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Abstract

We observe significant heterogeneity in the correlation between changes in house prices and the growth of small firms across certain countries in Europe. We find that, overall, the correlation is far greater in Southern Europe than in Northern Europe. Using a simple model, we show that this heterogeneity may relate to financial frictions in a country. We confirm the model's propositions in a number of empirical analyses for the following countries in Northern and Southern Europe: the United Kingdom, Norway, France, Italy, Spain, and Portugal. Small firms in countries with higher financial frictions (for example, places where bankruptcy resolution is more difficult and/or takes longer) see a greater dependence on "stable" real estate collateral. This is most pronounced for opaque (for example, very young) firms. Through an extension to our model and our choice of specification, we show that our findings are most consistent with a collateral-value-based credit supply channel and rule out a consumer-driven demand effect.

Key words: firm financing, real estate collateral, credit supply, bankruptcy laws, financial frictions

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1. INTRODUCTION

Smaller and younger firms are "opaque" from the perspective of lenders and often face difficulties in accessing finance due to informational asymmetries (Beck et al, 2006; Gertler and Gilchrist, 1994). Typically, such firms overcome such informational asymmetries by pledging collateral, which enhances their borrowing capacity (Kirschenmann, 2016; Barro, 1976; Hart and Moore, 1994; Stiglitz and Weiss, 1981)[1]. Residential real estate constitutes a common source of entrepreneurial collateral and, as a corollary, the value of real estate drives small firm activity and entrepreneurship (see for instance: Adelino et al., 2015; Bahaj et al., 2017; Schmalz et al. 2016)[2]. However, we document significant heterogeneity in the correlation between small firm activity and changes in the value of residential real estate across different countries in Europe. As can be seen in Figure 1, firm borrowing in southern Europe co-moves with real estate prices more than firm borrowing in northern Europe. This observation is confirmed by the statements of businesses themselves, as elicited by the SAFE survey[3]. Especially firms that are young or small report having to use real estate collateral to a much greater degree in southern Europe (the survey is discussed further below). Understanding what drives these cross country differences in the importance of real estate collateral is key to developing a deeper understanding of the role real estate plays in overcoming borrowing constraints as well as of the credit supply channel in general.

[Figure 1 about here]

[1] Seminal papers by Bernanke and Gertler (1989) and Kiyotaki and Moore (1997) suggest that improvements in collateral values ease credit constraints for borrowers and affect economic activity. Similarly, improvements in information (or the ease with which it is gathered) improve a firms borrowing ability, given the drop in asymmetric information (Berger et al. 2011).

[2] Naturally, corporate Real Estate prices also drive economic activity (consider: Chaney et al., 2015) while residential real estate can affect local consumption as households draw down home equity, thereby influencing small firm activity (consider: Mian & Sufi, 2011: Mian et al., 2013)

[3] Survey of Access to Finance for Enterprises

In this paper, we develop a model to show that financial frictions, such as the time needed to resolve bankruptcy- or recourse-disputes, can affect the degree to which real estate collateral matters for small firm growth. Recourse proceedings, which take several years to resolve, will induce lenders to apply a haircut to certain types of collateral. After all, assets whose value correlates negatively with time would be ill-suited as collateral in regimes that see very slow bankruptcy resolution[4]. The value of real estate, on the other hand, is traditionally more stable over time and its liquidation does not require specific entrepreneurial knowledge. Since opaque firms are forced to post a higher amount of collateral in any regime, our model is consistent with real estate collateral mattering most for opaque firms (small and especially small-young) in countries with slow bankruptcy resolution.

We confirm these propositions in a set of empirical analyses that make use of AMADEUS firm-level data from 6 European countries (France, Italy, Spain, UK as well as Portugal and Norway in extensions) for the years 2004 to 2012. This time period includes rising as well as falling house prices and avoids the confounding influence of some regulatory changes that followed the Eurozone crisis. We find that small firm borrowing, investment and employment are substantially more sensitive to changes in local real estate prices in Southern Europe (Italy, Portugal and Spain). These are countries in which, according to the World Bank, bankruptcy resolution is more complex and contract enforcement more difficult. This effect is strongest in very young firms, which are more opaque, compared with older firms of similar size. With this clear result, our paper helps

[4] Consider work by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998 & 2000) who show lending decisions of financial institutions are sensitive to legal systems, which shape loan recovery rates. Legal systems that lower the value of collateral, from a bank's perspective, will require companies to post more in order to avoid higher interest rates or credit rationing (Benmelech and Bergman, 2009; Cerqueiro, Ongena and Roszbach 2014). Similarly, Gao and Zhu (2015) find a stronger relation between firm's information asymmetry and short term debt in countries with clear bankruptcy regulation.

contribute to an understanding of the slump in economic activity and high number of NPLs in Southern Europe, which followed the sovereign debt crisis.

In our baseline specification, we make use of data on real estate price changes for around 20 regions[5] in each country and relate these changes to the activity of individual small firms (<500,000 USD in total assets) in these regions. We furthermore test whether marginally more opaque (i.e. young) firms are more responsive to real estate prices. In so doing, we are essentially estimating a quasi-difference in difference specification. In specifications in which we interpret this interaction coefficient, we can include region*time or even region*time*industry dummies as control variables, which absorb a number of possibly confounding influences. In all our analyses, we are furthermore able to control for a host of company specific factors, such as existing leverage, profitability, industry performance, and various size measures.

Despite being able to include these detailed controls, we are left with two identification challenges. First, given that we do not have full information about loan applications or an entrepreneur's private collateral, we cannot rule out that changes in aggregate conditions affect both small firms and house prices simultaneously. Second, consumer demand can be influenced by house price changes as was shown clearly by Mian, Rao, & Sufi (2013). Households, which experience a house-price based wealth increase, might consume more, which in turn could benefit small local firms.

In order to address the first identification challenge, we instrument house price changes with land supply in a set of additional analyses[6]. This paper is one of the first to make use of land supply

[5] NUTS-2 geographic aggregation level.

[6] Land supply data from Eurostat is interacted with long term interest rates (i.e. mortgage rates). This mirrors approaches by Chaney et al (2012). Several papers have recently used land supply as an instrument for house price changes (see Mian & Sufi, 2011), following Saiz (2010).

data for this purpose in the European context. Isolating exogenous house price changes allows us to abstract from aggregate influences that might drive both prices and firm activity. We argue that, when controlling for local characteristics, land supply is independent of short term changes in local lending- or business conditions.

Addressing the concern that our results are driven by consumer demand is empirically more difficult. We do so in part by extending our model to show that small firms are unlikely to respond to consumer demand, especially in countries with difficult bankruptcy resolution. The insight from the model is that only firms that are financially unconstrained (i.e. have reached an optimal size) are able to use debt financing to meet a demand shock in the short term. Firms that are already prevented from growing due to borrowing constraints, may not. Opaque firms, that are known to be borrowing constrained, are therefore inherently less likely to respond to consumer demand than less opaque firms. This holds especially in countries with higher financial frictions, where, as we show, a larger share of opaque firms face borrowing constraints. Particularly in specifications looking at the response of young-small (read: very opaque) firms to real estate prices in high-friction countries, our model suggests that demand could constitute, at most, a slight downward bias on our results. We discuss this at length in the following sections.

Our work joins a rich body of research on the collateral channel of credit supply and the importance of the value of housing for firm activity. Using US county level data, a study by Adelino et al (2015) found that rising house prices had a positive impact on small relative to large firm employment in the same geographical region in 2002–07. They found that increases in the value of firms' collateral boosted investment. Schmalz et al (2013) found that housing wealth was an important factor in the decision to start a new firm, as well as a determinant of growth, investment and employment of new firms in France. Bahaj et al (2016) estimate the differential impact of

housing equity by comparing activity in firms where the directors own residential real estate relative to those that do not. Fort et al (2014) found that the collapse of house prices accounted for a significant part of the large decline of employment growth in young and small businesses. Mehrotra and Sergeyev (2015) found that declines in US housing prices diminished job creation and job destruction, with a larger impact on smaller and younger firms, consistent with the collateral channel. Pinter (2015) found that regional UK house price declines were associated with higher unemployment and estimated a model with collateral constraints to explain this result. Chaney et al (2012) examined the relationship between collateral and investment using firm-level data for US listed corporations. Kleiner (2015) examined the impact of changes in UK firms' collateral value on changes in employment, capital stock and borrowing at the firm level. Giroud and Mueller (2016), though not analyzing collateral-based credit supply, found that the regional variation in unemployment due to house price declines was almost entirely driven by the shedding of workers in firms that had an above median increase in leverage in 2002–06, i.e. firms that were more likely to be financially constrained at the start of the recession.

Our paper extends the existing literature on the lending collateral channel along three dimensions. First and foremost, we compare the impact of the collateral channel across countries within the European Economic Area. We show that it varies strongly and link this variation to financial frictions and contract enforcement. In so doing, we also contribute to literature on the link between regulatory regimes and lending[7]. Second, our empirical strategy is novel in that it specifically identifies the collateral effect for an important group; i.e. young and small firms. These have received scant attention, yet account for a large share of employment in Europe and can often be significant determinants of aggregate economic growth. Finally, in extensions we can show that

[7] See for instance see for instance Kalemli-Ozcan et al, 2015 on a growing literature regarding the divide between financial frictions in northern vs. southern Europe

the collateral channel is less pronounced for those firms that have access to other pledge able assets, further explaining the residential real estate collateral channel.

The remainder of the paper is organized as follows. Section 2 presents some concepts pertaining to the importance of collateral in small and young firms across Europe. We then formalize these thoughts in a theoretical model from which we can derive predictions. Section 3 details our data, some summary statistics, and first visual results. Section 4 outlines our baseline methodology in greater detail and shows how we avoid the confounding influence of demand effects. Section 5 explores alternate specifications of the regressions, such as the IV methodology. It also explores extensions of our methodology that test certain implications of our ideas, which should be visible in the data if our basic assumptions are valid. Section 6 discussed Robustness tests and section 7 briefly concludes the study by also offering policy perspectives.

2. THE COLLATERAL CHANNEL AND FINANCIAL FRICTIONS

2.1 The importance of real estate collateral across Europe

It is a well-established principle that small firms make use of collateral to avoid borrowing constraints. In 2015, the ECB's Survey on the Access to Finance of Enterprises (SAFE) asked a new question about the use of collateral by firms. In France, Spain and Italy[8] 62% of small firms with less than 50 employees report needing collateral to acquire financing. Of these, half report using personal assets, including their own house, as collateral (vs. only 5% of larger firms). The effects are more pronounced for young firms. Of the firms surveyed that were less than 6 years old, 100% reported having to use some type of collateral to secure a loan. This reflects the fact that these firms cannot yet make use of relationship banking (consider Berger & Udell, 1995 or Kirschenmann, 2016) or an existing track record of performance that could mitigate information asymmetries between them and the lender.

The SAFE survey also documents significant heterogeneity in the need for small firms to post collateral across countries. In Spain, about 80% of small companies reportedly needed collateral. In France, the share was significantly lower at only 44% (Italy was close to the average of 60%). A possible reason for this heterogeneity may lie in the different legal institutions and, consequently, financial frictions at play in each of these countries. Conceivably, banks will be more likely to demand significant amounts of collateral from opaque firms in economies where enforcement of contracts is more complicated, so as to be compensated for the cost of contract enforcement. As shown by La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997, 1998 & 2000) lending decisions of financial institutions are sensitive to legal systems, which shape loan recovery rates. Legal systems that lower the value of collateral, from a bank's perspective, will require

[8] Portugal, UK or Norway are not in the survey

companies to post more in order to avoid higher interest rates or credit rationing (Benmelech and Bergman, 2009; Cerqueiro, Ongena and Roszbach 2014). This should apply in particular to collateral with a time-sensitive value (consider cars, specialized inventory, patents, etc.). If contract enforcement takes too long, the value of the collateral has to be discounted considerably[9]. Given that the value of real estate does not fall mechanically as a function of time, personal housing should be a key source of collateral for entrepreneurs in countries with higher financial frictions.

[Table 1 about here]

The World Bank's Doing Business Indicators show that financial frictions, measured by the ease of enforcing contracts, vary. The indicator shows that in 2012 the time required to enforce contracts was longest in Italy (657 days), followed by Spain (515 days), and lowest in France (29 days). Other indicators, for example those relating to recovery rates, follow a similar pattern. These can be found, for all the countries employed in our sample, in Table 1 and Appendix-Table 1. Countries, whose indicators suggest that doing business might be difficult, are considered "high friction" countries in the context of this study.

In the Appendix (Appendix Figure 1) we relate the relationship between corporate credit and house prices to contract enforcement. We can see that the time needed to enforce contracts relates to the correlation between house prices and corporate lending in the individual countries used in this paper. As is clear from the figure; other factors may influence the importance of real estate collateral[10]. However, the importance of financial frictions cannot be ignored. We formalize

[9] Acharya et al. (2011) explore how a firm's liquidation value at bankruptcy, together with the bankruptcy code of a country, affect firm borrowing /leverage. They show that difference in leverage across country should be decreasing function of the liquidation value.

[10] One such factor might be the differences in the home ownership rate. According to Eurostat, ownership rates were highest in Spain at 80%, similar in Italy, Portugal and the UK at about 75% and lowest in France, at 63% in 2008. We might reasonably expect a greater correlation between real estate prices and borrowing at the aggregate level, in countries where entrepreneurs can readily pledge housing collateral to overcome the frictions induced by their opacity.

frictions, firm opacity, consumer demand, and the need for collateral in a theoretical model in the following sections.

2.2 A Model of firm borrowing and financial frictions

We develop a simple model to study the channels through which housing can affect firm activity under different financial frictions. In the model, a rise in house prices can affect firm activity through two channels, first it can raise consumer demand and second, it can ease the credit constraints for entrepreneurs as housing owned by the entrepreneur provides an additional source of pledgeable collateral.

The main insights from the model are the following three concepts: Firstly, higher financial frictions cause a greater number of firms to face borrowing constraints. Secondly, if an increase in house prices only raises consumer demand, then unconstrained firms can use their spare borrowing capacity to expand investment to meet this additional demand. By contrast, credit constrained firms, remain credit constrained and cannot expand investment by increasing borrowing. Finally, if an increase in house prices only raises the value of entrepreneurial collateral and has no effect on demand, then credit constrained firms will use the additional borrowing capacity to increase investment but credit unconstrained firms will not increase borrowing or investment. If housing collateral affects constrained firms more than unconstrained firms, a credit supply effect will be identified among constrained firms, especially in countries with greater financial frictions.

2.2.1 No borrowing constraints

We assume an economy with many entrepreneurs. In period 0, entrepreneurs are endowed with initial firm capital $k_0$which is distributed uniformly $k_0 \sim u[0, \bar{k}]$. Firms use physical capital k to produce a differential good y with the following production function.

$$y = k^a$$

where a determines the returns to scale. The firm faces an isoelastic demand curve with elasticity, ε.

$$q = x(h)p^{-\varepsilon}$$

Where $x(h)$ is a demand shifter that is a function of the value of the housing equity of consumers, h, and $x'(h) \geq 0$ ie demand is increasing in consumers housing equity. This can be combined into a revenue function $R = x(h)^{\sigma}k^{\alpha}$ where $\sigma = 1/\varepsilon$, $\alpha = a(1 - 1/\varepsilon)$ and $0 < \alpha < 1$. Firms can borrow b to purchase additional capital at price 1, facing an interest rate of r, per unit of capital. The firm's problem is to choose investment to maximise profits

$$\max_k E[x(h)^{\sigma}k^{\alpha} - rb], \qquad st\ k - k_0 = b$$

The optimal capital stock in the absence of borrowing constraints is given by:

$$k^* = \left[\frac{x(h)^{\sigma}\alpha}{r}\right]^{\frac{1}{1-\alpha}} \tag{1}$$

Therefore, the capital stock is increasing in demand and decreasing in the cost of borrowing.

2.2.2 Borrowing constraints and collateral

As discussed above, small firms are considered relatively opaque. Consequently, a variety of agency problems arise in borrowing relationships, which can result in credit constrained firms. Firms can overcome these constraints by pledging collateral. However, not all collateral is accepted to the same extent in all countries. In the model, firms have access to two forms of collateral. Entrepreneurs can pledge their initial endowment of capital k_0 as collateral. In addition, we assume

that each entrepreneur owns a house and can pledge the equity h in their house as collateral. In regimes with higher financial frictions, the degree to which k_0 can be pledged is lower than in regimes with lower financial frictions. The borrowing constraint is given by:

$$b \leq \mu\theta k_0 + h$$

Where $0 < \mu < 1$ measures the pledgibility (i.e. the expected loss during recovery and consequently the degree to which banks accept collateral) of firm capital in a transparent firm. Hereby $0 < \theta < 1$, captures the opacity of the firm's collateral. We posit that young firms, with weaker lending relationships, will have to pledge a greater amount of collateral, all else equal. This may be, for example, because banks are less sure of the collateral's quality. However, h is the value of the house that can be pledged and it is not subject to an opacity-related discount, as the house is a more transparent asset. The entrepreneur's problems is:

$$\max_k E[x(h)^\sigma k^\alpha - rb], \qquad st\ k - k_0 = b\ and\ b \leq \mu k_0 + h$$

Assuming the value of housing h is less than k^*, the firm's optimal stock is given by

$$k' = \begin{cases} (1+\mu\theta)k_0 + h, & if\ k_0 < (k^* - h)/(1+\mu) \\ k^* & if\ k_0 \geq (k^* - h)/(1+\mu) \end{cases} \tag{2}$$

If the borrowing constraint binds, the firm's optimal capital stock is equal to the initial endowment plus the amount of capital the firm can purchase with debt. If a firm has a sufficient initial endowment, the firm can reach its optimal size. The firm's borrowing is given by

$$b' = \begin{cases} \mu\theta k_0 + h, & if\ k_0 \leq (k^* - h)/(1+\mu) \\ k^* - k_0, & if\ k^* \geq k_0 > (k^* - h)/(1+\mu) \\ 0, & if\ k_0 \geq k^* \end{cases} \tag{3}$$

Define $\widetilde{k_0}$ as $\widetilde{k_0} + (\mu\theta\widetilde{k_0} + h) = k^*$, ie the firm with the lowest endownment that can attain optimal size.

[Figure 2 about here]

The left hand panel of Figure 2 graphically illustrates the equilibrium capital stock of a firm as a function of the entrepreneur's initial endowment. The initial endowment k_0 divides firms into three regions in the graph. The first set are firms in the *credit constrained* region of the graph. These firms have insufficient collateral to reach the optimal size. A rise in the value of the entrepreneur's house, h, reduces the fraction of firms that are credit constrained. The second are firms that have sufficient collateral to borrow funds to reach the *optimal size.* The third are entrepreneurs with endowments greater than the optimal capital stock. The right hand panel (B) of Figure 2 illustrates the level of borrowing as a function of the initial endowment k_0 and the value of housing collateral h.

2.2.3 Model predictions

With this simple model where house prices influence both firm collateral and demand, we can derive five predictions for the differential effect of house prices on the activity of constrained relative to unconstrained firms.

Proposition 1: *If housing can be used as entrepreneurial collateral but demand is insensitive to house prices,* $x'(h) = 0$, *the sensitivity of borrowing by credit constrained firms to house prices is greater than that of unconstrained firms.*

Intuitively, the rise in house prices increases the collateral values of constrained entrepreneurs, which raises overall borrowing in the economy. The result is illustrated in Figure 3 on the right. When house prices increase the value of firm collateral, only previously constrained (smaller) firms undertake additional borrowing to get closer to reaching the optimal firm size. Previously larger unconstrained do not increase borrowing as they are already at the optimum size. Formally, borrowing of credit constrained firms in the economy is given by

$$B^c = \int_0^{\widetilde{k_0}} [\mu\theta k + h] dk \tag{4}$$

$$= \frac{\mu\theta\widetilde{k_0}}{2} + h\widetilde{k_0}$$

The sensitivity of borrowing by credit constrained firms to a change in house prices is therefore:

$$\frac{\partial B^c}{\partial h} = \widetilde{k_0} \tag{5}$$

Borrowing of unconstrained firms in the economy is given by

$$B^u = \int_{\widetilde{k_0}}^{k^*} [k^* - k_0] dk \tag{6}$$

$$= \frac{1}{2}(k^* - k_0)^2$$

And the derivative with respect to housing for unconstrained firms is:

$$\frac{\partial B^u}{\partial h} = (k^* - \widetilde{k_0}) k^{*\prime}(h) \tag{7}$$

If demand is insensitive to housing then $k^{*\prime}(h) = 0$. Thus the difference in borrowing by credit constrained firms relative to constrained firms is:

$$\frac{\partial B^c}{\partial h} - \frac{\partial B^u}{\partial h} = \widetilde{k_0} > 0$$

Proposition 2: *Within the set of credit constrained firms, the sensitivity of firm borrowing to house prices is increasing in the opacity of the firm*

From (5)

$$\frac{\partial B^c}{\partial h} = \widetilde{k_0} = (k^* - h)/(1 + \theta\mu)$$

$$\frac{\partial^2 B^c}{\partial h \partial \theta} = -\mu(k^* - h)/(1 + \theta\mu)^2 < 0$$

Under the assumption then that $k^* > h$, small and especially firms that are young and small (i.e. very opaque from the perspective of a lender) should respond more strongly than less opaque firms.

Proposition 3: *If housing cannot be used as entrepreneurial collateral but house price increases raise demand (i.e.* $x'(h) > 0$*), the sensitivity of borrowing by credit constrained firm to house prices is less than that of unconstrained firms.*

The result is illustrated in Figure 3. The left side describes the effect of a pure demand effect. When house prices increase demand, only previously unconstrained (larger) firms larger undertake additional borrowing to increase their size, shown by the shaded area to the right. Previously constrained smaller firms are unable to increase borrowing to meet higher demand. More formally, the borrowing of credit constrained firms in the economy when housing cannot be used as collateral is given by

$$B^c = \int_0^{\widetilde{k_0}} [\theta \mu k] dk \tag{6}$$

And hence $\frac{\partial B^c}{\partial h} = 0$. As $k^{*'}(h) > 0$ and $k^* - \widetilde{k_0} \geq 0$, then from (7)

$$\frac{\partial B^c}{\partial h} - \frac{\partial B^u}{\partial h} = -\left(k^* - \widetilde{k_0}\right) k^{*'}(h) < 0$$

Therefore, with only demand effects from housing, the difference in the sensitivity of borrowing by constrained and unconstrained is negative.

Proposition 4: *If housing can be used as entrepreneurial collateral and also affects demand, the relative sensitivity of borrowing to house prices is ambiguous. The direction depends on the relative strengths of the effects of the credit supply effect from Proposition 1 and the demand effect in Proposition 3.*

From (5) and (7)

$$\frac{\partial B^c}{\partial h} - \frac{\partial B^u}{\partial h} = \widetilde{k_0} - \left(k^* - \widetilde{k_0}\right) k^{*'}(h) \lessgtr 0$$

If the demand effect dominates, when house prices increase, the increase in firm borrowing by unconstrained borrowers will be greater than that of constrained borrowers. However, if the supply effect dominates, then the increase in firm borrowing by constrained borrowers will be greater than that of unconstrained borrowers.

Proposition 5: *If housing can be used as entrepreneurial collateral and also affects demand, the sensitivity of borrowing to house prices of credit constrained relative to credit unconstrained firms is increasing in the level of financial frictions and firm opacity.*

Substituting the definition of $\widetilde{k_0} = (k^* - h)/(1 + \theta\mu)$ into (5) yields

$$\frac{\partial B^c}{\partial h} = (k^* - h)/(1 + \theta\mu)$$

and taking the derivative with respect to the financial friction μ,

$$\frac{\partial^2 B^c}{\partial h \partial \mu} = -\theta(k^* - h)/(1 + \theta\mu)^2 < 0$$

This implies that for credit constrained firms, the sensitivity of borrowing to house prices decreases with lower financial frictions (higher μ). For unconstrained firms substituting the definition of $\widetilde{k_0} = (k^* - h)/(1 + \theta\mu)$ into (7) yields

$$\frac{\partial B^u}{\partial h} = \frac{k^*(h)}{(1 + \theta\mu)^2} k^{*'}(h)$$

and taking the derivative with respect to the financial friction μ,

$$\frac{\partial^2 B^u}{\partial h \partial \mu} = \frac{\mu k^{*'}(h)}{(1 + \theta\mu)^2}(k^* - h) > 0$$

Thus the relative sensitivity of borrowing by credit constrained, relative to credit unconstrained firms to house prices is higher in countries with greater financial frictions (lower μ).

$$\frac{\partial^2 B^c}{\partial h \partial \mu} - \frac{\partial^2 B^u}{\partial h \partial \mu} < 0$$

The sensitivity of borrowing by credit constrained, relative to credit unconstrained firms to house prices is therefore higher in countries with greater financial frictions (lower μ). Moreover, from *Proposition 2*, opacity compounds the effects of financial friction, (i.e. in countries with greater financial frictions, the difference in the sensitivity of more opaque (lower θ) credit constrained borrowers, relative to credit unconstrained firms is greater in countries with greater financial frictions (lower μ).

$$\frac{\partial^3 B^c}{\partial h \partial \mu \partial \theta} = \mu\theta(k^* - h)/(1 + \theta\mu)^3 > 0 \tag{7}$$

This final proposition is arguably the most important. It shows that, among opaque firms, the effects of aggregate consumer demand are likely to play a less important role (especially in countries with high financial frictions). Moreover, it delivers two important and testable hypotheses together with the propositions above. Firstly, small firms in countries with higher financial frictions are more likely to be credit constrained and should respond to house price movements to a greater degree than firms in countries with lower financial frictions. Secondly, this effect should be more pronounced among young firms, as these are particularly opaque.

3. DATA DESCRIPTION AND SUMMARY STATISTICS

We make use of data from a broad set of European countries: Italy, France, Spain, and the UK in our main sample as well as Portugal and Norway in extensions. We make use of these countries for two reasons. First, balance sheet data are available for a large number of companies. Second, as discussed above, financial frictions and the associated importance of collateral are likely greater in Italy, Portugal and Spain than in France, Norway and the United Kingdom. Portugal and Norway are used as additions, as these countries face some data limitations.

We use firm-level accounting data from AMADEUS database provided by Bureau van Dijk. The data is collected from local company registers and available at annual frequency. We use data for 2004–2012. These years include a period of economic and house price growth, and the onset of the financial and sovereign debt crises. This time period avoids major changes to bankruptcy law, which were endogenous to the sovereign debt crisis (which began in 2011 and affected many countries in our sample)[11]. The raw data from AMADEUS database covers around 700,000 firms per year in Spain, 900,000 in Italy, 1,000,000 in France, and 500,000 in the United Kingdom. Our extended set covers an additional 100,000 firms in Norway and 400,000 in Portugal.

Our sample is restricted to very small firms – those with less than 500,000 USD in assets and covers only unconsolidated entities to avoid double counting. We further remove extreme outliers that are likely to be a result of coding errors. In particular, we remove firms whose liabilities exceed their total assets by more than 1.2 in our main specifications as well as small firms with cash, or fixed asset holdings far larger than their stock of total assets. We also drop all financial, insurance, real estate, construction, agricultural and mining firms. Firms must be recorded for more than 2

[11] See for instance Garrido (2016) or “Spain’s new bankruptcy legislation offers hope for debtors” in El Pais (2015)

periods to stay in the sample, since our dependent variables are expressed as year-on-year changes. The majority of our independent variables are calculated ratios. Both ratios and year-on-year changes are winsorized on an annual basis at the 1% level. We assess the sensitivity of our results to these data cleaning choices in the robustness section of the paper. Given that a key variable in our analysis (see below) is firm age, we allow for firm entry. As a result, our panel is unbalanced. Firm age is defined as the number of years since incorporation.

Our final sample includes over 260,000 firms in Spain and Italy, over 400,000 in France, but fewer than 60,000 in the United Kingdom. Portugal can only be included after 2008, given data availability and includes 100,000 firms while Norway does not report employee information and only includes a few thousand firms. The majority of all the firms in our sample are very small, with total assets of less than $250,000, i.e. firms where changes in house prices are likely to have a significant impact on the amount of pledgeable collateral available for the firm's financing needs[12].

For our dependent variables of interest, we look at firm borrowing, employment and annual investment. We define borrowing as the sum of current liabilities plus non-current liabilities. Investment is defined as the change in total fixed assets plus depreciation divided by lagged total fixed assets. For employment, we consider total employees as reported by the firm. Firm-level borrowing grows by between 10 and 20% per year in our sample and annual investment around 30 – 40% of the book value of total fixed assets. Investment, however, is highly sporadic with some firms investing large sums in a single year and not at all in most others. Firm employment grows between 2% and 5% per year, though it is somewhat higher in Italy (at 10%). Due to the possible selection bias in our sample, given that not all firms in an economy report detailed information

[12] The distribution of firms by size (in the full sample of SMEs) can be found in the Appendix (Appendix Figure 1)

(and AMADEUS does not cover all those that do), these figures are likely to be higher than the average growth of firms in the economy

Our independent firm-level variables include log turnover, leverage (defined as the ratio of total debt to total assets), the cash to turnover ratio and earnings before interest and tax to total assets. We also include sales in a region-industry cell as a control variable for regional demand. This measure is constructed by taking the sum of sales per industry (defined by two digit NACE classifications) for the region in which a respective firm is headquartered. Table 2 displays some univariate characteristics for firms with less than $500,000 in assets. The variation across the four countries is broadly similar. Mean total assets are approximately $200,000 (slightly lower in the UK), mean leverage is approximately 60% and average EBIT varies between $10,000 and $21,000, with highest EBITs being earned in the UK. Around a third of our sample are firms with less than $100,000 in assets and a similar proportion are younger than 5 years. The mean firm has 5 employees.

[Table 2 about here]

We merge our firm-level data with information on local housing markets from a variety of sources. Our regional house price data for each the years between 2004 and 2012 for Spain comes from Euroval. It measures the square-meter price of average residential property at the level of the 17 autonomous communities. In 2012, for instance, the average price for a Spanish home, over all the regions and years in our data, was approximately $190,000 (for a 100 square metre apartment). For Italy, we use house price data for the 21 provinces from Muzzicato et al (2008) extended to 2013. French regional house price data are provided by the office of French notaries, available for the 21 “régions”. For the United Kingdom, house price data come from Nationwide for the different regions in England, as well as for Scotland and Wales (respectively measured as one region each).

For Norway, we observe prices for the NUTS2 regions. Some less populated provinces are merged for a total of 8 regions. Finally, our Portuguese sample is slightly truncated; the Banco de Portugal was able to provide us with house price data for Portugal's regions only from 2008 onwards. Moreover, Portugal only consist of 7 regions in our data. This means that identifying our effect of interest can be more difficult in Portugal and in Norway, which is one reason they constitute a separate sample that can be used to confirms our hypotheses.

In general, we refer to autonomous communities, provinces and régions by the more general term "region" for simplicity. We match these regions to individual firms according to the zip-code of each firm's headquarters. We implicitly assume that firms (or their owners) only pledge real estate close to the firm's headquarters. This assumption seems plausible for very small firms. We also assume that at least some small firm owners own real estate and that real estate ownership is distributed relatively uniformly between opaque and less opaque firms.

In the appendix, we show house price trends (at the national level) for the countries in our sample. In both Spain and Italy, a price boom before 2007 is followed by either a steady decline (as in Spain) or by a subdued state of limited growth (as in Italy). In France and the UK, the crisis precipitates a two year fall in house prices. After 2009, however, prices continue to rise, in many regions of France, and exceed levels reached in 2007. In the UK, prices recover somewhat after the crisis but remain relatively constant for several years thereafter. Our identification (discussed in detail below) relies not only on the time-series variation in house prices but also on the cross sectional variation between regions. Given that the regions in our sample are often quite distinct, we observe heterogeneity in the development of house prices within countries (see Panel B of the Appendix Figure).

In our analysis we aim to show that opaque firms in countries with higher financial frictions are more dependent on residential real estate as collateral. Therefore, we expect the correlation between firm activity and price changes to be higher in countries with higher frictions. Given that "age" can be seen as a good proxy for opacity, we further expect a compounding of the relationship between real estate and firm activity for young firms in high friction countries.

[Figure 4 about here]

Figure 4 illustrates the basic insights from our analysis in a set of graphs. We plot growth in house prices in a given region for a given year against average growth in firm liabilities in the region. In red, we plot observations for firms that are more opaque, and in blue firms that are less opaque. We consider firms that are less than five years old to be opaque. We show two countries, Spain and the UK; as examples for Southern and Northern Europe, respectively. Graphs for all countries can be found in the Online Appendix.

The graphs show that the relationship between changes in the value of real estate and changes in firm-level liabilities is more pronounced for companies in high friction countries. Moreover, the effect is larger for more opaque firms in Southern Europe but no different in Northern Europe. In order to formally test the propositions derived above and to determine whether the relationships shown in Figure 4 are statistically and economically significant, we perform a detailed set of regression analyses.

4. House Prices and Firm Activity

4.1 Baseline Methodology

In our baseline specification, we relate changes in local residential real estate prices to the changes in the activity of small firms operating in that area. The assumption underlying our methodology is that, on average, entrepreneurs/small firm owners will live close to where they open their business. Especially for small firms, this assumption seems justifiable. We run this analysis for 6 different countries (Spain, Italy, France the UK as well as Portugal and Norway in extensions in the online appendix). We can thereby compare the relationship between firm activity and real estate prices across countries that vary, in part, by the severity of financial frictions while still being members of the European Union or European Economic Area.

We measure firm activity as the year-on-year changes in firm liabilities, investment and year-on-year changes in number of employees. These are three metrics that cover both borrowing as well as important capital allocation decisions that influence aggregate employment or productivity. Changes in liabilities are defined as current and non-current liabilities in year t over current and non-current liabilities in t-1. Investments, as mentioned above, are defined as the change in total fixed assets plus depreciation divided by lagged total fixed assets. Finally, changes in employees are taken as the FTE, as reported by the firm, in t over FTE in t-1.

We focus particularly on small firms (i.e. firms with less than 500,000 USD in total assets) as these are firms for whom the value of residential real estate would be substantial. We include a number of firm-specific and regional controls and run different specifications of the following equation, separately for each country. Specifically, for firm i, at date t, registered in region r, in

industry l¸ we estimate the impact of local house price changes on the variable of interest Y_{it}^{r} with the regression:

$$\Delta Y_{it}^{r} = \beta_1 \Delta HP_t^r + \gamma X_{it-1} + \alpha^r + \theta^l + \varepsilon_{it} \qquad (8)$$

ΔHP_{it}^{r} denotes the change in the real estate index in region r for year t[13]. The coefficient of interest in our regressions is β_1. It identifies the impact of changing house prices (and therefore changes in the value of collateral). In all regressions, we use a vector of firm-level control variables, X_{it-1}. This includes: cash to turnover (capturing the amount of internal funds available), earnings before interest and tax (EBIT) to turnover (capturing firm profitability), leverage (capturing the degree to which the firm has already made use of debt financing), and industry level sales within the respective region in each period. This last variable attempts to capture industry-specific fluctuations in consumer demand within a region. To further control for region-specificities, we include region fixed effects, α^r . Finally, we also include time-invariant industry level dummies, θ^l. Standard errors are clustered by industry. In these baseline regressions, we do not include firm fixed effects. By estimating our regression with percentage changes in borrowing and employment we still control for firm specific characteristics that do not vary between individual years. Qualitatively, our results hold when we run very similar specifications that include firm fixed effects.

The above analysis can be extended to show that firms, which are opaque, are more affected by changing real estate values, particularly in countries with greater financial frictions. To do so,

[13] The manner in which real estate prices are measured implies a certain lag versus the dependent variables. This lag depends on the reporting time of the firm and the country in question but is usually between 3 and 6 months.

we also run the following equation, separately for Italy, France, Spain, and the United Kingdom as well as for Portugal and Norway in extensions.

$$\Delta Y_{it}^{r} = \beta_1 \Delta HP_t^r + \beta_2 \Delta HP_t^r * D_{it-1} + \beta_3 D_{it-1} + \gamma X_{it-1} + \alpha_t^r + \theta^l + \varepsilon_{it} \quad (9)$$

Here "D" is an interaction dummy that measures whether a firm is considered "opaque" from the perspective of a lender. The primary measure of opacity is age (i.e. time since firm founding). All firms that are less than 6 years old are considered young and therefore opaque. As a consequence, our variable of interest is now β_2. In order to account for all possible influences, that may be affecting an area during period t, we now include region-year fixed effects. These absorb any house price effect (i.e. one can no longer interpret β_1) and this specification can be considered extremely restrictive. However, these controls ensure that we measure only the degree to which more opaque firms are differentially affected by changes in local residential house prices compared to less opaque firms.

In extensions to this paper, which can be found in the online Appendix, we further make use of "very small" (less than $250,000 USD in assets) as another definition for opacity. Very small firms are likely in-transparent and may therefore face additional borrowing constraints. However, very small firms are also likely to be more susceptible to changes in the value of real estate prices, as housing collateral could constitute a more significant portion of their balance sheet. Consequently, we use the results as another way of confirming the observations discussed below.

4.2 Baseline Results

Table 3 details the results for regression 8. Each field represents a single regression, through only the coefficient of interest as well as the number of observations in the regression are reported

for brevity. The full tables of these specifications can be found in the Appendix. We have sorted countries, roughly, by the financial frictions in each going from high-friction to low friction countries. We abstain from a very specific interpretation of the results, given the numerous differences in house values, company size, etc. between the countries (this applies specifically for marginal dollar-to-dollar interpretations). We focus instead on the general relationships between the value of residential real estate and the activity of small firms.

[Table 3 about here]

One can observe that the changes in local house prices have a strong effect on changes in liabilities, investment and changes in employment in small firms in Southern Europe. The effect is almost negligible in northern Europe. A 1%-point increase in local house prices in Spain leads to a 0.84%-point change in liabilities. This is a substantial increase. In Italy, the effect is less pronounced, though still sizeable. A 1%-point increase in prices leads to a 0.5%-point increase in liabilities. France sees only a 0.13%-point increase and the smallest effect is observable in the UK at only 0.036%-points. The pattern is similar when looking at Investments and Changes in employment. In fact, in both these categories very small firms in the UK show negligible reactions to changes in the value of real estate. These observations are confirmed for Norway and Portugal (depicted in the Appendix) whereby the effect of real estate price changes on firm activity are far larger in Portugal (high financial frictions) than in Norway (low financial frictions). Despite very different and more limited data, our results are comparable to Chaney et al. (2015) in France who find a similar effect. They estimate that a 1% change in prices may lead to a 0.15% change in investments for real estate-holding firms[14].

[14] This indicates that, at worst, we underestimate the effect somewhat. However, given the differences in approach and data, we feel confident that we are observing similar effects

[Table 4 about here]

Table 4 shows the coefficients of β_2 from regression (9). It depicts to what extent the activity of small firms that are young, and therefore more opaque, co-move with real estate values. The table depicts only coefficients of interest and the number of observations used for the regression. As above, we abstain from an exact interpretation of the coefficients and look to the fact that they corroborate our expectations about the compounding effects of opacity and country-specific financial frictions.

We indeed find that companies, which are more opaque, are more dependent on real estate collateral in countries that see higher financial frictions[15]. In Spain, a 1%-point increase in residential real estate prices will lead to a 0.54%-point stronger increase in the borrowing of small-young firms vs. older counterparts of the same size. In Italy, the reaction of younger firms is 0.2%-points larger while in France it is only 0.07%-points larger. There seems to be no difference in the UK. The same patterns can be observed in investments and changes in employees. As can be seen in the Appendix, Portugal and Norway follow a similar pattern, with young firms in Portugal more susceptible to changes in the value of residential real estate[16].

4.3 Consumer Demand vs. Credit Supply

In general, our ability to control for industry-sales, region-time effects (equation 9), as well as our focus on very small firms in both equations (8) and (9) is likely to absorb the effects of

[15] Ultimately, these results are in line with findings by Schmalz et al (2015) who show that housing collateral has a positive impact on the borrowing of new entrants. However, we show the impact of real estate price changes can be an order of magnitude different between countries.

[16] These results are further confirmed in the online Appendix in which we make use of size as an additional definition of opacity

consumer demand, alluded to in earlier sections. Changes in consumer preferences would affect the industry as a whole. Changes in local consumption, caused by changes in consumer wealth (perceived or actual), can be absorbed by region-time fixed effects. This applies in particular to the second, more restrictive, specification (9). However, some concern may remain that consumer demand may influence young-small firms differently from old small firms or even affect small firms in general more than other firms. Our model, discussed above, helps assuage this concern.

As was shown, unconstrained firms, whose size has not yet been limited by borrowing constraints, can grow in response to a demand shock. A constrained firm can only grow with new capital, i.e. if borrowing constraints are alleviated. As can be seen in our model, the number of small constrained firms is higher in environments where financial frictions are more plentiful. This follows logically from the fact that collateral is accepted less readily (or accepted only with a larger haircut). Moreover, since the effect of financial frictions is compounded by firm opacity, the number of firms that can respond to demand is inherently lower among opaque (younger) firms.

This simply means that in countries with higher financial frictions, small and particularly young & small firms are less, not more, likely to respond to changes in consumer demand. The coefficients of specification (9) in Table 4 could be viewed as the degree to which more constrained firms, which are governed by credit supply, react to house price changes relative to unconstrained firms that could be governed by demand to a certain extent. In countries with very low frictions, one might expect small and opaque firms to be less borrowing constrained. As a consequence, all types of firms may be influenced by demand. However, if consumer demand played a significant role in the activity of small firms (above and beyond any region and industry effects), we would expect to see much larger coefficients for low friction countries in Table 4. Furthermore, one would expect a far greater correlation between house prices and aggregate firm borrowing (see Figure 1).

5. Alternate Specifications

If the assumptions behind the baseline methodology discussed above are valid, we would expect a number of other relationships to be visible in the data. Firstly, the importance of residential real estate should not depend upon aggregate conditions affecting both house prices and firms. This assumption can be tested with instrumented house prices. Secondly, if we are observing the mechanics of a credit supply effect that is driven by the availability of collateral, we should find a distinct difference between the firms that have other hard sources of collateral to pledge (i.e. large number of fixed assets) and those that do not. Firms with other sources of collateral should be, all else equal, less reliant on the value of residential housing. Finally, if the effect of opacity influences borrowing in high friction countries to the extent we suggest, the dependence on real estate collateral should decrease as opacity does i.e. the effect of "age" should diminish as firms get older.

5.1 Instrumental Variable Regression

We instrument house prices with available land supply, as in Saiz (2010). Given that available land does not change, and we require some degree of time-series variation, we follow Chaney et al (2012). As such, we interact land supply with changes in the long term interest rate[17]. The assumption behind this IV approach is that the available land supply is a large determinant of house prices, though also uncorrelated with economic conditions such as aggregate lending. While this is less true for aggregate long-term interest rates, these do not vary at the local level. Given, however,

[17] The results hold qualitatively if we collapse the panel, though the approach of Chaney et al. allows a larger number of controls and is in keeping with the baseline methodology outlined in the section above.

that land supply is calculated regionally, we feel this methodology is a suitable alternate-specification-test of our ideas.

Data for the instrument is drawn from Eurostat data on regional land usage. Eurostat tracks data at an extremely granular regional level, which, for the purpose of comparability, we aggregate up to fit our "regions". We assign a different value to each type of land-use, based on the ease with which it can be turned into buildable land[18]. In this sense, we largely follow Saiz, though we are not beholden to Satellite data and have a more granular breakdown of used land.

We re-estimate our regressions (9) from above. Given that we instrument house prices and the interaction of house prices with an opacity dummy, we are unable to make use of region-time dummies. We focus, however, on interpreting the interaction term (as above). We allow the coefficient on instrumented house prices to include a general economic effect that we do not necessarily need to interpret. The results are displayed in the same form as above in table 5[19].

[Table 5 about here]

As can be seen in table 5, our general results from above hold. The activity of opaque firms in countries with higher financial frictions respond more strongly to house price changes than in countries with lower financial frictions, relative to less opaque firms. In Spain, a 1%-point exogenous house price increase leads small and young firms to increase firm borrowing by 1%-point more than small and older firms. The relationship is seemingly stronger in Italy where the

[18] Bodies of water cannot be built upon, nor can steep mountainous slopes; Marsh can be drained though not within a reasonably short timeframe. Certain types of farmland and wooded areas can be turned into buildable land to a certain extent. To a lesser extent, this also applies to shrub-land or arid regions.

[19] Specification 8 with instrumented prices, which tracks the effect of instrumented house prices on small firm activity in general, can be found in the Appendix of the paper for all the countries employed in the study.

response is a 2%-point larger increase for young firm borrowing than for older firms. In Northern Europe, the relationship is again more subdued or insignificant.

5.2 Alternate Sources of Collateral

Firms with more fixed assets, which could constitute pledgeable collateral, should be less reliant on the value of housing collateral than similar firms with fewer fixed assets. Though the ability to pledge collateral other than housing varies across countries, within a country, a firm with other assets at its disposal will inherently find credit more readily available than one that does not. Moreover, unlike current or intangible assets, fixed assets are typically less likely to be time- or skill-sensitive, making them attractive as collateral (relative to these other types of assets) even in countries with higher financial frictions.

We re-run specifications (8) and (9) from above, though we split the sample by whether a household has higher or lower than mean levels of fixed assets for firms in its size, age and industry in the year prior. Table 6 focuses on the more restrictive specification (9). For both specifications it is clearly apparent that in all countries, the activity of firms with more fixed assets are less sensitive to the fluctuations of real estate prices. This is additional evidence that we are observing a collateral-based demand credit supply effect in our baseline specification.

[Table 6 about here]

In keeping with the conjecture that fixed assets are more attractive to lenders than current assets or intangible assets in high friction countries; the differences between companies with high and low assets are less pronounced in Spain, Italy or Portugal when using current or intangible assets to differentiate firms (results not reported for brevity).

5.3 Stepwise-Opacity Regressions

We run an alternate specification of the baseline model, similar to the approach implemented by Adelino et al (2015). As a firm grows older, it becomes less opaque from the perspective of lenders. The size of the coefficient on the interaction of changing house prices and opacity should therefore decrease monotonically with firm age[20]. To capture this effect, we define some additional variables for firms that are more granular than our original groups of "young" and "old". In particular, we now use dummies for firms that are 0-5, 6–10 years old and 11–15 years old. We run this specification in different iterations (in some we allow firms to be larger than 500,00 USD). The simple version of this regression is presented in the appendix of the paper for reasons of space economy. Overall, we can confirm our proposition. We show that as opacity decreases, the effect of house prices on firm activity decreases also.

[20] We also run a similar specification that focuses on firm size. Here we look at the effect of house prices on successively larger firms. These results also confirm our baseline propositions and can be found in the Appendix of the paper. We acknowledge that some of the improvement in the lender-borrower relationship can come from a bank's ability to cross sell products (Santikian, 2014), which is a function of time, however, decreasing information asymmetries remain key.

6. Robustness

We run a number of additional tests to confirm the validity of our assertions above. We do not display the results for brevity and since the patterns, depicted above, hold. First, we assess the sensitivity of our results to the level at which variables are winsorized. As discussed above, year-on-year changes are winsorized at the 1% level. Winsorizing at the 5% level instead does not impact the significance or sign of our estimates. It does, in some instances, change the magnitude and standard errors of our coefficients (downward). This is most noticeable in Italy. Winsorizing ostensibly places an additional burden on our identification. Firms with extremely high year-on-year growth can influence, to some degree, the shape and nature of the relationship between financial constraint and the propensity to make use of collateral. These outliers, however, could also be the result or erroneous coding. The significance of our estimates in the face of different winsorizing thresholds suggests that our earlier results are robust.

In an additional analysis, we also included observations that were previously removed for having implausibly high firm leverage ratios (leverage ratios of more than 1.2), as described in section 2. We took these firms to have been erroneously coded. If we increase the cut-off leverage ratio to 1.5, our estimated coefficients increase in size in some cases, but do not change substantially.

As is evident in the figures relating house prices and firm activity, some regions in France experience very significant movements in residential house prices. We rerun our basic estimations, excluding the years or regions in question. The size, significance and magnitude of the coefficients remain largely unchanged. This is partly because the proportion of firms in outlying regions most affected by these price swings, relative to the remaining sample, is small, and the overall effect we observe is not driven by outliers.

As can be seen from the summary statistics, different specifications of our regressions make use of slightly different sample sizes. This becomes particularly evident when comparing sample sizes between regressions dealing with changes in borrowing as a dependent variable, and those dealing with changes in employment. Employment information is recorded for a much smaller set of firms in AMADEUS. This is an issue that applies particularly to small firms. In a further robustness test we therefore restrict our samples to observations for which information on capital structure as well as employment is available. We find that the magnitude of the coefficients decreases somewhat. Unfortunately, firms that report less information to the official business registries are smaller and more opaque, i.e. precisely the firms for which the importance of housing collateral for borrowing is relatively large. Omitting such firms limits the power of our identification. The general relationship does not change, however, firms are more reliant on housing collateral in countries with higher financial frictions and the effect is compounded by opacity. Ultimately, these results may only imply that we are underestimating the effect of changing house prices on employment in opaque firms in our baseline regression.

7. Conclusion

In this paper, we document significant differences in the degree to which housing collateral and firm activity correlate across countries. We show that these differences may be in part a function of financial frictions (i.e. the ease with which contracts can be enforced and bankruptcy resolved). Even within the European Union/European Economic Area firms in countries with higher financial frictions find real estate to be one of the few sources of collateral banks can accept (see SAFE survey). This effect holds particularly for opaque firms. As such, the activity of small firms in Italy, Portugal and Spain are more sensitive to fluctuations in the value of residential housing than in France, Norway or the UK. This effect is compounded for young or very small firms that are likely "opaque" from the perspective of a lender.

It can be demonstrated that our findings are unlikely to be the result of house-price induced changes in consumer demand. This follows from our simple model in which we show that small firms and especially young-small firms are unlikely to be poised to exploit demand variation. Given that these firms are more likely below optimum size given borrowing constraints, they should respond primarily to changes in credit supply. In showing the final and most restrictive proposition of our model, which suggests real estate collateral matters most for small-opaque firms in countries with high frictions, we explicitly abstracting from any demand effects.

Small firms account for a substantial share of employment in Europe. Firms that are small and young, moreover, can account for aggregate productivity growth. The degree to which these firms depend on different types of collateral to develop, can shape a country's economic future. As monetary policy can affect the value of collateral through the balance sheet channel, our estimates suggest that changes in policy rates could have a more pronounced effect on firm activity in some countries than in others. Additionally, our results can help explain some of the investment and

employment slump, especially as pertains to the activity of small and opaque firms, in southern Europe. After all, house prices in Southern Europe have not recovered as well as they have in Northern Europe. New borrowing and investment of small firms may be hamstrung as a consequence.

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Figure 1: Correlation between house prices and credit

The figure shows correlations between year-on-year changes in house prices and corporate credit as well as changes in house prices and total credit. Source: BIS

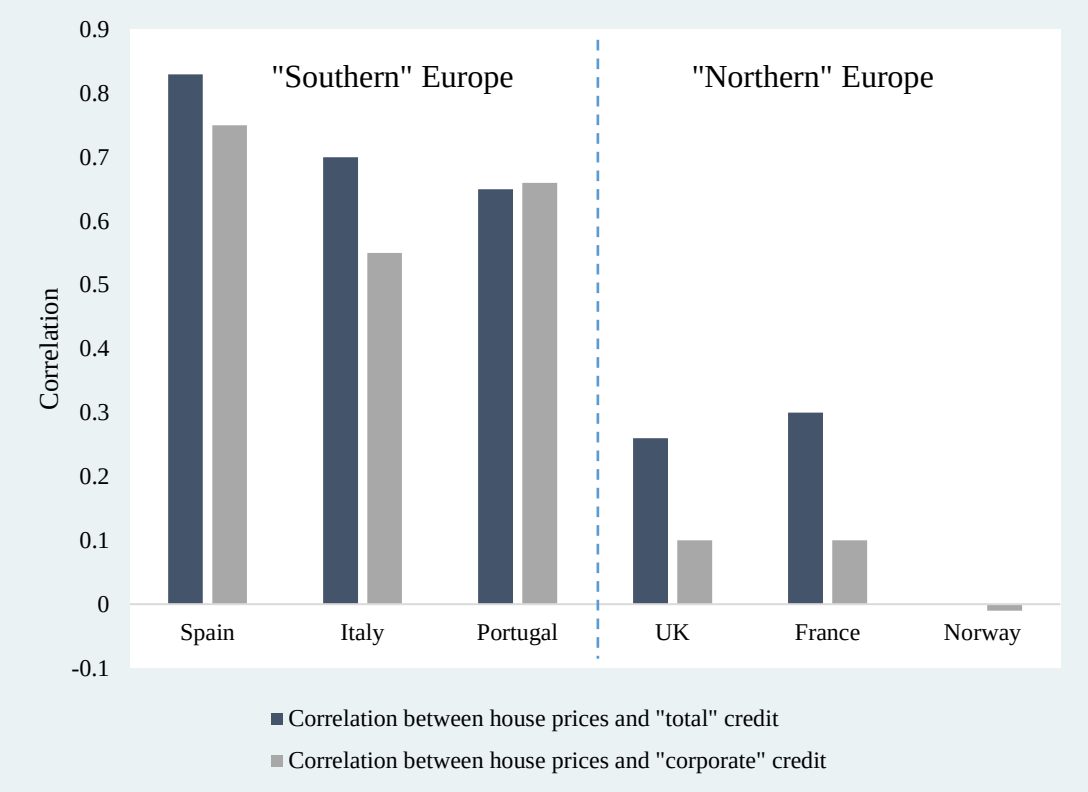
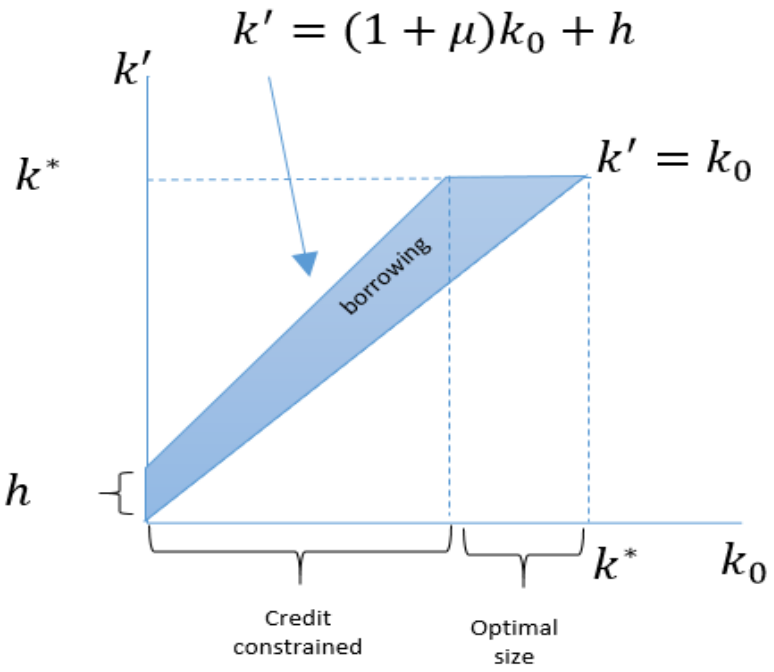


Figure 2: Entrepreneurial Endowment and Borrowing

Panel A visually depicts three types of firms based on initial endowment "K". Firms which are constrained from reaching optimal size, firms endowed with sufficient initial capital to reach optimal size and firms with greater than necessary capital stock. Panel B relates initial endowment to borrowing b) and housing collateral (h).

Panel A



Panel B

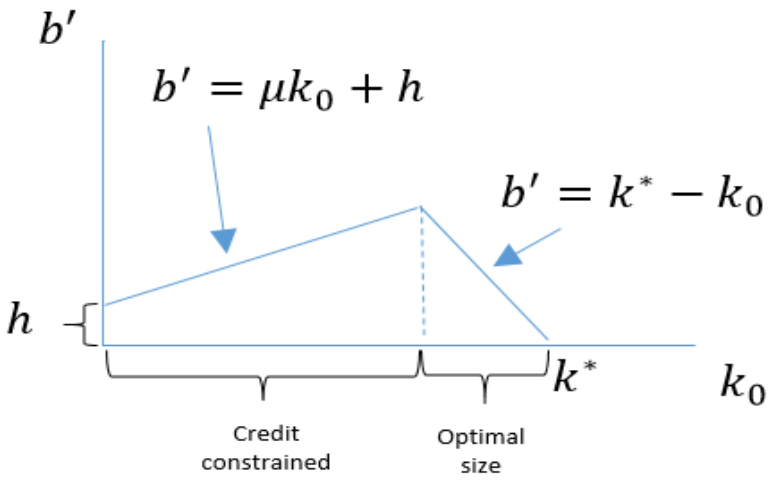
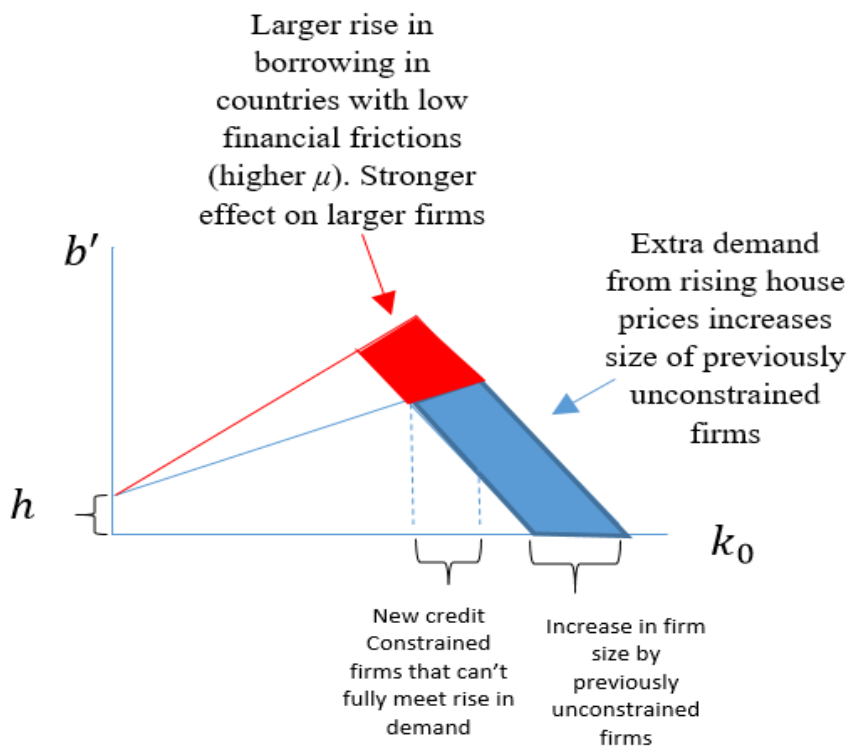


Figure 3: Firm borrowing in response to consumer demand and credit supply

This figure depicts the impact of changing house prices in a consumer demand and a credit supply setting. Panel A shows the effect of consumer demand based on an increase in house prices. Blue lines represent high friction countries and red lines low friction countries. Panel B details a credit supply-based reaction to an increase in house prices. Blue lines represent high friction countries and red lines represent low friction countires. The figure illustrates under which type of regime firms would respond more to house prices based on whether the effect runs through consumer demand or credit supply .

Panel A



Panel B

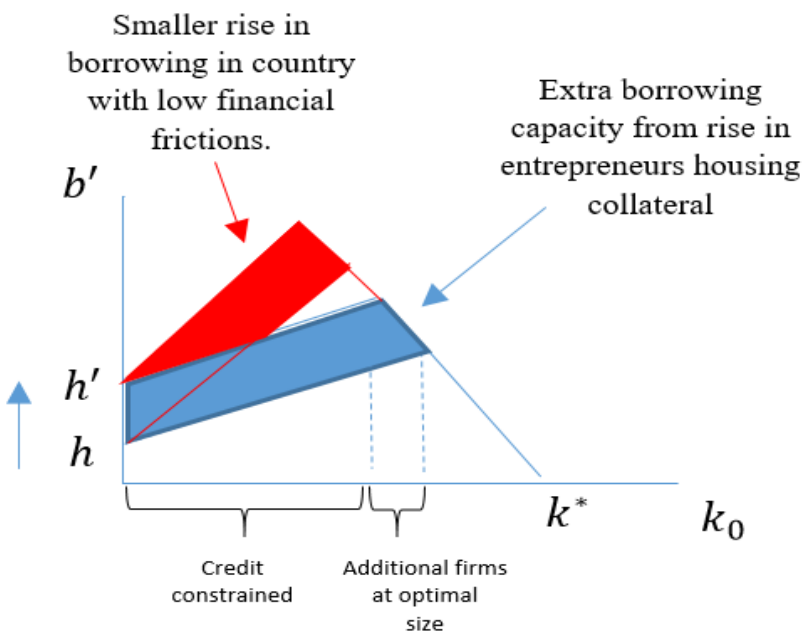
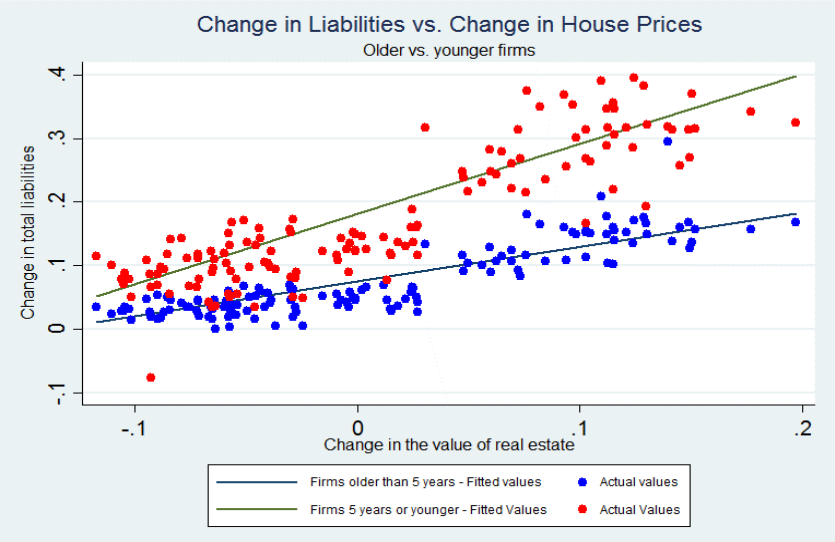


Figure 4: Sensitivity of firm liabilities to house prices

This figure depicts the average change in liabilities of all "small" firms in a region in a given year to the changes in that region's prices of residential real estate. The left graph uses data for Spain from 2004 to 2012 and the right graph makes use of data for the UK for the same period. The figures includes only data for firms with less than than 500,000 USD in total assets. The sample is split by wether a firm is 5 years or younger or older than 5 years at observation.

Spain



UK

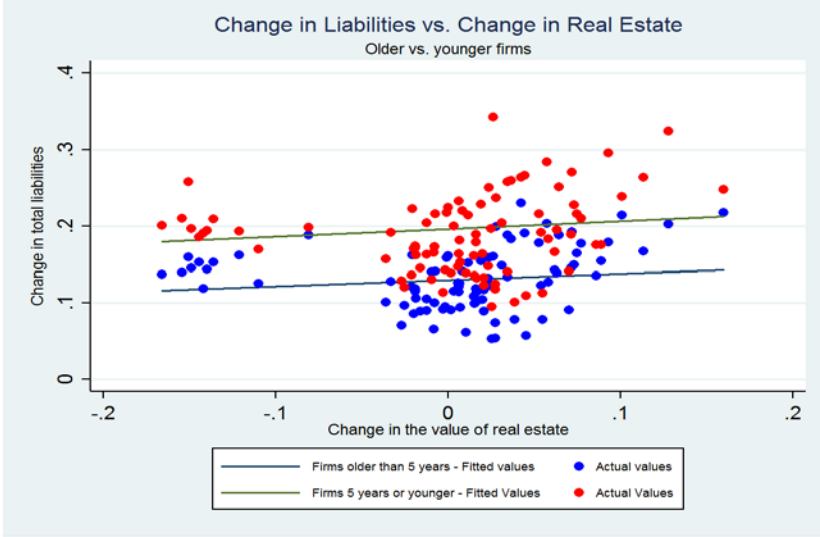


Table 1: Doing business indicators

This table presents summary statistics of the "doing business indicators" for the main countries used in this analysis. The indicators are drawn from the "World Banks Doing Business reports" for the year 2012 (the last year of our sample). They reflect the ease with which business can be conducted and, importantly, the ease with which bankruptcy can be resollved/contracts enforced.

	France	United Kingdom	Italy	Spain
Enforcing contracts (days)	29	365	657	515
Enforcing contracts (rank)	6	21	158	54
Ease of doing business (rank)	29	7	87	44
Enforcing contracts (cost of claim %)	17	25	30	17
Resolving insolvency (cost of estate %)	9	6	22	11

Table 2: Summary statistic

This table presents summary characteristics for variables used in the regression for firms with fewer than 500'000 USD in assets. Dependent variables are shown in both levels and changes. Available data varies strongly accross countries, leading to differing sample sizes.

France

	Mean	Standard deviation	Median	Number of observations
Total assets	180,730	125,906	151,105	1,782,947
Leverage (total liabilities / total assets)	0.6	0.2	0.6	1,782,947
Turnover	322,430	338,210	223,193	1,782,947
EBIT	18,873	39,016	11,134	1,782,947
Cash	46,899	58,408	25,542	1,782,947
Proportion of young firms (5 years or less)	0.43	0.49	-	1,782,947
Proportion of very small firms ($250.000 or less in assets)	0.72	0.45	1.00	1,782,947
Total liabilities	109,767	93,669	82,461	1,782,947
Investment (average per year)	10,907	62,512	1,695	1,648,342
Employees (number of)	3	4	2	508,076
Growth in liabilities	0.08	0.39	- 0.02	1,782,947
Investment (scaled to fixed assets in previous period	0.33	0.60	0.05	1,648,342
Employment growth	0.05	0.25	-	508,076

Italy

	Mean	Standard deviation	Median	Number of observations
Total assets	210,970	132,010	190,453	1,002,630
Leverage (total liabilities / total assets)	0.7	0.3	0.8	1,002,630
Turnover	284,775	351,870	188,984	1,002,630
EBIT	14,352	35,482	9,451	1,002,630
Cash	28,429	41,749	12,855	1,002,630
Proportion of young firms (5 years or less)	0.44	0.50	-	1,002,630
Proportion of very small firms ($250.000 or less in assets)	0.63	0.48	1.00	1,002,630
Total liabilities	153,668	118,078	126,812	1,002,630
Investment (average per year)	16,254	172,639	2,183	929,932
Employees (number of)	5	248	3	272,045
Growth in liabilities	0.14	0.42	0.03	1,002,630
Investment (scaled to fixed assets in previous period	0.42	0.76	0.09	929,932
Employment growth	0.10	0.37	-	272,045

Table 2: Summary statistic

Spain

	Mean	Standard deviation	Median	Number of observations
Total assets	204,716	132,101	182,195	923,883
Leverage (total liabilities / total assets)	0.6	0.3	0.7	923,883
Turnover	321,849	389,604	215,062	923,883
EBIT	9,800	31,519	5,620	923,883
Cash	34,599	47,241	16,987	923,883
Proportion of young firms (5 years or less)	0.3	0.5	-	923,883
Proportion of very small firms ($250.000 or less in assets)	0.7	0.5	1.00	923,883
Total liabilities	127,631	108,198	97,512	923,881
Investment (average per year)	14,443	157,039	1,594	798,440
Employees (number of)	5	10	3	742,575
Growth in liabilities	0.09	0.46	- 0.01	923,881
Investment (scaled to fixed assets in previous period	0.27	0.54	0.03	798,440
Growth of employment	0.03	0.29	-	742,575

United Kingdom

	Mean	Standard deviation	Median	Number of observations
Total assets	91,076	111,346	42,046	276,461
Leverage (total liabilities / total assets)	0.5	0.3	0.5	276,461
Turnover	163,296	362,599	58,534	276,461
EBIT	21,630	397,642	7,069	276,461
Cash	34,475	56,515	12,087	276,461
Proportion of young firms (5 years or less)	0.36	0.48	-	276,461
Proportion of very small firms ($250.000 or less in assets)	0.89	0.31	1.00	276,461
Total liabilities	45,272	73,808	15,208	276,461
Investment (average per year)	5,765	49,850	362	160,782
Employees (number of)	8	66	3	27,619
Growth in liabilities	0.16	0.59	0.01	276,461
Investment (scaled to fixed assets in previous period	0.36	0.65	0.02	160,782
Employment growth	0.02	0.15	-	27,619

Table 3: Impact of changes in house prices on small firm activity

This table depicts the coefficients of interest on regressions relating small firm activity (changes in liabilities, investment, and employment in firms with less than 500,000 USD in assets) to changes in local house prices. The regressions are performed separately for each country. Controls include industry- and region-fixed effects as well as leverage, profitability, liquidity ratios, size and age dummies. Standard errors are clustered at the indusrty level. *p<0.1 **p<0.05 ***p<0.01

	(1)	(2)	(3)
Dependent variable:	Change in liabilities	Investment	Change in employment
Spain	0.843***	1.241***	0.493***
	[8.41]	[13.67]	[16.68]
	N=923883	N=798440	N=742575
Italy	0.491***	1.202***	0.483***
	[14.78]	[18.11]	[5.58]
	N=1002630	N=929932	N=272045
France	0.132***	0.0758***	0.0428***
	[7.79]	[6.29]	[7.14]
	N=1706578	N=1575951	N=474797
United Kingdom	0.0366**	-0.0208	0.0248
	[2.31]	[-0.87]	[1.43]
	N=276461	N=160782	N=27619
Firm-level controls	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Table 4: House prices and activity of opaque firms

This table depicts the coefficients of interest on regressions showing the degree to which very opaque firms are more affected by house prices than slightly less opaque firms. The depicted coefficient shows the interaction term of "Young"*"house price changes" and identifies the degree to which younger firms are more affected by house price changes than similar, though older, firms. "Young" firms are defined as being five years old or younger. The regressions are performed seperately for each country. Controls include industry- and region-time-fixed effects as well as leverage, profitability, liquidity ratios, size and age dummies. Standard errors are clustered at the indusrty level. Detailed regressions can be found in the Appendix. *p<0.1 **p<0.05 ***p<0.01

	(1)	(2)	(3)
Dependent variable:	Change in liabilities	Investment	Change in employment
Spain	0.537***	0.659***	0.244***
	[6.37]	[6.77]	[10.37]
	N=923883	N=798440	N=742575
Italy	0.203***	0.361***	0.484***
	[4.24]	[8.67]	[13.71]
	N=1002630	N=929932	N=272045
France	0.0778***	0.0842***	0.0337**
	[4.78]	[4.39]	[2.96]
	N=1706578	N=1575951	N=474797
United Kingdom	0.00661	-0.0119	0.00613
	[0.32]	[-0.49]	[0.20]
	N=276461	N=160782	N=27619
Firm-level controls	Yes	Yes	Yes
Region-time fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Table 5: House prices and activity of opaque firms - IV Specification

This table depicts the coefficients of interest on regressions relating young & small firm activity (changes in liabilities, investment, and employment in firms with less than 500,000 USD in assets) to changes in local house prices. The depicted coefficient shows the interaction term of "Young"*"house price changes" and identifies the degree to which opaque firms are more affected by house price changes than similar, though less opaque, firms. "Young" firms are defined as being five years old or younger. House price changes are instrumented with the available land supply, interacted with changes in the long-term interest rate. The regressions are performed seperately for each country. Controls include industry and region-time fixed effects as well as leverage, profitability, liquidity ratios, size and age dummies. Standard errors are clustered at the indusrty level. Detailed regressions can be found in the Appendix. *p<0.1 **p<0.05 ***p<0.01

	(1)	(2)	(3)
Dependent variable:	Change in liabilities	Investment	Change in employment
Spain	0.619***	0.598***	0.234***
	[6.64]	[4.99]	[2.95]
	N=923883	N=798440	N=742575
Italy	1.489***	2.320**	-0.428
	[2.73]	[2.57]	[-1.41]
	N=1002630	N=929932	N=272045
France	0.0398	0.0365	-0.0388
	[0.95]	[0.49]	[-1.10]
	N=1706578	N=1575951	N=474797
United Kingdom	-9.290	-1.063	33.16
	[-0.01]	[-0.29]	[0.01]
	N=276461	N=160782	N=27619
Firm-level controls	Yes	Yes	Yes
Region-time fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Table 6: House prices and activity of opaque firms - sample split

This table showcases the coefficients on the interaction term of "young*house price changes" for two sub-populations. Specifically, the sample of each country is split by whether firms have high or low current assets (one year prior). Current assets proxy a firms ability to pledge other collateral. "Young" firms are five years old or younger. Standard errors are clustered at the indusrty level. *p<0.1 **p<0.05 ***p<0.01

Panel A: Firms with low current assets

	(1)	(2)	(3)
Coefficient of interest:	Change in house prices * age		
Subsample:	Firms with low current assets		
Dependent variable:	Change in liabilities	Investment	Change in employment
Spain	0.688***	0.733***	0.268***
	[7.36]	[7.25]	[9.89]
	N=509445	N=439204	N=389478
Italy	0.297***	0.413***	0.462***
	[4.81]	[10.54]	[7.77]
	N=540025	N=497843	N=120211
France	0.102***	0.0862***	0.0268*
	[4.27]	[4.37]	[1.93]
	N=936622	N=855058	N=248162
United Kingdom	0.0516	-0.0101	0.00345
	[1.76]	[-0.27]	[0.08]
	N=175207	N=94938	N=12799
Firm-level controls	Yes	Yes	Yes
Region-time fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

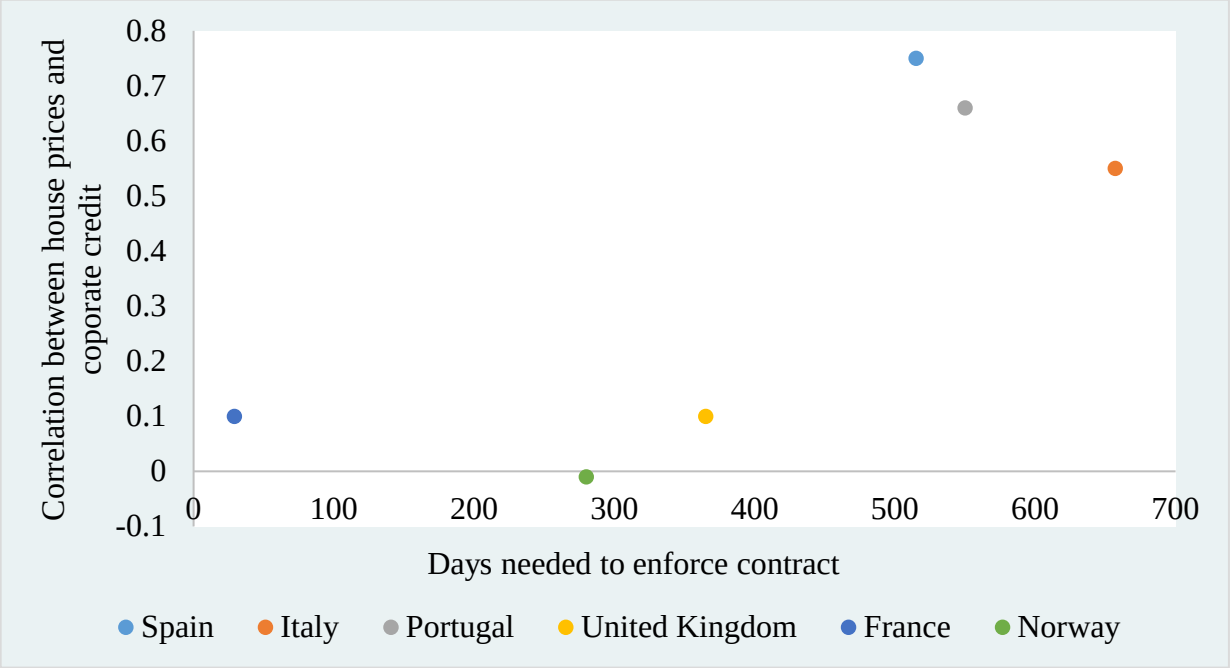
Panel B: Firms with high current assets

	(1)	(2)	(3)
Coefficient of interest:	Change in house prices * age		
Subsample:	Firms with high current assets		
Dependent variable:	Change in liabilities	Investment	Change in employment
Spain	0.376***	0.536***	0.216***
	[5.54]	[6.06]	[9.06]
	N=414436	N=359234	N=353095
Italy	0.144**	0.395***	0.504***
	[2.86]	[5.70]	[11.90]
	N=462603	N=432088	N=151832
France	0.0487***	0.0735**	0.0419***
	[5.29]	[2.98]	[3.48]
	N=769956	N=720893	N=226635
United Kingdom	-0.0616	-0.00256	-0.000109
	[-1.67]	[-0.10]	[-0.00]
	N=101253	N=65844	N=14820
Firm-level controls	Yes	Yes	Yes
Region-time fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Online Appendix:
Financial Frictions, Real Estate Collateral, and Small Firm Activity in Europe

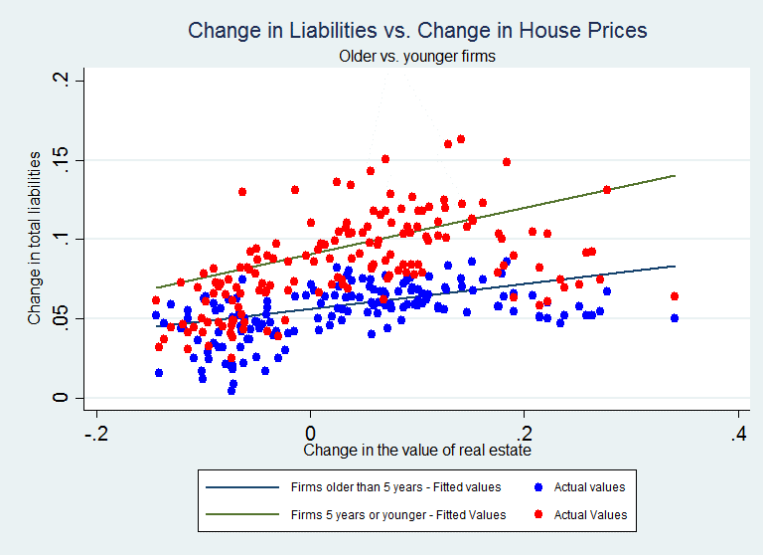
Appendix Figure 1: Correlation between house prices and credit vs. contract enforcement

The figure shows correlations between year-on-year changes in house prices and corporate credit on the y-axis vs. the time it takes to enforce contracts on the x axis. Contract enforcement proxies financial frictions. Source: BIS

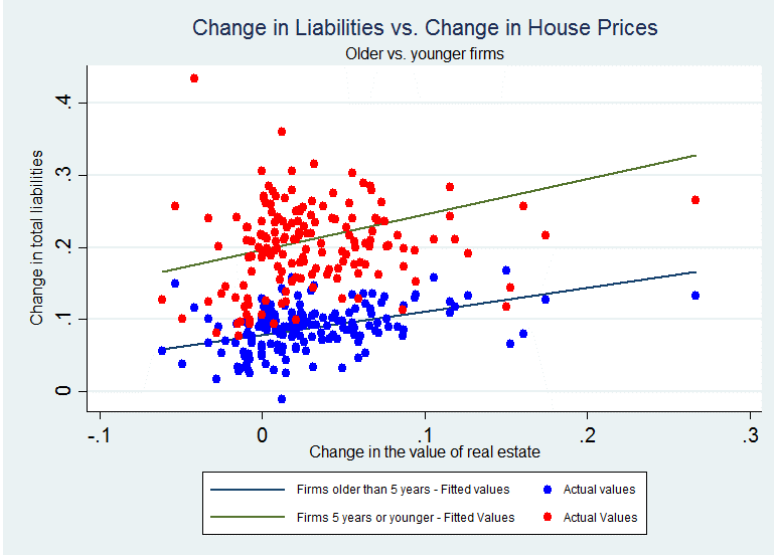


Appendix Figure 2: House Prices and Firm Activity

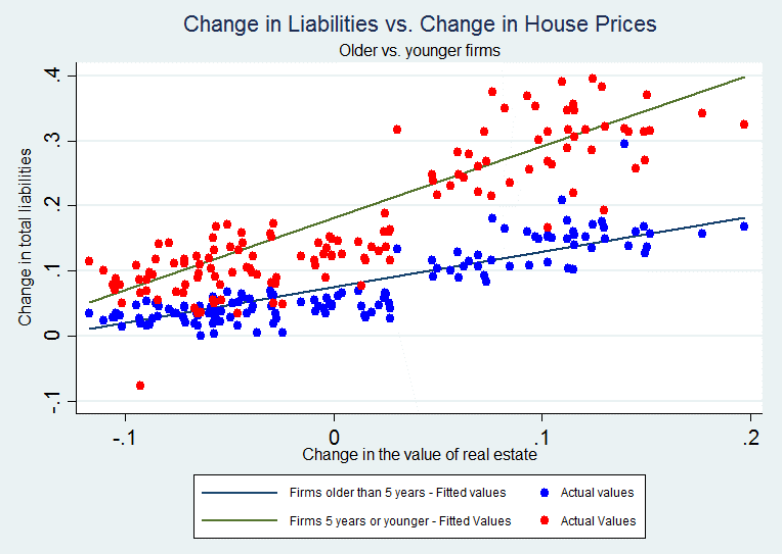
France



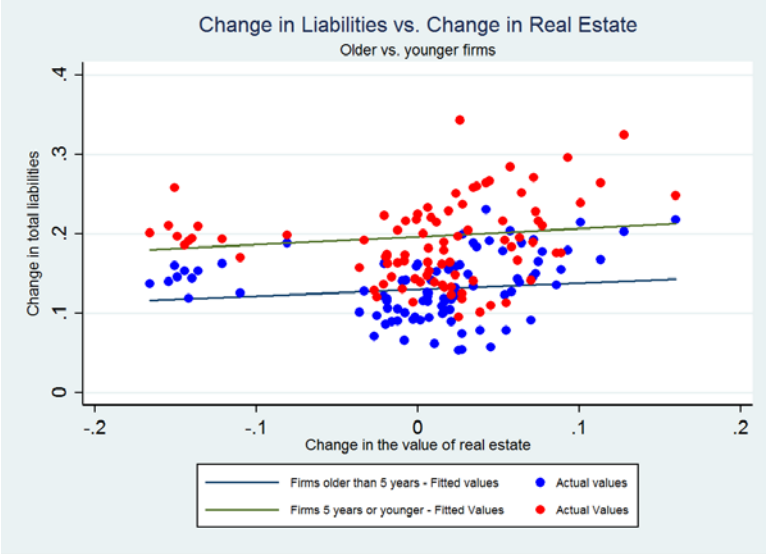
Italy



Spain


Change in Liabilities vs. Change in House Prices
Older vs. younger firms
Change in total liabilities
-.1
0
.1
.2
.3
.4
-.1
0
.1
.2
Change in the value of real estate
Firms older than 5 years - Fitted values
Actual values
Firms 5 years or younger - Fitted Values
Actual Values

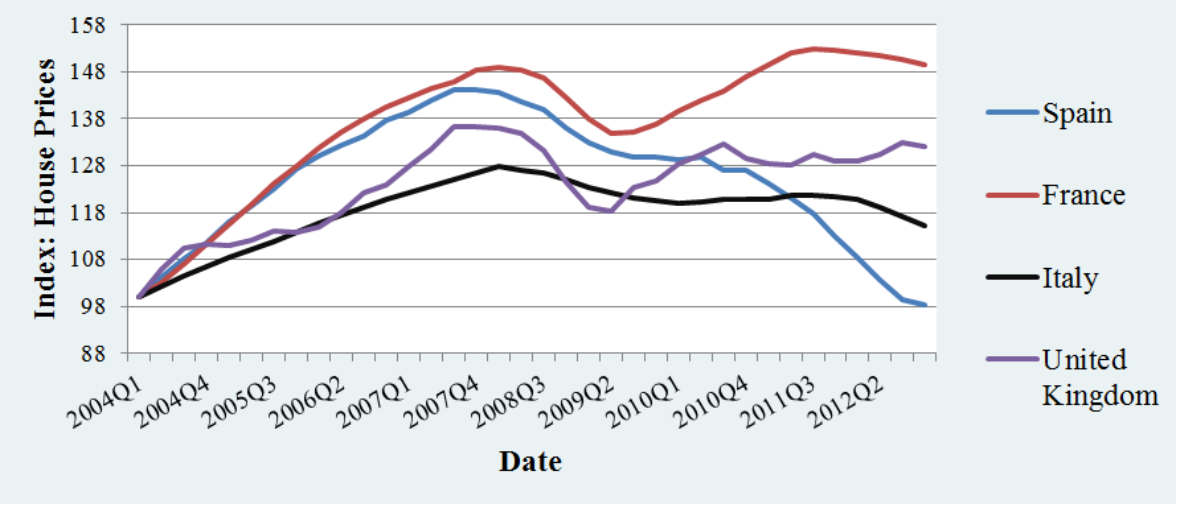
UK


Change in Liabilities vs. Change in Real Estate
Older vs. younger firms
Change in total liabilities
0
.1
.2
.3
.4
-.2
-.1
0
.1
.2
Change in the value of real estate
Firms older than 5 years - Fitted values
Actual values
Firms 5 years or younger - Fitted Values
Actual Values

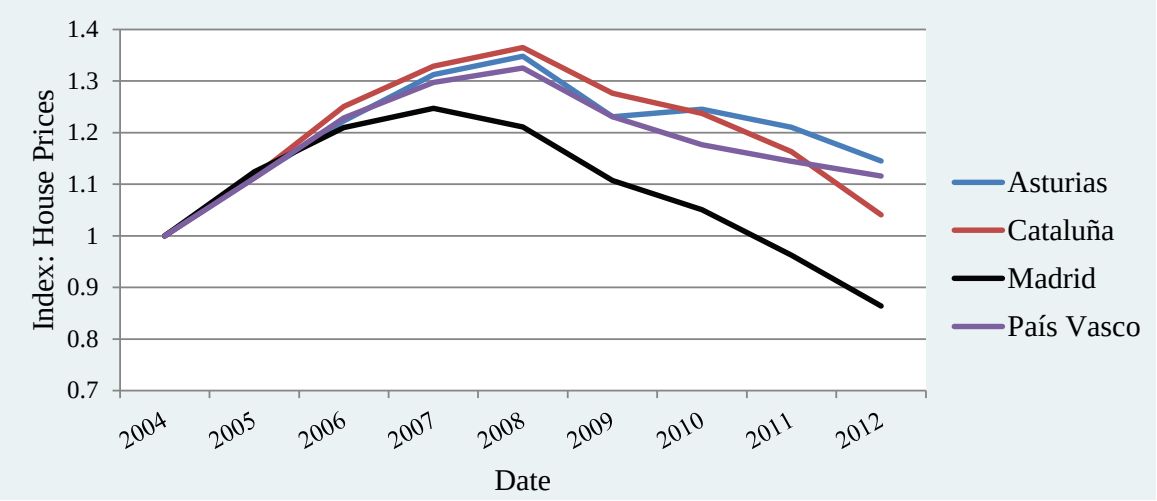
Appendix Figure 3: House prices

This figure shows house price devleopments. Panel A shows house prices in France, Italy, Spain and the UK between 2004 and 2012. Panel B shows house prices for a few selected regions within Spain.

Panel A: France, Italy, Spain and UK



Panel B: Selected regions in Spain



Appendix Figure 4: Distribution of companies in SME sample

This figure depicts the number of companies contained in each "size bin". The data is drawn from our full sample of SME firms (less than $43 million in assets). 1 = small firms with less than $250,000 in assets, 2 = $250,000-500,000 in assets, 3 = $500,000-2,000,000 in assets, 4 = $2-10 million in assets, 5 = $10-43 million in assets

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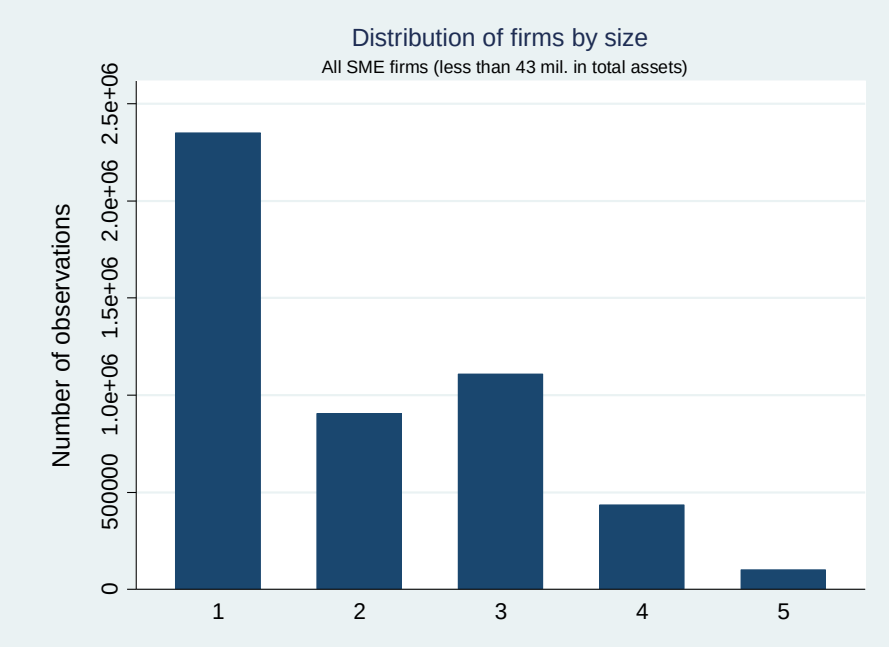
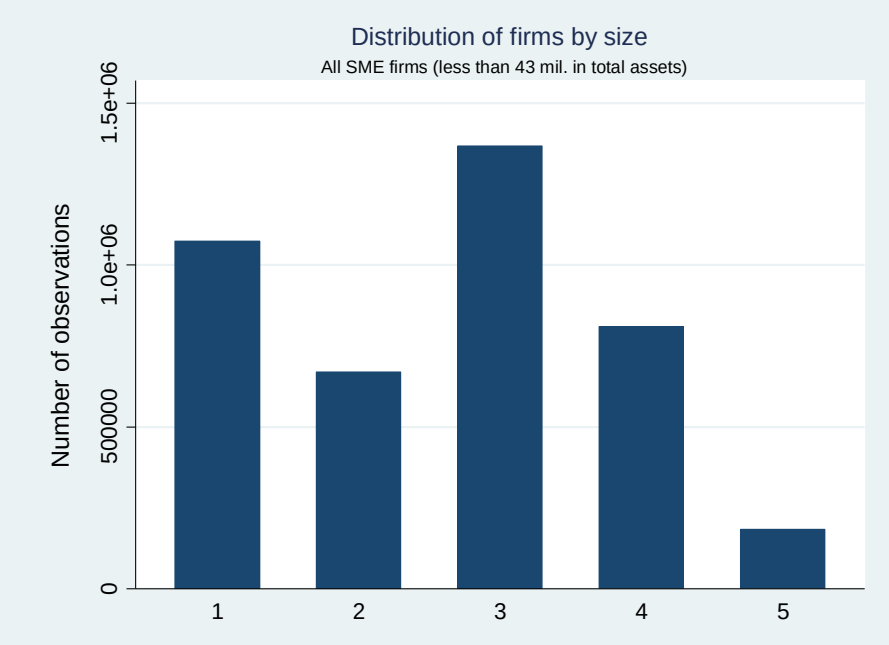
France

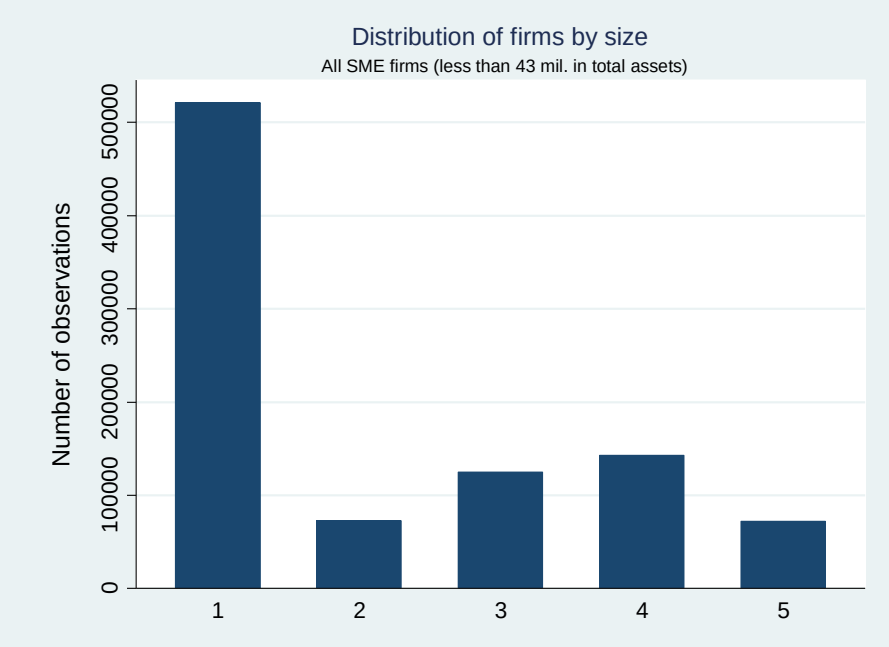


Italy



Spain

United Kingdom



Appendix Table 1: Doing business indicators

This table presents summary statistics for additional countries. In Panel A are listed "ease of doing business" indicators that are of interest to the paper. These are drawn from the World Banks Doing Business reports for the year 2012 (the last year of our sample). They reflect the ease with which business can be conducted and, importantly, the ease with which bankruptcy can be resloved/contracts enforced. Panel B presents summary characteristics for variables used in the regression for firms with fewer than 500'000 USD in assets. Dependent variables are shown in both levels and changes. Available data varies strongly accross countries, leading to differing sample sizes.

	Norway	Portugal
Enforcing contracts (days)	280	550
Ease of doing business (rank)	6	30
Enforcing contracts (rank)	4	22
Enforcing contracts (cost of claim %)	10	14
Resolving insolvency (cost of estate %)	9	9
	1	

Appendix Table 2: Summary Statistics (Norway and Portugal)

Norway

	Mean	Standard deviation	Median	Number of observations
Total assets	288,997	127,710	295,000	32,191
Leverage (total liabilities / total assets)	0.4	0.3	0.4	32,191
Turnover	636,758	1,347,136	422,000	32,191
EBIT	57,897	217,062	14,000	32,191
Cash	135,679	110,158	110,000	32,191
Proportion of young firms (5 years or less)	0.44	0.50	-	32,191
Proportion of very small firms ($250.000 or less in assets)	0.40	0.49	-	32,191
Total liabilities	131,865	113,691	107,000	32,191
Investment (average per year)	32,091	100,000	1,000	12,629
Employees (number of)	NA			
Growth in liabilities	0.28	0.66	0.08	32,191
Investment (scaled to fixed assets in previous period	0.36	0.75	-	12,629
Employment growth	NA			

Portugal

	Mean	Standard deviation	Median	Number of observations
Total assets	159,098	126,371	122,027	322,251
Leverage (total liabilities / total assets)	0.5	0.3	0.6	322,251
Turnover	201,003	324,491	115,536	322,251
EBIT	9,139	24,493	4,859	322,251
Cash	30,624	47,023	13,216	322,251
Proportion of young firms (5 years or less)	0.31	0.46	-	322,251
Proportion of very small firms ($250.000 or less in assets)	0.77	0.42	1.00	322,251
Total liabilities	92,468	97,337	56,997	322,251
Investment (average per year)	10,958	91,211	736	281,994
Employees (number of)	4	6	3	294,928
Growth in liabilities	0.11	0.49 -	0.00	322,251
Investment (scaled to fixed assets in previous period	0.42	0.88	0.03	281,994
Employment growth	0.02	0.21	-	294,928

Appendix Table 3 - Full regressions of Table 3

These tables show the full regressions for the coefficients depicted in table 3. Standard errors are clustered at the industry level.*p<0.1 **p<0.05 ***p<0.01

Panel A: Spain

	Change in liabilities	Investment	Change in employment
Interaction: Change in house prices* Financially constrained	0.537***	0.659***	0.244***
	[6.37]	[6.77]	[10.37]
Leverage	-0.262***	-0.0952***	0.0236***
	[-16.05]	[-7.83]	[9.80]
Cash to turnover (at beginning of year)	-0.0176***	0.0374***	0.0191***
	[-3.51]	[3.41]	[4.61]
EBIT to turnover (at beginning of year)	-0.0527***	0.0118	0.0401***
	[-6.82]	[0.80]	[6.37]
Industry region sales	0.00219	0.00308	0.00293**
	[1.27]	[1.09]	[3.00]
Log of turnover	-0.00937**	0.0433***	-0.00483
	[-2.86]	[20.43]	[-1.59]
Constant	1.230	-0.236***	1.074
	[0.12]	[-4.40]	[0.55]
Region*Year dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Size, age, financing dummies	Yes	Yes	Yes
N	923883	798440	742575
adj. R-sq	0.067	0.073	0.041

Panel B: Italy

	Change in liabilities	Investment	Change in employment
Interaction: Change in house prices* Financially constrained	0.203***	0.361***	0.484***
	[4.24]	[8.67]	[13.71]
Leverage	-0.258***	-0.0948***	-0.0145**
	[-23.55]	[-9.54]	[-2.82]
Cash to turnover (at beginning of year)	-0.00310**	0.0298***	0.00695***
	[-2.61]	[6.08]	[3.80]
EBIT to turnover (at beginning of year)	-0.00719***	0.00579	0.0112***
	[-10.05]	[0.89]	[5.99]
Industry region sales	0.00643***	0.00474**	0.00659
	[5.61]	[2.30]	[1.06]
Log of turnover	-0.00816***	0.0487***	-0.00658
	[-3.22]	[9.04]	[-1.36]
Constant	1.318	-0.109	1.190
	[.]	[-0.86]	[.]
Region*Year dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Size, age, financing dummies	Yes	Yes	Yes
N	1002630	929932	272045
adj. R-sq	0.072	0.038	0.017

Panel C: Portugal

	Change in liabilities	Investment	Change in employment
Interaction: Change in house prices* Financially constrained	0.276***	0.520***	0.0392
	[3.65]	[3.15]	[1.27]
Leverage	-0.371***	-0.282***	0.00594*
	[-12.32]	[-5.62]	[1.91]
Cash to turnover (at beginning of year)	-0.0306***	0.0453***	0.00835***
	[-8.54]	[3.16]	[4.15]
EBIT to turnover (at beginning of year)	-0.0416***	0.0548***	0.0102**
	[-5.49]	[3.49]	[2.84]
Industry region sales	0.00410**	-0.000393	0.00164***
	[2.23]	[-0.05]	[3.24]
Log of turnover	-0.0204***	0.0271***	0.00226*
	[-5.15]	[4.84]	[2.17]
Constant	1.605	0.342**	0.963***
	[0.36]	[2.94]	[84.19]
Region*Year dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Size, age, financing dummies	Yes	Yes	Yes
N	322251	281994	294928
adj. R-sq	0.069	0.050	0.025

Panel D: France

	Change in liabilities	Investment	Change in employment
Interaction: Change in house prices* Financially constrained	0.0778***	0.0842***	0.0337**
	[4.78]	[4.39]	[2.96]
Leverage	-0.309***	-0.166***	0.00790**
	[-22.29]	[-9.07]	[2.35]
Cash to turnover (at beginning of year)	-0.0174***	0.0386***	0.0182***
	[-3.98]	[4.84]	[5.71]
EBIT to turnover (at beginning of year)	-0.0574***	0.0243	0.0566***
	[-10.29]	[1.49]	[6.70]
Industry region sales	0.000669	-0.00332**	-0.000404
	[1.51]	[-3.02]	[-0.79]
Log of turnover	-0.00445	0.0435***	-0.00172
	[-0.90]	[9.58]	[-0.81]
Constant	1.265***	-0.192***	1.037
	[19.03]	[-4.31]	[0.13]
Region*Year dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Size, age, financing dummies	Yes	Yes	Yes
N	1706578	1575951	474797
adj. R-sq	0.057	0.048	0.020

Panel E: Norway

	Change in liabilities	Investment
Interaction: Change in house prices* Financially constrained	0.00311	0.112
	[0.05]	[1.10]
Leverage	-0.626***	-0.0978**
	[-30.64]	[-2.67]
Cash to turnover (at beginning of year)	-0.00274	0.0189***
	[-1.31]	[4.23]
EBIT to turnover (at beginning of year)	-0.0465***	0.00509
	[-4.68]	[0.40]
Industry region sales	0.00594	-0.00483
	[0.46]	[-0.37]
Log of turnover	0.0323***	0.0605***
	[4.22]	[5.81]
Constant	0.859***	-0.620***
	[7.59]	[-4.11]
Region*Year dummies	Yes	Yes
Industry Dummies	Yes	Yes
Size, age, financing dummies	Yes	Yes
N	32191	12629
adj. R-sq	0.094	0.016

Panel F: United Kingdom

	Change in liabilities	Investment	Change in employment
Interaction: Change in house prices* Financially constrained	0.00661	-0.0119	0.00613
	[0.32]	[-0.49]	[0.20]
Leverage	-0.288***	-0.0191*	-0.00226
	[-23.69]	[-1.81]	[-0.60]
Cash to turnover (at beginning of year)	-0.0110***	0.00992***	0.00137**
	[-3.73]	[8.88]	[2.42]
EBIT to turnover (at beginning of year)	-0.0172***	0.00721	0.00140
	[-3.39]	[1.73]	[1.55]
Industry region sales	0.000995	0.00251	-0.00304*
	[0.77]	[1.29]	[-1.82]
Log of turnover	-0.0136	0.0439***	0.00478***
	[-1.54]	[12.37]	[6.08]
Constant	1.628***	-0.130	1.150***
	[12.57]	[-0.44]	[4.22]
Region*Year dummies	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes
Size, age, financing dummies	Yes	Yes	Yes
N	276461	160782	27619
adj. R-sq	0.038	0.029	0.013

Appendix Table 4: Impact of changes in house prices on small firm activity

This table replicates table 2 for additional countries. It depicts the coefficients of interest on regressions relating small firm activity (changes in liabilities, investment, and employment in firms with less than 500'000 USD in assets) to changes in local house prices. The regressions are performed seperately for each country. Controls include industry and region fixed effects as well as leverage, profitability, liquidity ratios, size and age dummies. Standard errors are clustered at the indusrty level. *p<0.1 **p<0.05 ***p<0.01

	(1)	(2)	(3)
Dependent variable:	Change in liabilities	Investment	Change in employment
Portugal	0.637*** [5.22] *0.24* N=322251	1.771*** [8.91] *0.03* N=281994	0.207*** [7.34] *0.05* N=294928
Norway	0.00311 [0.05] - N=32191	0.112 [1.10] - N=12629	
Firm-level controls	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Appendix Table 5: House prices and activity of opaque firms

This table replicates table 3 for additional countries and depicts the coefficients of interest on regressions relating young & small firm activity (changes in liabilities, investment, and employment in firms with less than 500'000 USD in assets) to changes in local house prices. The depicted coefficient shows the interaction term of "Young"*"house price changes" and identifies the degree to which opaque firms are more affected by house price changes than similar, though less opaque, firms. "Young" firms are defined as being five years old or younger. The regressions are performed seperately for each country. Controls include industry and region-time fixed effects as well as leverage, profitability, liquidity ratios, size and age dummies. Standard errors are clustered at the indusrty level. Detailed regressions can be found in the Appendix. *p<0.1 **p<0.05 ***p<0.01

	(1)	(2)	(3)
Dependent variable:	Change in liabilities	Investment	Change in employment
Portugal	0.637*** [5.22] *0.24* N=322251	1.771*** [8.91] *0.03* N=281994	0.207*** [7.34] *0.05* N=294928
Norway	0.00311 [0.05] - N=32191	0.112 [1.10] - N=12629	
Firm-level controls	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Appendix Table 6: House prices and activity of opaque firms

This table depicts the coefficients of interest on regressions showing the degree to which very small firms are more affected by house prices than slightly larger firms. The depicted coefficient shows the interaction term of "very small"*"house price changes". "Very small" firms are defined as being smaller than 250'000 USD in assets. Comparisson firms hold between 250'000 and 500'000 USD in assets. The regressions are performed seperately for each country. Controls include industry and region-time fixed effects as well as leverage, profitability, liquidity ratios, size and age dummies. Standard errors are clustered at the indusrty level. *p<0.1 **p<0.05 ***p<0.01

	(1)	(2)	(3)
Dependent variable:	Change in liabilities	Investment	Change in employment
Spain	0.665***	0.822***	0.0487***
	[8.59]	[8.34]	[3.48]
	N=923883	N=798440	N=742575
Italy	0.506***	0.504***	0.0486
	[13.40]	[8.63]	[1.64]
	N=1002630	N=929932	N=272045
France	0.0596***	0.0906***	0.0253***
	[5.90]	[6.90]	[4.59]
	N=1782947	N=1648342	N=508076
United Kingdom	0.103***	0.0140	-0.0331
	[5.18]	[0.19]	[-0.93]
	N=276461	N=160782	N=27619
Firm-level controls	Yes	Yes	Yes
Region-time fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Appendix Table 7: Impact of changes in house prices on small firm activity (IV regression)

This table depicts the coefficients of interest on regressions relating small firm activity (changes in liabilities, investment, and employment in firms with less than 500'000 USD in assets) to changes in local house prices. In this specification, house prices are instrumented with available land supply, interacted with changes in long-term interest rates in acountry. The regressions are performed seperately for each country. Controls include industry and region fixed effects as well as leverage, profitability, liquidity ratios, size and age dummies. Standard errors are clustered at the indusrty level. Detailed regressions can be found in the Appendix. *p<0.1 **p<0.05 ***p<0.01

	(1)	(2)	(3)
Dependent variable:	Change in liabilities	Investment	Change in employment
Spain	1.045***	0.926***	0.296***
	[10.57]	[6.57]	[4.12]
	N=923883	N=798440	N=742575
Italy	2.218***	2.368***	1.215***
	[3.37]	[4.05]	[4.59]
	N=1002630	N=929932	N=272045
Portugal	0.896***	4.458***	0.558***
	[4.48]	[3.39]	[3.92]
	N=313279	N=274370	N=287289
France	0.117***	0.00158	-0.0138
	[4.28]	[0.04]	[-0.54]
	N=1706578	N=1575951	N=474797
Norway	0.464	1.198	
	[0.18]	[0.14]	
	N=32191	N=12629	
United Kingdom	-0.551*	-0.511**	-0.245*
	[-1.98]	[-2.15]	[-1.74]
	N=276461	N=160782	N=27619
Firm-level controls	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
Estimation technique	OLS	OLS	OLS

Appendix Table 8: Impact of changes in house prices on successively more opaque (young) firms

This table shows the coefficient of interest on the interaction of opacity and changing house prices. We now proxy opacity in successive, mutually exclusive, tranches of age. Youngest firms are less than 5 years old, mid-aged firms are 5 to 10 or 10 to 15 years old. The remaining firms are older than 15 years. The sample size for each regression is reported below each set of country-coefficients. Standard errors are clustered at the industry level. *p<0.1 **p<0.05 ***p<0.01

		(1)	(2)	(3)
Interaction of interest:		"Change in house prices" and "age"		
Dependent variable:		Change in liabilities	Investment	Change in employment
Spain	<5 years old	0.626***	0.926***	0.321***
		[7.33]	[6.64]	[12.70]
	5 to 10 years old	0.131***	0.202**	0.109***
		[4.69]	[2.91]	[10.83]
	10 to 15 years old	0.0753***	0.110**	0.0580***
		[4.21]	[2.83]	[5.55]
		N=1542546	N=826874	N=1238462
Italy	<5 years old	0.316***	0.250	0.654***
		[8.32]	[1.42]	[12.83]
	5 to 10 years old	0.0907***	-0.263	0.214***
		[3.27]	[-1.37]	[5.67]
	10 to 15 years old	0.0184	-0.292	0.117***
		[0.44]	[-1.61]	[4.23]
		N=1850769	N=979081	N=588738
France	<5 years old	0.0520***	0.0925***	0.0476***
		[3.40]	[4.89]	[6.09]
	5 to 10 years old	0.0226*	0.0557***	0.0165**
		[1.99]	[3.62]	[2.45]
	10 to 15 years old	-0.00208	0.0184*	0.00705
		[-0.28]	[2.00]	[1.44]
		N=2450855	N=1679279	N=700895
United Kingdom	<5 years old	0.0285	-0.0197	0.0428**
		[0.82]	[-0.39]	[2.74]
	5 to 10 years old	-0.0157	-0.00477	0.0150
		[-0.36]	[-0.10]	[0.67]
	10 to 15 years old	0.0303	0.0229	0.0271
		[0.57]	[0.31]	[1.10]
		N=335479	N=164229	N=46997
Firm-level controls		Yes	Yes	Yes
Region*Year fixed effects		Yes	Yes	Yes
Industry fixed effects		Yes	Yes	Yes
Estimation technique		OLS	OLS	OLS