaneous ones in order to alleviate some of the endogeneity concerns that may arise from doing so.

Our coefficient of interest, $\delta$, is identified by looking at the mean elasticity of variation in investment to variation in real estate prices for firms with positive land holding and comparing it to the same elasticity for firms with no land holding, adjusting the elasticities for firms' cash flows and market to book ratios. We should stress that, although we subsequently run robustness checks using a continuous variable for land holding, we first use a dummy variable for land holding since the bulk of the variation in land holding across firms is between firms who own real estate and firms who do not.

### 3.2 Main Results

There are two potential concerns in using equation (1) directly with regard to the endogeneity of the land holding variable $LAND_{it}$. First, there is a simultaneity issue. Assume for instance that only big firms are able to speculate on the real estate market and that big firms are less sensitive to the business cycle, which is correlated with the real estate market. Then, when real estate prices increase, big firms will tend to acquire real estate, and at the same time will tend to invest less than small firms (as those are more pro-cyclical). Because of such a speculative behavior of a-cyclical firms, a negative correlation between investment and real estate inflation for firms owning real estate would appear, leading us to under-estimate the true value of our coefficient of interest, $\delta$. To address such an issue, we use the beginning of period land holding (i.e. $LAND_{i0}$[5], where year 0 is either 1984, the first year where item #260 is available in COMPUSTAT, or the firm's year of IPO when the IPO happens after 1984) as a proxy for current land holding. Such a proxy is not affected by current decisions on real estate acquisitions and, given the stickiness of land ownership, predicts very well the amount of land holding that could be pledged to an outside investor.

If using initial land holding as a proxy for current land holding is a natural way to circumvent the simultaneity issue, another endogeneity problem may still be plaguing equation (1). It could be that some firm characteristics, such as size or age, are correlated with both initial real estate assets (for instance, old firms are more likely to own land in 1984) and covariance with the business cycle (old firms are less pro-cyclical, and therefore their investment covaries less with the real estate market). In such a case, the $\delta$ coefficient would be misleading as it would also capture the effect of these characteristics on the pro-cyclicality of firms' investment.

To alleviate part of the problem, we therefore regress the land ownership dummy on its economic determinants - such as size, age - and retrieve the residual of this equation. The covariates of land ownership are close to those used by Sharpe and Nguyen (1995) in their study of the share of leased capital by corporations. We include two-digit industry dummies, as well as a measure of firm size (log of total assets), a measure of firm age (years since IPO), firm profitability and a measure of capital intensity (tangible assets over total assets). We further include book leverage and state of

[5] $LAND_{i0}$ is a dummy indicating above median land to capital ratio, where this ratio is measured as item #260 normalized by last period capital stock (lagged item #8).

headquarter location dummies. These last regressors do not appear in Sharpe and Ngyuen's study, but may *a priori* affect both the propensity to own land, as well as the sensitivity of investment to local demand. Table 1 presents the result of the regression of initial land holding on the various observables we use. A quick inspection of the $R^2$ suggests that industry dummies have the largest explanatory power (33% of the cross sectional variance): obviously, supermarkets or restaurant chains are more likely to own land than internet start-ups. Most other coefficients have the expected sign: larger and older firms are more likely to own real estate. This is also the case for profitable and capital intensive firms. More surprisingly, leverage turns out to be positively correlated with land ownership, suggesting a possible reverse causality: land collateral allows firms to take on more debt. We then construct the variable $ABLAND_{i0}$: it is equal to zero when the residual of the equation presented in column 4 of Table 1 is positive, and zero else. Thus, when $ABLAND_{i0}$ equals 1, firm $i$ owns more land than what is expected given its industry, size, age, etc...

We therefore use as our baseline regression the following modified version of equation (1):

$$INV_{it}^{s} = \alpha_i^s + \gamma P_{t-1}^s + \delta ABLAND_{0i}^s \times P_{t-1}^s + \mu Cash_{it}^s + \nu Q_{it}^s + \epsilon_{it}^s, \qquad (2)$$

Because we use firm-fixed effects, we cannot identify the impact of $ABLAND_0$ separately from the fixed effect, which is why the $\beta$ coefficient of equation (1) is no longer present in equation (2). Table 2 reports various estimates of equation (2). Although we also include year dummies in equation (2), the price index $P_{t-1}^s$ remain identified because they are defined at the state level. The estimated coefficient for $\gamma$ will, however, be difficult to interpret. Column 1 is just the standard investment equation, estimated on our sample; it simply assumes that $\gamma = \delta = 0$. Both cash flow and Tobin's q come out statistically very significant, as in most studies. Column 2 adds the $LAND_{i0}$ dummy (equal to one for land owning firms) and its interaction with real estate prices. Land owning firms invest significantly more when real estate prices increase. A one standard deviation increase in real estate prices increases capital expenditure, for firms with initial land holding, by about 4% of a standard deviation.[6] This magnitude may not appear very large, but

[6]The standard deviation of the price index .73, the standard deviation of the capital expenditure to capital ratio is .33

it is important to keep in mind that land holding accounts, for firms with positive land holding, for only 10% of the capital stock. Many other tangible assets are at the firm's disposal, so that we cannot expect to explain an important of investment using only this specific type of collateral. Moreover, to give another order of magnitude, note that cash flows, which has been traditionally considered as an important determinant of investment only explains 15% of a standard deviation of investment.

Table 2, column 3, replaces the $LAND_{i0}$ dummy by the quantity of initial land holding, expressed as a fraction of total fixed assets. We still find a significant and positive impact of real estate prices on the investment behavior of firms. Using directly the value of a firm's real estate also allows us to quantify the stringency of credit constraints. We find that an increase of a firm's collateral value by $1 leads to an increase of investment of 35 cents, other things equal. A one standard deviation increase in the price index explains, for the average land holding firm, a 4% standard deviation increase in investment, very close to the explanatory power obtained with the dummy specification. Thus, our effect does not appear to be driven by the choice of a dummy variable rather than a continuous variable. Column 4 replaces land ownership by the abnormal land ownership dummy constructed above $ABLAND_{i0}$, thus taking into account the fact that land owning firms tend to be larger, older, more profitable, more indebted and in particular industries. Again, the effect remains statistically very significant (below 1%). Thus, our effect is not likely to be driven by the omission of obvious correlates of land ownership. Column 5 uses MSA level, instead of state level, real estate prices. As it turns out, the coefficient is slightly higher than the one obtained in column (4) (where the only difference between the two specification is the level of the real estate price index (state vs. MSA). With MSA-level price index, we find that a 1% increase in MSA land prices explains a 6% standard deviation increase in investment. This may suggest that we come closer to estimating the true value of the firm's holding of real estate, and reduce the measurement error associated with our state level variable. This comes at the cost of cutting half of the observations, given that MSA level prices are only available for the 61 largest MSAs in the United States.

One caveat with the estimates from columns 2-5 is that investment contains land purchase. As a result, our strong coefficients may simply reflect the fact that firms buy more land when its price goes up, a recommendation expressed by several real estate practitionners (see Pomazal, 2001). In non reported regressions, we looked at the elasticity of land holdings to real estate prices. We only found a slightly negative, and insignificant at the 41% level, relation between real estate inflation and the change in land ownership at cost, controlling for other investment determinants. The negative sign suggests that perhaps a fraction of the firms with positive land holdings are realizing some capital gains and transform them into cash windfalls. But they are far from being representative.

In column 6, we report estimates of an equation where we replace capital expenditure by capital expenditure net of change in land ownership. The coefficient on $ABLAND_{i0}$ is similar to the one reported in column 4. Increase in land value still explains, for land holding firms, a 4% standard deviation increase in investment. We are therefore confident that land acquisition is not relevant to explain our results.

We run further robustness checks. First, we replaced $LAND_{i0}$ by an alternative measure of real estate holdings based on COMPUSTAT item #263, i.e. "PPE-Buildings at cost". The idea behind this regression is simply that (1) a building's value is as sensitive to real estate prices as the land on which it is built and (2) if a loan is to be collateralized, it could be on the value of both land and building. We find that the implied elasticity of investment to collateral value is even slightly higher than when using the $LAND_0$ variable. Second, we ran "placebo" regressions. We replaced our $ABLAND_{i0}$ variable by a random dummy that mimics the sample distribution of $ABLAND_{i0}$. In 20 different estimations (taking 20 different draws of dummies), the interaction between the placebo variable and the price index was never found to be significant, even at the 5% confidence level. As an ultimate robustness check, we conducted a very similar analysis using French data, and obtained very similar results (see Chaney et al. (2006)).

## 3.3 Exposure to Local Demand Shocks

One clear possibility at this stage is that shocks to real estate prices capture local demand shocks. Thus, an increase in land prices will be correlated with firm investment, not because firms borrow against the new collateral, but simply because they need to expand capacity to serve new demand. We deal of such a "Keynesian accelerator" story by comparing firm who own real estate to firms who do not. Yet, it could be argued that land owning firms tend to be those firms that are typically the most exposed to a local demand shock. For instance, local supermarket chains both own land and are more sensitive to local consumption. On the contrary, software development firms neither own land, nor are sensitive to local demand shocks. We deal partly with this criticism by using our $ABLAND_{i0}$ variable, whose aim is precisely to control for industry, capital intensity, or even size. Yet, there may be some remaining unobserved heterogeneity in land ownership that also explains exposure to local demand shocks.

Table 3 takes a first step toward addressing this problem. In column 1, we add to our baseline regression a direct control for local demand and interact this control with our land holding proxy, $ABLAND_0$. To measure local demand, we take state level disposable personal income series available from the Bureau of Economic Analysis. Thus, we estimate the following equation:

$$\begin{aligned} INV_{it}^s &= \alpha_i^s + \mu Cash_{it}^s + \nu Q_{it}^s + \gamma P_{t-1}^s + \gamma' PINCOME_{t-1}^s \\ &\quad + \delta ABLAND_{i0}^s \times P_{t-1}^s + \delta' ABLAND_{i0}^s \times PINCOME_{t-1}^s + \epsilon_{it}^s, \end{aligned} \tag{3}$$

where $PINCOME_{t-1}^s$ is personal income in year $t-1$ in state $s$. As one can see from column 1 of table 3, adding the controls for local activity to our baseline regression does not change at all the estimates of our coefficient of interest. It decreases slightly the precision of the estimation but the result is still significant at the 2% level ($t$-value of 2.41). In addition, real estate owning firms do not behave differently in the wake of a demand shock: the coefficient on the DPI interaction term is slightly negative, and not even significant. This is comforting: at least part of the variability in real estate inflation is orthogonal to the dynamics of local demand, and still affects firm investment. Yet, this procedure is likely to be conservative, since the dynamics of DPI may capture part of the variability we need. For instance, a shock to local demand is generally accompanied with a shock to real estate prices, which may affect corporate investment. Thus, by filtering for DPI, we may be too conservative. Columns 2 and 3 split the sample into manufacturing (column 2) and service (column 3) firms. The idea behind this test is that manufacturing firms, given their ability to "export" out of state, must be less sensitive to local demand shocks. Thus, if a "Keynesian accelerator" mechanism was at work, we should find a stronger relation with land value for service, than manufacturing firms. A rapid glance at columns 2 and 3 confirms it is not the case. The effect is strongly significant for manufacturing firms, while it is much less so for service sector companies. Both coefficient are, however, not different statistically.

Another way out of the "Keynesian accelerator" is to rely on shocks to local land price that are not driven by local demand for goods and services. We construct such shocks by interacting local constraints on land supply with aggregate shifts in interest rates. Such an interaction is, as we have seen above, a strong predictor of shifts in real estate price. The mechanism is that, in MSAs where land supply is constrained, a drop in interest rate should have a larger impact on real estate prices. As a result, we use these differences in local real estate market responses, to identify differential shocks to the value of land collateral that are, a priori, unrelated to differences in consumer demand shocks.

Such regressions are reported in table 4, taking different measures of constraints on local land supply. Column 1 uses geographic restriction data constructed by Rose (1989). Column 2 uses the state level regulations gathered by Malpezzi (1996). Column 3 uses the city level rent control dummy reported in Malpezzi (1996). In all specifications, we see that land holding firms significantly increase their investment, when their state of location (or MSA) experience an increase in land prices, due to more stringent land restriction. Geographical constraints (mainly the presence of water in the city) appear the most powerful of the various land restriction measure we use.

# 4 Capital Structure

In this section, we try to explore the channel through which firms are able to convert the increased value on their land holdings into further investment. In order to do so, we first use COMPUSTAT and look at the response of various capital structure variables to real estate price shocks. The empirical methodology is similar to the one used in section 3.1: we simply change the dependent variable (investment) with capital structure variables and investigate which part of the capital structure is affected by changes in real estate market conditions.

## 4.1 Capital Structure Ratios

As we saw in section 3.2, firms, when confronted with an increase in the value of their land holdings, do not sell their real estate properties. It means that outside financing must be increased to explain the observed increase in investment. One clear candidate at this stage is the issue of new debt, secured on the incremental value of land holdings. If new investment is entirely financed with new debt, the book value of leverage should be increasing. Such an increase would be consistent with most theories of capital structure. For instance, an increase in the value of land holding does, a priori, reduce costs of financial distress, as land is a fairly liquid asset. Under trade-off theory, this encourages firms to take on more debt as a fraction of total assets, possibly as much as the size of the new investment. Both market and book leverage increase under trade-off. Under pecking order, the firms seeks to finance new investment with the least information sensitive security. A capital gains has the effect of allowing the firm to issue information insensitive secured loans. Such loans are less expansive than non secured loans or equity, their new availability makes some investment project profitable. Thus, under pecking order as well as under trade-off, capital gains should lead to more debt and more leverage.

Table 5 reports results of the effect of an increase in land value on capital structure variables. In column 1, we look at corporate leverage defined as total debt (long term debt + debt in current liabilities) normalized by total assets. Book leverage responds positively to an increase in land value, suggesting that firms use the increased value of land holding to boost their debt capacity and finance incremental investment.The point estimate is very close to the one obtained using investment as a dependent variable (Table 2, column 4). This suggests that exactly all of the new investment is financed through fresh debt issue, possibly secured on capital gains. This higher value of leverage results from new debt issues (column 2), but also from some early debt repayment (column 3), which suggests that firm take the advantage of their new equity to refinance their debt at a lower rate. This is confirmed in column 4. We look there at the average interest rate (the ratio of interest expenses to total debt), which is noisy measure of interests paid on debt (it includes, in particular, the effect of the yield curve and the maturity structure of debt). Yet, even this noisy measure shows a negative correlation with land value. Quantitatively, a one standard-deviation increase in real estate prices leads to a decrease in the average interest rate of about 30 basis points. Once again, these 30 basis points are fairly large given that land is only a small part of tangible assets. Finally, we look at equity issues to confirm that the additional investment observed in table 2 simply relies on debt financing. As we see in column 5, equity issues are not affected at all by real estate prices, whether for firms with land holding or firms without land holding. We conclude that collateral value simply affects debt financing, in line with what pecking order and trade-off theories would predict.

### 4.2 Debt Contracts

The above results are consistent with firms with more valuable land holdings taking on more debt, repaying some of their old debt, and taking new loans at lower interest rates. One plausible explanation is that new debt is secured on the increase in land value, which reduces its risk, its information sensitiveness and therefore its cost. Given their absence of detail on debt contracts, COMPUSTAT data do not allow us to go much beyond speculation on that front. This is why we comfort this interpretation looking at bond issues from SDC, and bank loans from DealScan[7].

It is natural to start with bank loans. The DealScan dataset provides detailed information on loans taken on by firms over the 1984-2005 period. It contains information about the debt contract itself - tranches, covenants, interest rates, performance pricing etc - and also on the lender - syndicate, number of lenders etc. It is feasible to merge this data with COMPUSTAT data, and thus to investigate the effect of a shock to collateral to the nature of debt contracts.

We estimate the following model, which is slightly different from equation (2):

$$DC_{ijt} = \gamma \Delta P^s_{t-1} + \delta ABLAND^s_{0i} \times \Delta P^s_{t-1} + \mu X^s_{ijt} + \epsilon^s_{ijt} \tag{4}$$

where $DC_{ijt}$ is a feature of debt contract $j$ issued by firm $i$ at date $t$. $X_{ijt}$ are controls that are specific to the borrower $i$ and the contract $j$. We do not include firm fixed effects as in equation (2), because we have too few observations per firm. Thus, we do not account for firm level heterogeneity, but control for the usual suspects: firm size, industry, profitability, leverage and growth opportunities. In addition, we focus on the effect of real estate inflation on contracts, instead of looking at price levels as in equation (2).

Estimates of equation (4), for various contracting dimension, are reported in table 6. Column 1 looks at the loan spread. Unsurprisingly, it is larger in the cross section for small firms, leveraged firms and unprofitable firms. Firms with growth opportunities pay also higher interest rates, as expected given that growth opportunities make poor collateral. As it turns out, however, the cost of debt is not lower for firms experiencing an increase in land value. One possible interpretation is that it just allows firms to take on debt

[7] We are deeply grateful to Amir Sufi for helping us with this dataset.

that they could not take on before. Land price inflation increase debt capacity, but do not decrease the cost of capital. Such an interpretation is supported by an examination of columns 2-4. The loans granted to firms with increased values of land holding are more likely to be secured. The risk of non repayment is lower, so the need for risk sharing between lenders is lower. Consistently with this interpretation, loans granted to firms with capital gains tend to concern a smaller number of borrowers, and are less likely to be syndicated. One other interpretation could be that firms use their increased collateral value to back up loans that will be repaid by the information sensitive tranches of their EBIT. Such loans cannot be delivered by large syndicates, and single lenders are better at dealing with these delicate loans (Sufi, 2006). Such loans would also typically command a high premium, which could be reduced by the collateral. This would explain why we find no effect on the spread, nor on maturity (column 5). Firms do not seem to get better conditions; they simply seem to get the loan.

But the listed firms of our sample are not forced to take on bank loans, and can instead issue debt on the bond market. This is why we turn our attention to bond issues using the SDC Platinium database. Along with interest spread and maturity, SDC provides informations on various options attached to the bond (whether it is callable, or not; whether it is secured, or not; whether it is subordinated, or not). We regress these characteristics on our measure of capital gains using the same econometric specification as in equation (4).

Estimates are reported in Table 7. As column 1 shows, firms with a more valuable collateral get substantially lower spread on their bond issues. A one standard deviation in real estate inflation generates a modest, though significant, decline of the interest spread by 10 basis points. These lower spreads arise, even though bond issues are no more likely to be secured for firms with capital gains than for firms without (column 4). This suggests that, overall, firm's risk must decrease. This is not too surprising given that, on average, only .35$ out of a 1$ wealth increase are transformed into debt. Consistently with this interpretation, the firm is more likely to issue subordinated bonds (column 3), and less likely to issue callable bonds (column 4). Given its decreased risk of default (or equivalently, the increased firm's liquidation value), a firm with higher collateral value has less incentives to hedge, and investors are more willing to acquire junior tranches on its debt.

# 5 Corporate Governance and Investment Performance

In the previous sections, we have shown evidence that firms are credit constrained. They invest more when the value of their collateral increases. What sort of investment do those firms undertake? How do credit constraints affect the performance of a firm? In this section, we show that when the value of a firm's collateral increases, its performance increases as well. More interestingly, we find that this effect is positive and much larger for firms with a sound corporate governance, whereas it is negative for firms with a poor corporate governance.

Depending on the nature of credit constraints in the first place, we should expect different effects of a relaxation of credit constraints on the performance of a firm. As Blanchard, Lopez-de-Silanes and Shleifer (1984) point out, if firms are credit constrained because of adverse selection problems, the performance of a firm should increase when its credit constraints is relaxed, whereas it should decrease if moral hazard is at the source of the credit constraint. In the first case with incomplete information, even though managers act in the best interest of shareholders, they have a better information on the value of a firm than investors do. Therefore, investors will typically under-invest in the firm for fear that they are overestimating its value. If the value of such a firm's collateral increases, managers will take advantage of this shock to undertake new profitable investments. In the second case on the other hand, managers and investors objectives are not aligned, so that managers do not maximize the value of the firm. When allowed to invest more following a positive shock on the value of their collateral, firms will invest in less profitable projects. In either case, the response of overall performance to balance sheet shocks appears *a priori* ambiguous.

To test those predictions, we measure the impact of shocks to real estate prices on the performance of land holding firms. We interact real estate price shocks with the quality of a firm's governance, to see whether firms where managers' incentives are more or less aligned with those of shareholders respond differently. We estimate the following equation:

$$ROA_{it}^s = \alpha_i^s + \gamma P_{t-1} + \gamma' GOV_i \times P_{t-1}^s + \delta GOV_i \times ABLAND_{0i}^s \times P_{t-1}^s + \epsilon_{it}^s, \quad (5)$$

where $ROA$ is Return on Assets, $P$ measures state level real estate prices,

$GOV$ is a measure of the quality of corporate governance, and $ABLAND_0$ is our land holding proxy.

Table 8 presents the results. We measure performance of a firm as the Return on Assets. ROA is insensitive to capital structure and the cost of debt, and is purely based on operational cash flows. In column 1, we look at all firms together, without including any interaction with corporate governance measures. When real estate prices increase, firms holding land marginally increase their performance. A one standard deviation increase in real estate prices leads land holding firms to increase their ROA by .8 percentage points. Overall, credit constrained firms undertake profitable investments and increase their performance.

In columns 2, 3 and 4, we directly test whether governance quality matters for the response of credit constrained firms to balance sheet shocks. Our coefficient of interest is $\delta$, which tells us how firms with different quality of corporate governance respond to collateral shocks. In order to interpret $\delta$ causally, we assume that a firm's governance quality is not correlated with its sensitivity to real estate price movements, so that $\gamma'$ is unbiased. Column 2, 3 and 4 report estimations of equation (5) using different measures of corporate governance, respectively the Gompers et al. (2003) index (GIM index), board size from IRRC, and the Bebchuck et al. (2004) Entrenchment index. Note that each is an inverse measure of corporate governance, so that a high GIM index, a large board size and a large Entrenchment index are all measures of poor corporate governance. All results point to a strong detrimental effect of poor corporate governance on the quality of investment and on performance. For instance, using the entrenchment index, we find that land holding firms with poor governance (i.e. with an entrenchment index superior to 3) see their profitability decrease by about .9 percentage point, after a one standard deviation increase in real estate prices and relative to poorly governed firm with no land holding,. On the opposite, we find that well-governed land holding firms (i.e. with an entrenchment index inferior or equal to 3) see their profitability increase by about 1 percentage point after a one standard deviation increase in real estate prices. These represents in each case around 5% of ROA's standard deviation.

These results suggest that only those firms with a sound corporate governance are able to translate a positive collateral shock into higher performance. Measures of corporate governance therefore seem to entail informational content about a firm's ability to transform financing into value. This comforts Blanchard et al (1994)'s view that firms differ in their willingness to maximize shareholder value. This also suggests that the quality of governance has real effects on firm profitability. Probably because they have focused on the cross sectional dispersion in profits, few papers have managed to exhibit real effect of corporate governance - an exception being Bertrand and Mullainathan (2003), who explores the link between wage setting and governance quality. This paper set itself a much less ambitious goal, as it focuses on the dispersion in performance among well and badly governed corporations, *conditional* on experiencing an exogenous shock to collateral value and assuming that governance is independent from this shock. Still, we believe these results are important considering the few results available in the literature.

# 6 Conclusion

The key implication of our analysis is normative. As positive shocks to land value alleviate financing constraints, holding real estate in the balance sheet may provide a useful corporate hedging mechanism. Following up on Holmstrom and Tirole (1998,2000), our analysis suggests that firms should benefit more from holding land when its returns are less correlated with their own cash flows. Thus, the decision to lease or buy land should be part of the corporate hedging policy.

The present paper opens up many leads for further research. One interesting hypothesis would be to use shocks to real estate value to investigate how internal capital markets function. On a restricted sample of oil conglomerates, Lamont (1997) has shown that capital markets indeed respond to cash flow shocks of one of the conglomerate's activities. Because so many firms have land in their balance sheet, studying such land value shocks allows to replicate Lamont (1997)'s study on a larger sample. Such a new approach would allow us to study the organizational determinants of well functioning capital markets. While US data are not necessarily well suited for this kind of study - COMPUSTAT does not provide land ownership at the segment level - French firms, with their group structure, provide the ideal field on which to test the various theories of internal capital markets that have emerged in recent years.

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# A Figures

Figure 1: Real Estate Price Growth and Investment Growth Differential for the state of California

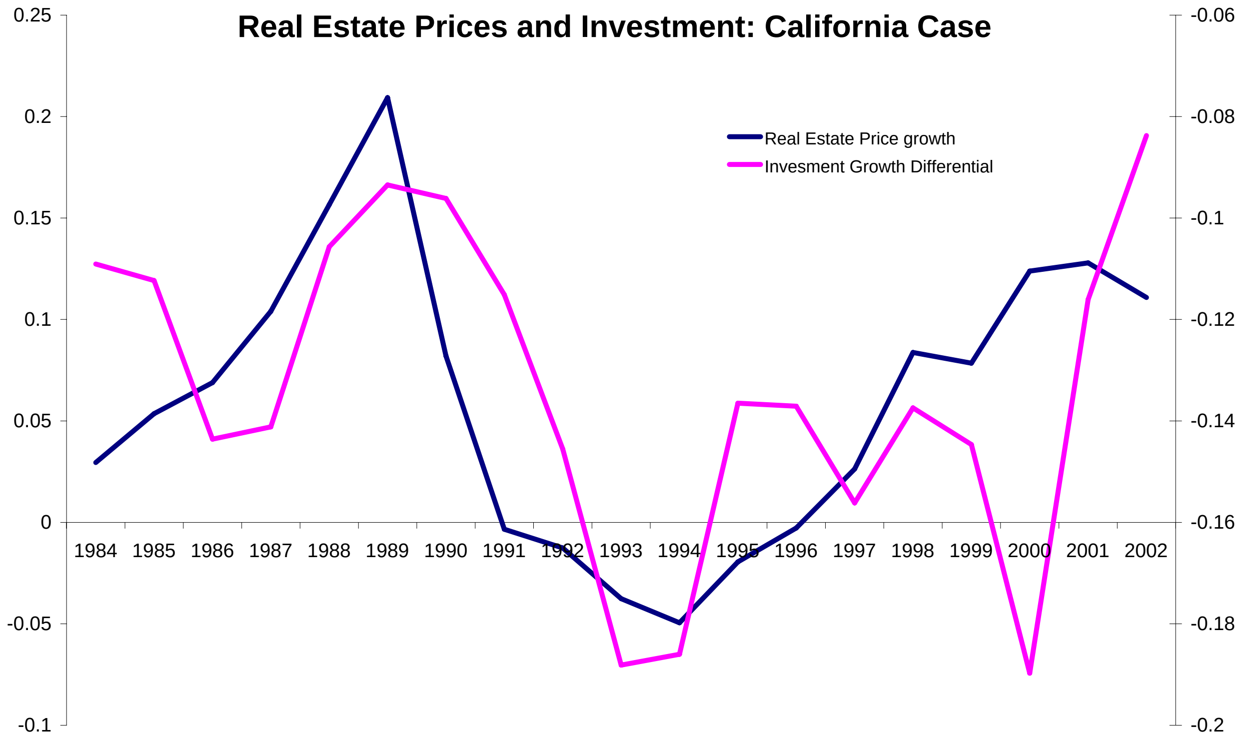
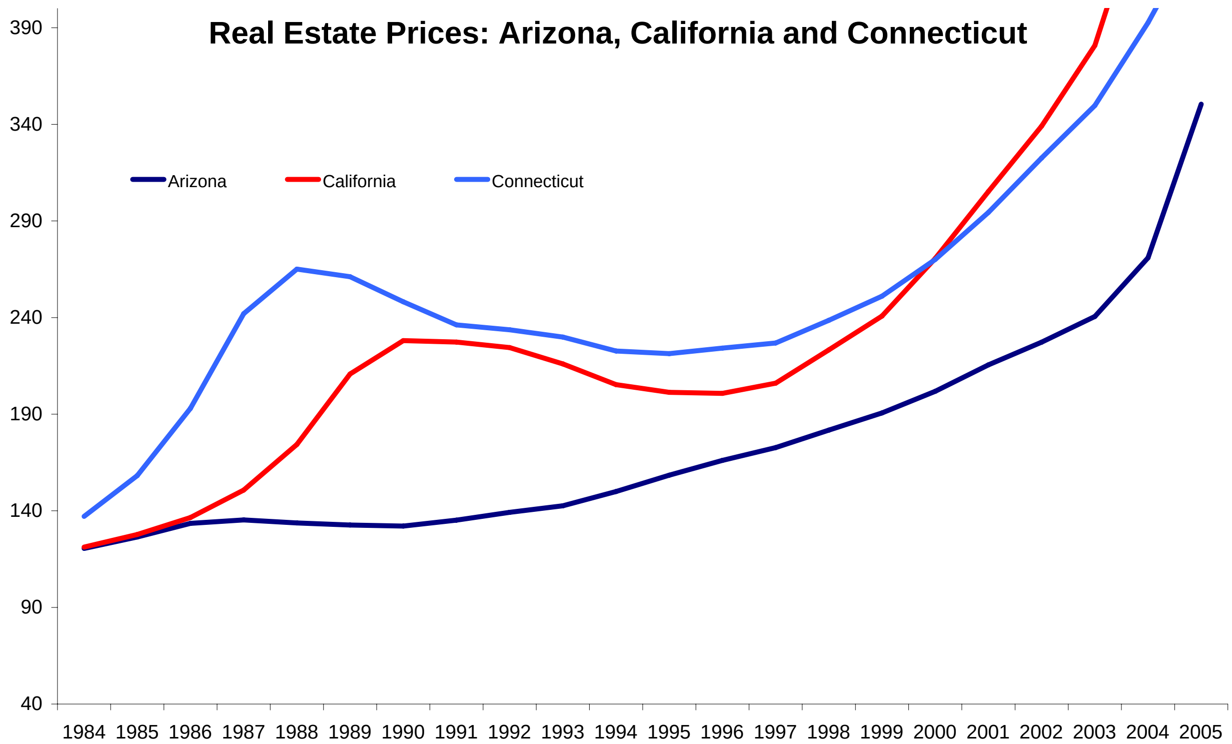


Figure 2: Real Estate Prices Evolution for California, Arizona and Connecticut



# B Tables

Table 1: Explaining Initial Real Estate Ownership

| | Initial RE Asset Dummy | | | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Log(Assets) | .054*** | .053*** | .05*** | .048*** |
| | (.0015) | (.0015) | (.0015) | (.002) |
| Firm Age | | .038*** | .038*** | .041*** |
| | | (.0067) | (.0066) | (.0078) |
| First Year is IPO | | .01 | .0071 | .0018 |
| | | (.027) | (.027) | (.03) |
| Tangible/Asset | | | .27*** | .33*** |
| | | | (.017) | (.021) |
| ROA | | | | .13*** |
| | | | | (.017) |
| Leverage | | | | .041*** |
| | | | | (.013) |
| Year Dummies | Yes | Yes | Yes | Yes |
| State Dummies | Yes | Yes | Yes | Yes |
| Industry Dummies | Yes | Yes | Yes | Yes |
| Observations | 14,336 | 14,336 | 14,316 | 12,176 |
| $R^2$ | .33 | .34 | .35 | .34 |

Notes: This table explains the initial real estate asset ownership of a sample of COMPUSTAT firms. The dependent variable is a dummy indicating land holding in 1984 or in its first year in COMPUSTAT. The explanatory variables are: Log(Assets) (item #6), Firm Age measured as the first year in COMPUSTAT, a dummy indicating whether the firm became public after 1984, Tangible net of real estate assets (item #8-item #260)/Assets(item #6), ROA ((item #13-item #14)/item #6) and leverage ((item #9 + item #34)/ item #6). All regressions also control for state of location, year and industry fixed effect. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 2: Real Estate Prices and Investment Behavior

| | Capital Expenditure | | | | | Cap. Exp. - RE Inv. |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Price Index$_{t-1}$ | | -.042*** | -.04*** | -.042*** | -.063*** | -.049*** |
| | | (.0056) | (.0061) | (.0057) | (.010) | (.0071) |
| LAND$_0$× Price Index$_{t-1}$ | | .028*** | | | | |
| | | (.0043) | | | | |
| Land Holding$_0$× Price Index$_{t-1}$ | | | .35*** | | | |
| | | | (.096) | | | |
| ABLAND$_0$× Index$_{t-1}$ | | | | .017*** | .026*** | .02*** |
| | | | | (.0045) | (.008) | (.0056) |
| Cash | .058*** | .058*** | .058*** | .06*** | .064*** | .058*** |
| | (.0021) | (.002) | (.0021) | (.002) | (.003) | (.0023) |
| Q$_{t-1}$ | .073*** | .072*** | .072*** | .073*** | .078*** | .071*** |
| | (.0019) | (.0016) | (.002) | (.0017) | (.0027) | (.0019) |
| Year Dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 76,094 | 76,094 | 69,934 | 72,133 | 31,630 | 64,254 |
| $R^2$ | .46 | .46 | .46 | .46 | .39 | .44 |

Notes: This table presents the impact of real estate prices variations on firm investment decision, depending on the firm's initial land holding. Columns (1), (2), (3), (4) and (5) use capital expenditure (item # 128 normalized by lagged item #8) as dependent variable. Columns (6) use capital expenditure less real estate investment (item # 128 - (item #260 in year $t+1$ - item #260) normalized by lagged item # 8). Column (1) estimates a basic investment equation, using cash (item #14 + item # 18 normalized by lagged item # 8) and lagged Market to Book ratio (item #6 +(item #24 × item #25)- item #60-item #74 normalized by item #6) as control variables. Column (2) controls for initial land holding and housing prices using $LAND_0$ as a measure of initial land holding. Column (3) use a continuous measure of initial land holding, i.e. the ratio of initial land to capital stock (variable Land Holding$_0$). Column (4) estimates equation 2, using $ABLAND_0$ as the measure of initial land holding. Column (5) estimates equation 2 at the MSA level. Finally, column (6) also estimates equation 2 using Investment minus real estate investment as a dependent variable. All specification use year as well as firm fixed effect. Column (1) cluster observations at the firm level ; all other columns cluster observations at the state-year-real estate ownership level. $^*$, $^{**}$, and $^{**}$ means statistically different from zero at 10, 5 and 1% level of significance.

Table 3: Real Estate Prices and Investment Behavior - Robustness Checks

| | Capital Expenditure | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Price $\text{Index}_{t-1}$ | -.044*** | -.053*** | -.024*** |
| | (.0069) | (.007) | (.0084) |
| $\text{ABLAND}_0\times$ $\text{Index}_{t-1}$ | .023*** | .02*** | .0068 |
| | (.0076) | (.0055) | (.0071) |
| $\text{Log}(\text{PINCOME}_{t-1})$ | -.059** | | |
| | (.028) | | |
| $\text{ABLAND}_0\times\text{Log}(\text{PINCOME}_{t-1})$ | -.014 | | |
| | (.014) | | |
| Cash | .06*** | .064*** | .055*** |
| | (.002) | (.0027) | (.0028) |
| $Q_{t-1}$ | .073*** | .067*** | .08*** |
| | (.0017) | (.0022) | (.0027) |
| Year Dummies | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes |
| Observations | 72,133 | 42,873 | 29,260 |
| $R^2$ | .46 | .43 | .48 |

Notes: This table presents three robustness checks the estimation made in table 2. Dependent variable is capital expenditure (item # 128 normalized by lagged item # 8). Column 1 estimates equation 3, where a control for local activity, the personal income in the state (PINCOME), is added and interacted with the land holding dummy. Column 2 and 3 estimates our interest equation for manufacturing and non manufacturing firms, respectively. All specification use year as well as firm fixed effect. All estimation cluster observations at the state-year-real estate ownership level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 4: Real Estate Prices and Investment Behavior: Shocks to Local Real Estate Prices

| | | Investment | |
|---|---|---|---|
| | Geography | Regulation | Rent Control |
| Mortgage Rate | .02*** | .027*** | .025*** |
| | (.0027) | (.0031) | (.0022) |
| Building Restrictions× Mortgage Rate | .048*** | .004 | .031*** |
| | (.014) | (.0042) | (.0078) |
| $ABLAND_0$×Mortgage Rate | .0056* | .0068* | .0027 |
| | (.0033) | (.0037) | (.0025) |
| $ABLAND_0$×Mortgage Rate×Building Restrictions | -.044*** | -.011** | -.02** |
| | (.018) | (.0053) | (.01) |
| Cash | .063*** | .067*** | .067*** |
| | (.004) | (.0034) | (.0034) |
| $Q_{t-1}$ | .079*** | .078*** | .078*** |
| | (.0033) | (.0029) | (.0028) |
| Year Dummies | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes |
| Observations | 20,245 | 25,298 | 25,386 |
| $R^2$ | .44 | .47 | .47 |
| First-Stage F-STAT. | 27.7 | 20.1 | 67.7 |

Notes: This table investigates investment response to shock in real estate prices. Column 1, 2 and 3 estimates equation 2 at the MSA Level, using exogenous shocks to housing prices instead of the local price index. Column 1 uses the presence of a lake or the sea (variable Geography) interacted with mortgage rates adjusted for the inflation rate. Column 2 uses land regulation while column 3 uses rent control instead of the geographical restrictions. All other variables are described in table 2. All regressions control for year as well as firm fixed effects, and cluster observations at the MSA-year-$ABLAND_0$ level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 5: Real Estate Prices and Capital Structure - COMPUSTAT Data

| | Leverage | Debt Issuance | Debt Repayment | Average Interest Rate | Equity Issues |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Price Index$_{t-1}$ | .039* | -.013* | -.003 | -.13 | .003 |
| | (.02) | (.0069) | (.013) | (.24) | (.0037) |
| ABLAND$_0\times$ | .051** | .02*** | .02* | -.41** | -.002 |
| | (.021) | (.0062) | (.012) | (.2) | (.0034) |
| Year Dummies | Yes | Yes | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes | Yes | Yes |
| Observations | 97,223 | 89,608 | 76,398 | 78,786 | 87,812 |
| $R^2$ | .55 | .32 | .19 | .42 | .33 |

Notes: This table presents capital structure regressions, using COMPUSTAT data. The dependent variables are: (1) firm's leverage, defined as ((item #9 +item #34)/ item #6) (2) firm's debt issuance defined as item #111 normalized by lagged item # 8 (3) firm's debt repayment defined as the difference between debt issuance (item #111) - the variation in long term debt(next year item #9 -item#9), normalized by lagge item #8 (4) firm's average interest rate (item #15/item #9) and (5) Equity Issues (item #108 normalized by lagged item #8). The specification is otherwise similar to that of column 4 table 2. All regressions cluster observations at the state-year-$ABLAND_0$ level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 6: Real Estate Prices and Debt Issuance - Bank Loans Characteristics

| | Loan Spread (1) | Secured Loan (2) | Number of Creditors (3) | Syndicated Loan (4) | Loan Maturity (5) |
|---|---|---|---|---|---|
| $ABLAND_0$ | .071 | -.016 | .38** | .016 | .012 |
| | (3.6) | (.012) | (.18) | (.011) | (.02) |
| $\Delta$(Price $Index_{t-1}$) | -2.8 | -.12 | 1.6 | .12* | .25 |
| | (24) | (.074) | (1) | (.066) | (.15) |
| $ABLAND_0 \times \Delta$(Price $Index_{t-1}$) | 4.4 | .19** | -3.2** | -.16** | -.16 |
| | (34) | (.088) | (1.3) | (.077) | (.18) |
| Long Term Leverage | 122*** | .38*** | 3.5*** | .3*** | .82*** |
| | (7.4) | (.02) | (.36) | (.017) | (.039) |
| Log(Asset) | -40*** | -.097*** | 2.2*** | .1*** | .00048 |
| | (1) | (.0034) | (.058) | (.0028) | (.005) |
| Q | -5.5*** | -.035*** | .1 | -.034*** | -.067*** |
| | (1.6) | (.0049) | (.077) | (.0049) | (.0089) |
| ROA | -281*** | -.32*** | -.042 | .21*** | .68*** |
| | (15) | (.036) | (.48) | (.036) | (.081) |
| Year Dummies | Yes | Yes | Yes | Yes | Yes |
| Industry Dummies | Yes | Yes | Yes | Yes | Yes |
| Observations | 15,551 | 11,680 | 17,764 | 16,509 | 16,218 |
| $R^2$ | .38 | .22 | .33 | .38 | .12 |

Notes: This table investigates bank loan characteristics, using the DEALSCAN sample. The dependent variables are: the loan spread, as given by DEALSCAN (column 1), a dummy variable indicating whether the loan is secured (column 2), the number of creditors (column 3), a dummy variable indicating that the loan is syndicated (column 4) and the logarithm of the loan's maturity measured in days. Because firms fixed effect cannot be identified, all regressions use the variation of the real estate price index ($\Delta(Price\ Index)$) instead of its level. Each regression also controls for firm-level variables: Log(Assets) is the logarithm of firm's total asset (item #6) ; Long Term Leverage is long term debt over total assets ((item #9 / item #6). Q and ROA are defined as in table 1 and table 2. Finally, all regressions cluster observations at the state-year-real estate ownership level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 7: Real Estate Prices and Bond Issuance - Public Issues Characteristics

| | Loan Spread (1) | Non Call. Loan (2) | Subordinated Loan (3) | Secured Loan (4) | Loan Maturity (5) |
|---|---|---|---|---|---|
| $\text{ABLAND}_0$ | 5.2 | -.0063 | -.0018 | .0017 | -.025 |
| | (7.6) | (.018) | (.0086) | (.011) | (.036) |
| $\Delta(\text{Price Index}_{t-1})$ | 64 | -.16 | .0028 | .065 | -.17 |
| | (49) | (.11) | (.047) | (.063) | (.16) |
| $\text{ABLAND}_0 \times \Delta(\text{Price Index}_{t-1})$ | -116** | .32*** | .1** | -.012 | .068 |
| | (50) | (.12) | (.05) | (.07) | (.2) |
| Long Term Leverage | 303*** | -.12*** | .35*** | .055** | .15** |
| | (19) | (.039) | (.027) | (.024) | (.064) |
| Log(Asset) | -45*** | .031*** | -.031*** | -.0082*** | -.044*** |
| | (2.4) | (.0046) | (.0021) | (.0026) | (.0084) |
| Q | -5 | -.0044 | -.015*** | .0042 | -.052*** |
| | (4.2) | (.0097) | (.004) | (.0048) | (.02) |
| ROA | -598*** | .35*** | .064 | -.17*** | .19 |
| | (73) | (.081) | (.039) | (.051) | (.18) |
| Year Dummies | Yes | Yes | Yes | Yes | Yes |
| Industry Dummies | Yes | Yes | Yes | Yes | Yes |
| Observations | 4,358 | 10,330 | 10,330 | 10,330 | 7,408 |
| $R^2$ | .57 | .1 | .18 | .14 | .094 |

Notes: This table investigates public loan characteristics, using the SDC sample. The dependent variables are: the loan spread, as given by SDC (column 1), a dummy variable indicating that the loan is not callable (column 2), a dummy variable indicating that the loan is subordinated (column 3), a dummy variable indicating that the loan is secured (column 4) and the logarithm of the loan's maturity measured in days. Because firms fixed effect cannot be identified, all regressions use the variation of the real estate price index ($\Delta(Price\ Index)$) instead of its level. Each regression also controls for firm-level variables: Log(Assets) is the logarithm of firm's total asset (item #6) ; Long Term Leverage is long term debt over total assets ((item #9 / item #6). Q and ROA are defined as in table **??** and table **??**. Finally, all regressions cluster observations at the state-year-real estate ownership level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 8: Performance and Collateral Windfall - Corporate Governance

| | | Return On Assets (×100) | | |
|---|---|---|---|---|
| | | GIM Index (1) | Board Size (2) | Entrenchment Index (3) |
| Price $\text{Index}_{t-1}$ | -2.4*** | -5*** | -5.4*** | -3.3*** |
| | (.28) | (.84) | (.8) | (.47) |
| $\text{ABLAND}_0\times$ Price $\text{Index}_{t-1}$ | 1.1*** | 3.8*** | 4.2*** | 2.2*** |
| | (.24) | (.95) | (.94) | (.49) |
| Governance$\times$ Price $\text{Index}_{t-1}$ | | .29*** | .41*** | .37*** |
| | | (.079) | (.075) | (.13) |
| $\text{ABLAND}_0\times$ Governance $\times$ Price $\text{Index}_{t-1}$ | | -.34*** | -.44*** | -.51*** |
| | | (.093) | (.091) | (.16) |
| Year Dummies | Yes | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes | Yes |
| Observations | 106,799 | 31,137 | 20,033 | 32,581 |
| $R^2$ | .57 | .53 | .52 | .53 |

Notes: This table relates corporate governance to investment quality, estimating equation 5. Dependent variable is ROA, defined as ((item #13-item #14)/item #6). Controls are the same as those defined in table 2. Column 2 uses the Gompers Ishii Metrick Index ; column 3 uses board size, and column 4 uses the Bebchuk et al's Entrenchment Index. All governance measures are constant for a given firm across time. Note that a high GIM or entrenchment index indicates poor governance. All specification use year as well as firm fixed effect. All regressions also cluster observations at the state-year-real estate ownership level. *, **, and ** means statistically different from zero at the 10, 5 and 1% level of significance.

# C Additional Tables

Table 9: Summary Statistics

| Variable | Obs. | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| Log(Assets) | 141,796 | 4.2 | 2.6 | -6.9 | 13.5 |
| Firm Age | 142,150 | 9.7 | 7.2 | 1 | 30 |
| ROA | 129,547 | .019 | .18 | -.64 | .75 |
| Market To Book | 107,317 | 1.79 | 1.18 | -.006 | 6.74 |
| Leverage | 139,315 | .27 | .28 | 0 | 2.0 |
| Cash Flows | 107,397 | .26 | .85 | -2.82 | 3.3 |
| Investment | 119,861 | .32 | .33 | -1.19 | 1.82 |
| Land Holding | 81,492 | .05 | .07 | 0 | .42 |

Notes: This table reports summary statistics for the main variables used in the paper. These variables are: Log(Assets) (item #6), Firm Age measured as the first year in COMPUSTAT, ROA ((item #13-item #14)/item #6), Market to Book ratio (item #6 +(item #24 $\times$ item #25)- item #60-item #74 normalized by item #6), Cash Flows (item #14 + item # 18 normalized by lagged item # 8), Leverage ((item #9 + item #34)/ item #6), Investment (item # 128 normalized by lagged item #8) and Land Holding(item # 260 normalized by lagged item #8).

Table 10: Impacts of Geography, Land Regulation and Rent Control on Housing Prices

| | Price Index | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Mortgage Rate | -.24*** | -.25*** | -.27*** |
| | (.013) | (.012) | (.012) |
| Geography×Mortgage Rate | -.24*** | | |
| | (.043) | | |
| Land Regulation×Mortgage Rate | | -.053*** | |
| | | (.011) | |
| Rent Control×Mortgage Rate | | | -.21*** |
| | | | (.024) |
| Cash | -.0073*** | -.02*** | -.016*** |
| | (.0023) | (.0042) | (.0038) |
| $Q_{t-1}$ | -.0024 | .0049 | .0094** |
| | (.0021) | (.0045) | (.0041) |
| Year Dummies | Yes | Yes | Yes |
| Firm Fixed Effect | Yes | Yes | Yes |
| Observations | 20,731 | 25,848 | 25,937 |
| $R^2$ | .92 | .91 | .92 |

Notes: This table investigates how geography, land regulation and rent control affects real estate prices. The dependent variable is the real estate price index. Column 2 uses the presence of a lake or the sea (variable Geography) interacted with mortgage rates adjusted for the inflation rate. Column 3 uses land regulation while column 4 uses rent control instead of the geographical restrictions. **All three variables are increasing in land scarcity**. All regressions control for year as well as firm fixed effects, and cluster observations at the MSA-year-$ABLAND_0$ level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.