The Corporate Wealth Effect:

From Real Estate Shocks to Corporate Investment[*]

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Abstract

Approximately 50% of US listed firms own some land. When real estate prices go up, these firms make capital gains. This paper presents evidence that such capital gains are used by firms to finance new investment. The land is not sold, but used as collateral to borrow more. Such a collateral windfall alleviates information asymmetries with creditors: new loans have longer maturity and are more syndicated. Debt contracts are less likely to include creditor protecting covenants. Yet, the relaxation of credit constraints is not always good news for investors. It results, for firms with weak shareholders, in lower operating performance.

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1 Introduction

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 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 balance is not the only asset that a firm can use to finance new investment. For instance, real estate property, but also trade credit, inventories or even productive equipment typically serve as collateral to back new loans (Davydenko and Franks, 2005).

This paper is a detailed empirical study of the effect of shocks to the value of collateral. We find robust evidence that firms transform capital gains on land into new investment. Firms invest more when their land value increases. Instead of selling the land, they finance this additional investment by issuing new debt. Increased land value seems to decrease the risk and asymmetric information attached to these new loans. New debt contracts are more long term, more likely to be syndicated, and are less likely to include covenants protecting the creditors. Such a relaxation of financing constraints reduces average profitability of capital for firms whose shareholders are weak and increases it for firms with strong shareholders.

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 shareholders' 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 Bernanke and Gertler (1989). 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 instrument. Following up on Holmstrom and Tirole (2000, 2001), our analysis suggests that firms should benefit more from holding land if 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. The first reason to study real estate is that land holdings at the firm level are directly available using standard datasets. Besides, 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)). The third virtue of real estate is that its value fluctuates, so that the amount of collateral that a given firm can mobilize varies from one year to the next. At least part of these fluctuations are likely to be exogenous to changes in investment opportunities for firms outside the finance, insurance, construction and real estate industries. These specific features of real estate property will allow us to identify the effect of collateral on investment. Yet, we believe that our analysis extends easily to other forms of capital, like foreign exchange denominated securities, trade credit or inventories.

First, we look at the sensitivity of investment to local land prices at the firm level. We expect in general such a correlation to be positive, simply because land prices comove with demand shocks, and firms tend to build up capacities in order to serve this demand. This is why we compare firms that have land to those that have none, and interpret the differential sensitivity as the effect of fluctuation of land value on investment and other financial policy variables. This strategy rests on two sources of identification. The first one comes from the comparison, *within a region*, of the investment responses to price shocks between land owning and land leasing firms. Our second source of identification is, within the set of land owning firms, the comparison of investment in high and low real estate inflation regions. This approach has been used, for instance, by Case, Quigley and Shiller (2001), in their study of home wealth effects on household consumption.

In spite of all these precautions, it could still be argued that the difference between land owning and land leasing firms is that the former tend to be more "local" than the latter. As a result, and any collateral consideration aside, land owning firms should respond more to land prices because they proxy for local demand fluctuations. We treat such criticism seriously, and submit our results to a series of robustness checks. In particular, we identify a source of land prices variation that is orthogonal to local demand shocks. We use local differences in the supply of land to predict the response of local land prices to shocks on national interest rates. Such differences in the supply of land affect local land prices, but not local demand. Using them as instrument, we find estimates that are very similar to those obtained using more straightforward estimation procedures

Leaning on this empirical strategy, we first report robust causal evidence that real estate inflation has a positive and significant impact on the investment behavior. The point estimate suggests that for each additional $1 of land holdings, firms invest $.60 more. Overall, when real estate prices increase by one standard deviation, firms with significant real estate ownership, relative to firms with no real estate assets, increase their level of capital expenditures by around 2% of the standard deviation of investment. The effect is large, given that land is in general only a very small fraction of assets[1]. Hence, while real estate is less liquid than

[1] On average, land accounts for 2% of Property, Plants and Equipment. When we restrict

cash, it appears that firms are still able to make use of such collateral to finance additional investments.

Second, we investigate the channel through which the appreciation of land value is converted into additional investment. We find that firms with significant land holdings in states with increased real estate prices significantly modify their capital structure. They do so by mostly increasing their long-term leverage. We then look more precisely into debt contracts. We find that new debt contracts tend to be more "asymmetric information free". They are more likely to be syndicated, to have long maturity, and less likely to include debt covenants, special clauses imposing lower bounds to firm performance whose goal is to protect creditors from moral hazard and adverse selection.

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 respond to such "windfalls" 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 separate firms whose shareholders are strong from firms whose management is strong, using standard corporate governance indices. We find that, for firms with strong shareholders, collateral windfall do not result in lower profitability of invested capital. But consistently with Blanchard et al's hypothesis, we find that collateral windfalls are followed by a decline in profitability when shareholders are weak. Thus, the shocks in collateral that we expose in this paper also provides us with a good way to evaluate some real effects 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 focused on the direct effect of cash *flows* on investment (Fazzari, Hubbard, and Petersen (1988)). Erickson and Whited (2000) and Hennessy and Whited (2007) have criticized this approach on the ground that, for both theoretical and empirical reasons, such coefficients are difficult to interpret. They advocate the use of GMM estimation. Another branch of the literature has tried to isolate cash flows shocks that are orthogonal to investment opportunies (Blanchard, Lopez-de-Silanes and Shleifer (1994), Lamont (1997), Rauh (2006)). This paper clearly belongs to that tradition. Even closer to the present paper, Almeida, Campello and Weisbach (2004) have focused on the role of cash *holdings*, instead of cash flows. They show that credit constrained firms tend to store cash on their balance sheet to avoid forgoing valuable investment opportunities in the future. Rather than looking at cash (flows or stock), we focus

ourselves to land owning firms, the mean goes up to 4%.

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, uses a more stringent identifying strategy - triple, instead of double, differences and investigates in detail the mechanism through which collateral is converted into investment.

In doing this, we touch two issues that have been unexplored by most of the empirical literature on financing constraints: financing policy and corporate performance. 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. 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. They also complement a recent paper by Sufi (2007), who shows that syndicated debt is associated with loans that exhibit less asymmetric information. We find debt to be more likely to be syndicated in the presence of collateral. A second issue we address is 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. We find that relaxing financing constraints reduces profitability if firms whose managers are strong. 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 on 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 of the Metropolitan Statistical Area (MSA), where the firm's headquarters are located. We complement this information with governance data from various sources, as well as data on land supply constraints (again, at the state and MSA levels).

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 whose headquarters are located in the United States and exclude from the sample firms operating in the finance, insurance, real estate and construction industries, as well as firms involved in a major takeover operation. Finally, we discard observations were land ownership is not reported.

2.1.1 Real Estate Ownership

As mentioned in the introduction, we seek to understand how firms transform capital gains on their real estate into additional collateral and investment. We first measure land holding using COMPUSTAT item #260, labeled "PPE - Land and improvements at cost". This balance sheet item includes all land directly bought by the firm, at its purchase price (Kieso, Weygandt, Warfield, 2006). It excludes constructions built on land, which enter the item "PPE - Buildings at cost" (#263). These variables are reported in COMPUSTAT starting in 1984, hence our choice of period. While "PPE - Buildings at Cost" is also related to real estate prices, we will here focus on land. The main reason for doing this is that facilities tend to be highly firm specific, and are thus likely to be worth little in themselves for other firms or real estate developers. Land, however, is not firm specific and its value as collateral should therefore be more sensitive to changes in real estate market conditions. While we believe it is more sensible to focus on land and exclude buildings, it must be noted that this convention does not affect our empirical results *at all*. This is not surprising. In our data, both items are strongly correlated ($R^2 = 0.63$). Aside from this, both items tend to be simultaneously positive, or simultaneously equal to zero. Among firms who report to own land, only 2% report no building. Almost 94% of firms who report at least some land also own buildings.

First, we check manually the reliability of these variables by looking at the 10K forms filed by listed corporations with the Security and Exchange Commission. We retrieve these documents from the SEC's EDGAR website (`http://www.sec.gov/edgar.shtml`). We first list all firms of our sample that are present in fiscal year 2004, and sort them alphabetically by ticker symbol. We take the first 20 firms whose item #260 is strictly positive, as well as the first 10 firms whose item #260 is equal to zero. For each of these firms, we then look in the 10K for item 2 (entitled "Properties"), which provides an often verbal - with some quantitative elements - description of the facilities that the firm owns or leases. The results of this investigation is reported in Table 1. The first two columns report the accounting value of land and buildings held by firms according to COMPUSTAT. The third column equals 1 when land value (from COMPUSTAT) is strictly positive, and zero else. This is to be compared with column 8, which reports a 1 when the firms declares owned land in its 10K. All 20 firms with a positive land holding report that they own at least one facility somewhere. All 10 firms with zero land holdings lease all their buildings and warehouses. Thus, COMPUSTAT information on land ownership is highly reliable.

Item #260 reports the book value of real estate owned by the firm when it was purchased (historical cost). It is not appreciated when real estate prices go up, so that capital gains do not show up in this accounting variable[2]. To measure (unrealized) capital gains, we thus need to interact this variable with actual real estate price indexes that vary over time. To factor the proper price, though, we need to know where the land held is located.

Of course, COMPUSTAT does not provide us with the geographic location of each specific piece of land owned by a firm. But fortunately, the data reports headquarter location (variables STATE and COUNTY), which we take as a proxy of where the firm holds its real estate. A concern could be that firms may either (1) not own any real estate in the state where their headquarters are or (2) own a lot of real estate in other states - or other countries. We ask if this is the case for the thirty firms of Table 1. Column 4 asks if the firms owns its executive offices, while column 5 asks if the firm owns any other property in the state where these offices are located. Out of the 20 land owning firms, 61% actually own their headquarters. Among the remaining firms, a third leases its headquarters, but owns other facilities in the same state (actually, the same town). Overall, 79% of these firms own some land in the state (in these cases, city) where they are headquartered. Thus, land ownership is a good indicator that the firm owns land in the state (even city) where its executive offices are located. As shown in column 6, there is, however, substantial measurement error left: 85% of these land owning firms also own land out of state, suggesting that COMPUSTAT item #260 vastly overestimates the fraction of land held in the HQ's location.

This discussion suggests that (1) COMPUSTAT item # 260 provides a good proxy that the firm owns land in the state (city) where its HQ are located, but that (2) this variable in general overestimates the amount of land the firm actually owns in the area.

This is why we use in most regressions a dummy variable equal to 1 if and only if item #260 is strictly positive. There is another reason why we should not trust the cross sectional dispersion in the value of land and buildings: since land is reported at historical cost, the value of this variable depends crucially on when

[2]But, under US GAAP, it is depreciated (impaired) when its market value falls below the purchase price.

the firms has bought the facility. Put otherwise, firms who bought early will look like firms who bought little real estate later on. One last reason to discretize item #260 is that the bulk of the cross sectional variation in land ownership comes from difference between firm owning and firms leasing real estate. Indeed, almost 46% of all observations correspond to firms owning neither land nor buildings.

2.1.2 Other Accounting Data

Aside from real estate, we also use other accounting variables, and construct ratios as is done in most of the corporate finance literature. Let us start with the variables used in the investment equations. We compute investment rate as the ratio of capital expenditures (COMPUSTAT item #128) to past year's Property Plant & Equipment (item #8). We compute market to book value of assets as follows: we take the total market value of equity as the number of common stocks (item #25) times end-of-year close price of common shares (item #24). To this, we add the book value of debt and quasi equity, computed as book value of assets (item #6) minus common equity (item #60) minus deferred taxes (item #74). We then normalize the resulting firm's "market" value using book value of assets (item #6). We also use the ratio of cash flows (item #18 plus item #14) to past year's PPE (item #8).

We use COMPUSTAT to measure debt issuance. We measure long term debt issue as long term debt issuance (item #111) normalized by PPE (item #8). We also compute long term debt repayment (item #114) divided by PPE. Finally, COMPUSTAT does not give us access to short term debt issuance and repurchase, so we content ourselves with net change in current debt (item #301) divided by PPE. Net change in long term debt is defined as long term issuance minus long term repayments normalized by PPE.

In our last regressions, we will measure accounting performance using Return on Assets: operating income before depreciation (item #13) minus depreciation (item #14) divided by total assets (item #6).

Finally, to ensure that our results are statistically robust, we windsorize all variable defined as ratios. Table 2 provides summary statistics, as well as the total number of observations after windsorization, for all accounting variables.

Governance Data

We then merge this dataset with corporate governance data. We use three different sources. First, the IRRC corporate governance and directors dataset provides us with board based measures of governance: 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 often used in the corporate governance literature. They are available for the 1996-2001 period only, and mostly for large firms. Second, we use 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 information 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 further away from maximizing value.

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 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.

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

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. Moreover, 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[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 homes, and therefore in limiting the expansion of land supply. First, regulation can affect the return to new homes and therefore 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. 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, although this part may be more endogenous to the local economy.

We use measures of rent control (at the city level) and state 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 state

[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.

regulation, the ordering of MSAs changes somewhat, but the correlation between these indexes is very high.

In section 3.3, we interact these measures of land supply restriction with a measure of interest rate. We use the "contract rate on 30 year, fixed rate conventional home mortgage commitments" from the Federal Reserve website, between 1977 and 2006.

2.3 Loan Contracts

Beyond debt issuance and its maturity, we look at debt contracts with more detail. Here, the dataset is DEALSCAN, which is described in detail by Chava and Roberts (2006) and Sufi (2007). Every year between 1987 and 2004, this dataset collects loans made by banks to many medium to large firms. Each observation is one tranche of a loan made to a given firm in a given year. The information on these tranches is collected directly from banks or through the specialized press. Obviously, this sample is biased toward large firms and large loans. The median loan amount if \$94m; the average amount is \$278m. More than 70% of the tranches correspond to syndicated debt. The coverage improves over time: there are 1,216 loans in 1987, 6,013 in 1996 and 6,445 in 2004. DEALSCAN gives a lot of detailed information on the debt contracts. We take out variables that measure the degree of information asymmetry between the lender and the borrower: the spread, maturity in months, the principal of the tranche, whether the tranche is part of a syndicated loan. We also retrieve information on debt covenants, i.e. promises made by the borrower about minimum interest coverage, minimum assets level, and about giving to the lender the proceeds in case of an asset sale. For each covenant, a dummy variable is constructed to be equal to one if the covenant is present.

We then match this information with our COMPUSTAT data; this leads to a dataset of firm-tranche-year observations that we use in section 4.2.

3 Real Estate Prices and Investment

3.1 Empirical Strategy

In this section, we explore the consequences of variations in real estate prices on investment policy. For firm i, at date t, with headquarters located in state s, we start with the following equation:

$$INV_{it}^{s} = \alpha_i + \delta_t^s + \beta.LAND_i \times P_t^s + controls_{it} + \epsilon_{it}, \tag{1}$$

where INV is the ratio of investment to previous year capital stock, $LAND_i$ is a measure of real estate ownership and P_t^s measures real estate prices in state s at time t, normalized by 1980's prices. As controls, we use two variables usually included in the literature: the ratio of cash flows to assets and one year lagged market to book value of assets (see section above for a definition). We also include a firm fixed effect α_i, as well as state-year dummies δ_t^s, designed to capture state specific investment shocks, i.e. fluctuations in the local economy. Shocks ε_{it} are clustered at the state $\times$ year level. This correlation structure is conservative given the explanatory variable of interest $LAND_i \times P_t^s$ is defined at the firm level (see Bertrand, Duflo and Mullainathan [2004]).

We are particularly careful with our land ownership variable $LAND_i$. First, as mentioned above, it is best to use a dummy variable equal to 1 when the firm reports at least some land in its fixed assets. To remove as much endogeneity problems as possible, we define $LAND_i$ as the dummy equal to 1 when the firm has land in the first year when it enters our panel (this date equals 1984 for all firms listed before that date, approximately half of the sample). As a result $LAND_i$ is not time-varying, and its level is not identified separately from the firm fixed effect $\alpha_{i.}$ Again, while sensible and conservative, this convention does not turn out to affect much our results, because the land dummy is very stable over time. Among firms who report at least some land in their first year of presence in the data, 96% of subsequent observations also do. Among initially non land owning firms, 87% still do not own any piece of land after the first year in sample.

Estimating β thus amounts to comparing the response of investment to real estate inflation, between land owning and non land owning firms. This comparison allows to abstract from state specific macro shocks δ_t^s. One potential problem with this approach, however, is that land ownership is itself an endogenous choice. Firms can choose to own or lease their assets. After all, our manual check from Table 1 showed that even among land owning firms, 40% were leasing their headquarters in 2004. Such a choice may induce strong endogeneity biases if real estate prices proxy for local demand shocks. Some firms may be more exposed than others to such local shocks, and it is possible that these firms tend to own more land, as for example in the case of local retailers. It could also be the case for, say, small firms. In such a case, the estimate of β would be misleading as it would also capture the effect of these characteristics on the pro-cyclicality of firms' investment.

To alleviate this endogeneity problem, we first control for observables that may affect both the sensitivity to local demand and the propensity to own - instead of lease - land. For the first observation of each firm, we regress the land ownership dummy on its economic determinants - such as size, age - and retrieve the residual of this equation. The determinants of land ownership we include are close to those used by Sharpe and Nguyen (1995) in their study of the share of the lease vs buy decision. 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 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 3 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 (almost 60% 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 may allow firms to take on more debt. We will actually shed some light on this mechanism in section 4.

We label $ABLAND_i$ the residual of the equation presented in column 4 of Table 3 and use, in most cases, the following specification:

$$INV_{it}^s = \alpha_i + \delta_t^s + \beta.ABLAND_i \times P_t^s + controls_{it} + \epsilon_{it} \quad (2)$$

This specification amounts to running equation (1), but including various observables (industry, size, age etc.) interacted with prices P_t^s. By virtue of Frisch-Waugh theorem, the estimate of β that we get using (2) is exactly the same. We thus control for observables that may induce a false correlation between investment and local real estate prices. Yet, there may be unobservables that could generate a strong correlation between land ownership and pro-cyclical behavior: for instance, more ambitious firms may follow demand more aggressively and prefer to buy land. We deal with this potential critique in section 3.3.

3.2 Main Results

Table 4 reports various estimates of equation (2). Column 1 is just the standard investment equation, estimated on our sample; it simply assumes that $\beta = 0$ and includes both Tobin's q and cash flows as explanatory variables. Both traditional determinants come out statistically very significant, as in most studies. Yet, as widely argued in the literature, it is difficult to interpret the positive correlation of cash flows and investment as evidence of financing constraints, both empirically and theoretically (see for instance Erickson and Whited (2000)). The explanatory power of variables included in this traditional model is not huge: for instance, a one standard deviation increase in cash flows increases investment by 3% of fixed assets, which corresponds to less than 9% of the cross sectional s.d. of investment.

In column 2, we remove those controls and include the interaction term $LAND_i \times P_t^s$. We test whether $\beta > 0$ and find that land owning firms ($LAND_i = 1$) invest significantly more when real estate prices (P_t^s) increase. A one standard deviation increase in real estate prices (+15 points) increases capital expenditure by about 1.8% of fixed assets more for firms who own real estate. This magnitude may not appear very large, as the cross sectional standard deviation of investment stands around 33% of tangible fixed assets (PPE). Yet, it is important to keep in mind that land holding accounts, for firms with positive land holding, for only 4% of the capital stock. Given that land is such a small portion of all assets, the estimated economic magnitude is surprisingly large, when compared to, for instance, cash flows in the traditional investment equation.

Column 3 uses a similar specification to that of column 2, but replaces the land ownership dummy $LAND_i$ by the abnormal land ownership variable constructed above $ABLAND_i$. In contrast to columns 2, we now take into account the fact that land owning firms tend to be larger, older, more profitable, more indebted and concentrated particular industries. We still exclude the usual determinants of investment. Again, the effect remains statistically very significant (below 1%). Including these controls, however, cuts the estimated size of the coefficient, by nearly 60%. In column 4, we add cash flows and Tobin's q. The coefficient of interest is unchanged, and remains statistically significant at 1% (with a t-statistic of 3). Taking the various correlates of land into account, as well as cash flows and market to book, a 1 s.d. deviation increase in real estate prices (15 points) leads to a differential increase in investment of some .4% of total PPE, between firms that stand 2 s.d. apart from each other in terms of $ABLAND_i$. This effect is small (about 1% of the sample s.d. of investment), but again, it has to be compared to the share of land in PPE (4%).

The methodology used so far allows to control for observable heterogeneity in sensitivity to local demand. Yet, some of this heterogeneity may be unobservable. One very first way to tackle this line of criticism is to actually control for local demand shocks. We do this in Table 4, column 5. There, to measure local demand, we take state level Disposable Personal Income (DPI) series available from the Bureau of Economic Analysis, and estimate the following equation:

$$INV_{it} = \alpha_i + \delta_t^s + \beta.ABLAND_i \times P_t^s + \delta.ABLAND_i \times DPI_t^s + \epsilon_{it}$$

where DPI_t^s is personal income in state s at date t. We normalise state level DPI to be equal to 1 in 1984. As one can see from column 6 of Table 4, adding the controls for local activity to our baseline regression does not change at all the estimates of our coefficient of interest. It decreases very slightly the precision of the estimation but the result is still significant at the 1% level (t-value of 2.4).

In addition, real estate owning firms do not behave differently in the wake of a demand shock: as expected, the coefficient on the DPI interaction term is slightly positive, but far from being statistically 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. It remains that this test may lack power if DPI_t^s does not accurately reflect local demand shocks.

One other way to test for this alternative interpretation is by focusing on firms that are most likely to sell locally. To do this, for each manufacturing industry, we run regression (2) separately and obtain distinct β coefficient. We then ask if β is larger for industries that tend to sell locally. We measure the propensity of each manufacturing industry to sell locally by using transport costs from National Accounts. In non reported results, we do not find any correlation between industry β and industry transport cost. In other words, in the cross section of sectors, it is not the case that "local" industries are responsible for the average β we find in Table 4. Yet again, this test lacks power as our measure of industry level transport costs is a very noisy proxy of whether a firm adresses local, or global markets. To gain such power, we will run similar regressions using city level home prices in section 3.3.

The overall effect of real estate prices on corporate investment that we describe in columns 2–5 of table 4 appears to be rather small. As we already mentioned, this is mainly due to the fact that land holdings account, on average, for a very small share of PPE (4%).

In column 6, we quantitatively assess the role of real estate assets on a firm's investment. We estimate the same equation as in column 4, replacing $ABLAND_i \times$ *index* by the market value of initial land holding, expressed as a fraction of total fixed assets (variable $p_t \times Land_i/K_{t-1}$). This "continuous" specification allows us to interpret quantitatively our results. For each extra \$1 of collateral, firms invest an \$.60. We must insist on the fact that the market value of land holding is not directly observable. We have to rely on a proxy for this variable.[5] The point estimate (\$.60 investment for each \$1 of collateral) is large and economically significant. It is in line with previous estimate in the literature. In their study of financial contracts in the property development industry, Benmelech, Garmaise and Moskowitz [2005] find leverage ratios of nearly 90% for loans secured on real estate. This coefficient should however be interpreted with caution. It relies on strong assumptions about the date of purchase of land holdings (see Appendix A), and the variable we use to derive it, COMPUSTAT item #260, is likely to be mis-measured (see Section 2.1.1). In any case, this regression confirms that our effect is not driven by the choice of a dummy rather than a "continuous" variable.

Finally, one last caveat with the estimates from columns 2-6 is that investment

[5]We defer the reader to Appendix A for details on the computation of this variable.

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 practitioners (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. In column 7, we report instead estimates of an equation where we replace capital expenditure by capital expenditure net of contemporaneous change in land ownership. The coefficient on $ABLAND_i$ is similar to the one reported in column 5.

We ran further robustness checks that we do not report here. First, we replaced $LAND_0$ by a dummy equal to one when the sum of land *and* buildings is strictly positive. The idea behind this regression is that some buildings may not be firm specific and have resale value that is affected to fluctuations on the real estate market. None of our results were affected, as firms owning land also tend to own buildings. Second, we ran "placebo" regressions in the spirit of Bertrand, Duflo and Mullainathan [2004]. For each observation in our sample, we used the model estimated in Table 3 to predict the probability of owning land. For each observation, we then make a draw from a uniform distribution $U_{[0;1]}$: if the draw is below the predicted probability of owning land, the firm is labeled "placebo land owner". The conditional distribution of these placebo land owners is the same as the distribution of actual land owners. We then run regressions (2) using the placebo land ownership dummy. We save the point estimate, and replicate the procedure 200 times. At the end of this process, we find placebo estimates centered around zero and spread between -.01 and +.01, while the point estimate using the actual $LAND_i$ dummy turned out to be .12 (see Table 4, col 2). Thus, it is the information contained in the $LAND_i$ variable that generates the correlation of investment with real estate prices, not some hard wired effect of our estimation procedure. Finally, as an ultimate robustness check, we conducted a similar analysis using French data, and obtained very similar results (see Chaney et al. (2006)).

3.3 City level results

In this section, we replace, in equation (2), state level home prices by home prices measured at the level of the city (Metropolitan Statistical Area) where the firm's headquarters are located. In this new equation, we assume implicitly that firms owning land tend to own land in the MSA where their headquarters are located (which is likely, given that 60% of the firms manually checked in Table 1 that own some real estate actually own their executive offices). This results in the amended version of equation (2):

$$INV_{it}^{m} = \alpha_i + \delta_t^m + \beta.ABLAND_i \times P_t^m + controls_{it} + \varepsilon_{it} \tag{3}$$

for firm i, at date t, with headquarters located in MSA m. Controls are cash flows and market to book ratio. We cluster the error terms ε_{it} at the MSA×year level. The result of this regression is reported in Table 5, column 1. The number of observations is lower than in Table 4 as home prices are not available for all MSAs in the US. The coefficient β that we obtain is equal to 0.1, significant at 1% (with a t-stat of 4.3). The estimated sensitivity of investment to land value is more than twice as large when we measure value using MSA level prices, rather than state level prices (we obtained, in column 5 of Table 4, a β of 0.039). Yet precision remains high: our interpretation for this difference is that, since firms tend to own their headquarters, the use of MSA level prices gives rise to less measurement errors, and therefore less downward bias in our measure of β.

One potential source of bias in such estimates is that our $ABLAND_i$ variable measures some particular exposition to the aggregate business cycle. In a fashion similar to the control used in Table 4, column 6, we first control for stock market prices (column 2) or aggregate GDP growth (column 3). None of these controls affects our estimate of β. Last, we choose to be more agnostic about patterns of the business cycle, and include direct interactions between $ABLAND_i$ and year dummies. Although we lose some precision, our coefficient remains high (.16) and statistically significant (with a t-statistic above 3).

These robustness checks are reassuring. Yet, it could still be argued that $ABLAND_i$ measures different exposition to *local* demand shocks. Although we have shown in the past section that our results are robust to the introduction to an interaction of $ABLAND_i$ with state level personal income, one clear possibility is that state level income does not measure local demand cycle precisely enough.

Fortunately, using MSA level data has the advantage of giving us natural instrumental variables. We interact measures of local constraints on land supply and aggregate shifts in the interest rate to predict real estate prices. A lowering of interest rates shifts the demand for real estate upward. If the local supply of land is very elastic, the increased demand will translate mostly into more construction (more quantity) rather than higher land prices. If the supply of land is very inelastic on the other hand, the increased demand will translate mostly into higher prices rather than more construction. We expect that in MSAs where land supply is constrained, a drop in interest rate should have a larger impact on real estate prices.

We start by checking this prediction. We estimate, for MSA m, at date t, the following model of real estate prices P_t^m:

$$P_t^m = \alpha^m + \delta_t + \gamma.SupplyConstraint^m \times IR_t + u_t^m \tag{4}$$

where $SupplyConstraint^m$ measures constraints on land supply at MSA level, IR_t is the aggregate interest rate at which banks refinance their home loans (see description above). α^m is an MSA fixed effect, and δ_t captures macroeconomic fluctuations in real estate prices, from which we want to abstract. These first stage regressions are reported in table 6. Each of three columns of Table 6 takes a different measure of constraints on land supply (see exact descriptions above). In column 1, we use physical land supply (lake or sea) preventing city expansion in one direction. This specification has slightly fewer observations as the physical constraints variables compiled by Rose[1989] are only available for a 20 cities in the US. In column 2, we take a dummy equal to 1 in the presence of rent control for at least part of the homes. In column 3, we take city level regulation (zoning restrictions, building permits, infrastructure).

In all cases, high values of $SupplyConstraint^m$ means an MSA with very constrained land supply. As a result, we expect the effect of declining interest rates on prices to be strongest in MSA with high $SupplyConstraint^m$. In line with our expectations, γ turns out to be negative, and significant at 1%. In the following, we compare the price responses of real estate prices to a 100bp interest rate decline, between "constrained" cities (75th percentile of the supply constraint distribution) and "unconstrained" cities (25th percentile). In column 1 (physical constraints), we find that prices in "constrained" cities increase by 11 more points than in "unconstrained" cities (out of sample s.d. in price increases of 15). The coefficient is significant, but the F-test is not larger than 6, suggesting that this instrument may be weak. In column 2, the F-stat is much larger (14) suggesting that rent control provides us with a stronger instrument. A 100bp decrease in aggregate interest rates leads to a rise of real estate prices that is 27 points larger in "constrained" cities than in "unconstrained" cities. In column 3, we also have a strong instrument (F-stat of 23) leading to a price response of 12 points. These effects are large economically, and highly significant.[6]

We then move to the second stage. Equation (4) allows us to predict prices $\widehat{P_t^m}$ at the MSA level using differential impact of interest rates between MSAs.

[6]The order of magnitude of these effects is, however, not unrealistic. Assuming for instance that land delivers a perpetuity of π, its value should be equal to:

$$V = \frac{\pi}{r}$$

Thus, the price response to an increase in r should write:

$$\frac{dV}{V} = -\frac{1}{r}.dr$$

Under this - simple and unrealistic - calibration, with interest rates of 5%, a 100bp decrease would generate an increase in prices of 20%.

We then use the predictors of price levels from this equation as inputs for our investment equation:

$$INV_{it}^m = \alpha_i + \delta_t^m + \beta.ABLAND_i \times \widehat{P_t^m} + \gamma.ABLAND_i \times \delta_t + controls_{it} + \varepsilon_{it}^m \quad (5)$$

which is identical to equation (3). The ε_{it}^m are clustered at the MSA-year level. The controls $ABLAND_i \times \delta_t$ are there to ensure that the identification of β rests on the differential impact of interest rates according to land supply, not on the aggregate impact of interest rate. We report the results using the three measures of land supply in Table 7, columns 1-3. All these estimates have to be compared with column 4, in Table 5, where actual MSA level prices are used instead of predicted prices, but where controls are identical (estimate of β equal to .16). The number of observations declines somewhat as land supply measures are not available for all MSAs.

In column 1, we predict price levels using physical constraints on land supply. We find a coefficient of .36, significant at 1%, which is larger than the non instrumented estimate. Regulation and rent control differences give lower estimates (.22 and .25 respectively), less significant (at the 5% level of significance). In all estimations, we find slightly larger coefficients than in non instrumented regressions, but the difference is never statistically significant. Our interpretation is that, if anything, MSA level home prices are still noisy proxies of the land value of firms, and that straight OLS (within) estimators deliver slightly underestimated, but broadly correct, coefficients. In the following, we will therefore focus on OLS (within) estimators.

4 Collateral and Debt

In this section, we try to explore the channel through which firms are able to convert capital gains on their land holdings into further investment. In order to do so, we first use COMPUSTAT and look at the response of debt issuance to real estate price shocks. We will then use DEALSCAN data to see what features of debt contracts are affected by capital gains on real estate.

4.1 Debt Issuance

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.

Table 8 reports results of the effect of an increase in land value on debt issues. To simplify interpretations, we will remove controls from equation (2), and replace investment on the right hand side by debt issuance:

$$DebtIssue^s_{it} = \alpha_i + \delta^s_t + \beta.ABLAND_i \times P^s_t + \varepsilon^s_{it} \quad (6)$$

To obtain estimates comparable to investment results, our debt issuance variables are normalized by tangible fixed assets (PPE). We start by running the investment regression, which is identical to the specification of Table 4, column 2. The only difference is that we include all observations for which cash flows and Tobin's q controls of investment are missing in COMPUSTAT. In this slightly larger sample, the investment coefficient is broadly the same as in Table 4, column 2: $\beta = 0.044$.

To see how this additional investment is financed, we then look at net long term debt issue (column 2), which COMPUSTAT allows us to break down into long term debt issue (column 3) and long term debt repayment (column 4). We also investigate net change in current debt (column 5), which is provided in a single item by COMPUSTAT. Overall net (of repayment) long term debt issue responds to real estate inflation by the same order of magnitude as investment ($\beta = 0.054$ compared to 0.044). This suggest that almost all investment is financed by long term debt issue. When we break down net issue of debt, the bulk of the effect of capital gains is on long term debt issue, whose coefficient β (0.073) is larger than that of investment (0.044). Put otherwise, the data is consistent with all new investment being financed by an additional issue of long term debt. A 15 points increase in the index is in general accompanied by a differential increase in new long term issues of .4% of total assets, between firms that stand 1 s.d. of $ABLAND_i$ apart from each other. This is a very significant effect, albeit small when compared to average new long term issues, which amount on average to some 30% of all tangible fixed assets. Yet again, land is small fraction of all assets (4%).

Column 5 shows that capital gains on land are in general accompanied by a slight decrease in short term debt. Overall, the coefficients on investment (0.044) and decrease in current debt (0.021) add up almost to the coefficient on long term debt (0.054). This suggests that the increase in land value is used both to invest more, but also to increase overall debt maturity, as both pecking order and trade off theories of capital structure would suggest.

4.2 Debt Contracts

The above results are consistent with firms with more valuable land holdings taking on more long term debt. We ask here whether the new debt issued tends to be less information sensitive, as the pecking order theory of capital structure would predict. To do this, we look at various features of the debt contracts themselves, and see how they correlate with capital gains, much in the spirit of equation (6). Since some firms may sign several debt contracts in a given year, the dataset we use in this section is a panel of debt contracts, matched with firm characteristics (see description in section 2.3). For debt contract j, issued by firm i, at t, located in state s, we estimate:

$$F^s_{j,it} = \alpha_i + \delta^s_t + \beta.ABLAND_i \times P^s_t + \varepsilon^s_{it} \tag{7}$$

where F is the chosen feature of the contract (maturity, spread etc.). As in equation (6), we do not include firm level, time changing, controls, mostly because the literature provides very little guidance as to what to control for. Error terms ε^s_{it} are clustered at the state year level. Results of these regressions are reported in Table 9.

We start with interest rates (column 1). We do not find that loans are significantly cheaper for firms whose land has appreciated. The spread is slightly lower, but the difference is slim. The differential response of spread to a 15 points increase in real estate prices between two firms standing 1 s.d. of $ABLAND_i$ apart from each other is less than 1 bp. The effect is therefore neither statistically significant nor economically meaningful. We interpret this as being consistent with the fact that collateral does not allow the firm to borrow at a cheaper rate, but rather allows the firm to borrow more. This is consistent with rationing on the credit market. Collateral helps the firm to take on loans (and possibly more expensive ones) that banks did not want to grant before.

The rest of the evidence presented in Table 9 is consistent with new loans being less information sensitive. First, these new loans are more likely to be syndicated (column 2). A 15 point increase in prices raises the probability of syndication by .5%, again comparing two firms apart from each other by 1 s.d. of $ABLAND_i$. Sufi (2007) shows that syndication is evidence of low asymmetry of information between lenders and borrowers; our evidence suggests that collateral may indeed reduce such information problems. Second, these new loans are more likely to be long term (column 4), which is consistent with COMPUSTAT evidence, although there may be doubts that DEALSCAN is actually representative of all firms' new loans (the sampling procedure does not ensure this). A 15 points increase in real estate prices increases maturity by nearly 1%. Thus, new loans seem less risky from the bank viewpoint.

Third, they are less likely to include three types of covenants. Covenants are promises in debt contracts that can take many forms, and are usually interpreted by the literature as features designed to reduce information asymmetries between the lender and the borrower (see for instance Chava and Roberts (2006)). Breaching a covenant usually leads to renegotiation, although technically the bank could terminate the loan and demand immediate payback (such events are labeled "technical default"). Hence, the outcome of this renegotiation is in general in favor of the bank. Column (5) uses as the dependent variable a dummy equal to 1 if the loan specifies a threshold on the interest coverage ratio (the ratio of operating income to interest expenses). If the firm breaks this threshold, it enters into technical default. Column (6) looks at the presence of a threshold on the firm's assets, below which the terms will most certainly be renegotiated. Column(7) focuses on "asset sweep" covenants, which force the firm to pay back the loan if it sells one of its assets. For each of these features, an increase in land value is associated with a significantly lower probability that the new debt contracts includes these covenants. As with syndication and debt maturity, the presence of additional collateral seems to alleviate information asymmetries and ease the contractual conditions under which firms can have access to new debt.

5 Corporate Governance and Investment Performance

In the previous sections, we have shown that additional collateral coming from increasing land value reduces information asymmetries between firms and lenders. It allows firms to borrow more long term and therefore invest more. Firms are therefore credit constrained, and quickly take advantage of new collateral to invest more. Yet, the question of why such sensitivity is present in the data remains open. Blanchard, Lopez-de-Silanes and Shleifer [1994] suggest two reasons for this. One first possibility is that managers are benevolent maximizers of shareholder value, but firms face adverse selection on the credit market. This creates rationing, so that a positive shock to collateral alleviates informational asymmetries and leads firms with valuable investment opportunities to invest more. The second possibility is that managers are simply empire-builders, not value maximizers. As a result, cash or collateral windfalls are a cheap way to help managers pursue their growth strategies, be they profitable or not.

Both theories are likely to contain some truth. To investigate their respective explanatory power, we look at the cross section of firms. We compare firms where shareholders are strong to firms where the management is strong. Our hypothesis is that additional investments made possible by collateral windfalls are more likely to be profitable in firms with strong shareholders. To test such a prediction, we measure the impact of shocks to real estate prices on the profitability of land owning firms. We compare this response for firms with strong shareholders (well governed) and firms with weak shareholders (badly governed). We expect profits of well governed firms to increase more - or decrease less - than that of badly governed ones. To check this, we take three governance measures from the existing literature and estimate the following equation:

$$ROA^s_{it} = \alpha_i + \delta^s_t + \gamma GOV_i \times P^s_t + \beta.ABLAND_i \times P^s_t + \zeta.GOV_i \times ABLAND_i \times P^s_t + \varepsilon^s_{it}, \quad (8)$$

where ROA is Return on Assets (operating income on total assets), and GOV_i measures the quality of corporate governance. The last interaction term $GOV_i \times ABLAND_i$ is not included because of the fixed effect α_i.

Table 10 shows estimates of (8). Column 1 first assumes homogenous governance in the sample ($GOV_i = 1$ for all firms). We find here that performance does not respond to collateral shocks. This can be consistent with both empire building and asymmetric information theories working in opposite directions. One other possibility is that the asymmetric information theory holds, but some firms have decreasing returns to scale, such that even a profit maximizing firm my reduce its average profitability by investing more (see for instance the discussion in Banerjee and Duflo (2004])). Some other firms may have increasing returns to scale - such that all investment results in improved productivity. On average, both effects may cancel out.

Yet, for given returns to scale, it is likely that profitability of badly governed firms improves less, or deteriorates more, than for well governed ones. In columns 2, 3 and 4, we interact the $ABLAND_i \times P^s_t$ term with three governance indices taken from the corporate governance literature, 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 all mean poor governance, i.e. weak shareholders. All results point to a statistically strong detrimental effect of poor corporate governance on the quality of investment. Again, however, given that land is only a very small fraction of assets, the economic magnitude of the resulting effect is small. Take, for instance, results from column 4. Well governed firms have an entrenchment index of 1. The effect of collateral increase, as measured by the difference between two firms that are 1 s.d. apart in terms of $ABLAND_i$, is nearly equal to zero. For badly governed firms (index of 3), the effect of collateral increase is to reduce ROA by 0.1 percentage point.

These results suggest that while firms with sound corporate governance do not translate a positive collateral shock into higher performance, profitability declines among badly governed ones. Measures of corporate governance therefore seem to entail informational content about a firm's ability to transform financing into value. In a recent paper, Franzoni (2007) obtains comparable results by looking at stockmarket reactions to negative cash flow shocks. He finds that such responses are less negative in firms whose governance is weak. His results and ours comfort 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). 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 "real effects" 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 (2000, 2001), 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 Construction of the $p_t Land_i$ Variable

In this section, we explain how we have constructed the $p_t Land_i$ variable used in column 6 of table 4. To derive a simple quantitative assessment of our effect, we want to regress investment on real estate capital gains made on initial land holding. The variable we have at our disposal in COMPUSTAT, item #260, provides us with the book value of initial land holdings. Calling $p_{t_{0i}}$ the "composite" price of land purchased by firm i before the first year of appearance in COMPUSTAT and L_i the quantity (square feet) of land purchased, we have:

$$item\#260 = p_{t_{0i}} \times L_i$$

The current market value of these initial land holdings is given by:

$$p_t L_i = p_{t_{0i}} \times L_i \times \left(\frac{p_t}{p_{t_{0i}}}\right) = item\#260 \times \left(\frac{p_t}{p_{t_{0i}}}\right)$$

We thus need to provide a proxy for this "composite price" of initial land holdings, as we do not observe the date of purchase of these real estate assets owned by firms initially. The most conservative proxy we can use assumes that firms purchased these initial real estate assets in their first year of appearance *in COMPUSTAT* (and not necessarily in our sample). Given that real estate inflation is positive on average, we will tend to underestimate the market value of real estate assets purchased after the birth date of a firm, and therefore we will tend to underestimate the sensitivity of investment to collateral. Using such an assumption, we are able to compute a proxy for the ratio $\left(\frac{p_t}{p_{t_{0i}}}\right)$ for most firms in our sample. A last difficulty with computing this ratio stems from the fact that real estate price series are available only since 1975. We need to define this ratio $\frac{p_t^s}{p_{t_{0i}}^s}$ for firms appearing in COMPUSTAT before 1975. We assume that before 1975, real estate inflation in state s is equal to the average real estate inflation in this state over the 1975-2004 period. Using this assumption, we can construct backward real estate prices for all years before 1975. Note that this approximation concerns 900 firms over the 8,493 firms that constitute our sample. Using this approximation and the assumption that real estate assets are purchased in the first year of appearance in COMPUSTAT, we are able to define, for each firm in the sample, the variable $p_t L_i / K_{t-1}$

Once we have defined this proxy, the regression we estimate amounts to:

$$\frac{CAPEX_{it}}{PPE_{it-1}} \sim \beta \times \frac{P_t^s L_i}{PPE_{it-1}},$$

which can be rewritten as:

$$\Delta \left(CAPEX_{it}\right) \sim \beta \times \underbrace{\Delta \left(P_t^s . L_i\right)}_{\text{capital gain}}$$

Column 6 of table 4 reports that β is significantly positive and equal to .60, implying that a $1 capital gain on land holdings translates in a $.60 increase in capital expenditure.

Table 1: Checking the Reliability and Meaning of COMPUSTAT item #260

		COMPUSTAT Information			10-K information (Item 2: Properties)				
Ticker Symbol	Company Name	Land at Cost ($m)	Building at Cost ($m)	Any property	HQ owned	Other owned in HQ state	Any ownership in non HQ state	Any property in HQ state	Any owned property
20 Firms owning Real Estate, According to COMPUSTAT									
A	Agilent Technologies, Inc.	97	1684	1	1	1	1	1	1
AA	Alcoa Inc.	462	6177	1	1		1	1	1
AAIIQ	aaiPharma, inc.	2.786	32.267	1	1	1	0	1	1
AAON	Aaon, inc.	2.082	26.805	1	1	1	1	1	1
AAP	Advance Autopart, inc.	187.624	373.862	1	0	0	1	0	1
AATK	American Access Technologies, Inc.	.104	1.374	1	1	0	0	1	1
ABC	Amerisource Bergen Co.	42.959	233.397	1	0	0	1	0	1
ABG	Asbury Automotive Group	37.085	132.886	1	0	0	1	0	1
ABL	Biltrite inc.	5.526	74.69	1	0	1	1	1	1
ABLE	Able Energy inc.	.479	1	1	0	1	1	1	1
ABS	Albertson's Inc.	2012	6203	1	1	1	1	1	1
ABT	Abbott Laboratories	338.428	2519.492	1	1	1	1	1	1
ACET	Aceto corporation	.326	0	1	0	0	1	0	1
ACME	Acme Communications, Inc.	.15	5.048	1		0	1		1
ACMR	A.C. Moore Arts and Crafts, Inc.	2.466	38.133	1	1	0	0	1	1
ACO	Acmol International Corporation	7.85	61.987	1	1	1	1	1	1
ACR	American Retirement Corporation	34.085	492.309	1		1	1	1	1
ACS	Affiliated Computer Services Inc.	19.089	106.003	1	1	1	1	1	1
ACV	Alberto-Culver Company	16.474	212.238	1	1	1	1	1	1
ACU	ACME United Corporation	.251	2.796	1	0		1		1
	Overall			100%	61%	61%	85%	78%	100%
10 Firms not owning Real Estate, According to COMPUSTAT									
AACC	Asset Acceptance Capital Corp.	0	0	0	0	0	0	0	0
ABAX	Abaxis Inc.	0	0	0	0	0	0	0	0
ABCO	The Advisory board Company	0	0	0	0	0	0	0	0
ABGX	Abgenix inc.	0	0	0	0	0	0	0	0
ABIX	Abatix Corp.	0	0	0	0	0	0	0	0
ABMD	Abiomed, Inc.	0	0	0	0	0	0	0	0
ABTL	Autobytel, Inc.	0	0	0	0	0	0	0	0
ABXA	ABX Air, Inc.	0	0	0	0	0	0	0	0
ACAD	Acadia Pharmaceuticals Inc.	0	0	0	0	0	0	0	0
ACCL	Accelrys, Inc.	0	0	0	0	0	0	0	0
	Overall			0%	0%	0%	0%	0%	0%

Notes: We restrict ourselves to firms present in our sample in 2004. We then split observations into firms with some land (item 260 > 0) and firms without any land (item 260 =0). For each group, we then sort firms by ticker symbol. We focus on the first 20 firms with land, and the first 10 firms without land. For each firm in this list, we look for the 10K form that correspond to activity in year 2004. Under item 2 (property), we find the information that we report here.

Table 2: Summary statistics

	Mean	Std. Dev.	Observations	25^{th} percentile	75^{th} percentile	
Firm Level Data						
	Investment	.386	.454	64,218	.112	.444
	Investment net of RE Inv.	.377	.457	56,156	.112	.439
	ROA	-.053	.313	71,488	-.091	.117
	Debt Issuance	.328	.562	67,875	0	.369
	Debt Repayment	.29	.461	68,783	.009	.316
	Changes in Current Debt	.006	.218	38,583	-.043	.048
	Average Interest Rate	1.76	6.623	54,749	7.17	12.14
	LAND_0	.536	.499	72,405	0	1
	$(p_t Land_0/K_{t-1})$	.06	.10	65,239	0	.37
	ABLAND_0	-.001	.315	70,415	-.206	.20
	Market/Book	2.482	3.59	60,105	.943	3.42
	Cash	-.086	1.539	64,858	-.235	.50
	Governance 1	8.718	2.679	19,535	6.8	10.6
	Governance 2	1.975	.814	12,182	1	3
	Governance 3	2.173	1.305	17,946	1	3
MSA Level Data						
	Index Growth Rate (MSA level)	.034	.244	1,785	-.062	.111
	Index (MSA level)	2.094	.997	3,404	1.4	2.43
	Land Constraint (Geography)	.134	.147	920	.0145	.2505
	Land Constraint (Rent Control)	.161	.367	1,288	0	1
	Land Constraint (Regulation)	2.039	.356	1,288	1.8	2.25
State Level Data						
	Index Growth Rate (State level)	.048	.047	965	.023	.062
	Index (State Level)	1.93	.71	1,014	1.36	2.3
	Personal Income Growth Rate	.057	.024	955	.04	.072

Notes: This table provides summary statistics at the firm level (panel 1) at the MSA level (panel 2) and at the state level (panel 3). Investment is defined as capital expenditure (item #128) normalized by lagged value of tangible assets (item #8). Investment net of RE investment is defined as Investment (item #128) minus investment in land (item #260 in year t+1 - item #260) normalized by lagged tangible assets (item #8). ROA is defined as operating income before depreciation minus depreciation and amortization normalized by total assets ((item #13-item #14)/item #6). Debt Issuance is defined as item #111 normalized by tangible assets (item #8). Debt Repayment is defined as item #114 normalized by tangible assets (item #8). Changes in current debt is defined as item #301 normalized by tangible assets (item #8). Average Interest Rate is defined as Interest expenses (item #15) normalized by total debt (item #9+item #34). LAND_0 is a dummy indicating land holding (item #260) in 1984 or in the first year of the firm's appearance in COMPUSTAT. $(p_t LAND_0/K_{t-1})$ is a proxy for the current market value of initial land holdings (See Appendix A for details on the construction of this variable). ABLAND_0 is defined as the residual in column (4) of table 3. Market/Book is defined as market value of equity normalized by its book value (item #199 /(item #60 /item #25)). Cash is defined as Income before extraordinary items + depreciation and amortization (item #14 + item # 18) normalized by lagged tangible assets (item # 8). Governance 1 is the Gompers et al. (2004) Index ; Governance 2 is board size (equals to 1 (resp 2 and 3) if the firm is in the bottom (resp. medium and top) third of the distribution of board size) ; Governance 3 is Bebchuck's entrenchment index. Index Growth Rate (MSA Level – resp. State Level) is the growth rate of the MSA (resp. State) real estate price index ; Index (MSA Level – resp. State Level) are levels of real estate price index, and are normalized to 1 in 1984. Personal income is the state's personal income, normalized to 1 in 1980.

Table 3: Explaining Initial Real Estate Ownership

	Initial RE Asset Dummy			
	(1)	(2)	(3)	(4)
Log(Assets)	.087***	.086***	.084***	.079***
	(.0018)	(.0018)	(.0018)	(.0021)
Firm Age		.052***	.053***	.055***
		(.0083)	(.0083)	(.0087)
IPO after 1984		.029	.032	.028
		(.037)	(.037)	(.037)
Tangible/Asset			.29***	.29***
			(.021)	(.022)
ROA				.12***
				(.012)
Leverage				.054***
				(.0098)
Year Dummies	Yes	Yes	Yes	Yes
State Dummies	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes
Observations	8,456	8,456	8,456	8,192
Adj. R^2	.56	.57	.57	.58

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 (item #260) in 1984 or in the first year of the firm's appearance 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 4: Real Estate Prices and Investment Behavior

	Capital Expenditure						Cap. Exp. - RE Inv.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$LAND_0\times$ Index		.12***					
		(.021)					
$ABLAND_0\times$ Index			.046***	.039***	.034**		.04***
			(.018)	(.013)	(.014)		(.015)
$ABLAND_0\times$ Personal Income					.019		
					(.018)		
$(p_t Land_0/K_{t-1})$						.60***	
						(.18)	
Cash	.033***			.034***	.034***	.032***	.034***
	(.0037)			(.0036)	(.0025)	(.0036)	(.0037)
Market/Book	.02***			.02***	.017***	.02***	.02***
	(.0015)			(.0015)	(.0011)	(.0015)	(.0014)
Year×State Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	53,237	53,237	52,107	52,107	52,100	53,237	45,046

Notes: This table presents the impact of real estate prices on firm investment decisions, depending on a firm initial land holding. Columns (1), (2), (3), (4), (5) and (6) use capital expenditure (item # 128 normalized by lagged item #8) as dependent variable. Columns (7) 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 #199 /(item #60 /item #25)) 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) uses $ABLAND_0$ (constructed as the residuals in column (4) of table 3) as the measure of initial land holding. Column (4) estimates equation 2 at the state level, while column (5) adds a direct measure of local activity (Personal Income define as an index with a value of 1 in 1980) to control for potential endogeneity issue. Column (6) uses a the current market value of initial land holding normalized by lagged tangible assets (i.e. $(p_t Land_0/K_t)$ – see Appendix A for details) as an explanatory variable. Finally, column (7) estimates equation 2 using Investment minus real estate investment as a dependent variable. All specifications use year-state as well as firm fixed effect and allow for correlation of residuals within a given state-year. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 5: Robustness Table: Looking at MSA level price variation

	Investment			
	(1)	(2)	(3)	(4)
$ABLAND_0 \times$ MSA Index	.1***	.08***	.12***	.16***
	(.023)	(.031)	(.047)	(.049)
$ABLAND_0 \times$ Stock Index		.005		
		(.0044)		
$ABLAND_0 \times$ GDP			-.013	
			(.029)	
Cash	.03***	.03***	.03***	.03***
	(.0049)	(.0049)	(.0049)	(.0049)
Market/Book	.022***	.022***	.022***	.022***
	(.0019)	(.0019)	(.0019)	(.0019)
Year FE$\times$ $ABLAND_0$	No	No	No	Yes
Year $\times$ MSA FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	23,781	23,781	23,781	23,781

Notes: This table investigates the robustness of results in table 4 looking at price variation at the MSA Level. The dependent variable is investment (item #128 normalized by lagged item #8). Column 1 simply estimates equation 2 at the MSA Level. Column 2 (resp. Column 3) controls for aggregate shocks in activity, controlling for the interaction of $ABLAND_0$ and the GDP (defined as an index taking the value 1 in 1980) (resp. the Stock Market Capitalization (also defined as an index)). Column 4 controls for $ABLAND_0$ interacted with year dummies. All regressions control for year-MSA as well as firm fixed effects, and cluster observations at the MSA-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 6: Impacts of Geography, Land Regulation and Rent Control on Housing Prices

	Price Index		
	(1)	(2)	(3)
Geography×Mortgage Rate	-.46***	-.27***	-.28***
	(.18)	(.071)	(.059)
Year Dummies	Yes	Yes	Yes
MSA Fixed Effect	Yes	Yes	Yes
Observations	874	1,196	1,196
Adj R^2	.84	.85	.85
F-STAT.	6	14	23

Notes: This table investigates how geography, rent control and land regulation affects real estate prices. The dependent variable is the real estate price index, defined at the MSA level. 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 rent control while column 3 uses building regulation at the MSA level. **All three variables are increasing in land scarcity**. All regressions control for year as well as MSA fixed effects, and cluster observations at the MSA-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 7: Real Estate Prices and Investment Behavior: IV estimates

	Investment		
	Geography	Regulation	Rent Control
$\text{ABLAND}_0 \times \widehat{MSA\ Index}$	.36***	.22**	.25**
	(.14)	(.11)	(.13)
Cash	.032***	.038***	.038***
	(.0062)	(.0053)	(.0053)
Market/Book	.018***	.021***	.022***
	(.002)	(.0025)	(.0025)
Year FE× ABLAND_0	Yes	Yes	
Year× MSA FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	13,433	17,282	17,228

Notes: This table presents IV estimation of equation 2 using restriction on land supply interacted with mortgage interest rates as instruments for the level of real estate prices (see table 6 for details). The instruments used are: geography (column 1) ; rent control (column 2) ; Building regulation (column 3). All regressions control for year-MSA as well as firm fixed effects, and cluster observations at the MSA-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 8: Real Estate Prices and Debt Issues - COMPUSTAT Data

	Investment (1)	Change in debt (2)	Long term debt issuance (3)	Long term debt repayment (4)	Change in current debt (5)
$ABLAND_0 \times$ Index	.044***	0.054**	.073***	.02	-.021*
	(.0054)	(0.025)	(.025)	(.02)	(.011)
Year× State Fixed Effect	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	68,203	64,917	66,369	67,259	69,477

Notes: This table presents capital structure regressions, using COMPUSTAT data. The dependent variables are: (1) Investment defined as (item #128) normalized by tangible assets (item #8), (2) Change in Total Debt (item # 111 - item #114) normalized by item #8, (3) Long Term Debt Issuance, defined as (item #111) normalized by item #8 (4) Long Term Debt Repayment defined as (item #114) normalized by (item #8) (5) Changes in Current Debt as (item #301) normalized by item #8. The specification is otherwise similar to that of column 2 of table 4. The regressions also include state-year and firm fixed effects. All regressions cluster observations at the state-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 9: Real Estate Prices and Debt Issues - Loans Characteristics

	Spread (1)	Syndicated Loan (2)	Loan's Principal (3)	Maturity (Log) (4)	Covenant on Interest Coverage (5)	Cov.on Asset (6)	Asset Sweep (7)
$ABLAND_0 \times$ Index	-15	.095***	.17	.17**	-.083**	-.32**	-.22***
	(14)	(.037)	(.19)	(.084)	(.041)	(.15)	(.085)
Year×State Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,102	11,893	12,181	11,656	12,736	3,183	3,183

Notes: This table investigates loan characteristics, using the DEALSCAN and SDC datasets. The dependent variables are: the loan spread (column (1)), the loan principal (column (3)), a dummy variable indicating whether the loan is syndicated (column (2)), the loan maturity in days (in logarithm, column (4)), a dummy variable indicating the presence of a covenant on interest coverage (column (5)), on asset sales (column (6)) and a dummy indicating the presence of an asset sweep (column (7)). The specification used in this regression is similar to that of column (2) in table 4. Each regression uses state-year as well as firm fixed effects and clusters observations at the state-year level. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 10: Performance and Collateral Windfall - Corporate Governance

	Return On Assets (×100)			
		GIM Index	Board Size	Entrenchment Index
	(1)	(2)	(3)	(4)
$ABLAND_0\times$ Index	.0078	.048***	.024*	.035***
	(.013)	(.017)	(.012)	(.0097)
$ABLAND_0\times$ Governance $\times$ Index		-.0049**	-.02***	-.0085**
		(.002)	(.0066)	(.0042)
Governance$\times$ Index		-.002***	-.0035**	-.004***
		(.00045)	(.0015)	(.0011)
Year×State Dummies	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Observations	69,851	19,238	12,044	17,657

Notes: This table relates corporate governance to investment quality, providing an estimation of equation 8. Dependent variable is ROA, defined as ((item #13-item #14)/item #6). Corporate governance measures are: the Gompers Ishii Metrick Index (column 2); board size (column 3) ; the Bebchuk et al's Entrenchment Index (column 4). 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-state as well as firm fixed effect. All regressions also cluster observations at the state-year level. *, **, and *** means statistically different from zero at the 10, 5 and 1% level of significance.