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Evidence from the French Real Estate Market

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* University of Chicago, Department of economics

** Département des Études Économiques d'Ensemble - Division « Marchés et Stratégies d'entreprise »
Timbre G230 - 15, bd Gabriel Péri - BP 100 - 92244 MALAKOFF

*** HEC and CEPR

Département des Études Économiques d'Ensemble - Timbre G201 - 15, bd Gabriel Péri - BP 100 - 92244 MALAKOFF CEDEX -
France - Tél. : 33 (1) 41 17 60 68 - Fax : 33 (1) 41 17 60 45 - CEDEX - E-mail : d3e-dg@insee.fr - Site Web INSEE :
http://www.insee.fr

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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 stand-alone French firms are credit constrained. They invest up to .39€ more per extra euro of collateral, and they finance this additional investment by issuing more debt. This result is obtained by looking at the specific case of the *Ile de France* real estate bubble of the 90s, which we use as a natural experiment providing exogenous variations in land value. Consistent with the view of efficient internal capital markets, we find that the effect collateral on corporate investment is limited to stand-alone firms.

Keywords: Internal financial markets, real estate bubble.

Valeur du collatéral et investissement des entreprises
Un examen fondé sur l'évolution du marché français de l'immobilier

Résumé

Ce texte propose une étude empirique des effets de chocs sur la valeur du collatéral des entreprises, avec un accent sur la détention de terrains. On met en évidence une contrainte de crédit sur les entreprises individuelles françaises. Elles accroissent leur investissement de 0,39 par euro supplémentaire de collatéral et elles financent ce surcroît d'investissement par émission de dette. Ces résultats découlent de l'examen des effets de la bulle immobilière qui a concerné la région Ile de France durant les années 1990. Cette bulle fournit une expérience naturelle de choc exogène sur la valeur du patrimoine foncier des entreprises. L'analyse empirique confirme aussi l'hypothèse d'efficience des marchés internes de capitaux : on trouve en effet que cet impact du collatéral ne concerne que les entreprises indépendantes.

Mots-clés : Marchés internes de capitaux, bulle immobilière

Classification JEL : G32, G21, R33

Contents

1 Introduction

Practitioners have long recognized how a bubble in the value of a tangible asset, such as real estate, can deeply impact the way firms obtain financing. In the early 90s, many observers attributed the successful Japanese expansion into foreign markets to their increased debt capacity, fueled by domestic real estate hyper-inflation. Cutts (1990), in the Harvard Business Review, pointed out that, "to corporations, the appeal of the quickly inflating asset values was that banks were eager to lend against the land as collateral at 80% or more of "fair market value", turning themselves into "fountainheads of corporate credit that grew along with the speculative value of land - whether sold or unsold". Inspired by the striking scale of the Japanese bubble, economic theorists, such as Kiyotaki and Moore (1997), build up on the tradition of the asymmetric information literature a la Barro (1976) and Stiglitz and Weiss (1981) to design models, either with moral hazard or adverse selection issues, emphasizing the role of collateral in enhancing a firm's ability to issue debt and, subsequently, to invest. Despite this important theoretical literature, there is still only scant evidence on the role that collateral plays in determining corporate investment.

This paper, along with a companion paper focusing on the U.S. case (Chaney et al. (2006)), is an attempt to fill this gap. We empirically study the effect of shocks to firms' collateral, with a focus on land holdings. We find evidence that French firms are credit constrained and invest, on average, €.24 more per extra euro of collateral: this additional investment is financed through the issue of new debt, which leads to an increase in financial leverage. Consistent with this evidence of credit constraints, we find that this sensitivity of investment to land holding is mostly concentrated upon stand-alone firms: for these stand-alone companies, an extra euro of collateral can increase investment up to €.39. On the opposite, investment in firms belonging to a business group do not seem to react to increased land holding value, which we interpret as evidence of efficient internal capital markets. Finally, we investigate the question of firms' performance and find that profitability measure such as returns on assets or operating margin increase when land holding values inflate, a result confirming the extent of credit constraints among French firms.

We believe these results are important, at least for 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. More precisely, by focusing on the bust of the real estate bubble that affected the Paris area in the 90s, this paper documents how a sharp decline in the asset market affects corporate investment decisions and therefore the whole business cycle. This "corporate wealth effect" we point out, similar to the wealth effect first observed for households in the life-cycle literature (beginning with Ando and Modigliani (1963)), might explain how purely financial shocks generate persistent macroeconomic fluctuations, as argued in the macroeconomic literature since at least Bernanke and Gertler (1988). This paper thus uncovers the micro foundations behind 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 against liquidity shocks. Following up on Holmstrom and Tirole (2000, 2001) analysis of liquidity, our empirical study confirms that firms whose liquidity needs are correlated with the real estate cycle should benefit more from holding real estate assets on their balance sheets. We believe that this hedging perspective should be taken into accounts when

firms decide upon renting or buying their real estate properties.

As can be noticed from a single glance at figure 1, France experienced in the 90's a major asymmetric shock on the value of real estate: land prices in the *Ile de France* region - the area surrounding Paris - experienced, between 1988 and 1992, a 60% increase, while prices in other regions of France (, i.e. the *province* areas) were only inflating by some 20%. In the next three years, *Ile de France*'s real estate prices declined by more than 30 %, while prices in *province* remained smoothly increasing. During the same period, as shown in figure 2, local GDPs or income growth were fairly similar, suggesting that the shock affecting real estate prices in *Ile de France* was fairly idiosyncratic to the real estate market. This shock thus provides us with a perfect setting to look at the impact of collateral values on corporate investment. Our empirical strategy rests on computing *triple differences*. We look at investment in *Ile de France* and *Province*. Within each location, we compare the *evolution* of investment behavior, between the peak and the bust of the bubble, for firms who own land and firms who do not. The differences (among these regions, firms and periods) measure the *causal* effect of a collateral shock on investment strategy, as the comparison between land holding and non land holding firms within a same region allows us to control for local demand shocks.

Our focus on real estate is first motivated by the commonly use of land as a source of collateral, either in developed (Davydenko and Franks (2005)) or in developing economies (World Bank Survey (2005)). Besides, as we previously argued, the land price shock observed in *Ile de France* appears quite exogenous to investment opportunities, at least for firms outside the finance, insurance, construction and real estate industries. Land price variations, such as those implied by the 90s bubble, thus provides us with a very natural source of variation in collateral value, although we believe that our analysis extends to other forms of capital, like foreign exchange denominated securities, or even trade credit.

Nevertheless, one may still argue that we lose a lot of information by pooling together different regions in *province*, which may have experienced different land inflation. To address this issue, we use the methodology developed in our companion paper, Chaney et al. (2006), and look more generally at the elasticity of corporate investment to local land prices variations, using a dataset which provides regional housing prices since 1985. This allows to use finer price evolution differentials as a source of identification. More precisely, we compare the evolution of the elasticity of investment to land prices, for land holding and non land holding firms, and in region with above and below average housing price inflation.

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, a 12% standard-deviation increase in their level of capital expenditures. Put another way, firms invest €.24 more per additional euro of collateral, other things equal. An interesting feature of the French economy, compared to the U.S. environment, is that many firms belong to a business group. The literature has traditionally emphasized how internal capital markets in such groups sheltered companies from credit constraints (see Schoar (2002)). When restricting attention to stand-alone firms, i.e. firms not affiliated to a business group, we find that the sensitivity of investment to collateral can rise up to €.39. We interpret this result as evidence of groups'

efficiency regarding investment policies. Overall, the effect we highlight in this paper is large compared to the existing literature. Investment to cash flow sensitivity coefficients typically give an additional €.10 investment per extra euro 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 finally 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 regions with increased real estate prices significantly modify their capital structure. They do so essentially by issuing new debts and increasing their financial leverage. To give an order of magnitude, we find that for stand-alone firms, a €1 increase in land holding increase by €.78 their debt issue, conditionally on issuing debt.

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 valuable 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 specific context of the 1980s Japanese real estate bubble. Peek and Rosengreen (2000) are interested in the supply side of finance, i.e. they look at the implied deterioration of Japanese Banks balance sheet on the supply of credit, a focus quite different from ours. Goyal and Yamada (2001) and Gan (2006), the closest contributions to this present paper, look at the impact of the Japanese bubble on corporate investment, differentiating between land holding and non land holding corporations. An important concern with these papers is that the shock to land prices they study is mainly a national shock, which may seriously affect their identification strategy. Our paper focus on French data, a country with a somewhat different corporate structure, and uses a more stringent identifying strategy - triple, instead of double, differences.

In addition, as in our companion paper Chaney et al. (2006) on US corporations, we make use of our focus on collateral to investigate the effect of corporate wealth shocks on capital structure. 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.

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 first results using the *Ile de France* land price bubble as a natural experiment on collateral value. Section 4 presents the results on corporate investment using the more general identification strategy and section 5 details the

findings on capital structure. Section 6 concludes.

2 Data

We use accounting data of French firms, merged with real estate prices measured at the level of the region.

2.1 Accounting Data

The firm-level data sets used in this study are based on accounting information available for all French firms, public or private, whose annual sales exceed 100,000 Euros in the service sector and 200,000 Euros in other sectors (the BRN file or "Fichier des Bénéfices Réels Normaux"). These accounting data are extracted, since 1984, from the tax files used by the Ministry of Finance for corporate tax collection purposes. French firms above these thresholds are required by tax authorities to fill in a detailed balance sheet and profit statement. Individual firms can be tracked over time by the use of a unique identifier, which allows for the construction of a panel data set.

We restrict the BRN sample to firms with more than 20 employees and firms that have accounting data for each year between 1984 and 1998. Both restrictions allows to work with a data set of usable size. Of course, these choices are likely to introduce bias in the sample, but it is crucial to note that both restrictions are more likely to make us under-estimate the impact of collateral on investment[1]. Indeed, it is well known in the corporate finance literature (Kaplan and Zingales (1998) for instance) that small firms experience more credit constraints that large firms. Moreover, distressed firms are also likely to have less access to financing, and therefore should rely more on collateralized debt to obtain funds.

We also excluded from the sample all firms in the finance, insurance, real estate or construction industry. Finance and Insurance firms were taken out because their accounting data cannot be easily compared with other industries' data. Real estate and construction firms were likely to have investment opportunities strongly tied to the real estate cycle, leading us to exclude them from the sample.

All these restrictions leave us with a sample of 11,975 firms from 1987 to 1998, spanning a large period in times. The BRN file contains an item indicating a firm's region of location, i.e. the region where the firm is likely to hold its real estate assets. Instead of relying on this information, we merged the BRN file with the REPERE file, a file detailing the location and number of plants for all French firms. We used as region of location the region of the plant with the largest number of employee. As it turns out, among our 11,975 firms, 72% (8,676 firms) are firms with one establishment, i.e. firms for which there is no doubt regarding the location. Moreover, for the 3,299 firms with more than one establishment, the second establishment has, on average, only 17% of the largest establishment employees. Therefore, one can be confident that the main part of a corporation's real estate holding are likely to be in the region of the

[1]We checked that the main results of the paper were not affected by any of this choices ; as expected, the measured effects of collateral on investment were even stronger when using the unbalanced panel

largest establishment. Nevertheless, all the results exposed in this paper remains unchanged when we use the mono-establishment panel.

2.2 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 the item "Terrain" on the BRN file, which can be found in the detailed description of a corporation's assets. A particularly convenient aspect of this item is that a law was passed in 1980 forcing all French firms to re-evaluate their real estate holding at "fair"-market value. Therefore, looking at land values in 1987, i.e. just before the burst of the bubble, should provide us with a measure of land holding not too affected by the date at which a firm acquired its property (since real estate inflation was fairly moderate and constant across regions between 1980 and 1987).

Land is not a massive part of firms' total asset. We find that among our sample of firms, 49% of them did report positive *terrain* in 1987. For those firms, land holdings were accounting for about 4% of total assets. Table 1 provides summary statistics for the main accounting variable we use in the paper.

2.3 Real Estate Data

Data for real estate prices come from the Statistical Office of the Equipment Ministry[2] and consists in the observed average transaction prices for new individual housing. The data set exists yearly since 1985 and gives prices at the region-level.

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.

We normalize housing prices to 1 in 1987 for each region in France and use this price index as our measure for land prices. The average price index in the sample is 1.31, and its standard deviation amounts to .25.

3 Using the *Ile de France* Bubble as a Natural Experiment

Our first identification strategy is very close to that used in Gan (2006), except that we also use cross-regional variations in housing price. As noted from figure 1, the *Ile de France* region

[2]The data can be downloaded from the web on the following web site: `http://www.statistiques.equipement.gouv.fr/IMG/xls/Ecln3RD4t05_cle6174dd.xls`.

experienced, between 1992 and 1995 and relative to the rest of France, a sharp 35% decline in real estate prices. Our identification strategy tries to take advantage of the bust of the bubble. More precisely, we wish to compare how land holding firms in Paris adapted their investment behavior through the bust of the bubble compare to (1) non-land holding firms also located in *Ile de France*, and therefore experiencing the same local shocks and (2) land holding firms located in *province*, these firms exhibiting *a priori* the same specific characteristics common to land holding firms.

This can be simply done by estimating a long difference equation such as:

$$\begin{aligned}\Delta(Inv)_{i,1992-1995} &= \alpha + \beta LAND_{i,1992} + \gamma Ile\ de\ France_i \\ &\quad + \delta LAND_{i,1992} \times Ile\ de\ France_i + \nu\Delta(Cash) + \mu X_i + \epsilon_i,\end{aligned} \tag{1}$$

where Δ is the long difference operator (i.e. the operator that makes the difference of a variable between 1995 and 1992), INV is a ratio of investment to total assets, Cash is the ratio of operating cash flows to total assets, X is a set of firm-level control variables, *Ile de France*$_i$ is a dummy indicating whether the firm is located in *Ile de France*[3] and $Land_{i,1992}$ is the ratio of *terrain* to total assets in 1992.

In equation 2, δ provides us with a measure of the impact of collateral value on firm investment. It is indeed identified by looking at the differential elasticity of increase in investment to increase in price for land holding firms in *Ile de France*, land holding firms in *province*, and non land holding firms in all region of France.

There are two potential concerns in using equation 2 directly and both are related to the endogeneity of the land holding variable $LAND_{1992}$. First, there is a simultaneity issue. Assume that the firms that like to speculate on the real estate market are also the firms that covary the most with the real estate market. In this case, large land holding in Paris in 1992 would be the result of the land price increase between 1989 and 1992, which would in turn reflects a large covariation with the real estate cycle. We would therefore observe that the firms holding land in *Ile de France* in 1992 sharply decrease their investment with the bust of the bubble, but this would not reflect their lower debt capacity but only the fact that they co-variate more with real estate prices. To address such an issue, a potential solution is to use the beginning of period land holding (i.e. $LAND_{1987,0}$) 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 between 1992 and 1995.

If using land holding in 1987 as a proxy for land holding in 1992 is a natural way to circumvent the simultaneity issue, another endogeneity problem may still be plaguing equation (2). It could well be that some firm characteristics, such as size or industry, are correlated with both initial real estate assets (for instance, large firms are more likely to own land in 1987) and covariance with the business cycle (large firms are less pro-cyclical, and therefore their investment co-varies less with the real estate market). In such a case, the δ coefficient would be misleading as it would also capture the effect of these characteristics on the pro-cyclicality of firms' investment.

[3]Note that, by definition of our location variable, all firms are location in the same region in all the year of the sample, which is why there is no time subscript in the *Ile de France* variable.

To alleviate part of the problem, we therefore regress the initial land holding variable LAND_{1987} on its economic determinants - such as size or industry - and use the residual of this equation as a measure of "abnormal" land holding conditional on a corporation observable characteristics (we label this variable ABLAND_{1987}). The co-variates 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), firm profitability, and a dummy indicating whether the firm belongs to a business group[4]. We further include financial leverage and region 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 2 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 and firm size have the largest explanatory power (10% of the cross sectional variance): obviously, supermarkets or restaurant chains are more likely to own land than internet start-ups. The sign on the other explanatory variables is quite surprising and appears at odds with what is found on US data in Chaney et al. (2006). More precisely, we find that more profitable and more leveraged firms are less likely to own their real estate properties. The correlation with firm leverage may simply indicates that only low-leveraged firms have the financial deepness necessary to acquire real estate. A potential, though not definitive, explanation for the correlation between land holding and firm performance may be that land holding increase asset size and that part of land holding are owned for non-operating reasons (for savings for instance).

As already mentioned, we then construct the variable $ABLAND_{1987,i}$ which is simply defined as the residual of the estimation in column 3 of Table 2: a large $ABLAND_{1987,i}$ indicates that firm i owns, in 1987, more land than what a firms with the same observable do.

We therefore use as our baseline regression the following modified version of equation 2:

$$\begin{aligned} \Delta(Inv)_{i,1992-1995} &= \alpha + \beta ABLAND_{i,1987} + \gamma Ile\ de\ France_{i,1992} \\ &\quad + \delta ABLAND_{i,1987} \times Ile\ de\ France_{1992} + \nu \Delta(Cash) + \mu X_i + \epsilon_i, \end{aligned} \tag{2}$$

Equation 3 is estimated in table 3. The first two columns use the LAND_{1987} measure, i.e. the 1987 ratio of *terrain* to total asset, while the two last columns use the ABLAND_{1987} variable. Column (1) and (3) control only for industry dummies and evolution of operating cash flows, while column (2) and (4) add control for the evolution of leverage and total sales. Table 3 presents strong, causal, evidence that land holding firms in *Ile de Fance* were strongly hit by the sharp decline in real estate prices, relative to other firms (land holding firms in *Province* and non land holding firms). For instance, using column (2) of table 3, we see that a firm with a 10 % Land to Asset ratio in 1987 experienced between 1992 and 1995 a drop of .014 in its investment ratio, relative to a firm with the same land holding in *province*: this represents more than 10% of the standard deviation of the variation of investment. This effect is thus both statistically significant as well as economically meaningful.

[4]The information on business group affiliation comes from a modified version of the LIFI files constructed by Claude Picart

When using the ABLAND_{1987} measure, we find very similar coefficients, but somewhat less precisely estimated. This should not be surprising considering that this measure comes from the residual of a first estimation. Nevertheless, results are still significant statistically, pointing out to a causal, robust relationship between corporate investment and land value.

4 Real Estate Prices and Investment: Using Cross-Regional Variability

4.1 Main Results

In this section, we departs from the natural experiment setting developed in section 3 to use a softer identification strategy similar to that exposed in Chaney et al. (2006).

In this section, we explore the consequence for corporate investment of variations in real estate prices using "regular" inter-regional housing price variability. More precisely, we are looking for the investment response in a 1 euro increase in local real estate prices. Our empirical procedure still relies on a *triple* difference method: we compare firms in regions 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:

$$INV_{it}^{s} = \alpha_i^s + \beta LAND_{it}^{s} + \gamma P_t^s + \delta LAND_{it}^{s} \times P_t^s + \mu Cash_{it}^{s} + \epsilon_{it}^{s}, \tag{3}$$

where INV is the ratio of investment to previous year capital stock, $LAND$ is a the *terrain* to asset ratio, P is the local real estate index and $Cash$ is Operating Cash Flows normalized by lagged book value of assets. 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, δ, is identified by looking at the average 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. In order to check for the robustness of our results to the linear specification used in equation 3, we also use a dummy variable indicating positive *terrain* in 1987 as a measure for initial land holding.

As mentioned in the previous section and stressed in Chaney et al. (2006), it is highly problematic to use the contemporaneous measure of land holding in estimating equation 3. We therefore use the $ABLAND_{1987}$ measure to address endogeneity issues, and therefore estimate

a slightly modified version of equation 3:

$$INV_{it}^{s} = \alpha_i^s + \gamma P_t^s + \delta ABLAND_{1987,i}^{s} \times P_t^s + \mu Cash_{it}^{s} + \epsilon_{it}^{s}, \tag{4}$$

Because we use firm-fixed effects, we cannot identify the impact of $ABLAND_{1987,i}$ separately from the fixed effect, which is why the β coefficient of equation (3) is no longer present in equation (4).

Table 4 reports various estimations of equation (4). Although we also include year dummies in equation (4), the price index P_t^s remain identified because they are defined at the state level. Column 1 is just the standard investment equation, estimated on our sample; it simply assumes that $\gamma = \delta = 0$. The cash flow variable comes out statistically very significant, as in most studies. Column 2 adds the $LAND_{1987}$ variable and its interaction with real estate prices. 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 25 cents, other things equal. In other words, a one standard deviation increase in the price index leads, for the average land holding company, to a 2.6% standard deviation increase in investment. This magnitude may not appear very large, but it is important to keep in mind that land holding accounts, for firms with positive land holding, for only 4% of their total assets. Many other tangible assets are at the firm's disposal, so that we cannot expect to explain an important part of investment using only this specific type of collateral. Moreover, to give a comparable order of magnitude, note that cash flows, which has been traditionally considered as an important determinant of investment only explains 13% of a standard deviation of investment in our sample.

Table 4, column 3, replaces the $LAND_{1987}$ continuous variable by a dummy variable indicating 1987 positive land holding. We still find a significant and positive impact of real estate prices on the investment behavior of firms. A one standard-deviation increase in housing prices implies, for land holding firms, a 3% standard deviation increase in investment, relative to non land holding corporations. This effect is very close to the explanatory power obtained with the LAND_{1987} variable, which indicates that our effect is not primarily driven by the choice of a continuous rather than a dummy variable.

Finally, Column 4 uses the abnormal land ownership variable constructed above ($ABLAND_{1987}$) as a measure of initial land holding, thus taking into account the fact that land owning firms tend to be larger, less profitable, less indebted and in particular industries. Again, the effect remains statistically significant (at the 1% significance level). Thus, our effect is neither likely to be driven by the omission of obvious correlates of land ownership.

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 practitioners (see Pomazal, 2001). In non reported regressions, we looked at the elasticity of land holdings to real estate prices for land holding firms. We only found a slightly negative, and insignificant at the 15% 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. As another robustness check, we ran "placebo" regressions. We replaced our $ABLAND_{1987}$ variable by a random variable drawn from a uniform distribution with the same support as the $ABLAND_{1987}$ variable. In 20 different estimations (taking 20 different draws of variable), the interaction between the placebo variable and the price index was never found to be significant, even at the 5% confidence level.

4.2 Exposure to Local Demand Shocks

It could well be 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 with such a "Keynesian accelerator" theory by comparing firms 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 $ABLAND_{1987}$ 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 5 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 use the average taxable regional income available from INSEE regional database. Thus, we estimate the following equation:

$$\begin{aligned} INV_{it}^s &= \alpha_i^s + \mu Cash_{it}^s + \gamma P_t^s + \gamma' \text{LOCAL INCOME}_t^s \\ &\quad + \delta ABLAND_{i,1987}^s \times P_t^s + \delta' ABLAND_{i,1987}^s \times \text{LOCAL INCOME}_t^s + \epsilon_{it}^s, \end{aligned} \tag{5}$$

where $LOCAL\ INCOME_t^s$ is average taxable income in year t in state s. As one can see from column 1 of table 5, adding the controls for local activity to our baseline regression does not change at all the estimates of our coefficient of interest. In addition, real estate owning firms do not behave differently in the wake of a demand shock: the coefficient on the Local Income interaction term is slightly positive, and not even significant. This is quite comforting: at least part of the variability in real estate inflation is orthogonal to the dynamics of local demand, and still affects firm investment. Moreover, this procedure may be judged too conservative, since the dynamics of taxable income 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 local income, we may be too cautious. 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 both manufacturing firms and service sector companies: both coefficient are, moreover, not

statistically different from each other.

4.3 Group vs. Stand Alone Firms

The existence and efficiency of internal capital markets within business groups have been widely discussed in the empirical finance literature (see Lamont (1997) or Lamont and Polk (2002)). France is well known for its large number of business groups (see Thesmar (2001)). Our sample is thus likely to contain a non trivial number of firms affiliated to a business group. If internal capital markets are functioning within a group and that we are indeed identifying shocks to collateral value, then these financing shocks should be absorbed by the different firms of a group. In other words, the extra-financing brought by increased collateral value should benefit all firms in a group, and especially those firms with the highest financing need.

Empirically, this should be translated into a lower δ coefficient for firms belonging to a group than for stand-alone firms. This idea is tested in table 6, where we split the sample between stand-alone and group affiliated firms. The results are striking. All the effect we pointed out in the previous sections is concentrated among stand-alone firms. On the one hand, the effect of an increase in land holding prices becomes very close to 0 for land holding firms affiliated to a group. On the other hand, the estimation of δ for stand-alone firms goes up to .39 which has to be compared to the .24 estimated in column 4 of table 4. Focusing on stand-alone firms therefore more than doubles the explanatory power of land holding value on corporate investment. It comforts us in believing that we are indeed identifying a financing shock. It also is of interest for financial economists as it provides them with another test of internal capital markets' efficiency.

5 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. The empirical methodology we use is similar to the one in section 4: 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.

As we saw in section 4.2, 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 increase in order 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 gain 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 7 reports results of the effect of an increase in land value on capital structure variables, for stand-alone firms. We focus our attention on stand-alone firms as we know from section 4.3 that group affiliated firms are not affected by collateral shocks. In column 2, we look at financial leverage defined as financial debt normalized by lagged value of 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 higher than the one obtained using investment as a dependent variable (Table 4, column 4), which suggests that the debt issued on the increased land value does not only serve to finance incremental investment.

A natural question stemming from this result is then to know whether firms facing increasing land value issue debt more frequently or make larger debt issuance when issuing. The answer to this question is presented in columns 3 and 4 of table 7. We see there that an increase in collateral value increase significantly the amount of debt issue, when issuing debt, but does not affect the probability of issuing debt. To give an order of magnitude, we find that a one euro increase in collateral leads land holding firms to a 78 cents larger debt issuance, conditionally on issuing debt. These results are consistent with the view of credit constraint binding not on the access to financing but on the extent of funds obtained. This is somewhat intuitive as most project are, by nature, scalable.

That debt strongly reacts to variations in collateral value is confirmed by column 1 of table 7. This column report the result of an estimation of equation 3, where the dependent variable is the evolution of financial leverage instead of the evolution of corporate investment. Land holding firms located in *Ile de France* confronted with the bust of the real estate bubble experienced a sharp decline in their financial leverage ratio, compare to land holding firms in *province* and to non land holding firms in France.

We finally look in column 5 of table 7 at the evolution of firms' interest rate. An important issue is that we only have a very crude measure of interest rate, namely the average interest rate measured as total financial expenses normalized by financial debts. As it turns out, we do find in column 5 a decrease in interest rate, which could be consistent with the debt being more secured on land holdings, but this decrease is far from being significant. A first interpretation could simply be that our measure of interest rate is too noisy to capture any effect. Another interpretation would push the idea that firms are using the increase in land value to finance riskier additional project, so that at equilibrium the decrease in risk brought by increased collateral value is neutralized by the increase in projects' risk.

6 Conclusion

The result presented in this paper for France are very similar to the one we point in our companion paper in the US (Chaney et al. (2006)). Variations in tangible assets' value have, when these assets are present on a firm's balance sheet, a significant impact on (1) the financing firms obtain and (2) the investments they undertake. Moreover, these results are mostly concentrated

for stand-alone companies, as opposed to business groups. Taken together, these results suggest that stand-alone French companies have been affected by important credit constraints in the 90s, part of which were triggered by the real estate crisis.

As we already noted in Chaney et al. (2006), an important implication of our analysis is normative. As positive shocks to land value alleviate financing constraints, holding real estate in the balance sheet may act as an efficient hedging tool against liquidity shocks in the future. Following up on Holmstrom and Tirole (2000,2001) analysis of liquidity, we advocate that firms with liquidity needs independent of the real estate market should benefit more from holding land. Thus, the decision to rent or buy real estate property should integrate this hedging motive.

Most importantly, the present paper opens up many leads for further research. We insist strongly on two of these leads.

First, we have seen that collateral did not seem to impact financing decisions in group affiliated firms. This seems to indicate that internal capital markets are indeed functioning within these groups. An interesting question would be to look more precisely into these groups and determine according to organizational variables which groups have efficient internal capital markets.

Second, we have mainly exhibited what looks like a financing shock and we have shown that this financing shock lead to decreased investment. A nice feature of the BRN file is that it can be merged, at least on the 1986-1992 period, with precise exhaustive data on firms export and import behavior (see Eaton et al. (2004) for a detailed review of these data). We could thus investigate the link between credit constraints and export behavior, an important question in international economics, explored theoretically in Chaney (2005), but which has received few empirical answer at the moment. This question ranks high on our research agenda.

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A Figures

Figure 1: Real Estate Prices: *Ile de France* vs. *Province*

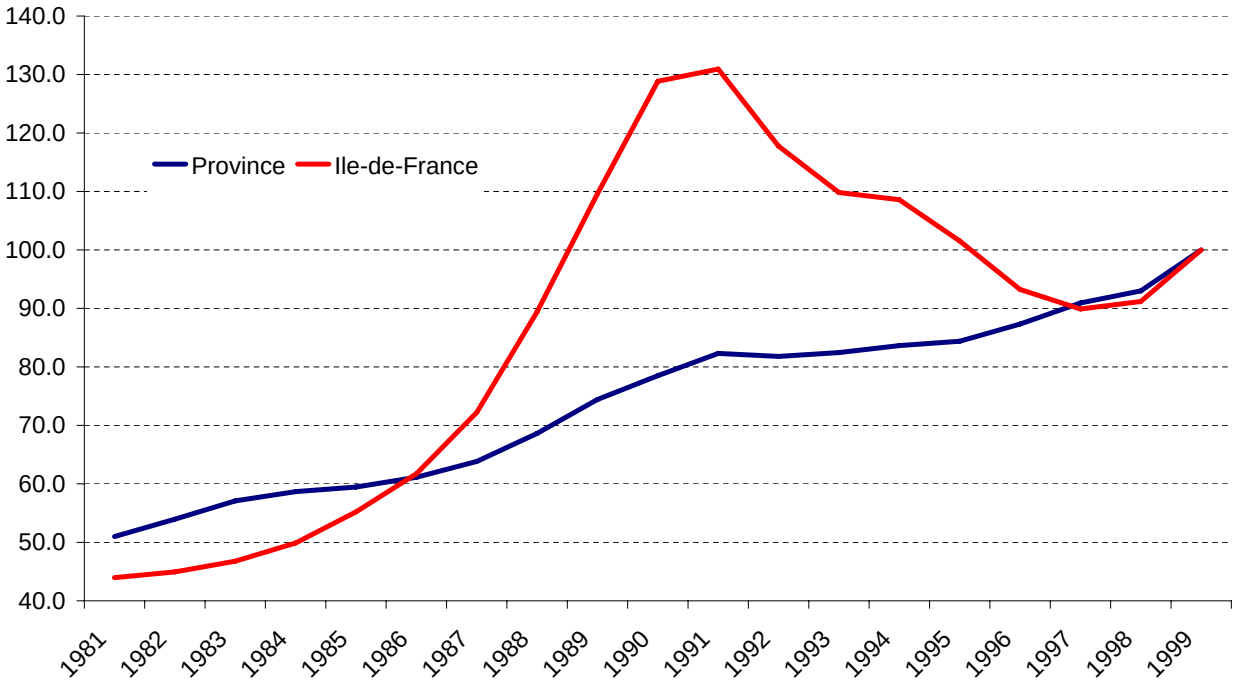
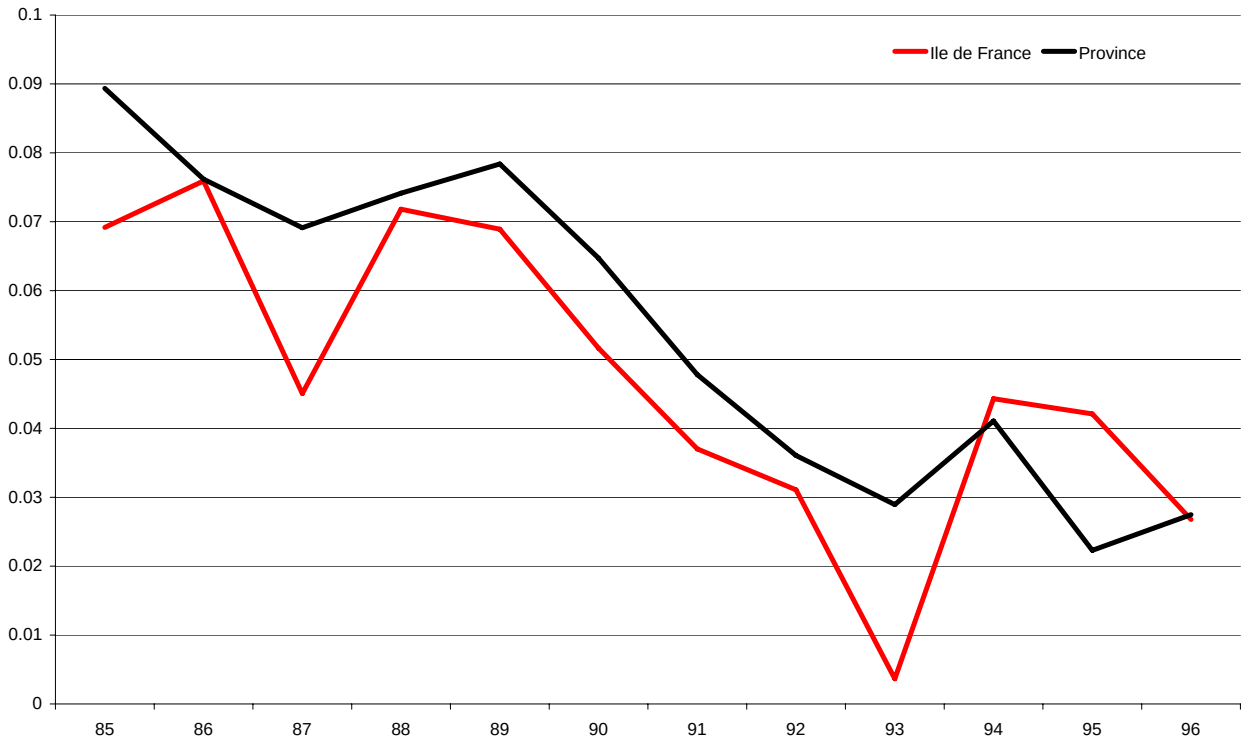


Figure 2: Local GDP growth: *Ile de France* vs. *Province*



B Tables

Table 1: Summary Statistics

Variable	Obs.	Mean	Median	Std. Dev.	Min	Max
Price Index	119,420	1.31	1.24	.25	.98	2.06
Log(Assets)	143,700	9.29	9.09	1.66	0	18.74
ROA	142,929	.082	.078	.084	-.35	.51
Interest Rate	130,720	.15	.11	.13	-.10	.89
Total Leverage	143,609	.49	.49	.20	0	2.09
Financial Leverage	140,387	.43	.30	.45	-.02	2.7
Investment	140,400	.11	.072	.118	-.53	.705
Group Dummy	143,700	.23	0	.42	0	1
Land Holding	11,959	.017	0	.03	0	.11
LAND HOLDING	11,975	.495	0	.5	0	1
$ABLAND_{1987}$	139,308	-.002	-.009	.024	-.06	.088
Issuance Probability	143,700	.42	0	.49	0	1
Debt Issuance	57,955	.137	.085	.149	.0007	.81
Cash Flows	139,100	.23	.18	.30	-1.22	1.59

Notes: This table reports summary statistics for the main variables used in the paper. These variables are: Log(Assets), ROA (EBITDA/Asset), Total Leverage (Total Debt/Asset), Financial Leverage (Total Debt/Asset), Cash Flows (EBITDA-Dividends)/Asset), Investment (Investment normalized by Asset), Group Dummy (a dummy indicating whether the firms is affiliated to a business group), Issuance Probability (probability of any debt issuance), Debt Issuance (Issues of new debt normalized by Asset – conditional on debt issuance) Land Holding (Land Holding normalized by Asset) - this variable is defined for the year 1987- and LAND HOLDING, a dummy variable indicating whether a firm has positive land holding in 1987.

Table 2: Explaining Initial Real Estate Ownership

	1987 Land Holding		
	(1)	(2)	(3)
Log(Asset)	.0042***	.0042***	.0039***
	(.00018)	(.00018)	(.00022)
ROA		-.011***	-.013***
		(.0031)	(.0032)
Total Leverage			-.0053***
			(.0016)
Group Dummy			.0012
			(.00094)
Region Dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Observations	11,926	11,866	11,866
R^2	.11	.11	.11

Notes: This table investigates firms' initial real estate holding. The dependent variable is initial land holding defined as the ratio of land to total assets in 1987. The explanatory variables are: Log(Assets), ROA, Leverage, a dummy variable indicating whether the firm belongs to a group, industry dummies (at the 2 digit level), year dummies and Region Dummies. *, **, and *** means statistically different from zero at 10, 5 and 1% level of significance.

Table 3: Real Estate Prices and Investment Behavior : The Bust of Paris real estate Bubble (1992-1995)

	$\Delta(Capital\ Expenditure)$			
	(1)	(2)	(3)	(4)
Ile de France	-.004	-.0035	-.0065***	-.0055**
	(.0025)	(.0027)	(.002)	(.0022)
LAND_{1987}	.0072	-.024		
	(.049)	(.041)		
$\text{LAND}_{1987} \times$ *Ile de France*	-.17***	-.14***		
	(.047)	(.039)		
ABLAND_{1987}			.03	.018
			(.059)	(.052)
$\text{ABLAND}_{1987} \times$ *Ile de France*			-.16**	-.14**
			(.06)	(.052)
$\Delta(Cash)$	.04***	.014***	.039***	.013**
	(.0056)	(.0048)	(.0056)	(.0048)
$\Delta(Leverage)$		.058***		.058***
		(.004)		(.0039)
$\Delta(Ln(Sales))$		.0034		.003
		(.0044)		(.0043)
Industry Fixed Effect	Yes	Yes	Yes	Yes
Observations	10,910	10,407	10,633	10,143
R^2	.019	.091	.02	.091

Notes: This table investigates the long term impact of real estate inflation in the *Ile de France* Region on corporate investment, according to equation 3. Dependent variable is the difference in the ratio of capital expenditure to lagged book value of assets between 1992 and 1995. Column (1) and (2) use the LAND_{1987} variable as a measure of initial land holding, while column (3) and (4) use the ABLAND_{1987} measure. Column (1) and (3) controls for the difference in Cash, while column (2) and (4) add controls for differences in Total Leverage and differences in Ln(Sales). All specification include year fixed effect. Observations are clustered at the Region-Year level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 4: Real Estate Prices and Investment Behavior - General Specification

	Capital Expenditure			
	(1)	(2)	(3)	(4)
Price Index		-.0028	-.0022	.0013
		(.0021)	(.0023)	(.0021)
$LAND_{1987}\times$ Price Index		.26***		
		(.047)		
Land $Dummy_{1987}\times$Price Index			.013***	
			(.0035)	
$ABLAND_{1987}\times$Price Index				.24***
				(.06)
Cash	.053***	.054***	.054***	.054***
	(.0017)	(.0026)	(.0026)	(.0026)
Year Dummies	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes
Observations	136,460	112,991	110,185	110,185
R^2	.28	.3	.3	.3

Notes: This table investigates the impact of real estate price variations on corporate investment behavior. Dependent variable is capital expenditure normalized by lagged book value of assets. Column 1 estimates a simple investment to cash flow equation, using EBITDA less dividends normalized by lagged book value of asset as a measure for cash flows. Column (2), (3) and (4) present estimations of equation 4, using respectively $LAND_{1987}$, a dummy indicating positive *terrain* in 1987 and $ABLAND_{1987}$ as a measure of initial land holding. All specification include year as well as firm fixed effect and cluster observations at the state-year level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 5: Real Estate Prices and Investment Behavior - Robustness Checks

	Capital Expenditure		
	(1)	(2)	(3)
Price Index	.00081	-.0038	.016***
	(.0022)	(.0037)	(.0043)
$ABLAND_{1987}\times$ Price Index	.21***	.23***	.27***
	(.068)	(.084)	(.093)
Local Income	.011		
	(.011)		
$ABLAND_{1987}\times$ Local Income	.12		
	(.15)		
Cash	.054***	.068***	.038***
	(.0026)	(.0033)	(.0027)
Year Dummies	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes
Observations	110,185	53,951	46,483
R^2	.3	.29	.33

Notes: This table presents three robustness checks of the estimation made in table 4. Dependent variable is capital expenditure normalized by lagged book value of assets. Column 1 estimates equation 5, where a control for local income, the average taxable income in the region, is added and interacted with the $ABLAND_{1987}$ variable. 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 region-year level. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.

Table 6: Real Estate Prices and Investment: Group vs. Stand Alone

	Capital Expenditure	
	Group	Stand Alone
	(1)	(2)
Price Index	.0044	-.0012
	(.0038)	(.0027)
$ABLAND_{1987}$×Price Index	.069	.39***
	(.11)	(.07)
Cash	.05***	.056***
	(.0033)	(.0028)
Year Dummies	Yes	Yes
Firm Fixed Effect	Yes	Yes
Group=Non Group	.001	
Observations	40,098	70,087
R^2	.33	.29

Notes: This table estimates equation 5 for firms affiliated to group and stand-alone firms, respectively. The variables used are similar to those defined in table 4. All specification include year as well as firm fixed effect and cluster observations at the region-year estate ownership level. *, **, and ** means statistically different from zero at the 10, 5 and 1% level of significance.

Table 7: Real Estate Prices and Capital Structure

	$\Delta(Leverage)$	Financial Leverage	Debt Issuance	Probability of of Issuance	Interest Rate
	(1)	(2)	(3)	(4)	(5)
Ile de France	.000013				
	(.0034)				
$ABLAND_{1987}$	-.0077				
	(.13)				
$ABLAND_{1987} \times$ *Ile de France*	-.30**				
	(.14)				
Price Index		.017*	.013**	-.0072	-.0005
		(.0095)	(.0065)	(.013)	(.0027)
$ABLAND_{1987} \times$ Price Index		.68**	.78***	-.055	-.04
		(.34)	(.26)	(.31)	(.13)
Year Dummies	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effect	Yes	Yes	Yes	Yes	Yes
Observations	11,013	72,222	30,112	73,540	66,955
R^2	.008	.66	.4	.36	.51

Notes: This table investigates the link between land Prices and Capital Structure decisions. Column (1) use the same specification as column (3) of table 3, i.e. looks at long term variation in financial leverage in *Ile de France* vs. other regions, for land and non land holding firms. Column (2), (3), (4) and (5) estimates equation 4 using, respectively, financial leverage (financial debts normalized by lagged book value of assets), Debt Issuance (Debt issued normalized by lagged book value of assets, conditionnal on debt issuance), Probability of Debt Issuance and Average Interest Rate (measured as financial expenses normalized by financial debt). All specification include year as well as firm fixed effect and cluster observations at the region-year level. The sample is restricted to Stand-Alone firms. *, **, and ** means statistically different from zero at 10, 5 and 1% level of significance.