Housing Collateral and Entrepreneurship

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Abstract

We show that collateral constraints restrict firm entry and post-entry growth, using French administrative data and cross-sectional variation in local house-price appreciation as shocks to collateral values. We control for local demand shocks by comparing treated homeowners to controls in the same region that do not experience collateral shocks: renters, and homeowners with an outstanding mortgage, who (in France) cannot take out a second mortgage. In both comparisons, an increase in collateral value leads to a higher probability of becoming an entrepreneur. Conditional on entry, treated entrepreneurs use more debt, start larger firms, and remain larger in the long run.

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This paper provides evidence that entrepreneurs face credit constraints that restrict firm creation and post-entry growth, even over the long run. Existing literature documents a strong correlation between entrepreneurial wealth and the propensity to start or keep a business (Evans and Jovanovic (1989), Evans and Leighton (1989), Holtz-Eakin, Joulfaian, and Rosen (1993)). However, whether such a correlation constitutes evidence of financial constraints is an open question. For example, individuals who experience a wealth increase through inheritance are more likely to start a firm, but they may also have greater access to business opportunities for reasons unrelated to their wealth (Hurst and Lusardi (2004)). Whether financing constraints significantly limit firm creation and growth has important policy implications: many public programs, such as the 7a loan program from the Small Business Administration, subsidize small business lending based on the premise that young firms are in fact financially constrained.

To contribute to this debate, we use variation in house prices across French regions together with administrative micro-level data on individual homeownership and entrepreneurial outcomes.[1] Our methodology follows Chaney, Sraer, and Thesmar (2012) and is akin to a difference-in-differences strategy. Specifically, we compare the entrepreneurial outcomes of individuals who own a house and individuals who rent a house within the same region, and then relate this difference to the house-price dynamics observed across 25 sample regions. Underlying our identification strategy is the idea that when house prices rise, homeowners experience an increase in the value of the collateral available to start a business. In this context, renters in the same region serve as a useful benchmark because they face the same investment opportunities and demand shocks as homeowners. Thus, within-region comparison of entrepreneurial outcomes across homeowners and renters allows us to difference out local economic shocks that may drive both house prices and the creation of local businesses.

We consider the extensive margin (i.e., entry decisions) and the intensive margin (i.e., post-entry growth and survival conditional on entry) of entrepreneurship as outcome variables. To quantify the effect of collateral shocks on households' propensity to start a business, we use the French labor force survey, a rotating panel that tracks randomly selected households for three consecutive years and contains information on homeownership, location, and occupational choice. We find that homeowners located in regions where house prices appreciate more are significantly more likely to create businesses than to renters in the same regions. The effect is economically sizable: going from the 25th to the 75th percentile of the distribution of past house-price growth increases the probability of firm creation by homeowners, relative to renters, by 11% in the most saturated specification. This effect is larger for poorer homeowners, whose debt capacity is more likely to depend on collateral value, and for homeowners with larger houses, for whom a given rate of growth in house prices leads to a larger increase in collateral value.

One possible concern with our methodology is that renters are not an adequate control group because they are too different from owners. To address this concern, we split the group of homeowners into "full" and "partial" owners, where partial owners are homeowners who still have a mortgage outstanding on their house, while full owners own their houses outright. Both categories of households face the same exposure to real estate prices, but only full owners can pledge their houses as collateral to obtain business loans. As we document in Section I, home equity withdrawals and second lien loans are very rare in France (IMF (2008)), and thus it is almost impossible for partial owners to extract capital gains from

their houses. Consistent with these observations, we find that the collateral effect is indeed driven entirely by full owners. Specifically, relative to renters, partial owners are not significantly more likely to start a business when house prices increase, while for full owners, a one-interquartile-range increase in past house-price growth leads to a significant 28% increase in the probability of starting a new business. Given that partial and full owners experience the same wealth shock, our findings are unlikely to be driven solely by a decrease in risk aversion or an increased preference for being "one's own boss" (Hurst and Lusardi (2004)). The comparison of full and partial owners also mitigates concerns that the exposure of renters to house-price growth drives our main results: renters and partial owners have opposite exposures to house price changes, but both react in a similar way (i.e., not at all) to changes in past house prices with respect to their choice of becoming an entrepreneur.

We next investigate whether, conditional on entry, variation in collateral value affects size at creation, post-entry growth, and survival. To this end, we use a detailed survey on a large cross section of French entrepreneurs that registered a business in 1998. We merge this data set with firm-level accounting data from tax files for up to eight years following the creation of the new firm. We find that in regions with greater house-price growth in the early 1990s, firms started in 1998 by homeowners are significantly larger at the time of creation than firms started by renters. "Treated" firms with higher owner collateral also use more debt and create more value-added.[2] These effects are robust to controlling for a large set of individual characteristics. Moreover, consistent with the collateral channel hypothesis, these effects are more pronounced for entrepreneurs starting businesses in industries in which credit constraints at creation are more prevalent. Importantly, these effects are also persistent: firms started by entrepreneurs with lower collateral in 1998 remain significantly smaller in terms of assets, sales, and employment until the last year in our data (2006). Finally, the documented effects are economically large: going from the 25th to the 75th percentile of house-price growth in the five years preceding creation allows homeowners to create firms that are 13% larger in terms of total assets.

In a third set of analyses, we investigate the importance of the collateral channel for firm creation in the aggregate. We find that total firm creation at the regional level is more highly correlated with house prices in regions where the fraction of homeowners is larger. This result confirms that the *net* effect of house-price shocks on entrepreneurship across homeowners and renters is positive at the regional level: following an increase in house prices, firms created by homeowners do not fully crowd out firms that renters may have started in the same region.

This paper contributes to the literature on financing constraints and entrepreneurship. Extant literature focuses on the link between entrepreneurial wealth and firm creation, growth, or survival. Hurst and Lusardi (2004), Adelino, Schoar, and Severino (2013), and Corradin and Popov (2015) are closest to our paper. We complement these papers in two ways. First, the information on individual homeownership allows us to control for local economic shocks that might create a spurious correlation between the entrepreneurial rate and local house prices, thus improving identification, and the comparison of full versus partial owners allows us to distinguish wealth from liquidity effects.[3] Second, the nature of our data allows us to track not only firm creation (the extensive margin), but also post-entry growth and survival over a long horizon (the intensive margin).

Several earlier papers focus on the role of inheritance shocks to firm quality and survival. Holtz-Eakin, Joulfaian, and Rosen (1993) find that firms started after a large inheritance are more likely to survive, a finding they interpret as evidence of credit constraints.[4] Contrasting this interpretation, Andersen and Nielsen (2012) find using Danish data that businesses started following a large inheritance have lower performance. This finding suggests that the relationship between wealth and entrepreneurship could be driven at least in part by private benefits of control, or in other words, that business ownership has a luxury-good component (Hurst and Lusardi (2004), Kerr and Nanda (2009)). The relation between wealth shocks and post-entry growth/survival thus remains an open question. Our paper contributes to this debate by using local variation in house prices as shocks to wealth. Arguably, these shocks are less likely to be correlated with unobserved individual-level heterogeneity than inheritance shocks. Fracassi, Garmaise, Kogan, and Natividad (2012) provide a clean identification of the role credit constraints play in small business survival by exploiting a discontinuity in the attribution of loans to start-ups at a small local bank. In a similar vein, Black and Strahan (2002) find that banking deregulation in U.S. states led to a large increase in firm creations. Whereas these papers focus on the effect of credit supply on firm creation and survival, our paper focuses on the effect of collateral.

Finally, our paper contributes to the literature on the link between economic activity and collateral value (Black, De Meza, and Jeffreys (1996), Bernanke and Gertler (1986), Kiyotaki and Moore (1995), Holmstrom (2015)) by focusing on real estate collateral. Benmelech, Garmaise, and Moskowitz (2005) and Benmelech and Bergman (2008) show that the value and redeployability of collateral affects financial contracts. Recent papers document a link between house prices and household borrowing and consumption (Mian, Rao, and Sufi (2013), Gan (2010)), a link between real estate prices and corporate investment (Gan (2007a), Chaney, Sraer, and Thesmar (2012)), and a link between real estate bubbles and bank lending (Gan (2007b)). Our paper shows that entrepreneurial activity also reacts strongly to changes in the collateral available to potential entrepreneurs.

The paper is arranged as follows. Section I describes the French institutional setting. Section II explores how collateral affects the extensive margin of entrepreneurship. Section III describes the role of housing collateral on the intensive margin of entrepreneurship. Section IV quantifies the effect of the collateral channel on aggregate firm creation at the regional level. Section V concludes.

I. The French Mortgage Market

The mortgage market in France is quite rudimentary. Among 18 advanced economies, France ranks last on the Mortgage Market Index, which characterizes the level of development of national mortgage markets (IMF (2008)). The typical mortgage contract is a fixed-rate loan with a 15- to 20-year maturity and a severe pre-payment penalty. The average loan-to-value ratio is close to its U.S. counterpart (75%), but mortgage securitization is almost nonexistent (less than 1% of residential loans outstanding). Importantly for our purposes, the French mortgage market allows for no or very little home equity withdrawal, and second lien loans are a rarity (IMF (2008)). As a consequence, and in contrast to the U.S. (Kleiner (2014)), the collateral channel in France does not work through entrepreneurs funding their venture by taking on

a second mortgage: only owners without an outstanding mortgage (full owners) can use their houses as collateral, owners who still have to repay some debt (partial owners) cannot. This institutional feature suggests that the collateral channel should only work for full owners in France.[5]

In France, entrepreneurs often pledge their private homes as collateral to obtain business loans. While this practice is common in most other countries, Davydenko and Franks (2008) provide evidence that in a event of a corporate bankruptcy, French banks are likely to activate the entrepreneur's personal guarantee, and that this feature is a defining feature of the French environment compared to that in Britain or Germany (Table VI, Panel A of their paper). In particular, they report that personal or firm guarantees account for 44% of exposure at default in French bankruptcies, versus 13% in the UK or Germany. Personal guarantees are also prevalent, however, in Italy and the U.S. Using a sample of 343,300 loans from the Italian central credit register from 2004 Q2 to 2007 Q4, Rodano, Serrano-Velarde, and Tarantino (2012) report that 55% of Italian loans use personal guarantees as collateral – the most frequent source of personal guarantees is, of course, real estate (for example, the entrepreneur's house). Meisenzahl (2014) documents the pervasiveness of private residences as entrepreneurial collateral in the U.S. Using the U.S. Survey for Small Business Finances, he reports that 52% of firms have to pledge collateral to receive a loan, 54% have to give personal guarantees, and 30% provide both with about 29% of such firms using the entrepreneur's private residence as a source of collateral. Robb and Robinson (2014) further document that debt is an important source of financing for start-ups (approximately 44%) and that its availability is related to the scarcity – and therefore the value – of real estate collateral.[6]

Finally, the collateral channel has the potential to be quantitatively important in France, even though it operates through house-pledging rather than equity withdrawals. The reason is that full ownership is widespread in France. Although the homeownership rate is similar to that in the U.S. (57%), an important difference between France and the U.S. is that 65% of French homeowners own their houses entirely, as opposed to only 32% in the U.S. (Census Bureau N963 Mortgage Characteristics & Owner Occupied Units, 2007).

II. Housing Collateral and the Decision to Start a New Firm

A. Data

To analyze the effect of variation in the value of housing collateral on the decision to start a new business, we use 11 consecutive yearly waves of the French Labor Force Survey (LFS) ("Enquête Emploi") from 1992 to 2002. The French LFS is a three-year rotating panel that in many ways is similar to the U.S. PSID. The unit of observation is the home address. Each participating address is surveyed each year for three consecutive years, which allows for observations of transitions from employment to entrepreneurship. The survey contains a rich set of characteristics about respondents. Critical to our empirical design are variables on homeownership and geographic location. We restrict the sample to individuals who are surveyed for the second time. Doing so ensures that we only include individuals who stay in the sample for exactly one more year. We also restrict the sample to household heads.[7] We exclude

retirees and students from the sample, as well as individuals under 20 or older than 64. Because we are interested in the transition into entrepreneurship, we also drop respondents who are already entrepreneurs or self-employed.

Table I, Panel B presents summary statistics on individuals' characteristics. The sample contains 73,390 observations, which correspond to approximately 6,600 unique household heads surveyed between 1992 and 2002. Of the sample respondents, 58% are homeowners and 7% are unemployed.[8] The median respondent is 43 years old, 13% of respondents are women, and 7% are foreigners. Finally, 38% of the respondents have no diploma, whereas 8% have a college degree. The outcome variable we consider in this section is a dummy equal to one if the household head starts a business in the following year, which corresponds to year 3 in the survey for this individual. The average probability that non-entrepreneurs transition into entrepreneurship is 1.4%.[9]

We merge this data set with information on local house prices for 25 regions in France.[10] For each year t and for each of these 25 regions, we calculate the cumulative growth of house prices between year $t-6$ and year $t-1$. Table I, Panel A reports summary statistics for cumulative house-price growth across regions. The median five-year regional house-price growth in our sample period (1992 to 2002) is 14%. Crucial for our design, there is substantial heterogeneity across regions: the standard deviation of five-year house-price growth is 20%; at the 10^{th} percentile, five-year house-price growth is -3%, whereas at the 90^{th} percentile, it is as high as 31%. Panel A also reports the distribution of the unemployment rate in percentage points across regions. Internet Appendix Figure IA1 gives more detail.

[Table 1 here]

B. Empirical Strategy

B.1. Specification

The sample constructed in Section II.A consists of repeated cross sections of unique nonbusiness owners who may transition into self-employment from year t to year $t+1$. Specifically, let i be a non-business owner in year t, j a region, and t the year in which the individual is surveyed. Our estimating equation is

$$E_{i,j,t+1} = \alpha + \beta \cdot Owner_{i,t} \times \Delta p_j^{t-6 \to t-1} + \theta \cdot Owner_{i,t} + \gamma \cdot Z_{i,t} + \tau \cdot Z_{i,t} \times \Delta p_j^{t-6 \to t-1} + \delta_l + \delta_{jt} + \varepsilon_{i,j,t}\,, \quad (1)$$

where $E_{i,j,t+1}$ is a dummy variable equal to one if individual i living in region j and surveyed in year t becomes self-employed at date $t+1$, $Owner_{i,t}$ is a dummy equal to one if the individual owns her house in year $t-1$, the first year in which she is surveyed and $\Delta p_{j,t-6 \to t-1}$ is the cumulative house-price growth in region j between year $t-6$ and year $t-1$, the vector $Z_{i,t}$ contains the control variables summarized in Table I: four education dummies, gender, foreign dummy, past-year wage (or unemployment insurance (UI) benefit if unemployed), past-year employment status dummy (employed versus unemployed), industry of occupation in year $t+1$, age, and father's job description (14 items). Note that we also control

for the interaction of house-price increases and personal characteristics, which alleviates concerns that heterogeneity across homeowners and renters drives our results. Department fixed effects, where a department is a geographic subdivision of a region,[11] are captured by δ_l, and region-by-year fixed effects, which included to capture time-variation in local investment opportunities, are captured by δ_{jt}. Note that these fixed effects absorb not only house-price increases, but also all unobserved variables within a region in which our owners and renters live.

B.2. Identification

The coefficient of interest in equation (1) is β. Its estimation relies on a difference-in-differences identification. The "treatment group" comprises the individuals in the LFS who own their house, whereas the "control group" consists of renters. The (continuous) "treatment" is the five-year cumulative house-price growth in the region. An increase in house prices increases the collateral value available to homeowners, while leaving renters' debt capacity unaffected. At the same time, homeowners face the same local shocks to economic activity as renters, so renter's self-employment decisions serve as a useful benchmark for the effect of local economic activity on entrepreneurship.

Our identification strategy uses two sources of variation in the data to identify β. First, in a given year, some regions experience larger house-price growth than others, so β is identified by comparing the difference in entrepreneurial activity between homeowners and renters across these regions with different house-price growth. Second, within a given region, house-price growth varies in the time series, so β is also identified by comparing, within each region, how the difference in entrepreneurial activity between homeowners and renters varies as house-price growth evolves. A positive β indicates that homeowners are more likely to register a new business than renters in regions with high house-price growth relative to regions with low house-price growth. The null hypothesis is that $\beta = 0$, which would indicate that collateral values do not affect entrepreneurial activity. By contrast, if collateral facilitates business starts, we should expect a positive estimate, $\beta > 0$.

Our approach identifies β under relatively mild assumptions. Consider the case in which equation (1) is estimated without controls. The identifying assumption is that the elasticity of self-employment to local house prices differs between homeowners and renters only through the effect of house-price growth on housing collateral value. This assumption is quite strong. Homeowners and renters differ significantly in observable dimensions (Table IAI). These observable characteristics could be correlated with the sensitivity of self-employment decisions to local house-price growth. For instance, older individuals could be more likely to own a house *and* to start businesses in industries that have greater exposure to local economic activity. In this case, failing to control for age and the interaction of age with house-price growth would lead to an upward bias in the estimate of β.

We address this concern about omitted variables in several ways. First, we include a large set of control variables as well as their interaction with house-price growth ($Z_{i,t}$ and $Z_{i,t} \times \Delta p_j^{t-6 \to t-1}$ in equation (1)). These control variables, described in Section II.B.1, are correlated with the own-versus-rent decision and potentially with the individual elasticity of self-employment to house-price growth. Second, we augment equation (1) to include the interaction of the homeownership dummy and a proxy for local

economic activity – the change in the department-level unemployment rate from $t-6$ to $t-1$. Finally, we exploit various dimensions of cross-sectional heterogeneity to show that our results are likely driven by the collateral channel and not some other omitted factor. However, as in Chaney, Sraer, and Thesmar (2012), we lack an instrument for households' homeownership status. This is one limitation of the analysis.

Another concern with our empirical strategy is that wealth affects entrepreneurship decisions for reasons unrelated to financing constraints. One possibility is that risk aversion decreases when individuals become wealthier.[12] Another version of this argument is that entrepreneurship is a luxury good: when people are wealthy enough, they can afford to be their own bosses. To address this concern, we split homeowners into full and partial owners. As we argue in Section I, both types of homeowners become wealthier when house prices grow but the collateral channel should not operate for partial owners. Thus, if our findings derive from wealth effects, we should expect both full and partial owners to react to variation in local house prices. If, however, collateral constraints drive our results, then given the French institutional context we should expect only full owners to have a significant positive β. To the extent that partial and full homeowners are more likely to share similar unobservable characteristics, this test also partially addresses the concern that homeowners and renters differ on unobservable dimensions that correlate with their propensity to start businesses following house-price growth.

A last issue with our empirical strategy is that renters may not be a valid control group, because they are themselves negatively affected by variation in local house prices: as local house prices increase, rents increase, so renters have less cash to start a company. An alternative version of this argument is that since everyone wants to own real estate, any increase in house prices forces renters to save more in order to buy later, which reduces the resources available to invest in the firm. This channel is unlikely to play a large role for two reasons. First, rents do not respond much to house prices in France, in part because they are strictly regulated.[13] Second, we show below that renters do not behave differently than partial homeowners, which is inconsistent with this alternative explanation.[14]

C. Main Results

Results of OLS estimation of equation (1) are presented in Table II. The standard errors are clustered at the region-by-homeownership level.[15] All regressions include department and region-by-year fixed effects. To evaluate the effect of observables on the estimation of β, we add control variables and their interaction with house-price growth (Δp) progressively: four dummies for education (column (2)); past-year salary or UI benefit if eligible (column (3)); age (column (4)); gender and nationality (column (5)); current industry of occupation (column (6)); and father's job description (column (7)). In column (8) we add the interaction of the homeownership dummy with changes in the unemployment rate from $t-6$ to $t-1$, measured at the department level, that is, a finer geographic division than the region. This additional control is potentially important because it ensures that our effect is not simply driven by homeowners reacting differently to local investment opportunities/demand shocks, at least to the extent that the unemployment rate captures local shocks to economic activity.[16]

[Table 2 here]

The estimates of β reported in Table II are positive and statistically significant at the 1% level across all specifications. The point estimates are also stable across specifications. The point estimate of 0.014 drops slightly to about 0.01 when we control for age and age interacted with Δp (going from column (3) to column (4)). The reason for this decrease is that, as is well known, age is one of the main determinants of homeownership; at the same time, in our sample, older individuals tend to be more likely to start businesses in locations that have recently experienced an increase in house prices. Apart from age, the inclusion of the other control variables has no influence on the estimated β. Yet these variables are relevant for the decision to become self-employed, as witnessed by the increase in adjusted R^2s (from zero in column (1) to 0.07 in column (8)). The fact that controlling for relevant observables that are correlated with homeownership (see Table IAI) has little effect on the point estimate of β is comforting regarding the robustness of our result (Bellows and Miguel (2009) and Altonji, Elder, and Taber (2005)),[17] as it indicates that our estimated effect is unlikely to be driven entirely by selection into homeownership based on unobservables.

The effects we report in Table II are of a sizable magnitude. Using the point estimates from column (8), we find that going from the 25^{th} to the 75^{th} percentile of house-price growth (a 16-percentage-point increase) leads to a 0.15-percentage-point (0.0094×0.16) increase in the probability of starting a business. The unconditional probability of starting a business is 1.4%. Thus, the estimate corresponds to an 11% increase in the probability of becoming an entrepreneur.

We finish this section by emphasizing the importance of controlling for the homeownership status of the individual, which is one of the key findings of this paper. In their seminal contribution, Hurst and Lusardi (2004) use PSID data to regress the probability of starting a business on past house-price appreciation, without interacting the price appreciation with individual or average ownership rates. They do not find a significant and positive effect of past house-price growth on the entrepreneurship decision, and interpret this finding as a rejection of the hypothesis that credit constraints significantly reduce entrepreneurial activity. In Table IAII, we report results that are consistent with the results in Hurst and Lusardi (2004), that is, a weak negative relationship between recent past house-price appreciation in the region where the individual is located and the decision to become an entrepreneur. This result shows how not interacting past house-price appreciation with homeownership status can affect the results significantly, at least in our sample. The table also establishes the comparability of the characteristics of our sample with the PSID sample used by Hurst and Lusardi (2004).

D. Sample Splits

In this section, we provide additional evidence that is consistent with the collateral channel interpretation but hard to reconcile with alternative interpretations. As we explain in Section I, in the French setting the collateral channel should operate mostly through full owners (owners with no outstanding mortgage) as opposed to partial owners (those with an outstanding mortgage). Since the LFS contains an indicator for the presence of an outstanding mortgage on the house, we can construct separate ownership groups: partial and full homeowners. We then estimate equation (1) using these separate treatment groups, while

keeping renters as our control group. We thus obtain two separate estimates for β: $\beta^{\text{partial owners}}$ and $\beta^{\text{full owners}}$.

As argued above, this analysis has three main advantages. First, it improves on the control for unobserved heterogeneity. The unobserved difference (with respect to the sensitivity of entrepreneurship to house prices) between full and partial owners is a priori smaller than the unobserved difference between owners and renters. Second, it allows us to check that our results are not a result of renters being negatively affected by increases in house prices through an increase in housing affordability. Third, this analysis addresses the possibility of wealth effects driving our results (Kerr, Kerr, and Nanda (2014)): partial and full owners experience similar capital gains when house prices go up, so their exposure to wealth effects should be the same.

[Table 3 here]

The results reported in Table III are consistent with the collateral channel hypothesis but harder to reconcile with alternative explanations. Note first that among the 42,549 homeowners in the sample, 40% are full owners.[18] Columns (1), (2), and (3) estimate equation (1) using owners with an outstanding mortgage on their house as the treatment group and renters as the control group. Columns (4), (5), and (6) restrict the sample to renters and full owners. Columns (1) and (4) include only department and region-by-year fixed effects. Columns (2) and (5) add all the observables from column (7) of Table II. Columns (3) and (6) include changes in the department-level unemployment rate from $t-6$ to $t-1$ as well as its interaction with the homeownership dummy. Results across these specifications show unambiguously that an increase in house prices leads to more entry for full owners but not for owners with an outstanding mortgage. When we include the full set of control variables, $\beta^{\text{partial owners}}$ is an insignificant -0.0016. This zero-effect is precisely estimated, with a standard error of 0.0025 (10 times smaller than the estimated effect on full owners). On the other hand, $\beta^{\text{full owners}}$ is highly significant with a point estimate of 0.025. This effect is more than twice as large as that estimated using all owners as our treatment group, as discussed previously. Going from the 25^{th} to the 75^{th} percentile of house-price growth (a 16-percentage-point increase) leads to a 0.4-percentage-point (0.025×0.16) increase in the probability of starting a business, which is a 28% increase in the probability of becoming an entrepreneur. The results in Table III are thus inconsistent with interpretations based on a wealth effect or on unobserved differences in owner versus renter characteristics that lead to heterogeneous self-selection into homeownership.

It may appear surprising that full owners, who own their house outright and are therefore likely to be wealthy individuals, are nonetheless affected by somewhat small changes in liquid wealth through shocks to house prices. Table IAIII uses data from the French Wealth Survey ("Enquête Patrimoine") to quantify the extent of liquid wealth owned by full homeowners.[19] Using the 1998 and 2004 waves of this survey we find that, even for full owners, liquid wealth is not huge. In 2004, for instance, the median house value of full owners is about €140k while their median liquid financial wealth is about €16k. These numbers imply that for more than half of the sample households, an increase in real estate prices of 16% (the interquartile range of five year price growth in our main sample) represents more than a doubling of their liquid financial assets. In other words, the data show that a large fraction of full owners do not hold

a significant amount of liquid wealth, and thus shocks to house prices represent a significant shock to the financing capacity of these individuals.

We further explore two additional comparative statics based on households' house size and income. We find that an increase in house prices leads to a greater relative increase in the propensity to start a new firm for households that own larger houses and for households that receive smaller incomes. These findings are consistent with a collateral channel interpretation, to the extent that larger houses constitute a more valuable source of collateral and poorer households have more difficulty accessing the unsecured credit market. These results are detailed in the Internet Appendix.

III. Housing Collateral and Entrepreneurial Outcomes

A. Data

We use a large-scale survey run by the French Statistical Office as well as tax files to construct a sample of individuals who are already self-employed with information on location, real estate ownership, and accounting statements. Details on the construction of this data set are provided in the Internet Appendix. Our final sample comprises 9,125 firms created in the first semester of 1998 with nonmissing accounting information in 1999 and detailed information about the entrepreneur prior to firm creation.

[Table 4 here]

Table IV presents summary statistics for this sample. Panel A reports the distribution of house-price growth from 1992 to 1997 across the 25 geographic regions. Panel B reports summary statistics for the firm characteristics we use as controls in our regression analysis for 1999, the first whole fiscal year after firm creation. The average firm has €131k in assets, €209k in sales, €102k of debt, and close to two employees. For the median firm, the owner is the firm's only employee. The average value-added (revenue less outside purchases of materials and services) is €131k, of which €50k correspond to wage payments (total employee compensation). Panel C summarizes the personal characteristics of the entrepreneurs in our sample. Only 23% of our sample entrepreneurs have a college degree, and 41% have technical training comparable to an associate's degree in the U.S. Before starting their business, 36% of respondents were unemployed and 10% were inactive. Further, 44% take the legal form of a sole proprietorship, a fraction similar to that reported in Levine and Rubinstein (2013). Overall, because of the large fraction of less educated and formerly unemployed individuals, the homeownership rate among entrepreneurs in this sample is relatively low: only 29% of these entrepreneurs are homeowners, compared to 58% of all households in France (in 2010). Figure 1 shows the industry distribution of the firms in our sample. Construction, retail, hotel, restaurant, and business services are the most common industries.

Table IAVI compares homeowners and renters along observable characteristics. Entrepreneurs who own real estate create smaller firms (about 25% smaller in terms of assets or employment), are less educated (4 percentage points more likely to have no diploma, 7 percentage points less likely to have a college diploma), are less likely to incorporate their firm (by 21 percentage points), and are more likely

to work from home (by 50 percentage points). Relative to renters, entrepreneurs who own their houses are older and less likely to have already started a firm prior to their current entrepreneurial experience. We find no large differences in terms of prior occupation or previous job descriptions across homeowners and renters, except that owners are more frequently from a blue-collar background. Overall, Table IAVI is not consistent with the notion that homeowners are richer, more educated, or have other characteristics suggesting that they are unconditionally more able to run a business. Importantly, however, our empirical strategy controls for observable heterogeneity across homeowners and renters.

B. Empirical Strategy

B.1. Specifications

To study the effect of collateral values on outcomes at firm creation, we estimate the following equation, where i is an entrepreneur/firm and j is the entrepreneur's region of location:

$$Y_{ij}^{1999} = \alpha + \phi \cdot Owner_i \times \Delta p_j^{1992\to1997} + \theta \cdot Owner_i + \gamma \cdot Z_i + \tau \cdot Z_i \times \Delta p_j^{1992\to1997} + \delta_l + \delta_{\text{industry}\times\text{region}} + \varepsilon_{i,j} \,. \quad (2)$$

The 1999 superscript indicates that the outcome variable is measured in 1999 (the first year after firm creation). The outcome variables we consider are the logarithm of one plus total assets, total sales, number of employees, total debt, value-added, and total wage bill. On the right-hand side, *Owner* is a dummy equal to one if the entrepreneur is a homeowner, $\Delta p_j^{1992\to1997}$ is real estate price growth in region j from 1992 to 1997, δ_l are department fixed effects, $\delta_{\text{industry}\times\text{region}}$ are industry-by-region fixed effects, meant to capture region-industry-specific investment opportunities, and Z_i is a vector of control variables that capture characteristics of the business owner and the firm she creates, which are also interacted with past house-price growth, $\Delta p_j^{1992\to1997}$. The controls include: separate dummies equal to one if the firm is a sole proprietorship, if the entrepreneur works from home, if someone in the entrepreneur's entourage is an entrepreneur, and if the entrepreneur already started a firm before his or her current entrepreneurial experience; age; gender; four dummies for education (no diploma, technical training, high school diploma, college diploma); three dummies for prior occupation (employed, unemployed, out of the labor force); five dummies for prior job description (craftsman, executive, intermediary profession, employee, worker); and 34 industry dummies.

Beyond firm size and other outcomes at firm creation, higher collateral value may also affect outcomes in the medium run, that is, several years after creation. For instance, a firm may have to make irreversible technology choices at creation, or may face significant adjustment costs to capital. To investigate this possibility, we estimate equation (2) but replace the outcome variables measured in 1999 with the same outcome variables measured in later years (up to 2005). More specifically, we estimate the following equation:

$$Y_{ij}^{t} = \alpha + \phi_t \cdot Owner_i \times \Delta p_j^{1992\to1997} + \theta_t \cdot Owner_i + \gamma_t \cdot Z_i + \tau_t \cdot Z_i \times \Delta p_j^{1992\to1997} + \delta_l + \delta_{\text{industry}\times\text{region}} + \varepsilon_{i,j}^{t} \,. \quad (3)$$

An issue with this specification is that we only observe outcomes in later years for those firms that do not exit the sample. The possibility of exit may create survivorship bias. Firms started by homeowners in regions that experienced large house-price growth from 1992 to 1997 might be more likely to exit, for example, because they overborrowed. Had they remained, these firms would have been small, so that their attrition creates an upward bias on the estimate of ϕ_t. We address this issue in two ways. First, we impute a value of zero for the dependent variables of firms that exit the sample. Exiting firms are thus considered to have zero employees, zero assets, and so on. Doing so should remove any potential bias for ϕ_t. Second, we separately examine the role of financing constraints on survival by estimating equation (3) using as the dependent variable a dummy equal to one if firm i is in the sample in year t but exits the sample in year $t+1$ and to zero if the firm remains in the sample in year $t+1$. We measure these failure hazard rates from $t = 1998$ to $t = 2003$. We also consider the total probability of failure before 2005 as a dependent variable. We perform all estimations in this section using OLS and cluster standard errors at the region $\times$ homeownership level.

B.2. Identification

As with the extensive-margin regressions presented in the previous section, equation (2) can be interpreted as a difference-in-difference strategy. The treatment group consists of entrepreneurs who own their home, whereas renters constitute the control group. The continuous treatments are the various levels of house-price growth that entrepreneurs experience prior to registering their firms. The first difference compares the size of new businesses created by homeowners in regions with high house-price growth from 1992 to 1997 with the size of new businesses created by homeowners in regions with low house-price growth. Intuitively, if entrepreneurs need real estate collateral to access external financing, homeowners should be able to create larger firms in regions that experience high real estate appreciation relative to regions with low house-price appreciation. But region-level house-price appreciation may be correlated with omitted region-level variables that also affect the size of newly created businesses. The second difference thus compares the size at creation of firms started by renters and firms started by homeowners within a given region. Renters serve as a natural benchmark in our setting as they constitute a group of entrepreneurs who are not exposed to variation in collateral values (the treatment) but are exposed to similar local demand shocks and investment opportunities as homeowners (the "treated" group). A positive ϕ coefficient— our coefficient of interest— in equation (2) would indicate that, in regions with high house-price growth, homeowners create larger firms than renters, compared to regions with low house-price growth. By contrast, the null hypothesis that collateral values are irrelevant for entrepreneurial activity predicts that $\phi = 0$.

A natural concern in this setting is that homeowners may exhibit specific characteristics (or create firms with specific characteristics) that explain why the firms they create tend to be more sensitive to the local housing cycle. We attempt to alleviate this concern in different ways. First, in equation (2) we control for a variety of personal/firm characteristics that might be correlated with the own-versus-rent decision (see Section III.B.1 for a description of the controls Z_i). By interacting these variables with our price-growth variable in equation (2), we ensure our effect is not driven by composition effects arising

from renters and homeowners differing significantly on these observable dimensions. Second, we augment equation (2) to include the interaction of the homeownership dummy and two proxies for local economic activity: the change in the department-level unemployment rate from 1992 to 1997, and the growth rate of region-level GDP from 1992 to 1997. Finally, as we detail in Section III.D, we exploit various dimensions of cross-sectional heterogeneity to show that the collateral channel and not some other omitted factor drives our results.

C. Main Results

C.1. Outcomes at creation

Table V reports the estimates of ϕ in equation (2). The outcome variables are the natural logarithm of one plus total assets (column (1)), sales (column (2)), number of employees (column (3)), debt (column (4)), value-added (column (5)), and total wage bill (column (6)). The specification reported in Table V uses the full set of control variables introduced in Section III.B.1.

[Table 5 here]

Table V shows significant effects of collateral value on the size of newly created businesses, conditional on entry. Going from the 25th to the 75th percentile of house-price growth from 1992 to 1997 (i.e., an 11-percentage-point increase in house-price growth) leads to a 13% ($= 1.2 \times 0.11$) increase in total assets, a 10.3% ($= 0.94 \times 0.11$) increase in total sales, and a 4% ($= 0.37 \times 0.11$) increase in employment. Consistent with the collateral channel, we find that this larger scale of operation following housing capital gains is accompanied by larger debt levels: going again from the 25th to the 75th percentile of house-price growth leads to a 10.3% ($= 0.94 \times 0.11$) increase in total debt.[20] These elasticities are economically large. The average house value at the time is around €175k. A house-price increase of 11% over the past five years represents an increase of €19.25k in collateral value. This leads to an increase in total assets at firm creation of $1.2 \times 0.11 = 13.2\%$. Given that the average size at creation in our sample is about €130k, this represents an increase in assets at creation of about $130 \times 0.0132 =$ €17.2k or about 90% of the increase in collateral value. This elasticity is large but plausible.

We also investigate how access to more valuable collateral affects total value-added and the total wage bill. The estimated effect on the employee's total compensation is large (9.7% increase following an 11-percentage-point increase in house-price growth). Total value-added created by homeowners, measured as sales minus intermediary inputs, is also significantly larger following greater house-price appreciation in the five years preceding firm creation: an 11-percentage-point increase in house prices leads to a 9.2% ($= 0.88 \times 0.11$) increase in value added.[21] All the results in Table V are significant at the 1% level when standard errors are clustered at the region-by-ownership level.

We further estimate how important selection based on unobservables would have to be to drive these results. Recall that Table V reports results from estimating equation (2) when all the controls Z are included in the regression. In Table IAVII, we present the estimates of ϕ in equation (2) when we progressively add the controls to the analysis. We use the logarithm of one plus total assets (columns (1)

to (4)) and total sales (columns (5) to (8)) as representative dependent variables. Columns (1) and (5) have only department and region-by-industry fixed effects. Columns (2) and (6) add controls for industry and legal status of the firm. Columns (3) and (7) add controls for education, previous job description, and previous employment status. Columns (4) and (8) add controls for age, gender, entrepreneurial background, and previous entrepreneurial activity. Table IAVII shows that adding these controls changes the estimation of ϕ in equation (2) only slightly; it hovers around 1 for total assets and 0.8 for total sales, both significant at the 1% level. However, including the controls increases the R^2 from 5% to 29% for log(Assets) and from 5% to 20% for log(Sales). As discussed before, the stability of the point estimate of ϕ as we include additional relevant control variables suggests that selection based on observables is of limited scope, and hence selection on unobservables would have to be very large to explain away our results in Table V. This result is particularly important here, because potential selection biases may be at play in the sample. Individuals may decide to become homeowners based on unobserved characteristics that also explain why they start more cyclical businesses. In addition, if access to more valuable collateral increases expected profits from entrepreneurship, the marginal homeowner-entrepreneur in a region with increasing house prices may have lower productivity than the marginal homeowner-entrepreneur in a region with lower house-price growth. Such a correlation structure would lead to a downward bias in ϕ. The results in Table IAVII, which show that selection on observables characteristics has little effect on the estimated ϕ, suggest that selection based on unobservable characteristics is unlikely to be driving entirely the effects we report in Table V.

We also control for the possibility that past house-price appreciation may be correlated with local investment opportunities in the 2000s. We use two variables to capture local investment opportunities – (1) region-level GDP growth from 1992 to 1997 and (2) the department-level change in the unemployment rate from 1992 to 1997 – and we include the interactions of these two variables with the homeownership dummy in equation (2). We report the results in Table IAVIII. As can be seen from the table, the results are almost unchanged relative to the main analysis of Table V. Including the interaction of the homeownership dummy with past local GDP growth and the past change in local unemployment decreases the point estimate of ϕ from 1.2 to 1.1 for total assets and from 0.94 to 0.9 for total sales, and leaves the point estimate for debt unchanged. All results remain statistically significant at the 1% level.

We additionally check that our results are not driven by house price momentum, that is, that areas experiencing high house-price growth from 1992 to 1997 also have high house-price growth in the late 1990s / early 2000s. To address this concern, we augment equation (2) by adding the interaction of the homeownership dummy with realized house-price growth from 1999 to 2004. We present the results in Table IAIX. Once again, the results are almost unchanged relative to our main findings of Table V. For instance, for total assets, ϕ continues to be equal to 1.2, whereas for total debt, ϕ increases from 0.94 to 1. All results remain statistically significant at the 1% level.

Finally, we note that Paris and the neighboring areas are large regions that experienced the largest house price decline from 1992 to 1997. To ensure that these particular regions are not driving our main results in Table V, we reestimate equation (2) but exclude Paris and its surrounding departments ("Petite Couronne") from the sample. The results are presented in Table IAX. The point estimates are again very

close to those in Table V and all results remain statistically significant at the 1% level.

C.2. Long-run results

Our finding so far is that financing frictions affect firms' outcomes at creation. This effect on size at creation has the potential to significantly affect aggregate total factor productivity (TFP) and output (Midrigan and Xu (2013)). However, it is theoretically possible that this effect is short-lived and mitigated after a few years, because firms accumulate enough profits to self-finance their growth amid persistent productivity shocks (Moll (2014)). In this section, we directly address the question of how long the effects of collateral shocks at creation last. To this end, we estimate equation (3), which uses outcome variables measured up to seven years after firm creation as a dependent variable.

[Table 6 here]

Table VI reports point estimates for ϕ_t in equation (3) for the six outcome variables considered in Table V. Figure 2 plots the ϕ_t coefficients and their associated 90% confidence intervals as a function of t for each of these variables. We first find that all the coefficient estimates remain positive for all years. Further, except for 2002, most estimates are statistically significant at the 10% level or better. In 2000, 2001, 2004, and 2005, all six estimates of ϕ_t are significant at the 5% level. We also find that except for 2002, the point estimates for ϕ_t are remarkably stable over time and close to their 1999 value. Consider column (1) of Table VI, which reports the ϕ_t estimates when the dependent variable is the log of one plus total assets. We see that the coefficients vary from 1 in 2000 to 1.1 in 2005, with a low value of 0.58 in 2002 and 0.93 in 2003. The 2004 estimate of ϕ_t for total assets is equal to its 1999 estimate shown in Table V. In other words, the size differential between firms created by homeowners and firms created by renters across regions has a similar magnitude five years after these firms are created. Using the 2005 estimates, we see that firms that were created after an 11-percentage-point increase in house prices from 1992 to 1997 were still 12% larger in 2005. The stability of the ϕ_t coefficient is similar for most outcome variables. For instance, excluding 2002, when all point estimates except one are smaller and insignificant, we find that the average ϕ_t coefficient estimated when debt is the dependent variable is equal to 0.85, which is close to its 1999 value of 0.94. In sum, Figure 2 and Table VI show that collateral shocks have a persistent effect on the long-run behavior of newly created firms.

One potential issue with our long-run analysis is that if house-price growth is persistent, regions with high house-price growth from 1992 to 1997 may also experience high house-price growth after the firm is created in 1998, which may correspond to a further increase in the value of their housing collateral. In the Internet Appendix, we present two pieces of evidence showing that the long-run effects we document are not driven by the persistence of house-price growth. First, we show that house prices from 1998 to 2003 are negatively correlated with those from 1992 to 1997. Second, we control for post-1998 house-price growth in our regression analysis and find that it does not affect our estimates. Overall, this analysis suggests that firms that are able to use higher collateral values to start on a larger scale remain significantly larger even seven years after creation. This finding is consistent with models of irreversible technology

choices at birth (Midrigan and Xu (2013)) and with significantly slower accumulation of internal funds by constrained firms (Moll (2014)).

C.3. Survival and initial collateral value

Turning to our extensive-margin analysis, a possible interpretation of our results so far is that collateral shocks make homeowners less risk averse, because risk aversion is a decreasing function of wealth in some utility specifications. Besides the fact that wealth changes do not seem to be correlated with the holdings of risky assets (Brunnermeier and Nagel (2008)), we show in the previous section that the decision to enter is the same for full and partial owners, both of which experience the same wealth increase. In the context of our intensive-margin regressions, we can also test this hypothesis more directly. A consequence of the reduced risk-aversion hypothesis is that firms started by wealthier homeowners should be riskier than firms started by relatively poorer individuals.[22]

As a first test of this risk-taking hypothesis, we estimate equation (3) using the failure hazard rate from t to $t+1$ as the dependent variable. Table IAXII presents the estimation results. Columns (1) to (6) look at the instantaneous failure hazard rate from year t to $t+1$, whereas columns (7) and (8) use the probability that the firm will exit the sample before 2005 as the dependent variable. The results show that higher collateral values at creation lead, if anything, to a *lower* probability of exit. We find that the effect of housing wealth on the exit rate is insignificant for all but one year (2003), and it is then negative — implying that larger collateral values at creation to a lower conditional failure hazard rate in 2003. Consistent with the results from columns (1) to (6), column (7) shows that the overall probability of exiting the sample before 2005 is negatively but insignificantly correlated with the interaction of house-price growth from 1992 to 1997 and the homeownership dummy. In column (8), we additionally control for the interaction of the homeownership dummy and region-level GDP growth from 1992 to 1997 and the department-level change in unemployment rate from 1992 to 1997. Doing so makes the point estimate of ψ negative and statistically significant at the 5% level. Taken together, the results from Table IAXII are inconsistent with the hypothesis that access to more valuable collateral increases risk-taking and in turn exit rates.

D. Sample Splits

We now show that our estimates of ϕ (effect of housing wealth on post-entry growth) are stronger when the entrepreneur is more likely to be credit-constrained. To this end, we use two alternative measures of credit constraints.

The first measure we consider is industry-level credit constraints. If the collateral channel drives our results, we expect the estimated effect to be stronger for entrepreneurs operating in industries in which credit constraints are more prevalent. If, on the other hand, a wealth effect or selection into homeownership drives our results, the effect should be uniform over the industry dimension. To construct a measure of industry-level credit constraints at creation, we use the 2006 wave of the SINE survey. This wave asks entrepreneurs about the main difficulties they face when creating their firms.[23] We construct a dummy

variable equal to one when the entrepreneur self-reports difficulty in obtaining financing as one of the main difficulties in creating her firm, which is the case for 26% of the entrepreneurs in our sample. We then regress this dummy variable on the control variables described in Section III.B.1 and on a set of 34 industry fixed effects. These industry fixed effects proxy for credit constraints at the industry level: they tell us how much more likely an entrepreneur is to report difficulties in obtaining financing in a given industry, conditional on observable characteristics.[24,25] We then split our sample of entrepreneurs into two groups: entrepreneurs with businesses operating in an industry with below-median credit constraints and entrepreneurs operating in an industry with above-median credit constraints. We report the results in Table VII. For the sake of brevity, we only report the results using log(Assets), log(Sales), log(#Emp.), and log(Debt) as dependent variables. The estimates of ϕ over these two samples are always positive and generally statistically significant, although the effect estimated on the sample of above-median credit-constrained industries is much larger. For instance, looking at employment as the dependent variable, we find a point estimate of 0.54 in constrained industries and only 0.19 in unconstrained industries. The p-value for the difference between the two estimates is 0.05. Similarly, looking at assets as the dependent variable, we find a point estimate of 1.5 in constrained industries and only 0.89 in unconstrained industries. Overall, the evidence in Table VII shows that ϕ is significantly larger for entrepreneurs operating in industries in which credit constraints at creation are more prevalent, and thus lends credence to our interpretation that housing shocks alleviate credit frictions.

[Table 7 here]

Our second test of credit constraints is at the individual level, where we run our regression separately for previously unemployed versus employed entrepreneurs. We find that our measure of housing gains has a larger impact on business size for entrepreneurs that were previously unemployed. This finding is consistent with the idea that unemployed households have more difficulty in accessing the unsecured credit market, and thus housing collateral has a larger impact for them. These findings are detailed in The Internet Appendix.

IV. Housing Collateral and Entrepreneurship in the Aggregate

In this section, we investigate whether the collateral channel we document using micro-data can be observed using aggregated region-level data on entrepreneurship. This exercise is useful because it allows us to obtain a direct empirical estimate of the impact of house prices on entrepreneurial activity at the regional level, which may not necessarily be positive even if there is a positive collateral effect at the individual level. For instance, firms that enter the market because of a collateral effect might "crowd out" other firms in the same region that would have otherwise been created. If such a crowding-out effect is important, our difference-in-differences estimator can be significant at the micro-level while the collateral channel has no effect on region-level entrepreneurial activity. The results presented in this section account for any such region-level crowding-out effect.

A. *Data*

We aggregate our data set at the regional level – the same geographic unit as that used for house prices. We first use the 1990 exhaustive French Census to obtain the fraction of homeowners in 1990 at the regional level. This measure is defined as the fraction of first houses (as opposed to second houses) in the region that are owner-occupied. We use the same source to compute the size of the active population in the region in 1990. We measure firm creation at the department level by aggregating information from the Business Creation Registry maintained by the French statistical office (INSEE). This data set is available for the period 1992 to 2002 and contains the universe of firms created in France, with their precise creation date, headquarters' location, legal form (limited liability corporation or sole proprietorship), and employment at creation. We also obtain information from INSEE on the industry composition (agriculture, manufacturing, construction, for-profit services, nonprofit services) of the workforce by region for 1990. The 1990 LFS provides information on the median wage by region in thousands of Francs. The final sample contains 349 observations. Table IAXIV presents summary statistics.

B. *Empirical Strategy*

B.1. *Specification*

We estimate the following equation, where the unit of observation is now region j in year t:

$$\ln(\textit{New Firms}_{j,t}) = \alpha + \chi \cdot \%\textit{Owners}_j^{1990} \times \Delta p_j^{t-6\to t-1} + \tau \cdot Z_j^{1990} \times \Delta p_j^{t-6\to t-1} + \mu \cdot \%\textit{Owners}_j^{1990} \times \Delta\, \textit{Unemp}_j^{t-6\to t-1} + \theta \times \Delta p_j^{t-6\to t-1} + \delta_j + \eta_t + \varepsilon_{j,t}\,. \quad (4)$$

$\%\textit{Owners}_j^{1990}$ is the fraction of homeowners in region j in 1990, $\Delta p_{j,t-6\to t-1}$ is house-price growth in region j in the five years preceding year t, δ_j are region fixed effects, η_t are year fixed effects, and $\Delta\, \textit{Unemp}_j^{t-6\to t-1}$ is the variation in unemployment in region j from $t-6$ to $t-1$. The region-level controls Z included in equation (4) are the fraction of the working population in 1990 working in manufacturing, the fraction of the working population in 1990 working in construction, the size of the region measured by its population from the 1990 Census, and the logarithm of the median wage. Finally, $\ln(\textit{New Firms}_{j,t})$ is the log of the number of newly created firms in year t in region j.

We also explore the effect of these collateral shocks across regions on employment in newly created firms. To do so, we exploit the fact that the exhaustive registry of new firms contains information on the number of jobs at creation and use, as an alternative dependent variable in equation (4), the log of all jobs in newly created firms in a region.

Equation (4) is estimated using OLS. Because we have only 25 regions, we report asymptotic standard errors clustered at the regional level, but compute the associated p-values using the wild bootstrap procedure of Cameron, Gelbach, and Miller (2008).

B.2. Identification

Equation (4) can be thought of as an aggregation of equation (1). Here, χ is the coefficient of interest. Regions are characterized by the fraction of homeowners living in the region. In regions with more homeowners, a given increase in house prices leads to a larger increase in collateral values available to residents, which, under the collateral channel hypothesis, leads to an increase in the number of new firms created in the region. If we ran the regression without further controls, the identifying assumption would be that, absent the collateral channel, aggregate self-employment in regions with different levels of homeownership would react similarly to variation in house prices. However, regions with more homeowners may have a population with observable characteristics that lead to a larger elasticity of firm creation to the local business cycle. To account for this possibility, we control for some observable characteristics (the Z_l described in Section III.B.1) and the interaction of these characteristics with past house-price growth in the region. Because of the limited sample size, however, we cannot include too many control variables, which constitutes a limitation of this aggregate analysis. To account for the possibility that regions with a large fraction of homeowners are more sensitive to the local business cycle, we interact $\%Owners$ with variation in the region-level unemployment rate from $t-6$ to $t-1$.

C. Main Results

Table VIII presents the estimated χ from equation (4). The two dependent variables, which measure entrepreneurial activity at the regional level, are the log number of firms created in the region (Panel A) and the log number of employees in newly created firms in the region (Panel B). We report both unweighted results (columns (1) and (3)) and results weighted by the regional population (columns (2) and (4)). Columns (1) and (2) include only year and region fixed effects. Columns (3) and (4) add the region-level observables, Z_l, and their interaction with past house-price growth. Columns (5) and (6) add the interaction of variation in the region-level unemployment rate and $\%Owners$ 1990. All specifications yield positive and highly statistically significant coefficients. In our sample, entrepreneurial activity responds significantly more to past increases in house prices in regions with a larger fraction of homeowners.

[Table 8 here]

The magnitudes we report in Table VIII are large, for the effect of collateral value on both business counts and induced job creation. Looking at column (5) of Panel A (the unweighted specification including the full set of controls) and the median homeownership rate (0.58%), we find that a 19-percentage-point increase in Δp (the interquartile range of house-price growth in this sample) leads to an increase in the number of newly created firms in the region of 6% ($0.54 \times 0.58 \times 0.19$). Given that a region has, on average, 6,800 new firms created every year, such a change in home prices implies the creation of about 400 additional firms per region per year. Similarly, column (5) of Panel B suggests that a similar shock would lead to the creation of about 30,000 jobs nationwide, which represents about 0.16% of total employment. Of course, these estimates do not account for general equilibrium effects across regions.

V. Conclusion

Using variation in local house prices, this paper shows that collateral frictions are a significant determinant of the creation of new firms, as well as of the size of newly created firms, both at the individual level and the regional level. Our paper highlights a channel through which house prices can affect aggregate activity that is different from the one emphasized by Mian and Sufi (2012), who show that declining house prices impair the balance sheet of levered households, thus contributing significantly to a decline in employment. In particular, our analysis shows that declining house prices also negatively affect the supply of entrepreneurs, which may in turn decrease aggregate activity. Quantifying the relative importance of these two channels is a task that we leave for further research.

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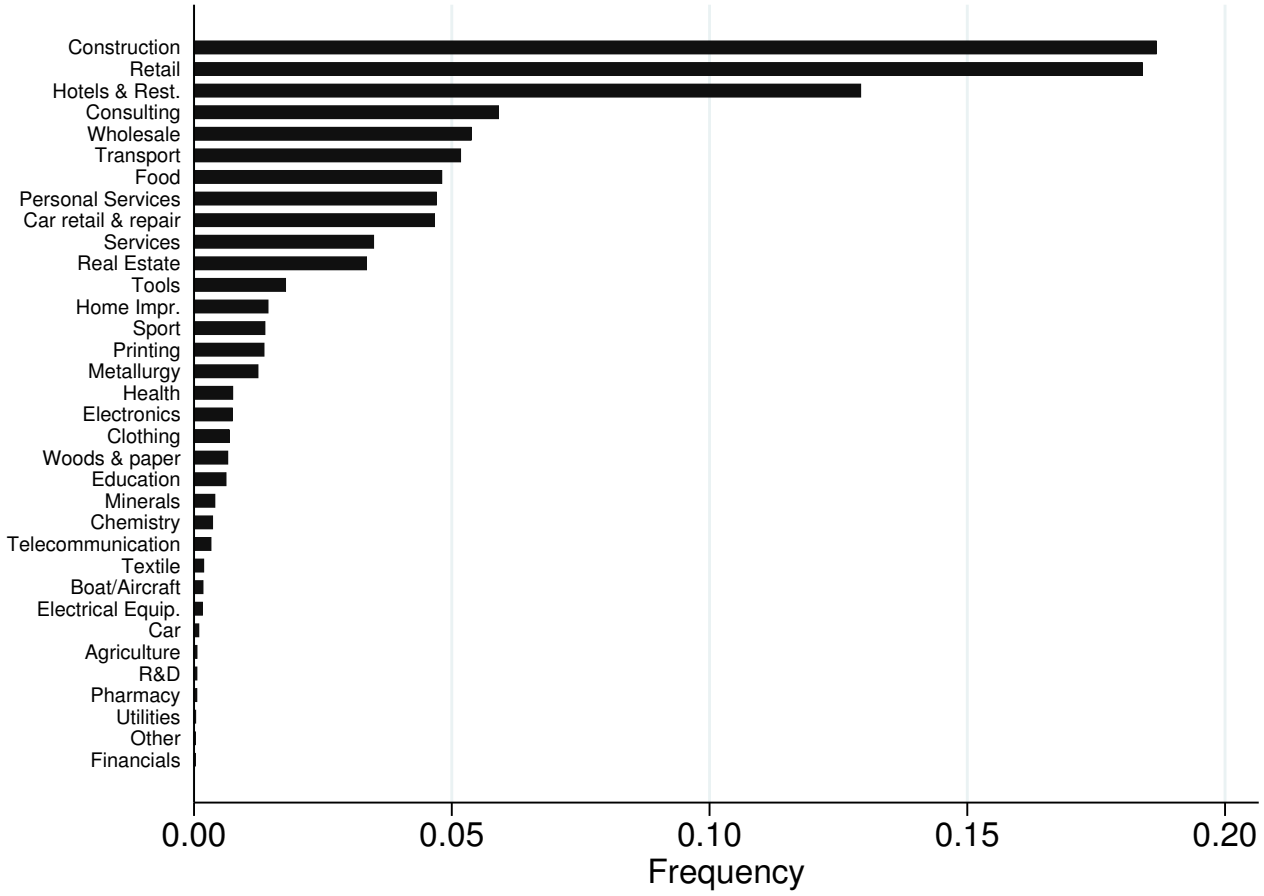

Figure 1. Industry distribution of newly created businesses. The graph shows the industry distribution of the businesses created in the first half of 1998 that are in our sample.

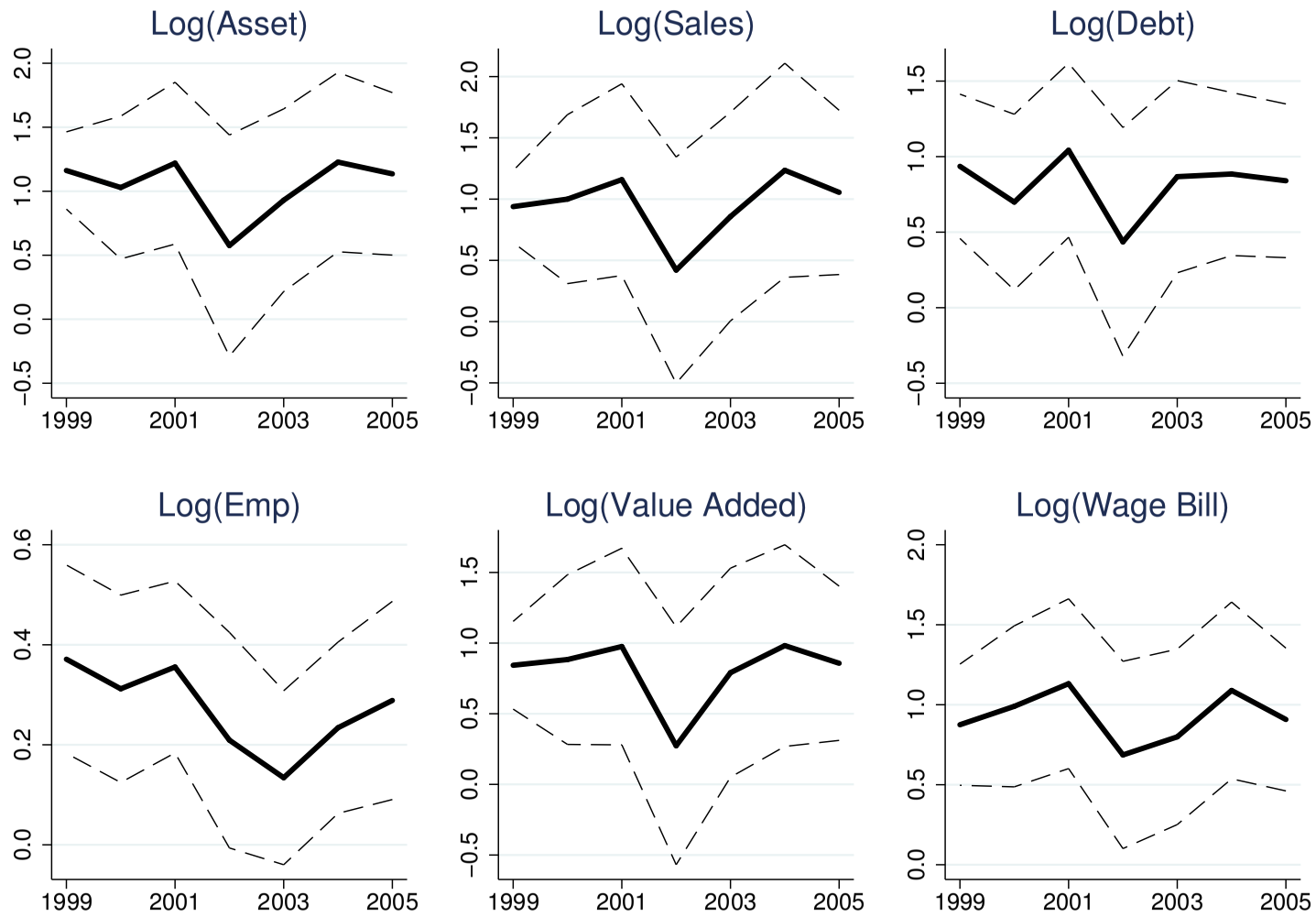

Figure 2. Real estate capital gains and entrepreneurial outcomes: long-run effects. The graphs plot the point estimate and the 90% confidence interval of the ϕ_t coefficient in equation (3), where the outcome variable is measured in year t and is assigned a value of zero if the firm has exited the sample. These regressions control for characteristics of the business owner (occupation prior to becoming an entrepreneur, age, education, gender), legal form of the business (sole proprietorship or corporation), industry, whether the firm is located in the owner's home, whether the entrepreneur has an entrepreneurial background, a serial entrepreneur dummy, as well as all interactions of these controls with Δp. The regressions also include department fixed effects and region-by-industry fixed effects. Standard errors are clustered at the region-by-ownership level. The outcome variables are the logarithm of one plus total assets (top left panel), total sales (top right panel), total debt (bottom left panel), and total employment (bottom right panel).

Table I. Summary Statistics for the Extensive-Margin Analysis.

This table presents summary statistics for the sample that we use in our analysis of the effect of real estate capital gains on the decision to start a company. The sample period is 1990–2002. Panel A describes house-price growth from year $t-6$ to year $t-1$ across the 89 French regions used in the analysis. Panel B describes characteristics of the individuals surveyed in the LFS: a dummy equal to one if the individual starts a business, a dummy for homeownership, log of wages in the year prior to the decision to start a business (or log of unemployment benefits if eligible), a dummy for unemployed, age, gender (1 for male, 0 for female), a foreigner dummy, and education dummies (for college degree, some college, high school diploma, technical training).

	Mean	Std. Dev.	p(10)	p(25)	p(50)	p(75)	p(90)	Obs.
Panel A: House-price growth								
$p_{t-1}/p_{t-6}-1$	0.14	0.20	-0.03	0.04	0.10	0.20	0.31	1,026
$\text{Unemp}_{t-1}-\text{Unemp}_{t-6}$	0.29	1.72	-2.00	-1.00	0.35	1.57	2.60	1,026
Panel B: Individual characteristics								
Entrepreneurship	0.01	0.12	0.00	0.00	0.00	0.00	0.00	73,390
Homeowner	0.58	0.49	0.00	0.00	1.00	1.00	1.00	73,390
log(Wage)	8.74	1.77	8.41	8.77	9.02	9.32	9.68	73,390
Unemployed	0.07	0.25	0.00	0.00	0.00	0.00	0.00	73,390
Age	42.95	8.79	31.00	36.00	43.00	50.00	55.00	73,390
Gender	0.87	0.33	0.00	1.00	1.00	1.00	1.00	73,390
Foreigner	0.07	0.25	0.00	0.00	0.00	0.00	0.00	73,390
Education								
College Degree	0.08	0.28	0.00	0.00	0.00	0.00	0.00	73,390
Some College	0.08	0.26	0.00	0.00	0.00	0.00	0.00	73,390
High School	0.11	0.31	0.00	0.00	0.00	0.00	1.00	73,390
Technical	0.35	0.48	0.00	0.00	0.00	1.00	1.00	73,390
No Diploma	0.38	0.49	0.00	0.00	0.00	1.00	1.00	73,390

Table II. Real Estate Capital Gains before Firm Creation and Probability of Starting a Business
The table reports estimates of a linear probability model regressing the decision to start a company on the interaction of local house-price appreciation in the five years prior to the decision (Δp) which a dummy for individual homeownership (Owner). All regressions include department fixed effects and region-by-year fixed effects. Column (1) has no additional controls. Column (2) adds controls for education (four dummies) as well as their interaction with Δp. Column (3) adds controls and interaction terms for prior-year salary (or unemployement insurance benefit if eligible) and previous year employment status. Column (4) adds controls and interaction terms for age. Column (5) adds controls and interaction terms for gender and nationality. Column (6) adds controls and interaction terms for current industry. Column (7) adds controls and interaction terms for the job description of the respondent's father. Column (8) additionally controls for the change in unemployment rate in the department from year $t-6$ to year $t-1$, as well as its interaction with the ownership dummy. Standard errors are reported in parentheses and are clustered at the region-by-ownership level. *, **, and *** indicate statistically different from zero at the 10%, 5%, and 1% level of significance, respectively.

	Entrepreneurship Dummy							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Owner × Δp	0.014***	0.014***	0.014***	0.011***	0.011***	0.01***	0.0099***	0.0094***
	(0.0022)	(0.0023)	(0.0023)	(0.0027)	(0.0026)	(0.0025)	(0.0026)	(0.0026)
Owner	0.00091	0.0003	0.0053***	0.0054***	0.0036***	0.0025***	0.0022**	0.0025***
	(0.00078)	(0.00075)	(0.00085)	(0.00091)	(0.00086)	(0.00085)	(0.00088)	(0.00092)
Owner × ΔUnemp								-0.0006**
								(0.00029)
ΔUnemp								0.0015
								(0.0014)
Controls	None	Educ.	Wage &	Age	Gender &	fathers'	Industry	All
Controls×Δp			Emp.		national.	job descr.		
Department FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	73,390	73,390	73,390	73,390	73,390	73,390	73,390	73,390
Adj.-R^2	0.00	0.00	0.05	0.05	0.05	0.07	0.07	0.07

Table III. Real Estate Capital Gains before Firm Creation and Probability of Starting a Business: Leverage

The table reports estimates of a linear probability model regressing the decision to start a company on the interaction of local house-price appreciation in the five years prior to the decision (Δp) with a dummy for individual homeownership (Owner). Columns (1) and (2) have no additional controls. Columns (3) and (4) add controls for education (four dummies), prior year employment status, age, gender, nationality, father's job description and current industry, as well as these variables' interactions with house-price growth in the region from year t-6 to year t-1. Columns (5) and (6) additionally control for change in unemployment rate in the department from year t-6 to year t-1 and its interaction with the homeownership dummy. Columns (1), (3), and (5) are run on the sample of individuals who are either renters or owners who still have an outstanding mortgage on their house. Columns (2), (4), and (6) are run on the sample of individuals who are either renters or owners with no outstanding mortgage on their house. All regressions include department fixed effects and region-by-year fixed effects. Standard errors are reported in parentheses and are clustered at the region-by-ownership level. *, **, and *** indicate statistically different from zero at the 10%, 5%, and 1% level of significance, respectively.

	Entrepreneurship Dummy					
	Owners with leverage			Owners without leverage		
	(1)	(2)	(3)	(4)	(5)	(6)
	Owners with leverage			Owners without leverage		
Owner × Δp	0.0023	-0.00085	-0.0016	0.032***	0.025***	0.025***
	(0.0024)	(0.0026)	(0.0025)	(0.0044)	(0.0045)	(0.0045)
Owner	0.00086	0.00079	0.0012	0.0012	-0.00051	-0.00032
	(0.00082)	(0.00098)	(0.00097)	(0.0011)	(0.0011)	(0.0011)
Owner × ΔUnemp			-0.00075*			-0.00046
			(0.00041)			(0.0004)
ΔUnemp			0.00032			0.002
			(0.0017)			(0.0017)
Controls	No	Yes	Yes	No	Yes	Yes
Controls×Δp	No	Yes	Yes	No	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes
Region × Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	56,698	56,698	56,698	47,533	47,533	47,533
Adj.-R^2	0.00	0.03	0.03	0.00	0.03	0.03

Table IV. Summary Statistics for the Intensive-Margin Analysis.

This table presents summary statistics for the sample used in the analysis of the effect of real estate capital gains on size at creation, conditional on entry. Panel A describes regional characteristics (house-price growth, GDP growth from 1992 to 1997) and department characteristics (change in unemployment rate from 1992 to 1997). Panel B describes characteristics of the firms created by entrepreneurs surveyed in the SINE survey in 1998 and measured in 1999 in the tax file: total assets, total sales, total debt, number of employees, value-added, and total wage bill. Panel C describes characteristics of the entrepreneurs surveyed in the SINE survey in 1998: homeownership status, whether they are sole proprietors, whether they work from home, age, entrepreneurial background, gender, serial entrepreneur dummy, education as captured by four dummies (no diploma, technical training, high school diploma, college diploma), occupation prior to starting a business (employed, unemployed, and out of workforce), and prior job description (craftsman, executive, intermediary profession, employee, worker).

	Mean	Std. Dev.	p(10)	p(25)	p(50)	p(75)	p(90)	Obs.
Panel A: Regional characteristics								
$\frac{p^{97}}{p^{92}} - 1$	-0.00	0.13	-0.21	-0.03	0.02	0.08	0.13	25
$\Delta \text{GDP}^{92-97}$	0.14	0.03	0.11	0.12	0.13	0.16	0.17	25
$\Delta \text{Unemp.}^{92-97}$	1.48	0.73	0.65	0.93	1.45	1.90	2.47	94
Panel B: Firm characteristics (1999 book values, in thousand euros)								
Asset	131.77	1,072.05	7.17	18.60	41.01	96.65	221.81	9,125
Sales	209.44	1,284.92	14.94	35.52	73.63	172.11	396.67	9,125
Debt	102.46	970.58	3.20	11.43	29.88	76.22	179.43	9,125
# Employees	1.85	6.71	0.00	0.00	0.00	2.00	4.00	9,125
Value-Added	130.78	616.59	9.91	24.24	48.94	112.81	250.17	9,125
Total Wage	49.99	218.94	0.46	3.05	12.65	44.82	108.85	9,125
Panel C: Entrepreneur characteristics								
Home Owner	0.29	0.45	0.00	0.00	0.00	1.00	1.00	9,125
Sole Proprietor	0.44	0.50	0.00	0.00	0.00	1.00	1.00	9,125
Business at Home	0.41	0.49	0.00	0.00	0.00	1.00	1.00	9,125
Age	37.51	9.33	26.00	30.00	36.00	44.00	50.00	9,125
Entr. Background	0.72	0.45	0.00	0.00	1.00	1.00	1.00	9,125
Gender (Male = 1)	0.77	0.42	0.00	1.00	1.00	1.00	1.00	9,125
Serial Ent.	0.26	0.44	0.00	0.00	0.00	1.00	1.00	9,125
Education								
No Diploma	0.18	0.39	0.00	0.00	0.00	0.00	1.00	9,125
Technical training	0.41	0.49	0.00	0.00	0.00	1.00	1.00	9,125
High School Diploma	0.18	0.39	0.00	0.00	0.00	0.00	1.00	9,125
College Diploma	0.23	0.42	0.00	0.00	0.00	0.00	1.00	9,125
Prior occupation								
Employed	0.53	0.50	0.00	0.00	1.00	1.00	1.00	9,125
Unemployed	0.36	0.48	0.00	0.00	0.00	1.00	1.00	9,125
Out of Workforce	0.10	0.30	0.00	0.00	0.00	0.00	1.00	9,125
Prior job description								
Craftsman	0.15	0.36	0.00	0.00	0.00	0.00	1.00	9,125
Executive	0.20	0.40	0.00	0.00	0.00	0.00	1.00	9,125
Intermediary Prof.	0.10	0.30	0.00	0.00	0.00	0.00	1.00	9,125
Employee	0.25	0.43	0.00	0.00	0.00	1.00	1.00	9,125
Worker	0.21	0.41	0.00	0.00	0.00	0.00	1.00	9,125

Table V. Real Estate Capital Gains before Firm Creation and Entrepreneurial Outcomes

The table reports results of regressions of entrepreneurial outcomes – measured in 1999 (the first entire fiscal year after firm creation) – on the interaction of regional house-price appreciation from 1992 to 1997 (Δp) with a dummy for individual homeownership (Owner). We control for characteristics of the business owner (occupation prior to becoming an entrepreneur, age, education, gender), legal form of business (sole proprietorship or corporation), industry, whether the firm is located in the owner's home, whether the entrepreneur has an entrepreneurial background, a serial entrepreneur dummy, as well as interactions of these controls with Δp. The regressions also include department fixed effects and region-by-industry fixed effects. The outcomes we consider are logarithm of one plus total assets (column (1)), sales (column (2)), number of employees (column (3)), total debt (column (4)), value-added (column (5)), and total wage bill (column (6)). Standard errors are reported in parentheses and are clustered at the region-by-ownership level. *, **, and *** indicate statistically different from zero at the 10%, 5%, and 1% level of significance, respectively.

	log(Assets) (1)	log(Sales) (2)	log(#Emp.) (3)	log(Debt) (4)	log(Value-Added) (5)	log(Wage Bill) (6)
Owner × Δp	1.2***	0.94***	0.37***	0.94***	0.84***	0.88***
	(0.18)	(0.17)	(0.11)	(0.28)	(0.19)	(0.23)
Owner	0.079***	-0.13***	-0.11***	-0.035	-0.14***	-0.22***
	(0.027)	(0.026)	(0.015)	(0.029)	(0.024)	(0.03)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls × Δp	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes
Region × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Price Change	0	0	0	0	0	0
Observations	9,125	9,125	9,125	9,125	9,125	9,125
Adj.-R^2	0.29	0.20	0.30	0.32	0.22	0.30

Table VI. Real Estate Capital Gains before Firm Creation and Long-Run Outcomes

The table reports results of regressions of entrepreneurial outcomes – measured in year $t \in [2000, 2005]$ – on the interaction of regional house-price appreciation from 1992 to 1997 (Δp) with a dummy for individual homeownership (Owner). We control for characteristics of the business owner (occupation prior to becoming an entrepreneur, age, education, gender), legal form of business (sole proprietorship or corporation), industry, whether the firm is located in the owner's home, whether the entrepreneur has an entrepreneurial background, a serial entrepreneur dummy, as well as interactions of these controls with Δp. The regressions also include department fixed effects and region-by-industry fixed effects. The outcomes we consider are logarithm of one plus total assets (column (1)), sales (column (2)), number of employees (column (3)), total debt (column (4)), value-added (column (5)), and total wage bill (column (6)). To control for endogenous attrition, we assign a zero value to the dependent variable for firms that exit the sample. Standard errors are reported in parentheses and are clustered at the region-by-ownership level. *, **, and *** indicate statistically different from zero at the 10%, 5%, and 1% level of significance, respectively.

	log(Assets) (1)	log(Sales) (2)	log(# Emp.) (3)	log(Debt) (4)	log(Val.-Add.) (5)	log(Wage) (6)
			Panel A: 2000			
Owner × Δp	1***	1**	0.31***	0.7**	0.88**	0.99***
	(0.33)	(0.41)	(0.11)	(0.35)	(0.36)	(0.3)
			Panel B: 2001			
Owner × Δp	1.2***	1.2**	0.36***	1***	0.98**	1.1***
	(0.38)	(0.47)	(0.1)	(0.34)	(0.41)	(0.32)
			Panel C: 2002			
Owner × Δp	0.58	0.42	0.21	0.44	0.27	0.69*
	(0.52)	(0.55)	(0.13)	(0.45)	(0.5)	(0.35)
			Panel D: 2003			
Owner × Δp	0.93**	0.86*	0.13	0.87**	0.79*	0.8**
	(0.43)	(0.51)	(0.1)	(0.38)	(0.44)	(0.33)
			Panel E: 2004			
Owner × Δp	1.2***	1.2**	0.23**	0.88***	0.98**	1.1***
	(0.42)	(0.52)	(0.1)	(0.32)	(0.43)	(0.33)
			Panel F: 2005			
Owner × Δp	1.1***	1.1**	0.29**	0.84***	0.86**	0.91***
	(0.38)	(0.4)	(0.12)	(0.3)	(0.33)	(0.27)
Observations	9,125	9,125	9,125	9,125	9,125	9,125

Table VII. Real Estate Capital

Gains before Firm Creation and Entrepreneurial Outcomes: Industry-Level Financing Constraints

The table reports results of regressions of entrepreneurial outcomes – measured in 1999 (the first entire fiscal year after creation) – on the interaction of regional house-price appreciation from 1992 to 1997 (Δp) with a dummy for individual homeownership (Owner). We control for characteristics of the business owner (occupation prior to becoming an entrepreneur, age, education, gender), legal form of business (sole proprietorship or corporation), industry, whether the firm is located in the owner's home, whether the entrepreneur has an entrepreneurial background, a serial entrepreneur dummy, as well as interactions of these controls with Δp. The regressions also include department fixed effects and region-by-industry fixed effects. The outcomes we consider are logarithm of one plus total assets (columns (1) and (2)), sales (columns (3) and (4)), number of employees (columns (5) and (6)), and total debt (columns (7) and (8)). Standard errors are reported in parentheses and are clustered at the region-by-ownership level. Columns (1), (3), (5), and (7) ((2), (4), (6), and (8)) run the regression on the sample of industries with below- (above-) median financing constraints. *, **, and *** indicate statistically different from zero at the 10%, 5%, and 1% level of significance, respectively.

	Industry Financing Constraint							
	log(Assets)		log(Sales)		log(#Emp.)		log(Debt)	
	(1) High	(2) Low	(3) High	(4) Low	(5) High	(6) Low	(7) High	(8) Low
Owner × Δp	1.5***	0.89***	1.4***	0.48	0.54***	0.19**	1.1**	0.84**
	(0.31)	(0.31)	(0.28)	(0.33)	(0.19)	(0.093)	(0.44)	(0.36)
Owner	0.03	0.12***	−0.18***	−0.081**	−0.099***	−0.11***	−0.083	−0.00075
	(0.049)	(0.034)	(0.049)	(0.036)	(0.023)	(0.016)	(0.05)	(0.037)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls × Δp	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Department FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region × Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4,364	4,753	4,364	4,753	4,364	4,753	4,364	4,753
Adj.-R^2	0.29	0.29	0.20	0.18	0.29	0.30	0.33	0.30

Table VIII. House-Price Growth, Ownership Rate, and Local Entrepreneurial Activity

The table reports results of linear regressions of entrepreneurial activity at the regional level on the interaction of local house-price appreciation in the past five years (Δp) with the fraction of homeowners in the region (% Owner). Panel A uses the log of the total number of firms created in the region as the dependent variable. Panel B uses the log of the total number of jobs in newly created firms in the region as the dependent variable. Columns (1), (3), and (5) are unweighted. Columns (2), (4), and (6) are weighted by the size of the regional population. Columns (1) and (2) control for year and region fixed effects. Columns (3) and (4) add controls for industry composition, size, and median wage in the region, as well as interactions of these controls with Δp. Columns (5) and (6) add controls for the change in the regional unemployment rate over the past five years, as well as its interaction with the fraction of homeowners in the region (% Owner). Robust standard errors clustered by region are reported in parentheses. The p-value (CGM) reported in the table is for the coefficient on % Owner $\times\Delta$ p and is calculated using clustering at the regional level (k = 25) using Cameron, Gelbach, and Miller (2008)'s wild-cluster bootstrap. *, **, and *** indicate statistically different from zero at the 10%, 5%, and 1% level of significance, respectively.

	Measure of Entrepreneurial Activity					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Log(# New Firms)						
% Owners 1990 $\times \Delta p$	0.58***	0.56***	0.58***	0.57***	0.52**	0.54***
	(0.11)	(0.08)	(0.19)	(0.16)	(0.2)	(0.18)
Δp	-0.24***	-0.23***	1.2*	1.5***	1.3*	1.6***
	(0.036)	(0.027)	(0.65)	(0.5)	(0.72)	(0.55)
p-value (CGM)	0.008	0.002	0.054	0.04	0.062	0.038
Panel B: Log(# Jobs in New Firms)						
% Owners 1990 $\times \Delta p$	0.58**	0.55***	1.1**	1.1**	1.2*	1.2**
	(0.22)	(0.18)	(0.48)	(0.4)	(0.64)	(0.53)
Δp	-0.23*	-0.2*	-0.56	-0.17	-0.7	-0.21
	(0.12)	(0.099)	(1.9)	(1.5)	(2.2)	(1.6)
p-value (CGM)	0.006	0.028	0.054	0.048	0.04	0.04
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
(Industry Composition, Size, Wage)	No	No	Yes	Yes	Yes	Yes
(Industry Composition, Size, Wage) $\times \Delta p$	No	No	Yes	Yes	Yes	Yes
Δ Unemp	No	No	No	No	Yes	Yes
% OwnerΔ Unemp	No	No	No	No	Yes	Yes
Observations	349	349	349	349	349	349
Adj.-R^2	0.996	0.996	0.996	0.996	0.996	0.996
Weighted	No	Yes	No	Yes	No	Yes

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Footnotes

[1]We refer to all owners of newly registered businesses as "entrepreneurs."

[2]We also find that total factor productivity is not smaller and that labor productivity is higher.

[3]By mechanically controlling for local economic conditions, our econometric approach avoids the problem of having to define and measure appropriate controls for economic conditions as in Fairlie and Krashinsky (2012).

[4]Similarly, Olds (2013) finds that the provision of public health insurance stifles entrepreneurship in the U.S. Hombert, Schoar, Sraer, and Thesmar (2013) find that a more generous unemployment insurance system for entrepreneurs leads to a massive increase in entrepreneurial activity in France.

[5]Cash-out refinancing, which is another way of extracting home equity, is uncommon in France. Prepayment penalties are pervasive and typically set at their maximum authorized level of six months interest (capped at 3% of the outstanding capital). Beyond these penalties, a refinancing borrower will face additional charges amounting to 3% to 5% of the new loan – mostly in the form of application fees and notary costs or guarantee costs depending on the type of loan). As a consequence, refinancing is much less frequent in France than in the U.S. In 2002, only 8.9% of French households had at some point refinanced their loan (2002 French Housing Survey). In the U.S. in the same year, 32% of levered households reported that their mortgage was a refinancing of a previous mortgage (2002 wave of the American Housing Survey).

[6]Additional evidence includes Connolly, La Cava, and Read (2015), who show that at least three-quarters of small business lending in Australia is collateralized, and around one-half to two-thirds of this lending is secured by houses.

[7]Given that we are studying housing collateral, only one person per household should be able to pledge the household's house to outside investors. This person is likely to be the head of the household.

[8]Note that 7% is below the average unemployment rate for France over this period because we are restricting the sample to household heads.

[9]Table IAI in the Internet Appendix, available in the online version of the article on the *Journal of Finance* website, provides a comparison of homeowners and renters on these observable dimensions. Relative to renters, homeowners earn higher wages (by about 60%), are less likely to be unemployed (by about 6.4 percentage points), are older (by about five years), are more likely to be male (by 12 percentage points), and are less likely to be a foreigner (by 7 percentage points). These differences are economically large and statistically significant but our empirical strategy controls for this heterogeneity among homeowners and renters.

[10]See the Internet Appendix for details on the construction of this data set.

[11]France has 90 departments. The median department has a population of about 600,000 people. In terms of relative size, a department should be thought of as a U.S. MSA.

[12]Note, however, that prior research finds no evidence of change in risky portfolio weights in response to wealth shocks (Brunnermeier and Nagel (2008)).

[13]Since 1986, rents can only be freely set at the signing of a lease. Once a lease is signed, rents cannot increase by more than a reference index for five full years. Until 2006, this index was the construction cost and is now called the "Indice de Réference des Loyers". It is set by the French Statistical Office and mimics the consumer price index. As a result, the rental price index is uncorrelated, in aggregate, with house prices. A time-series regression of quarterly growth in the national price index on quarterly growth in the rental price index yields an insignificant coefficient of 0.027. We show these series in Internet Appendix Figure IA2.

[14]Campbell and Cocco (2007) investigate this question using UK household data and find that renters do *not* increase their savings in response to an increase in house prices.

[15]With 25 regions and two values for the homeownership dummy, we have 50 clusters. Given the analogy to a difference-in-differences estimator, clustering at the region-by-homeownership level is akin to clustering at the level of the unit of treatment, which is standard in quasi-experimental settings (Bertrand, Duflo, and Mullainathan (2004)).

[16]We do not use region-level GDP growth as a control in this specification as this variable is available only from 1995 onwards and hence its inclusion would lead to a large decrease in sample size. We use regional GDP growth as a control in our analysis of the intensive margin below.

[17]Formally, let $\beta^{(8)}$ be the estimated β using the full set of control variables in column (7), and let $\beta^{(1)}$ be the estimated

β using no controls except département and region-by-year fixed effects. Bellows and Miguel (2009) show that the ratio $r = \frac{\beta^{(8)}}{\left(\beta^{(1)}-\beta^{(8)}\right)}$ measures how much stronger selection on unobservables, relative to selection on observables, must be to explain away the full estimated effect. In our case, r is 2.41: to attribute the entire OLS estimate to selection into homeownership based on unobservables, selection on unobservables would have to be 2.4 times greater than selection on observables.

[18]This proportion of full owners is lower than for the whole population (60%) because of our sample selection (individuals younger than 65, already employed, etc.).

[19]The French Wealth Survey is run by the French statistical office every six years and is stratified on a household's total income in order to over-sample wealthy households. The sample size is about 10,000 households per survey. We use the 1998 and 2004 waves of this survey to construct our statistics. Table IAIII provides details on the construction of the proxy for liquid and housing wealth.

[20]In unreported regressions, we use the leverage ratio as a dependent variable and estimate a positive but insignificant ϕ. One interpretation is that firms use 100% leverage to finance their incremental assets and that, given the small size of the firms we are looking at, the corresponding increase in the leverage ratio is too low to be detectable in our sample.

[21]To further our understanding of the efficiency consequences of shocks to collateral value, we estimated equation (2) using measures of productivity as the dependent variable. In unreported regressions, we find that the gap between the TFP of firms created by homeowners and renters does not vary significantly as a function of local house-price growth prior to firm creation. In other words, firms started with larger debt capacity appear to be neither more nor less productive.

[22]Another version of this hypothesis is that risk aversion is negatively correlated with homeownership, such that homeowners tend to start larger firms when local business conditions improve. The literature on homeownership is not decisive in terms of the correlation between homeownership and risk aversion. Sinai and Souleles (2005) argue that an important margin in the rent-versus-buy decision is hedging, which would suggest that risk aversion is *negatively* correlated with homeownership.

[23]Unfortunately, previous waves do not include this question, which is why we use the 2006 wave.

[24]The fixed effects range from -0.2 to 0.3, with a standard deviation of 0.08. A firm in an industry at the 25^{th} percentile of this industry-level financing constraint measure is 9.1 percentage points less likely to report obtaining financing as one of its main difficulties in entering the market, relative to a firm in an industry at the 75^{th} percentile.

[25]Another way to determine the role of financing constraints in explaining our results would be to split the sample of industries into high and low start-up capital. The results we obtain when conducting such a split are mixed, for which there is a natural explanation. We expect our effect to be stronger in industries in which individuals tend to be on average more credit-constrained. But the extent to which credit frictions bind is a function of two factors: (1) the start-up capital needed to start the firm and (2) the net worth of the entrepreneur. In the data, start-up capital and entrepreneur wealth are likely to be positively correlated – wealthier individuals will tend to start firms in higher-scale industries. If so, then using industry start-up capital cannot be used for determine the role of the collateral channel.