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ABSTRACT

We use Census micro data to shed new light on how growth in house prices boosts US entrepreneurship. At the height of the 2007 real estate boom, 5% of self-employed individuals and 12% of employer-businesses used home equity to partly or wholly finance a new business. Despite this frequency, several analyses suggest that little of the observed city-level relationship between house price increases and entrepreneurship operates through expansion of the home equity collateral channel. First, home equity gains mostly appear to substitute against loans from friends and family. The vast majority of entrepreneurs used personal savings to finance their business, and these individuals usually hold sufficient start-up capital absent the house price increases. Second, we estimate that over 90% of the relationship between house price increases and entrepreneurship observed in city-level analyses comes from higher local demand that boosts entry. Our results provide a nuanced picture: while housing collateral is important for some entrepreneurs to access needed credit, the empirical relationship between house price increases and start-up activity is more about local demand than about financing constraints.

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1 Introduction

Given the pivotal role of new firms in driving economic growth (Decker et al., 2014; Pugsley and Sahin, 2019), the magnitude of financing constraints facing potential entrepreneurs is a central question for academics and policy makers (Evans and Jovanovic, 1989). While potential entrepreneurs do not always receive as much capital as they would like, there is also increasing evidence of heterogeneity in the motivations of founders, as well as the aggregate implications of these constraints (Kerr and Nanda, 2010). Recent academic work shows, for example, that a large share of individuals starting a new business are in (i) the top percentiles of the wealth distribution starting firms in industries with low capital needs (Hurst and Lusardi, 2004) and/or (ii) have little ambition to innovate or grow their businesses (Hurst and Lusardi, 2004; Hurst and Pugsley, 2011). Consistent with this, Decker et al. (2014) point out that older small businesses in the US do not exhibit the strong up-or-out dynamic associated with job creation and economic dynamism.

These facts suggest that the sub-population of firms that are both financially constrained and likely to be important for productivity growth could be much smaller than the overall set of entrants in the economy. Indeed, Levine and Rubinstein (2017) and Guzman and Stern (2017) draw attention to the small number of high-potential entrepreneurs and highlight that these individuals tend to be among the few entrepreneurs who incorporate their firms at founding.

What role does housing collateral play in alleviating financial constraints for high-potential entrepreneurs? Related, to what extent do house price increases lead to aggregate entrepreneurship by increasing individuals' ability to borrow against housing equity? These questions are not only important in the context of understanding heterogeneity in the financing frictions facing entrepreneurs, but are also tied to the renewed interest in the role of the housing sector in driving aggregate outcomes following the rapid increase of house prices during the early 2000s and their subsequent decline after the 2008 financial crisis. Debt financing is the principal form of external finance for most businesses raising money (Robb and Robinson, 2014). The degree to which the collateral channel alleviates credit constraints—and the extent to which this is a broad-based effect vs. restricted to a small sub-set of individuals—is also of interest to policy makers, because subsidies to mortgage financing or homestead exemptions in bankruptcy procedures impact the relative costs of owning a home and the value of housing collateral to a bank, and thereby potentially shaping the access of small businesses to external finance.[1]

A growing body of research examining the role of housing collateral in entrepreneurship has exploited regional variation in house price changes to quantify the impact of the collateral

[1]For example, Berkowitz and White (2000), Berger, Cerqueiro and Penas (2011), Cerqueiro et al. (2017), Cerqueiro and Penas (2017), and Bracke, Hilber, and Silva (2018). See also Stiglitz and Weiss (1981), Berger and Udell (1998), and Chaney, Sraer and Thesmar (2012).

channel. Fairlie and Krashinksky (2012), Corradin and Popov (2015), Harding and Rosenthal (2017), and Schmalz, Sraer, and Thesmar (2017) find large elasticities when examining entry into entrepreneurship. Adelino, Schoar, and Severino (2015) trace the collateral channel to job creation by small firms in the US, and Hyytinen and Ylhäinen (2014) find related evidence in Finland. Black, de Meza and Jeffreys (1996) provide some of the earliest evidence in this regard.

While our paper is related to this prior work, features of our data allow us to take a new empirical approach. In particular, we draw on three different micro datasets from the US Census Bureau to characterize the home equity channel for entrepreneurial finance in greater detail. We further analyze legal changes in pledgeability of housing collateral to enable tighter controls for unobserved heterogeneity.

We first consider the 2007 Survey of Business Owners (SBO), a representative survey that covers the universe of over 26 million employer and non-employer businesses in the US. The SBO contains a question about home equity as a source of external finance, providing direct evidence on its typical use. At the height of the 2000-2007 real estate boom, about 12% of US employer businesses used home equity financing partly or wholly for start-up capital; the share for self-employed entrepeneurs was lower at 5%. This frequency is not trivial compared to other forms of external finance (e.g., 16% of employer businesses used bank loans), but it is small compared to the reliance on personal savings by 75% entrepreneurs that needed start-up financing.

While frequent in use, the SBO data describe how ventures reliant on home equity financing tend to less productive, run by less educated business owners, and more likely to be family-based businesses. Moreover, there is also little action in terms of house price growth: our estimations find that every 10% increase in house prices between 2000 and 2007 was associated with just a 0.3% increase in the share of home equity use. This modest increase represented some shift away from business loans from friends and family, while business loans from banks were stable. When compared to the work documenting how growing house prices unlocked personal consumption, these patterns suggest a muted response for unlocking collateral for business creation.

While extremely useful in providing direct evidence of home equity financing, the SBO data are cross-sectional in nature. In order to better identify the dynamic role of housing collateral in enabling entrepreneurial entry, we therefore turn to two other micro datasets to examine the role of housing collateral in enabling entrepreneurship.

Our next analysis exploits legal changes in the pledgeability of housing collateral in Texas relative to neighboring states to isolate the impact of housing collateral on entrepreneurship. We exploit a 1997 constitutional amendment in Texas that relaxed stringent constraints on the ability of banks to lend against housing collateral. Prior to 1997, the home could only be used as collateral for an individual's primary mortgage and related home improvement loans. The Texas amendment in 1997 first allowed for home equity loans to be used for business or consumption

purposes, and a subsequent reform in 2003 further allowed for home equity lines of credit. Texas was the only state with such restrictions, which enables us to compare the relationship between house prices and entry rates in Texas relative to its neighbors, before and after the reform.

We use the Longitudinal Business Database (LBD) to study this question over the twenty-year period spanning 1988 to 2007. Our empirical strategy decomposes the aggregate relationship between house prices and entrepreneurship into the part stemming from relaxed collateral constraints versus other factors such as increased aggregate demand. If *intra-city* aggregate demand is an important driver of the relationship between house prices and entrepreneurship—such that booming local areas are raising house prices and encouraging the creation of new firms—studies using regional-level data will be unable to separate the specific role of the bank collateral channel even if they isolate exogenous shifts in collateral values at the regional level.

We find that relative to neighboring states, cities in Texas showed a statistically similar link between entrepreneurship and house price changes in the decade prior to 1997. In the decade following the constitutional reforms, the responsiveness of entry rates in Texas to house price changes increased relative to neighbors, a pattern that is consistent with relaxed liquidity constraints spurring entry.

In regressions that control for aggregate demand only at the regional level, a 10% increase in house prices is associated with a 6% increase in employment among entering firms, estimates comparable to the prior literature. When we use the Texas reform to isolate the part of the 6% attributable to the collateral channel as opposed to other factors correlated with house price increases, we estimate that 0.6%—one-tenth of the overall relationship between house prices and entering employment—is attributable to housing collateral. Our estimates highlight that regional analyses of house prices and firm entry capture much more than just relaxed financing constraints on the entrepreneur's side.

Next, we combine the Longitudinal Employer-Household Dynamics (LEHD) database and the 2000 Decennial Census of Population to create a dataset with detailed *individual-level* covariates and employment histories for a representative subset of the population. This unique dataset allows us to study heterogeneity in the individual response to house price increases, using zip-code level price changes and information about the earnings, wealth, estimated loan-to-value (LTV) ratio for the mortgage, and other demographic attributes of the household. We compare the responses of those who are able to tap into rising home values with those limited by LTV ratios that are too high or who experience rare local price declines. We show that controlling for individual covariates attenuates our estimates substantially, again pointing to a small aggregate link of house price gains to entry via the collateral channel. We trace the small overall relationship on the collateral channel to a large response among the 5% of the working population who were highly levered prior to rising house prices and experienced home equity gains in excess of $75,000.

These three analyses combine to yield a nuanced story of how house price changes connect to entrepreneurship. Returning to our first results, entrepreneurs use home equity loans at rates modestly less than bank loans or credit cards, even at the height of the real estate boom. Consistent with prior research, we document that increases in home values connect to greater entrepreneurship, but we also show that these changes are substantially smaller once we control for intra-city aggregate demand and individual-level covariates. The increase in collateral value accounts for perhaps one-tenth of the overall relationship between house prices and entrepreneurship because most home owners already have sufficient wealth and home equity to start a typical business, without any need for additional collateral through house price increases. The small aggregate effects combine a 'null' response among most founders with very large elasticities among the 5% of home owners who had high LTVs and experienced extremely rapid house price gains.

This granular perspective is important for policy makers. There may be good reasons to favor (or oppose) broad-based policies to boost home ownership, but potential connections to the bank lending channel for entrepreneurs appear too weak to be a material factor. Instead, policy interventions are likely to be more effective if they target the lending challenges experienced by the small share of constrained individuals dependent on the home equity channel.

Our results also speak to the growing literature looking to understand heterogeneity in the population of potential entrepreneurs and the degree to which financing constraints bind for them. A number of models suggest that individuals are either precluded from entry or that firms enter small and then grow because of the fact that they face initial financing constraints.[2] At the firm level, changes in local banking conditions have been connected with entrepreneurship (e.g., Black and Strahan, 2002; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009). On the other hand, studies looking at entry have questioned the extent to which financing constraints are the leading driver behind entry decisions (Hurst and Lusardi, 2004). We find a causal effect of an exogenous increase in home equity on entrepreneurship, but also find that the average effect is relatively small and heterogeneous. Our limited effects parallel the findings of Bracke, Hilber, and Silva (2018) for the UK and Jensen, Leth-Petersen and Nanda (2014) for Denmark.

Beyond entrepreneurship, our work is relevant to literature documenting the link between the value of housing assets and the impact through household balance sheets on aggregate

[2]Classic and recent work includes Evans and Jovanovic (1989), Holtz-Eakin, Joulfaian, and Rosen (1994), Rajan and Zingales (1998), Cooley and Quadrini (2001), Gentry and Hubbard (2004), Cabral and Mata (2004), Cagetti and De Nardi (2006), Buera, Kaboski, and Shin (2011), Chatterji and Seamens (2012), and Barrot (2016).

Greenstone, Mas, and Nguyen (2014), Krishnan, Nandy and Puri (2015), Tsoutsoura (2015), and Nguyen (2019) are recent contributions to a parallel literature on local lending conditions and existing firm and small business access to credit (Petersen and Rajan, 1994, 1995; Paravisini, 2008). Similar to entrepreneurship studies, this work emphasizes the very localized nature of lending relationships to small businesses.

consumption, employment, and household investment.[3] To the extent that entrepreneurship holds non-pecuniary benefit (e.g., being one's own boss) and 'consumption value' (Astebro et al., 2014), some of the entry in this period likely stems from such 'entrepreneurial consumption'.

The rest of the paper is structured as follows: Section 2 provides baseline evidence on use of home equity financing by entrepreneurs with the 2007 Survey of Business Owners. Sections 3 and 4 describe our analyses connecting house prices and entrepreneurship through the collateral channel using the LBD and LEHD, respectively. Section 5 compares the economic magnitudes of various empirical exercises, and the last section concludes.

2 Start-up Reliance on Home Equity Loans

We first document the use of home equity loans among start-up firms using the 2007 Survey of Business Owners (SBO), which contains a direct question regarding use of home equity financing by entrepreneurs. We use the publicly available micro data released by the Census Bureau for the 2007 SBO.[4] The file contains over two million observations on employer and non-employer firms, and the data contain detailed information about the firm and its owners. Each firm has a recorded state and industry; sales and receipts, employment, and payroll from 2007; the year the business was established; and the sources of financing for start-up capital and for expansion capital. For each business owner, the SBO reports the owner's age in 2007, the highest level of education they completed, the number of hours per week spent working in the business, the owner's primary functions in the business, and when and how each owner acquired or started the business.

The total number of firms represented by the data (weighted) is about 26.4 million, of which 5.3 million are employer firms. The Census Bureau has applied statistical safeguards to ensure that the public-use data do not identify any individuals or businesses. Most important for our purposes, the data do not separately identify the District of Columbia and seven states: North Dakota, South Dakota, Rhode Island, Vermont, Alaska, Wyoming, and Delaware. Our sample thus focuses on 43 states that are separately identified, and we focus on businesses that were founded between 2000 and 2007. We exclude firms with missing or unknown start-up financing history (accounting for about 12.5% of the base sample), and we merge at the state-level house price indices during this period from the Federal Housing Finance Agency (FHFA, described in greater detail in the next section).

[3]For example, Hurst and Stafford (2004), Lustig and Van Nieuwerburgh (2005), Leth-Petersen (2010), Mian and Sufi (2011, 2014), Mian, Rao and Sufi (2013), Glaeser and Nathanson (2014), Mian, Sufi and Trebbi (2015), and Favilukis, Ludvigson and Van Nieuwerburgh (2017).

[4]Data and descriptions are available at https://www.census.gov/econ/sbo/pums.html.

2.1 Descriptive Features

Column 1 of Table 1 shows that over 90% of employer firms report using some form of start-up financing, with three-quarters reporting personal savings were used for start-up capital. Following personal savings, credit cards (18%), bank loans (16%), other personal assets (12%), and home equity (12%) are the most frequently mentioned sources. Respondents can check as many types of financing as applicable, and these raw statistics can represent modest or large contributions.

The total value of start-up financing is not split by source, but interesting differences emerge among the firms depending on which sources they report having used. Among employer-firm start-ups, those relying on personal savings and credit cards report the smallest totals on average ($77,756 and $91,500, respectively), followed by home equity loans at $140,931. This level is comparable to businesses backed by loans from friends and family and smaller than banks or venture investors. Thus, home equity appears to be a source that can be accessed by businesses with mid-sized financing needs.[5]

Columns 3 and 4 of Table 1 report similar statistics for non-employer firms, with only 5% of self-employed using home equity to support their business start. While documenting this share for completeness, the remainder of this paper focuses on employer firms exclusively. While there are millions of self-employed individuals, they represent a small share of employment and output. For example, the Census Bureau estimates that non-employer firms account for less than 4% of annual US sales[6] and they are excluded from the LBD or LEHD datasets that we use later. The limited use of home equity by self-employed and their small economic footprint make them an unlikely channel for significant collateral effects on the economy.

While the SBO data do not record what share of financing comes from home equity loans among those who use them, we can provide some complementary evidence through a second data source. Among entrepreneurs surveyed by the 2001 and 2003 Panel Study of Entrepreneurial Dynamics (PSED), which includes non-employer firms, 7% report using home equity loans for an average of $20,000 in investment capital or roughly 40% of business financing. The PSED data are sparse and should be viewed with caution. Nonetheless, the PSED's 7% is consistent with our SBO figures (5% for self-employed and 12% for employer firms), and the 40% figure would suggest typical home equity usage of around $33,000-$56,000, although the variation would be substantial.[7]

Table 2 describes the types of businesses that are started with home equity financing. Firms

[5]The relatively small use of home equity as a source of capital is not necessarily due to fixed costs in starting firms. Home equity loans are used considerably less frequently to expand businesses, where the quantum of capital required might be expected to be less. Among firms reporting that they expanded in 2007, home equity loans are reported as a financing source by 9% of the businesses.

[6]See https://www.census.gov/programs-surveys/nonemployer-statistics/about.html.

[7]Similarly, regressions of SBO financing amounts on indicators for the types of financing used by the entrepreneurs returns marginal increments of around $50,000 associated with home equity use.

that rely on home equity financing tend to slightly larger than average (6.4 employees versus 6.0 overall). They are bigger than those not using financing or relying on personal savings and credit cards, but they are also one-third smaller than those backed by bank loans. Interestingly, firms backed by home equity loans are among the least productive in terms of revenue per employee and support lower paying jobs. Column 4 shows that some of this could be due to a high propensity for family-based or husband-wife businesses to use home equity for loans. Owners using home equity financing are less likely to have a bachelors or higher degree than the average start-up raising external finance between 2000 and 2007.

2.2 House Prices and Use of Home Equity Financing

While the cross-sectional portrait suggests a modest role for home equity financing in new ventures, we next turn to a more dynamic perspective of whether sources of start-up financing shift substantially when house prices move.[8] As we only have a cross-section of data, our empirical approach explores cross-state variation in house price swings leading up to 2007 (among the 43 states separately identified).

Table 3 reports regressions of state-level financing behavior for start-up capital. The dependent variable in each analysis is a type of start-up financing used by entrants since 2000 in each state (e.g., the share of recent entrants using home equity loans). Our explanatory variables control for the type of start-up financing used by older firms that entered before 2000 in each state (e.g., the share of pre-2000 entrants that used home equity loans for start-up capital). We thus analyze whether strong house price growth during 2000-2007 for a state is correlated with a major shift in how young firms access capital in the state compared to how older firms did when they got started. We test whether young firms in states with high house price appreciation show a pronounced shift towards home equity financing than older firms nearby, compared to states with less house price growth. We will also consider any connected shifts related to other financial sources.

Table 3 considers the share of firms entering during 2000-2007 indicating reported financing, focusing attention on the composition of start-up financing. Columns 1-3 divide the sample into businesses not raising external finance, those using home equity as a source of start-up financing, and those whose start-up financing does not include home equity. These categories are collectively exhaustive and mutually exclusive, such that the coefficients sum to zero, and the means of the dependent variables sum to one (weighted state-level averages): 8% of respondents did not raise external finance, 80% raised external finance that does not include home equity

[8] Adelino, Schoar, and Severino (2015) demonstrate rising home prices connect to greater refinancing and use of home equity lines of credit in cities. The important difference in our estimations is that we are isolating the use of home equity loans for start-up capital specifically.

loans, and 12% raised finance that includes home equity loans.

We regress these shares on the log state-level house price change during 2000-2007, as well as unreported covariate controls for log house price levels in 2000, the log count of pre-2000 entrants by state, and the share of older firms in each state that used the forms of financing listed in Table 1 (seven regressors in total). These unreported regressors are held constant over specifications to provide a consistent baseline estimation and control for long-standing financing behavior in the state. We weight states by their count of pre-2000 respondents.

House price growth during 2000-2007 is positively associated with a greater share of ventures in the state using home equity for start-up financing compared to pre-2000 entrants. This pattern suggests an intuitive substitution towards home equity financing as it becomes more available and is statistically significant. However, the magnitude of these effect is rather modest. A 10% price growth is associated with a 0.3% increase in the share of firms using home equity financing, or a 2.6% relative increase in home equity financing off of the 12% baseline. These effects suggest that an enormous run-up in prices, along the lines of the 59% average state house price growth from 2000 to 2007, would be associated with just a 1%-2% increase in the share of the state's entrants using home equity.

Table 4 provides additional examples of capital included in a venture's initial financing. These other five outcomes are a subset of varieties of capital reported, and other forms of capital may be used as well; these coefficients are comparable to home equity loans regression in Column 2 of Table 3. Table 4 shows that house price growth leads to some substitution towards home equity loans instead of using business loans from friends or family. These sources are perhaps good substitutes from the perspective of business owners, as Tables 1 and 2 show similar types of businesses rely on them.[9]

In summary, the SBO analysis identifies that employer firms using home equity for start-up financing tend to be of slightly larger size but also less productive and more family-based. An increase in house prices is associated with an increase in the share of firms using home equity, possibly away from friends and family loans, but the magnitude is small. It is also noteworthy that the share of ventures backed by bank loans does not increase, suggesting that house price growth facilitates home equity loans to the entrepreneurs themselves more readily than it boosts collateral for other forms of credit via personal guarantees and similar.

[9]Estimations that use log counts of firms reliant on various financing forms as outcome variables reach similar conclusions. We also find an even smaller link of home price growth to use of home equity for expansion capital than what is shown here for start-up capital.

2.3 House Prices, Collateral and Entrepreneurship

While the SBO data provides a baseline level of home equity financing used by start-ups, it conditions on firms that have entered rather than looking at the entry decision. We next analyze more broadly house price increases, housing collateral, and new firm entry.

While house price appreciation leads to higher collateral values and hence a higher likelihood of receiving bank financing if requested, exploiting house price appreciation as a source of identification faces several challenges. Areas with high or rising levels of economic activity will generally be the ones where house prices increase and where entrepreneurship is likely to be particularly attractive. This could simply follow from strong local economic performance influencing many measures, with business starts and house prices being two of them. There could also be a systematic relationship, but with the causal connection being outside of loan markets for entrepreneurs. For example, entrepreneurs could be responding to changes in household consumption following adjustments in housing wealth (e.g., Mian and Sufi, 2011; Mian, Rao, and Sufi, 2013). Likewise, Stroebel and Vavra (2019) link house price growth to increases in local mark-ups, which could make new businesses more attractive. Thus, separating the impact of aggregate demand from the supply side drivers of credit is particularly important.[10]

Moreover, those who experience larger dollar increases in housing equity are likely to be wealthier, since the same percentage price increase unlocks greater equity in a more valuable home. If wealthier individuals have a differential response to business cycles (e.g., they are able to recognize or take advantage of opportunities more easily) then this and related individual-level covariates will confound the relationship between house price increases and entrepreneurial entry due specifically to the collateral channel.[11]

We approach these challenges in several ways. First, we exploit legal changes in the pledgeability of home collateral in Texas to isolate the role of the collateral channel in entrepreneurship from broader economic factors related to house price increases. This setting provides a well-identified approach for isolating the collateral channel due to home equity when studying firm-level entry, along with a natural benchmark for comparison in the overall relationship between house prices and entry. Second, we use individual-level micro data on homeowners combined with zip-code level variation in prices to identify individual-level entry into entrepre-

[10] Some recent efforts in this regard have used geographic constraints of cities for housing supply growth, first measured by Saiz (2010), as instruments for credit growth. Davidoff (2016) describes the challenges to this approach, and we find this does not provide well-grounded identification in our setting.

[11] For example, home equity gains may make individuals more willing to experiment with entrepreneurship through lower risk aversion (e.g., Kihlstrom and Laffont, 1979; Evans and Jovanovic, 1989) and/or changing occupational preferences to "be one's own boss" (e.g., Hamilton, 2000; Hurst and Lusardi, 2004; Åstebro and Thompson, 2011; Hurst and Pugsley, 2011; Åstebro et al., 2014). These mechanisms can lead to a positive association between wealth and entrepreneurship that is independent of the ability of the potential entrepreneur to access bank loans.

neurship. This allows us to control for unobserved heterogeneity at much finer levels of analysis and isolate sub-populations where our average effects are stemming from.

These analyses draw upon different datasets, each with unique elements and constraints. To facilitate readability, we report our results based on each dataset separately, and then bring the combined magnitudes and insights together in Section 5.

3 Longitudinal Business Database Analysis

Our next analysis uses the Longitudinal Business Database (LBD), a dataset available within the Census Bureau to approved researchers that provides annual employments for every private-sector establishment with payroll from 1976 onward. The underlying data are sourced from US tax records and Census Bureau surveys, and the LBD's complete accounting of very small firms and establishments, which are often excluded or sub-sampled in corporate surveys, is important for our analysis of entry patterns. The data focus on employer firms (those reported in Column 2 of Table 1) and thus exclude self-employed individuals who file tax returns via Schedule C or private household employees. The LBD also lists physical locations of establishments instead of states of incorporation, circumventing issues such as higher incorporation rates in Delaware. Jarmin and Miranda (2002) provide further details on the LBD construction.

The LBD assigns a firm identifier to each establishment that allows us to distinguish stand-alone firms from facilities of multi-unit firms. Our dependent variables focus on the entry of new single-unit firms by location, industry, and year spanning the period 1987–2007, which constitutes ten years before and after the Texas lending reform that we outline in Section 3.1 below.[12]

The LBD identifies the county location of each establishment, which we aggregate to Core Based Statistical Areas (CBSA).[13] We focus on CBSAs in the Texas region, defined to be Texas and its neighbors of Arkansas, Colorado, Kansas, Louisiana, New Mexico, and Oklahoma. This region contains 56 CBSAs that we can match with housing price data over the 1987-2007 period. A small number of included CBSAs lack house prices in early years, with the sample becoming

[12] We use the entry rate of facility expansions as a control for local economic activity in many specifications. In various analyses, we further separate entrants by establishment size in year of entry. For each establishment, we define its entry year to be the first year of positive employment, and our analyses are robust to whether we include or drop the new firms believed to be spin-outs of existing corporations, which can be assessed through the establishment identifiers existing before a firm is born.

[13] Core Based Statistical Areas (CBSAs) are a geographic unit defined by the Office of Management and Budget to replace the prior focus on Metropolitan Statistical Areas. CBSAs consist of one or more counties that have an urban center of at least 10,000 people. Adjacent counties are included in the CBSA when they are socioeconomically tied to the urban center by worker commuting. There are over 900 CBSAs currently defined, and these include 388 Metropolitan Statistical Areas (MSAs, urban core over 50,000) and Micropolitan Statistical Areas.

a full panel from 1994 onwards.

Our housing price data come from the Federal Housing Finance Agency (FHFA), following Adelino, Schoar, and Severino (2015). The FHFA data are reported at different levels of geographic detail and are considered reasonably representative of the overall house price development, although they are based on sales of single-family homes and do not include condos.[14]

3.1 Texas Reform

We draw extensively on Abdallah and Lastrapes (2012), who provide a detailed account of the restrictions in mortgage financing in Texas prior to 1998 and the political economy related to the Texas Constitutional Amendment to Article XVI, Section 50, which was approved by Texas voters on November 4, 1997 and became effective January 1, 1998. The constitutional amendment of 1998 allowed home equity loans for the first time in Texas, up to a loan-to-value ratio of 80% (inclusive of primary mortgage), without restrictions on how the funds could be used.

The sanctity of the homestead has been viewed as an essential right for Texas citizens ever since the Texas Homestead Act of 1839, and it was enshrined into Texas' original Constitution in 1845. As Abdallah and Lastrapes (2012) note, "Article XVI, Section 50 of the Texas Constitution of 1876, the fifth version of the document since statehood, protected homesteads from foreclosure except for nonpayment of the original loan to purchase the home or for debt incurred to finance home improvements." This effectively restricted housing collateral to the mortgage and related home improvement credit, and housing collateral could not be used to finance consumption or investment beyond the home. Related products like "cash out" refinancings and reverse mortgages were also prohibited. Although home equity lending in the rest of the US boomed following the federal Tax Reform Act of 1986, which eliminated income tax deductibility on interest payments related to all forms of consumer credit other than mortgages, the constitutional restriction prevented such home equity lending from taking effect in Texas.

Abdallah and Lastrapes (2012) provide a detailed discussion on the appropriateness of using January 1, 1998 as the start of the period, highlighting how Section 50 had been amended only twice between 1876 and 1997, and that the actual passage of the law remained uncertain, having failed to receive legislative support when it had been first proposed in 1995. The details of the reform remained unclear even after its passage, with several rules being ironed out in the few years after 1998. One of these changes was a rule in 2003 that further loosened restrictions to

[14] The FHFA website states: "The FHFA House Price Index (HPI) is a broad measure of the movement of single-family house prices. The HPI is a weighted, repeat-sales index, meaning that it measures average price changes in repeat sales or refinancings on the same properties. This information is obtained by reviewing repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac since January 1975."

allow home equity lines of credit (HELOCs). Throughout this period, however, the 80% loan-to-value remained the maximum borrowing limit, a legal restriction on pledgeability that did not exist in other states in the Texas region.

We use these three features of the Texas reforms—the introduction of home equity loans in 1998, the further introduction of home equity lines of credit in 2003, and the 80% loan-to-value restriction—as sources of variation in our analyses below. Abdallah and Lastrapes (2012) show that these reforms had bite for consumer spending in Texas, with sustained increases of 2%-3% in retail sales. Moreover, they demonstrate that the underlying heterogeneity in spending responses is consistent with house price gains and the unlocking of housing collateral. We analyze whether a similar effect exists for entry into new businesses.

3.2 Empirical Results

Table 5 provides the simplest evidence of the limited impact of the Texas reforms that opened up the home equity collateral channel for entrepreneurship. Using a technique dating back to Holmes (1998), we look at counties that are part of CBSAs on the Texas border with its neighbors. The core identification assumption in a state border analysis is that the counties on either side of the border would behave similarly excepting the legal change in Texas. If the neighboring entrepreneurs are subject to the same economic shocks and changes in local economic opportunities, we can look for evidence in changes in behavior on the Texas side that would indicate collateral being opened up.

Our tabulations simply aggregate activity on either side of the Texas border in the three time periods, normalizing by what is observed in the pre-period. If an interior county is part of a CBSA that touches the Texas border, it is retained in the sample. The first two columns show that house price changes on both sides of the border look similar through 2007. The next two columns show that entry counts behave quite similarly. Entry counts as measured by the LBD have been in decline nationally since the 1970s (e.g., Decker et al., 2014), and we see this in our sample too. The more important trait is the parallel trends in entry rates on either side of the border. The same again holds for entry employment in Columns 5 and 6.

We have conducted an extensive regression analysis on the border region. These unreported analyses consistently find a null effect on the border, which is not too surprising given the tabulations in Table 5. Of course, while the identification provided by a border discontinuity is attractive, the amount of activity on the Texas border is limited compared to the big cities of Dallas, Houston, Denver, etc., and so we instead turn towards testing whether we observe an entrepreneurship response in the larger sample.

Specifically, we run triple differences-in-differences estimations comparing the elasticity of a CBSA's entry rate with respect to local house prices in Texas to the neighboring states in the

pre and post periods. Our baseline LBD estimation takes the form:

$$\begin{aligned} \ln(Y_{c,t}) &= \varphi_c + \eta_t + \beta \ln(HPI_{c,t}) \\ &\quad +\delta \ln(HPI_{c,t}) \cdot Post_t \\ &\quad +\gamma \ln(HPI_{c,t}) \cdot TX_c \\ &\quad +\zeta \ln(HPI_{c,t}) \cdot TX_c \cdot Post_t + \varepsilon_{c,t}, \end{aligned} \tag{1}$$

where c indexes CBSAs and t indexes years. The dependent variable $Y_{c,t}$ is the log entrant count or log employment in new single-unit entrants in the CBSA by year. Panel estimations control for CBSA and year fixed effects. TX_c is an indicator variable for a CBSA being located in Texas, and $Post_t$ is an indicator variable for a year after 1998. $\ln(HPI_{c,t})$ is the log house price index for the CBSA by year.

The β coefficient captures the base relationship between house prices and entry outside of Texas, with the δ coefficient being the change in correlation of house prices and entry in the second half of the sample period common over the region. The γ coefficient measures the degree that Texan CBSAs behave systematically different throughout the twenty years. Last, but most important, the ζ coefficient captures the change in the connection of house prices to entry that occurs in Texas after the Constitutional amendment.

Column 1 of Table 6a shows that entry counts had a limited relationship to CBSA house prices in the Texas region before 1998, but that this connection became quite strong after 1998. Throughout the twenty year period, Texan CBSAs don't behave that differently than CBSAs in neighboring states, and continues to be the case after the 1998 amendment. Thus, the estimations in Table 6a show no discernible difference in the relative change in entry for Texas in the post period compared to neighboring states. Such an elasticity may have been present, for example, if there was pent up demand in the pre-period from an inability to use housing collateral that was released with the legal change and surge in home values nation wide. These results are robust if we add controls for local economic activity or use employment in start-ups as the dependent variable.

To discern whether this limited finding is due to the time taken to enact the Texas reform and have it diffuse to loan decisions, Table 6b divides the post period into two separate five-year periods. The period 1998-2002 corresponds to when the reform took place but only home equity loans were legalized. The period 2003-2007 comes after home equity lines of credit also became legal. The greater granularity shows an increased sensitivity to house prices in Texas in the 2003-2007 period relative to neighboring states. Even here, though, the magnitude is small. Column 2 shows a 0.14% higher entry count in Texas in the 2003-2007 period for every 10% increase in house prices. Column 4 shows a corresponding 0.6% increase in employment in entering firms.

This compares to the overall relationship of 3% and 6% for entry and employment, respectively, to a 10% increase in house prices. In other words, even well after the reform and at the height of the real estate boom, the collateral channel appears to account for about 4% of the overall relationship between house prices and entry and about 10% of the overall relationship between house prices and entering employment.

Table 7 evaluates this effect by entrant size and industry, reporting just the ζ interactions. The smallest entrants with 1-2 persons behave quite similarly to the overall effect, as they constitute a large share of entrants. Entrants with 3-9 employees show the weakest response. The strongest effect is evident in entrants with 10 or more employees. These effects are statistically significant, albeit still rather small in economic size, and could be consistent with both reduced collateral constraints for a segment of entrepreneurs or local consumption effects, as described further below. The remaining columns quantify responses by sector of the economy. Entry in the manufacturing sector in 2003-2007 shows the most significant uptick for Texas after the reforms relative to other states. Across the region, entry into the construction sector is highly sensitive to house prices swings, but Texan CBSAs do not display a differential to CBSAs in neighboring states.

Taken as a whole, these estimations suggest a limited impact of the Texan home equity lending reforms on entrepreneurship. We reach similar findings in many robustness checks: dropping the size weights given to the CBSAs, expanding the CBSA sample to include the whole US versus a focus on the Texan region, and so on. Most estimations show a statistical difference for Texas after 2003, indicative of the collateral channel being opened up, but the results remain modest in overall economic size. Unreported analyses also consider extending the sample onwards through 2012, when the LBD data end. The effects we measure in 2003-2007 are present in 2008-2012. Given the onset of the Great Recession and the increased time elapsing since the date of the Texas reform, we hesitate to emphasize these results too much, but the results suggest a persistent change that is of the magnitude evident by 2003-2007.

Our magnitudes imply that "unlocking" housing collateral in Texas led to 0.6% higher employment in start-ups for every 10% increase in house prices. Importantly, this home equity channel accounted for one-tenth of the overall (6%) house price-employment relationship we estimated in the LBD for every 10% increase in house prices. These estimates highlight that factors like intra-city aggregate demand operate alongside the collateral channel when considering regional relationships between house prices and entry.

While the LBD analysis is well-identified, there are two important questions that we cannot address at this level of analysis. First, unlocking housing collateral also has an impact on household consumption (e.g., Mian and Sufi, 2011). Specific to this Texas reform, Abdallah and Lastrapes (2012) find a significant increase in retail sales stemming from an increase in household

expenditure, and some of this demand could have led to increased firm entry independent of the *entrepreneur's* home equity being unlocked. Only a small fraction of home equity loans are used for business purposes (e.g., Benito, 2009), with most going towards home improvements or consumer purchases. Thus, our coefficients may even still pick up both the demand and supply effects of a relaxed collateral channel. Second, the supply-side effect of the home equity channel reflects both the collateral channel and wealth effects. This ambiguity is similar to studies of other windfall gains leading workers to be more willing to experiment with starting a new business (e.g., Lindh and Ohlsson, 1996; Anderson and Nielsen, 2012; Manso, 2016), which we cannot isolate using firm-level data. We therefore turn to understanding these features through micro data at the individual level.

4 Longitudinal Employer-Household Dynamics Database

We complement the LBD's longitudinal analysis of the Texas reform with a quite different approach using the LEHD. The individual-level data on home values in the Decennial Census and entrepreneurial transitions present in the LEHD allow for sharp empirical analyses but also require that we exploit cross-sectional variation across individuals and states. We begin with a depiction of the data and then the empirical strategy.

4.1 LEHD Data Platform

Our analysis combines the Longitudinal Employer-Household Dynamics (LEHD) database and the 2000 Decennial Census of Population. Similar to the LBD, these datasets are confidential and housed by the US Census Bureau. The LEHD is built from quarterly worker-level filings by employers for the administration of state unemployment insurance benefit programs, identifying the employees of each US firm and their quarterly compensation. It is longitudinally linked at both the firm and employee levels, allowing one to model how firm employment structures adjust over time, how new start-ups form, and how individuals transition into entrepreneurship. This rich data source is currently available for 31 states for research purposes. The initial dates differ across states in terms of inclusion in the LEHD, and we focus on states that have records that begin in 1995 or earlier to allow us to measure meaningful income accumulation over the prior decade.[15] The LEHD directly records some information about individuals, such as age, gender, race, place of birth, and citizenship status as well as earnings and employment histories by job.

We match the LEHD to individual-level records contained in the 2000 Decennial Census of Population (Census) through unique person identifiers. The Census has long-form responses for

[15] Included states are CA, CO, FL, ID, IL, IN, LA, MD, NC, NM, OK, OR, TX, WA, and WI.

one in six of the population, and thus, roughly speaking, we can match a similar ratio of our LEHD workers. The long form is given to a random sample of households for a nationally representative population. With this match comes a wealth of information about individuals (e.g., level of education, occupation, marital status) and their households (e.g., family composition, household income by source, home ownership and values). Importantly for our purposes, the Census asks whether the housing unit occupied by the respondent is rented or owned, how long the individual has been living in the residence, how much the monthly rent or mortgage payment is, and what the market value of the unit is.[16]

4.2 Sample Design and Empirical Approach

We build a custom dataset for the analysis of house prices and entry, focusing our primary analysis on homeowners (70% of the data sample, which closely compares to a national average of 67% in 2000). We use renters to formulate control variables described below. We also restrict our sample to individuals who are in wage employment in 2000 and examine their probability of transitioning into entrepreneurship by 2004. Since the LEHD does not have an official indicator for entrepreneurship, we define an individual as being an entrepreneur if they were among the top three earners in the entry year of a new firm. The appendix provides details on the specific steps we took to create the sample and this definition of entrepreneurial transition.

As seen in Table 8, our final regression sample is based on 529,600 individuals. The average value of a home in our sample is approximately $188,000. Most homeowners in 2000 have a mortgage outstanding but also hold significant home equity: the average homeowner in our sample is estimated to have about 57% of their home value as equity, or in the ballpark of $107,000. Our 57% estimate is very close to the 52% measure found by Bracke, Hilber, and Silva (2018) with their UK loan data. The average ratio of this home equity to household income is also consistent with other data sources (e.g., Gentry and Hubbard, 2004).[17]

Looking forward, house price growth from 2000 to 2004 is substantial and averages 43% for

[16] The exact question in 2000 is "What is the value of this property; that is, how much do you think this house and lot, apartment, or mobile home and lot would sell for if it were for sale?" Respondents selected from 28 ranges of values, with a minimum of "Less than $10,000" to a maximum of "$1,000,000 or more." We convert these to midpoints, excepting the last category, which is simply assigned $1,000,000. We perform a number of simple cross-checks on the data that are feasible with the long form of the 1990 Decennial Census.

[17] We estimate an individual's home equity in 2000 based upon time since home purchase, home price growth from time of purchase to 2000, and similar data. Specifically, we collect from Freddie Mac the average value, interest rate, and number of points on 30-year fixed rate loans for the years in which homeowners in our sample moved into their homes. Using a mortgage calculator, we then quantify the expected equity levels by year of move-in for that cohort in 2000 against the original loan amount and price levels. Owners are assumed to have as further equity all additional price growth from the time of their home purchase until 2000, which can be material given the price increases in the 1990s. Moreover, if no outstanding mortgage exists, we assign home equity to be 100% of the value of the home in 2000.

our sample. This results in an estimated home equity gain on the order of $85,000, which is a sizable wealth shock equal to one year's pre-tax household income. It is important to note that the expected nominal gain in home equity, all else equal, is independent of the individual's 2000 home equity level. That is, if the home value appreciates by $80,000, the owners enjoys all of this wealth gain regardless of whether their initial equity in 2000 is $10,000 or $250,000.

Our empirical approach exploits differences across individuals in their ability to take advantage of the 2000-2004 upswing. We define three groups of individuals that we expect to have different responses to the increases in house prices. About 85% of the sample is part of an "unlevered" group. These individuals moved into their home before 1998 and would be able to access home collateral if they wanted to, both before and during the 2000-2004 run up in prices. On average, these individuals held about $117,000 in home equity in 2000, compared to an increase in home equity of about $80,000 during the 2000-2004 period. Along the lines of the investment cash-flow sensitivity literature, we expect these individuals to have a small response, if any, to the 2000-2004 house price growth as they were already relatively unconstrained in 2000.

A second "levered" group represents about 13% of the sample and contains individuals who moved into their home after 1998. These individuals are the most sensitive to increases in house prices if they are financially constrained, as they have very little home equity available to borrow against in 2000. The final "lending constrained" group is about 2% of the sample. These are individuals who would be unlikely to borrow against any changes in home equity over this period, either because of legal limits on borrowing (e.g., to keep a loan-to-value ratio less than 0.8) or because their zip codes experienced price declines during the 2000-2004 period.[18]

We use cross-sectional variation across groups interacted with 2000-2004 house price changes as our source of identification. Specifically, the lending-constrained group serves as our baseline, as these are individuals with very limited access to financial markets via home equity gains in the 2000-2004 period. We anticipate the levered group to have the strongest response. Finally, in the spirit of the investment-cash flow sensitivity literature, our unlevered group can be seen as a placebo that we would expect to provide a null response. Such a null response can provide reassurance that our effects are indeed capturing supply-side changes stemming from the collateral channel as opposed to also capturing demand-side factors.[19]

[18] In defining these groups, there is some temptation to use additional features like the mortgage payment to infer whether the individual has loaded up more debt or substantially paid down the original loan. It is better, however, to stay with the baseline formulation as these adjustments, such as remodelling the kitchen, are often endogenous with entrepreneurial ambitions.

[19] In some of our estimations, we also use renters and their entrepreneurial transitions to project the expected behavior for homeowners. These calculations model the housing stock of renters through their monthly rental payment. To assign an implied value to rental properties, we simply use 20 times the annual rent. In 2000, the average multiple was 21.6, using quarterly reports from Case-Shiller and FHFA data. Comparing the implied value of homes for renters with the actual home values of owners shows that renters tend to live in dwellings of

Table 8 provides descriptive statistics on the LEHD sample. Column 1 reports averages for the key variables across all groups, and the next two columns split them by group. Disclosure restrictions on the Census data prevent us from splitting the sample into the three groups we use in our analysis for all of these traits. Instead, we provide descriptive statistics separately for the unlevered group (which we expect not to be financially constrained and therefore not as responsive to house price increases) and those potentially constrained. This latter set contains the levered and lending-constrained groups outlined above.

Due to the large sample size, virtually all traits are statistically different between the two reported groups, even when the differences are small in magnitude. Rows 4-10 show that the potentially constrained group is somewhat younger, more male, more minority and immigrant, and more single than the baseline group. The potentially constrained group is more educated on average, partly reflecting their younger average age. Rows 12-17 show traits of income and home values of the groups. Potentially constrained individuals live in more valuable homes, on average, and with recent move-in dates. Their household income in 2000 and LEHD earnings are roughly comparable to the unlevered set, but their estimated wealth in 2000 is substantially lower due to limited home equity. The final rows show that price increases and estimated home equity gains are also comparable across groups. There is a small positive correlation of zip code price growth to higher home values in 2000.

4.3 Empirical Results

Table 9 reports estimates of the transition into business ownership by 2004 for homeowners not in entrepreneurship in 2000 due to home equity gains. We group expected home equity gains from 2000 to 2004 into four levels: <\$25,000, \$25,000-\$75,000, \$75,000-\$150,000, and >\$150,000. The middle bins include the ballpark range from the SBO for typical home equity usage in business formation capital when this form of financing is present. We model these gains separately for the levered and unlevered groups, with the lending constrained control group serving as the reference category.

Column 1 models region fixed effects and indicator variables developed by initial financial status in 2000 and home equity gains during 2000-2004, allowing non-parametric measurement of effects relative to the lending-constrained group. An intuitive coefficient pattern emerges: entry transition is rising in the size of home equity gain for both the baseline and levered groups. The coefficients are monotonic within each group and statistically significant for groups with home equity gains greater than \$25,000. These results hold with the substitution of tighter geographic

modestly less value, but that the distributions overlap substantially. Owners have a significantly longer average tenure in their properties than renters.

fixed effects zip codes in Columns 2.[20]

Column 3 adds the four indicator variables for initial wealth levels in 2000, aggregating home equity and household income. Up to this point, we have not incorporated controls to model that wealthy individuals are more likely to experience larger home equity gains (as they own more valuable properties) but are also more likely to enter into entrepreneurship for many reasons beyond house price changes. Column 3 also includes explanatory variables for demographics, earnings histories, and mortgage payments and interact these variables with zip code price growth.[21]

These simple additions wipe out all of the transition effects evident for the unlevered group. This is an important finding, as this group accounts for 85% of the total sample of homeowners. The estimations show that this group does not transition to entrepreneurship at a different rate as house prices rise, even for very large house price shocks, when compared to a group for which lending is constrained. At a more intuitive level, it simply highlights that most homeowners in 2000 already held borrowing capacity if they wanted it, and so the subsequent house price changes are not unlocking a collateral channel that had been previously closed to them. Column 4 further shows that the results are robust to including a projection of the likelihood of transition, given a homeowner's traits, based upon what we observe for renters with similar traits during 2000-2004.

The response of the levered group is even more interesting. These are individuals who have moved into their home recently, have much smaller home equity, and face no local price or legal constraints to benefiting from house price gains. This group, when achieving equity gains in excess of $75,000, continues to show a heightened rate of entrepreneurial transition compared to the lending-constrained group. Even with the many controls in place, the house price gains are sufficient to boost entry rates by 50% compared to the sample average rate. This segment is conceptually the most likely to benefit from house price growth, and the effects are strongest here. For those experiencing weaker home equity gains of less than $75,000, the response is much more muted.

[20] While our focus is on heterogeneity, the LEHD sample behaves much like the LBD analysis in terms of aggregate relationships. We derive a 0.0039 (0.0008) coefficient when simply regressing the transition probability on the zip code level price growth for an individual and region fixed effects. This coefficient is 0.0119 (0.0016) when using CBSA prices. Compared to the baseline entry rate of 0.0159, these coefficients would suggest a 10% increase in local prices boosts overall entry by a relative rate of 2.5%-7.5%.

[21] We model fixed effects for estimated initial wealth levels in 2000 that use the same four increments as home equity gains: {<$25,000, $25,000-$75,000, $75,000-$150,000, >$150,000}. Additional covariates are also introduced as fixed effects, with category counts in parenthesis: age (9), education (6), gender (1), race (4), immigration status (1), marital status (1), LEHD earnings in 2000 (10), accumulated LEHD earnings to 2000 (10), and monthly mortgage payment levels (9). The latter are included due to the challenges that debt repayment creates for entrepreneurial transitions (Bracke, Hilber, and Silva, 2018). Accumulated earnings are measured relative to the respondent's state due to different durations of states in the LEHD sample. Each of these control variables is also interacted with the individual's zip code price growth.

This contrast provides the essence of our LEHD results and connects back to the limited response we estimated in a longitudinal manner with the LBD. For most homeowners, it is hard to identify an entry effect following house price growth relative to the group with lending constraints. For the baseline set of homeowners moving in before 1998, which constitutes 85% of the sample, this is not too surprising (at least in hindsight) because they already had sufficient home equity capacity if they wanted to use it. Similarly, 6% of homeowners are individuals who could have benefited from home equity gains but simply did not experience them in a very large way. On the other hand, for the 6% who experienced big gains and were highly levered beforehand, the growth in entrepreneurship was significant. Figure 1 captures these core findings graphically.

A few extensions are noteworthy to report. In addition to looking at actual house price gains, we find similar outcomes when using an exogenous element of house price gains due to frothy markets developed by Charles, Hurst and Notowidigdo (2017, 2018).[22] Complementary analyses also show that levered individuals experience large home equity gains become less likely to join an existing early stage company compared to starting a new one (e.g., Campbell et al., 2012; Roach and Sauermann, 2015). Joiners likely face a lot of the same rewards and risks associated with entrepreneurial ventures, but they do not need to put up starting capital. Thus, the absence of a tight linkage of home equity gains for joiners suggests that we can place greater confidence in the limited effects that are present in Table 9. Finally, the entry response persists when examining entry to 2008.

In summary, we use an empirical strategy that is inspired by the investment-cash flow sensitivity literature to document that the large majority of individuals, including many who experienced substantial increases in home equity due to house price run-ups, were no more likely to become entrepreneurs than our control group that was lending-constrained due to legal limits or local price declines. A small group of individuals who were highly levered and also experienced large house price gains did increase their entry rate substantially.

While house price increases are important in alleviating financing constraints for some homeowners, these findings suggest that the aggregate effects measured in Tables 6a and 6b are modest because most homeowners already have sufficient equity in their homes (consistent with the SBO) and thus house price increases do not alleviate any binding credit constraints. Our setting is particularly attractive in this regard, as we can show that the response is a null effect for 85% of our sample. This includes a number of individuals with home equity gains over $150,000, which is well beyond the starting capital required for a typical new venture (Hurst

[22] Charles, Hurst and Notowidigdo (2017, 2018) note that local real estate markets often entered a hot run-up period during 2000-2005 where the price gains were escalating too fast to be a consequence of slower-moving fundamentals. Their work estimated on a city-by-city basis where trend breaks exist, and then isolate the price escalation that happens around that trend break.

and Lusardi, 2004). In other words, our zero response is not due to home equity gains being insufficiently large to overcome potential financing constraints.

5 Magnitudes of Results

We have used three datasets, multiple levels of analysis, different sources of identification, and somewhat different time periods to study the relationship between house prices and entrepreneurship. Although the magnitudes are not directly comparable across approaches due to these differences, we next verify that they provide a consistent picture in terms of the implied size of effects. This is first done with a focus on elasticities, by comparing the effect through the collateral channel of a 10% increase in house prices for entrepreneurship. We also quantify the share of the house price and entry relationship that is explained by the collateral channel in our context.

Focusing first on Column 4 of Table 6b, our LBD estimations measure that a 10% increase in house prices in the overall Texas region was associated with a 6% increase in entering employment in the 2003-2007 period. The Texas interactions that isolate the role of home equity collateral channels yield responses of 0.6%. Thus, about one-tenth of the overall relationship between house prices and entrepreneurship is attributed to the collateral channel.

The LEHD estimations model individual-level entry into entrepreneurship in the 2000-2004 period among homeowners in wage work, but nevertheless find comparable results. Column 3 of Table 9 shows that levered individuals with over $75,000 in home equity gains experienced a 0.008 increase in entrepreneurial transitions, a sizeable boost of slightly more than 50% to the baseline entry rate of 0.0159 shown in Table 8. These individuals account for 6% of the population, and strong responses are not evident for other groups. The estimates thus suggest a 3% aggregate (50% $\times$ 6%) increase in entry during a period that experienced a 43% increase in house prices. Reporting this in terms of a 10% increase, therefore, we estimate a 0.7% increase in entry, which is very consistent with the 0.6% number found in the LBD. If we re-do this exercise where we model zip code fixed effects but do not control for individual covariates, we obtain a 6% impact that is more than eight times larger, similar to the LBD analysis.

The SBO analysis is not directly comparable to the LBD and LEHD estimations, since the SBO data condition on being an entrepreneur in 2007. Yet, the implied entry elasticities are again quite consistent. This can be seen through a sample model where 100 of every 1000 entering firms in 2000 used home equity (the exact fraction is 10.4% for 2000-2002 entrants alive in 2007). In unreported regressions, we find that a 10% increase in prices would have led to a 5% increase in entry among firms using home equity. These extra five firms would constitute 0.5% of the 1000 firm baseline. While this type of calculation is not exact, it suggests that the

magnitude evident within the SBO using cross-sectional variation over states is comparable to the panel variation in other datasets.

In summary, our estimated effects of housing collateral on entry are aligned over the three approaches, consistently pointing to about a 0.6% increase in start-up activity for every 10% gain in house prices due specifically to the collateral channel. The comparability is reassuring given the very different empirical strategies, levels of analyses, and time periods. These results portray how the collateral channel operates for the entry of employer firms, which would be the core channel for the collateral effect to influence broad economic outcomes. Self-employed entrepreneurs may show different dependencies on house prices growth. However, as the SBO data show an overall lower reliance among this group to home equity loans for start-up capital, sizable economic effects in this category are unlikely to emerge.

6 Conclusions

The financing conditions of entrepreneurs is a topic of central importance given the link of young firms to economic growth. The massive recent swings in house prices in the US and other countries have brought renewed interest to the role of adjustments in home equity in decisions to start new firms. Home equity has the potential to play an important role since it is amenable to pledging against bank loans and because its swings can provide substantial windfalls or losses. Entrepreneurs also use home equity at a frequency that is similar to, if a bit less than, bank loans or credit cards. Yet, looking at the massive price growth in the early 2000s, we find only modest connections between house price changes and rates of entrepreneurship that we can link to home equity growth experienced by individuals.

We use three different approaches: looking at employment in entering firms, individual-level transition rates, and the sources of financing used by new entrants. Overall, the three approaches show that in the US during the 2000-2008 period, (i) most entrepreneurs did not rely on home equity to finance their businesses; (ii) most homeowners already had sufficient housing collateral to pledge for a bank loan even in the absence of house price increases; and (iii) because of these two facts, the substantial house price increases in the 2000s impacted only a fraction of potential entrepreneurs via the collateral channel.

Nevertheless, similar to prior work, we also find a strong overall relationship between house price increases and entry. In fact, the 6% increase in entry that we find to be associated with a 10% increase in house prices is close to the magnitude reported by several other papers. Once we account for aggregate demand and control of individual covariates, however, we estimate that the collateral channel is perhaps one-tenth of this overall effect. While housing collateral is clearly important for some entrepreneurs in accessing bank credit, the role of house price increases in

alleviating financing constraints appears small in aggregate and highly correlated with many other factors that influence potential entrepreneurs' entry decisions. We hope that future work can further study in a related manner other forms of entry like Schedule C self-employment, to complement our analysis of employer firms.

There are several opportunities for future research. Our analysis ends before the Great Recession and the relative collapse of housing prices in many areas of the US. It is important in future work to consider whether price expansions and contractions have different properties for the collateral channel, as the latter could undermine the entrepreneurial efforts of existing borrowers if banks retract lending in a contagion effect that operates along the intensive margin of borrowers (e.g., Makridis and Ohlrogge, 2017). Second, a longer panel of employment data will allow a consideration of the long-term career implications for those drawn into entrepreneurship or the joining of young firms by house price gains. The nature of entrepreneurial experimentation suggests the ability to test business ownership as a career has benefits beyond the immediate job consequences (e.g., Manso, 2016; Dillon, and Stanton, 2016). Third, work by Levine and Rubinstein (2017) and Guzman and Stern (2017) highlights new ways to differentiate entrepreneurs entering with high growth ambitions for their firms, and it would be attractive to marry the LEHD transitions with these types of quality indicators as they become incorporated into the Census Bureau data family. These extensions will better define how house price changes link into local economic growth.

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Appendix: LEHD Sample Construction

We start by retaining individuals who have positive earnings in any of our 15 states in each of the three focal years 2000, 2004, and 2008. We require individuals be present in the LEHD throughout the sample period to understand the medium-term career transitions of these workers. As the LEHD covers only a subset of states, and only businesses paying payroll tax within these states, we cannot verify whether a person who is not present is unemployed, an independent contractor, self-employed, working in an uncovered state, working in the uncovered public sector, or similar. Our focus on employer firms does not include Schedule C self-employed activity. While one could worry that this state selection procedure might limit the types of individuals considered (e.g., selecting less-mobile people who are then less inclined to start something new), this is not a material concern given the very large states we consider and the proximity of included states. Our sample is also not behaving differently with respect to mobility in the 2000 Census compared to the nation as a whole.

We match the LEHD individuals to the Census and retain those covered by the long-form questionnaire.[23] From the Census, we extract individual-level characteristics from the Person File, household and housing-unit characteristics from the Household File, and geographic location details from the Geocode File. We further restrict our sample to individuals aged 25 to 50 in 2000 with non-missing and non-imputed information on all key variables. This age restriction is such that we stay reasonably far away from retirement decisions, as the oldest member of the cohort in 2008 will be 58. Likewise, the minimum age of 25 in 2000 means that we can compute reasonable pre-period earnings for the sample. We finally require that the individual live in a CBSA for which we have house price data from 2000 to 2008, which we describe next. After these steps, we have a complete sample of 976,900 individuals. All observation counts in this paper are disguised and rounded to the nearest 100 according to Census Bureau disclosure restrictions.

We extract the geographical location of the household at the spatial levels of states, counties, and five-digit zip codes. Similar to the LBD analysis, we merge in FHFA data for the 173 CBSAs in the 15 states covered by the LEHD sample. For about 85% of the persons in our base sample, we are further able to collect house price data from Zillow at the zip code level. Zillow is an online real estate database that uses information from the Multiple Listing Service (MLS) and public record. Zillow maintains data on average home sale prices and estimates of the average home values for zip codes. The coverage of the Zillow data is in part limited by the fact that the data for small zip codes may be sparse to the extent that few home sales occur.[24] Despite

[23] The Census Bureau creates unique person identifiers (PIKs) that are based on Social Security Numbers (SSNs) and allow the linking of individuals across demographic surveys, censuses and administrative records. PIKs are internal Census identifiers that have a one-to-one correspondence with the SSNs.

[24] Zillow has data on 110 million homes across the United States, and so its value series is not limited to

these issues, zip code prices carry the advantages of allowing us to estimate more precisely the expected price appreciation of an individual's home and to control for CBSA-level aggregate demand, thus making sharper assessments about the impact of prices through housing collateral versus other channels. Guerrieri, Hartley, and Hurst (2013) document features of the variation in house price appreciation across zip codes within MSAs and demonstrate the high correlations across data sources for these localized measures.

Our sample is quite representative of the US housing market, and the opinions of respondents about their home values appear reasonable. To show this, we first take an unweighted average of the respondents' estimated home values by zip code. Our unweighted average across zip codes is \$188,000, compared to \$186,000 for the US as a whole in the 2000 Zillow data. Second, for the zip codes in our sample, the correlation of the average estimated 2000 value to that reported by Zillow is 0.91.

While quite representative, the LEHD sample of one million people is small compared to the 15 included states, and it is helpful to review the numbers in greater detail to place our sample within the broader population. The 15 states in our sample account for about 133 million people in the public-use 2000 Census IPUMS. This number declines to 52 million when considering those aged 25 to 50, and then further to about 21 million when restricted to people in known MSAs with private-sector employment who are living outside of group quarters. This 21 million includes irregular workers, and one would find a base of 18 million individuals if additionally screening for a wage income of \$10,000 or more, usual weeks worked of 40 or more, and usual hours worked per week of 20 or more. A 1-in-6 sample of this latter group would be about 3 million people, or three times larger than our core LEHD sample.

Three factors are mostly responsible for the difference. First, we require individuals be present in the data in 2004 and 2008, thereby excluding those who leave the private sector or migrate out of the 15 covered states. The annual migration rate (interstate and globally) during the 2000-2008 period averages 2.7%, as measured by the American Community Survey, and cumulatively this rate would reduce the sample size by 20%. There are multiple reasons why this 20% would not be exact—e.g., we focus on employed adults and not sedentary elderly or transient college students—but the benchmark provides a useful reference point. Transitions to being unemployed, out of the labor force, or being employed in an uncovered sector (e.g., public sector) would also result in additional sample reductions.

Second, we require that the individual's SEIN match in the LEHD to the LBD to obtain the important information in that database and to align with our LBD-based results. This LEHD-

just those homes that were recently sold or currently for sale. While the value estimates of a single home have measurement error, the Zillow price trend data can be quite representative of actual changes in market values for local areas and may also be a better proxy for the exogenous component of house price appreciation, independent of changes in value due to home improvement and the like.

LBD establishment match rate is a little under 80% in the Business Registry Bridge, as the LEHD contains more types of legal entities than the LBD. While these LEHD-LBD differences lie along several dimensions, the most important factor for this study relates to the elimination of private employer households (e.g., legal employment of a nanny by a household) that are contained in the LEHD (and IPUMS) but excluded from the LBD. This LEHD-LBD match must again be present in 2000, 2004, and 2008, and we estimate that the cumulative impact of this requirement is about a third of potential individuals being eliminated. Additional resources on these issues include Stevens (2007), McKinney and Vilhuber (2011) and Hyatt et al. (2014).

With both of these requirements, it is important to highlight that illegal immigrants are not captured in our sample as they are not part of official administrative payrolls. It is often estimated that 10% of California workers are illegal immigrants. Over half of our sample comes from California, Florida and Texas, where illegal immigration could play a non-trivial factor.

A final and mundane requirement is to have full house price series for the CBSA of the individual from 2000 to 2008, which affects about 20% of the workforce.

These differences account for the size of this study's sample compared to IPUMS, and some of these differences are important in framing the types of entrepreneurial transitions captured. Overall, the sample still lines up quite well with what one observes from IPUMS (the following traits are listed as LEHD vs. IPUMS and use the home owners grouping): average age of 39.4 vs. 38.4, male share of 53% vs. 59%, Hispanic share of 10.8% vs. 14.2%, African American share of 5.3% vs. 7.6%, Asian share of 5.3% vs. 6.2%, immigrant share of 14.3% vs. 17.2%, married share of 83% vs. 73%, college-educated share of 42% vs. 32%, household income of $88,575 vs. $84,669, home value of $187,947 vs. $178,919, and move-in date of 1992.5 vs. 1992.9. The differences that exist are usually intuitive in terms of the requirement to match LEHD-LBD linked work over the eight years and other sample traits set out.

From this, we identify entrepreneurial transitions through a combination of the LEHD and LBD, which can be linked through State Employer Identification Numbers (SEINs) and the federal counterpart (EINs), which are created for tax purposes, and the Census Bureau's overall company identifier (ALPHA) that links the establishments of multi-unit companies together.[25] Following the procedures described in Haltiwanger, Jarmin, and Miranda (2013) and Decker et al. (2014), we trace each establishment to its parent firm and identify the first year the firm was in operation. We also measure the number of employees that the LBD reports were working for this firm in the initial year. Approaching entrant definition in this way accomplishes several things—it builds off of the national LBD database to avoid issues related to the partial LEHD state coverage, connects SEINs as appropriate into parent firms, and ensures a consistent

[25] The data structure of the LEHD and LBD allow for establishments within each firm to have different industries and locations. Where used in this study, we define the main industry and main location of a multi-unit firm through the facility with the largest number of employees.

definition of entry with prior academic work using the Census Bureau data. Thus, our approach focuses on the formation of employer establishments, excluding Schedule C self-employed activity and also private employer households. This set of entrants connects most directly to job creation and economic growth, but does not encompass all form of entrepreneurial activities, which is important to bear in mind when comparing our work to other studies.

More formally, our definition of "entrepreneur" requires a person be 1) in an entering firm per the Haltiwanger, Jarmin, and Miranda (2013) definition, 2) present in the LEHD in the first year that the firm enters and among the top three earners of the firm in that entry year, and 3) in a firm that entered after 1995. We can think of our work as describing the formation of a top founding team and key early hires. While noisy, this approach captures a substantive element of entrepreneurship. About 1.6% of our sample enters as an entrepreneur by 2004. As an external benchmark, entry rates into employer firms are typically estimated to be about 0.6% per year. Without any churn, this would lead to a 2.4% entry rate from 2000-2004. However, about half of entrants fail within the first four years of entry, so accounting for such churn makes the entry rates we measure via the LEHD very reasonable. Second, we show in the main text a very different connection between house price growth and joining an early stage company versus being one the initial three top earners.

Table 1 - Sources of start-up financing for businesses founded between 2000 and 2007

Notes: The sample includes firms founded in 43 states that are separately recorded by the public-use 2007 Survey of Business Owners. Row titles indicate forms of financing, and business owners can check as many boxes as applicable. Start-up capital amounts include all financing raised by ventures using that type of financing. Observations with missing records or the respondents not knowing the financing history of their business are excluded from these shares (accounting for about 12.5% of the base sample).

Source of financing used	Employer firms (firms with at least one employee)		Non-employer firms (self-employed business owners)	
	Share using type of financing for start-up capital	Start-up capital when type of financing used	Share using type of financing for start-up capital	Start-up capital when type of financing used
	(1)	(2)	(3)	(4)
No financing	8%	n.a.	27%	n.a.
Any external financing	92%	87,023	73%	33,689
Home equity loan	12%	140,931	5%	82,095
Personal savings	75%	77,756	63%	28,988
Other personal assets	12%	131,258	7%	68,450
Bank loan	16%	188,994	5%	154,742
Credit card	18%	91,590	13%	30,780
Business loan from friend or family	4.3%	163,746	1.5%	94,877
Angel or venture financing	0.7%	370,973	0.2%	265,324

Table 2 - Attributes of businesses founded between 2000 and 2007, by source of financing

Notes: See Table 1.

	Firm attributes in 2007				Attributes of primary owner	
	Number of employees	Payroll per employee ($ 000s)	Receipts per employee ($ 000s)	Family business or run jointly by husband and wife	Owner's age	Owner has Bachelor's degree or higher
	(1)	(2)	(3)	(4)	(5)	(6)
All firms	6.0	32.6	171.4	35%	45.1	52%
No financing	4.6	38.2	166.8	25%	45.7	54%
Any external financing	6.1	32.1	171.8	36%	45.0	52%
Home equity loan	6.4	27.4	155.7	47%	44.7	46%
Personal savings	5.6	32.4	171.8	35%	45.0	54%
Other personal assets	7.3	30.1	164.4	46%	45.4	48%
Bank loan	9.8	31.8	176.5	40%	44.9	54%
Credit card	5.2	27.1	141.8	41%	43.3	47%
Business loan from friend or family	8.7	31.8	178.2	40%	42.4	49%
Angel or venture financing	15.1	52.4	269.3	27%	45.5	67%

Table 3 - House price growth and use of home equity loans for start-up financing

Notes: This table reports regressions of state-level financing behavior for start-up capital of non-public companies recorded in the 2007 Survey of Business Owners (SBO). The sample includes 43 states that are separately recorded by the public-use 2007 SBO. Column headers indicate forms of financing. Observations with missing records or the respondents not knowing the financing history of their business are excluded from these shares (accounting for about 12.5% of the base sample). The categories in Columns 1-3 are collectively exhaustive and mutually exclusive, such that the coefficients sum to zero. Unreported explanatory variables include the log count of SBO businesses among the pre-2000 firms and the shares by state of pre-2000 entrants using each form of financing listed in Table 1; these regressors are held constant over specifications for consistent baseline estimation and to control for long-standing financing behavior in the state. Estimations have 43 observations, are weighted by count of pre-2000 respondents, and report robust standard errors.

	Share of firms entering between 2000 and 2007 indicating reported financing		
	No start-up capital raised	Start-up capital includes home equity loans	Start-up capital does not include home equity loans
	(1)	(2)	(3)
Log house price growth 2000-2007	0.007	0.031*	-0.037**
	(0.013)	(0.019)	(0.018)
Mean of dependent variable	7.9%	12.1%	80.0%
10% price growth effect relative to mean of dependent variable	0.8%	2.4%	-0.4%

Table 4 - House price growth and other forms of start-up financing

Notes: See Table 3.

	Start-up capital includes personal savings	Start-up capital includes other personal assets	Start-up capital includes business loan from a bank	Start-up capital used includes credit cards	Start-up capital includes business loan from family or friends
	(1)	(2)	(3)	(4)	(5)
Log house price growth 2000-2007	-0.004 (0.024)	-0.003 (0.014)	-0.027 (0.040)	-0.006 (0.019)	-0.019*** (0.007)
Mean of dependent variable	75%	12%	16%	18%	4%
10% price growth effect relative to mean of dependent variable	-0.1%	-0.2%	-1.6%	-0.3%	-4.2%

Table 5 - Price changes and entry rates for CBSAs on Texas border

Notes: This table documents descriptive statistics of house price index, count of new entrants, and employment in entering firms for the three periods: 1987-1997, 1998-2002, and 2003-2007. Reforms in 1998 and 2003 unlocked the use of home equity loans for business purposes in Texas, which was previously possible in all other states. Counties part of CBSAs along the Texas state border are grouped into those on the Texas side versus opposite. The table compares Texas and non-Texas counties by showing each measure relative to the baseline rate observed in 1987-1997.

	House price index		Entry count		Entry employment	
	non-Texas	Texas	non-Texas	Texas	non-Texas	Texas
	(1)	(2)	(3)	(4)	(5)	(6)
1987-1997	1.000	1.000	1.000	1.000	1.000	1.000
1998-2002	1.048	1.048	0.763	0.777	0.790	0.772
2003-2007	1.103	1.098	0.737	0.732	0.750	0.716

Table 6a - Analysis of collateral's effect on entrepreneurship using Texas reform

Notes: This table reports regressions of log entrant counts and log entrant employment with log CBSA-level home prices from 1987-2007. Sample includes CBSAs in Texas and bordering states. The dependent variables are given by column headers. Estimations include CBSA and year fixed effects, such that coefficients measure the correlation between changes in entry activity with changes in house prices. The Post period is defined to be after 1998, which marked the first reform to allow home equity lending for business purposes in Texas. The first row captures the key interaction: whether entry in Texan CBSAs becomes closer linked to house price growth after the collateral channel becomes available. Estimations have 1,132 observations, report standard errors clustered by CBSA, and are weighted by CBSA size. Columns 2 and 4 include controls for lagged total firm count and contemporaneous multi-unit firm establishment expansion rate in the CBSA.

	Log new entrants		Log employment in entrants	
	(1)	(2)	(3)	(4)
Log house price x Texas x Post	0.005	0.003	0.020	0.018
	(0.005)	(0.004)	(0.016)	(0.016)
Log house price x Post	0.725***	0.294***	0.825**	0.387*
	(0.113)	(0.050)	(0.283)	(0.232)
Log house price x Texas	0.100	0.029	0.228	0.158
	(0.100)	(0.046)	(0.150)	(0.155)
Log house price	0.041	0.053	0.530**	0.170
	(0.173)	(0.099)	(0.250)	(0.260)
Log firm count in prior year		0.941***		0.965***
		(0.079)		(0.183)
Log new plants for multi-unit firms		0.055**		0.042
		(0.024)		(0.092)

Table 6b - Table 6a with separate time periods for stages of Texas reform

Notes: See Table 6a. Estimations break the Post period into 1998-2002 (after the initial 1998 reform to allow home equity lending in Texas) and 2003-2007 (after the 2003 reform to allow home equity lines of credit).

	Log new entrants		Log employment in entrants	
	(1)	(2)	(3)	(4)
Log house price x Texas x 2003-2007	0.015	0.014**	0.064**	0.063**
	(0.012)	(0.007)	(0.030)	(0.031)
Log house price x Texas x 1998-2002	0.006	0.005	0.025	0.024
	(0.007)	(0.004)	(0.017)	(0.016)
Log house price x 2003-2007	0.788***	0.320***	1.080**	0.604*
	(0.150)	(0.067)	(0.413)	(0.354)
Log house price x 1998-2002	0.710***	0.326***	0.782**	0.395
	(0.093)	(0.056)	(0.313)	(0.288)
Log house price x Texas	0.027	-0.053	-0.094	-0.173
	(0.148)	(0.067)	(0.206)	(0.224)
Log house price	0.408**	0.050	0.515**	0.156
	(0.172)	(0.091)	(0.220)	(0.232)
Log firm count in prior year		0.946***		0.965**
		(0.078)		(0.189)
Log new plants for multi-unit firms		0.053*		0.042
		(0.024)		(0.095)

Table 7 - Firm-level analysis of collateral's effect on size and sector of entrants following Texas reform

Notes: See Table 6a. Columns 1-3 aggregate employment by size of entrant; Column 4-7 aggregate employment by sector.

	Log employment by size of entrant			Log employment by sector			
	1-2 empl.	3-9 empl.	10+ empl.	Construction	Mfg.	Transport and trade	Services
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PANEL A: LOG ENTRY COUNTS							
Log house price x Texas x 2003-2007	0.014**	0.003	0.050***	0.002	-0.001	0.001	0.007
	(0.007)	(0.008)	(0.016)	(0.017)	(0.014)	(0.008)	(0.006)
Log house price x Texas x 1998-2002	0.005	0.003	0.026***	0.007	-0.007	-0.004	0.000
	(0.004)	(0.007)	(0.009)	(0.013)	(0.009)	(0.005)	(0.003)
PANEL B: LOG EMPLOYMENT IN ENTERING FIRMS							
Log house price x Texas x 2003-2007	0.035***	0.000	0.087**	-0.004	0.127**	0.032	0.045
	(0.010)	(0.010)	(0.042)	(0.048)	(0.064)	(0.037)	(0.041)
Log house price x Texas x 1998-2002	0.017***	0.001	0.036	0.010	0.054	0.007	0.023
	(0.006)	(0.007)	(0.023)	(0.032)	(0.051)	(0.016)	(0.025)

Table 8 - Descriptive statistics on LEHD sample

Notes: The LEHD sample includes working individuals present in 2000, 2004, and 2008 in one of 15 states: CA, CO, FL, ID, IL, IN, LA, MD, NC, NM, OK, OR, TX, WA, and WI. Sample focuses on wage workers in 2000 with home locations to which we can map zip code prices. Demographic traits are measured in 2000. Per Census Bureau disclosure requirements, the listed observation counts are rounded. Most traits are statistically different between Columns 2 and 3.

		All	Unlevered	Potentially constrained
		(1)	(2)	(3)
(1)	N	529,600	452,100	77,500
(2)	Share		0.85	0.15
(3)	Entry as an entrepreneur	0.0159	0.0154	0.0189
(4)	Age	39.41	39.99	36.03
(5)	Male	0.5281	0.5224	0.5612
(6)	Hispanic	0.1082	0.1056	0.1235
(7)	African American	0.0533	0.0523	0.0593
(8)	Asian	0.0527	0.0511	0.0614
(9)	Immigrant	0.1432	0.1388	0.1685
(10)	Married	0.8262	0.8343	0.7785
(11)	Bachelor's education and higher	0.4173	0.4085	0.4685
(12)	Household income (max=$2.5 million)	88,575	89,086	85,594
(13)	Home value (max=$1 million)	187,947	185,284	203,485
(14)	Move-in date	1992.5	1991.3	1999.0
(15)	Wealth	194,397	205,630	128,848
(16)	LEHD earnings 2000	51,253	51,088	52,219
(17)	LEHD earnings 2004	61,153	60,825	63,067
(18)	Zip code price growth 2000-2004	0.4262	0.4266	0.4240
(19)	Estimated home equity gains	85,481	84,519	91,093

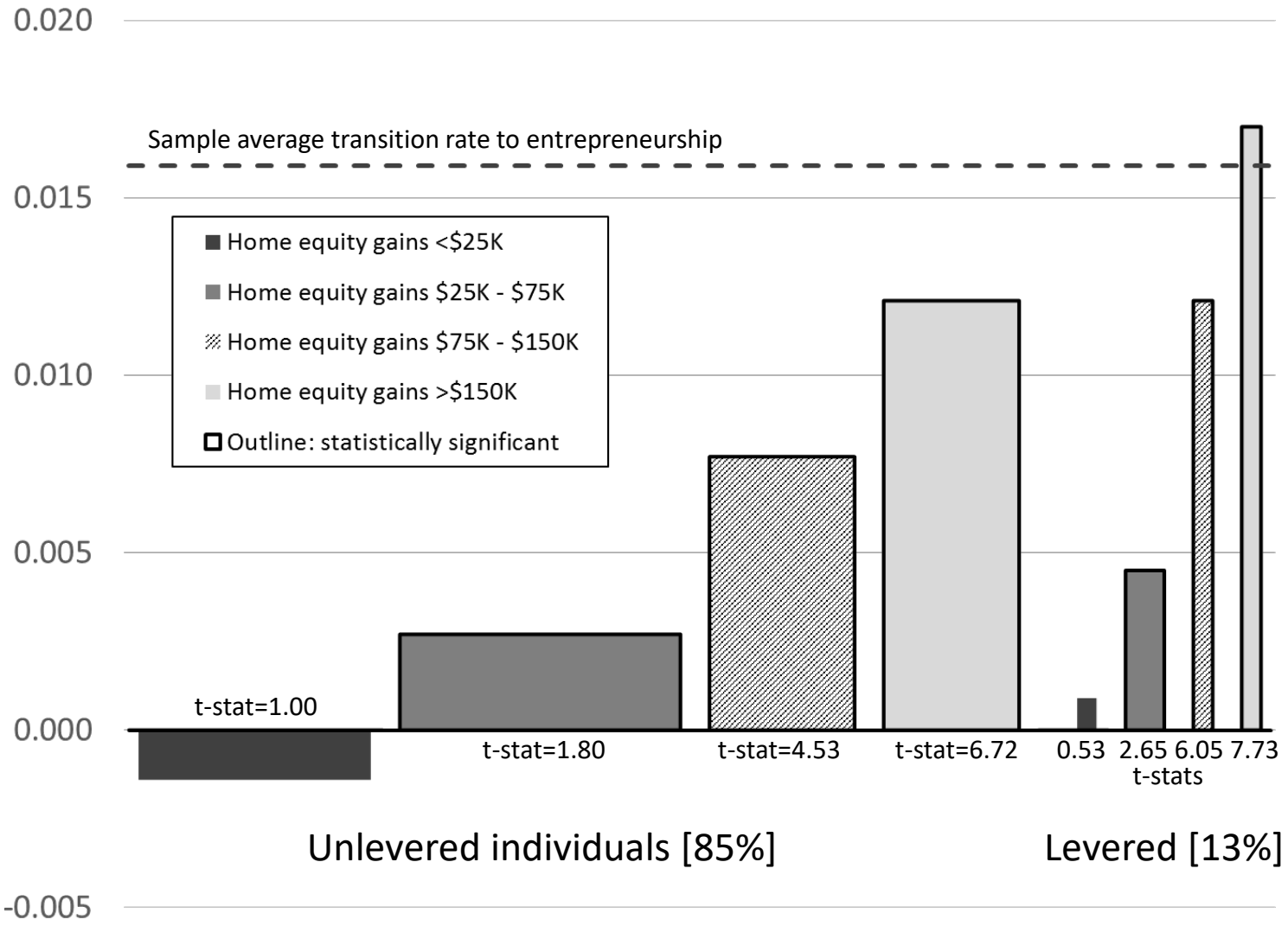
Table 9 - House prices and entry into entrepreneurship at the individual level

Notes: Table reports coefficients from regression of entry into business ownership by 2004 for home owners not in entrepreneurship in 2000. The sample only includes people working for wages in 2000 who joined a company three or more years after that firm's founding. The explanatory variables are indicator variables for the estimated dollar value of home equity increase during 2000-2004 using the local price growth and the value of the property in 2000. Separate indicator variables are included for "unlevered" and "levered" groups, with effects measured relative to lending-constrained individuals. The unlevered group includes people who would not be constrained towards home equity borrowing based upon move-in dates before 1998 or owning their home outright. The levered group have post-1998 move-in dates and face no state-level legal limits on borrowing and experience positive local price growth. The omitted group have post-1998 move-in dates and face either state-level limits on borrowing or local price declines. Wealth FE are built by group and use increments similar to home equity gains. Covariates include demographics, earnings histories, and mortgage payments and interact these variables with zip code price growth. The entry projection used in Column 4 is based upon the entrepreneurial transitions of renters during 2000-2004 with traits similar to individuals. Estimations have 529,600 observations and cluster standard errors by zip code.

	Sample share	CBSA FE	Zip code FE	Wealth + covariates	Wealth + covariates + projection
		(1)	(2)	(3)	(4)
LENDING-CONSTRAINED CONTROL GROUP: Local Price Declines or Legal Limits [2% of sample]					
UNLEVERED, Pre-1998 Move-In with Local Price Growth					
Home equity gains <$25k	25%	-0.002	-0.001	-0.006	-0.005
		(0.001)	(0.001)	(0.008)	(0.008)
Home equity gains $25k-$75k	30%	0.003**	0.003	-0.004	-0.003
		(0.001)	(0.002)	(0.008)	(0.008)
Home equity gains $75k-$150k	16%	0.009***	0.008***	-0.001	-0.001
		(0.002)	(0.002)	(0.008)	(0.008)
Home equity gains >$150k	15%	0.015***	0.012***	0.001	0.000
		(0.002)	(0.002)	(0.008)	(0.008)
LEVERED, Post-1998 Move-In with Local Price Growth and No Legal Limits					
Home equity gains <$25k	3%	0.001	0.001	0.002	0.002
		(0.002)	(0.002)	(0.005)	(0.005)
Home equity gains $25k-$75k	5%	0.005***	0.005***	0.004	0.004
		(0.002)	(0.002)	(0.005)	(0.005)
Home equity gains $75k-$150k	3%	0.013***	0.012***	0.008*	0.008*
		(0.002)	(0.002)	(0.005)	(0.005)
Home equity gains >$150k	3%	0.020***	0.017***	0.008	0.008
		(0.002)	(0.002)	(0.005)	(0.005)

Figure 1a: Entry response without individual controls

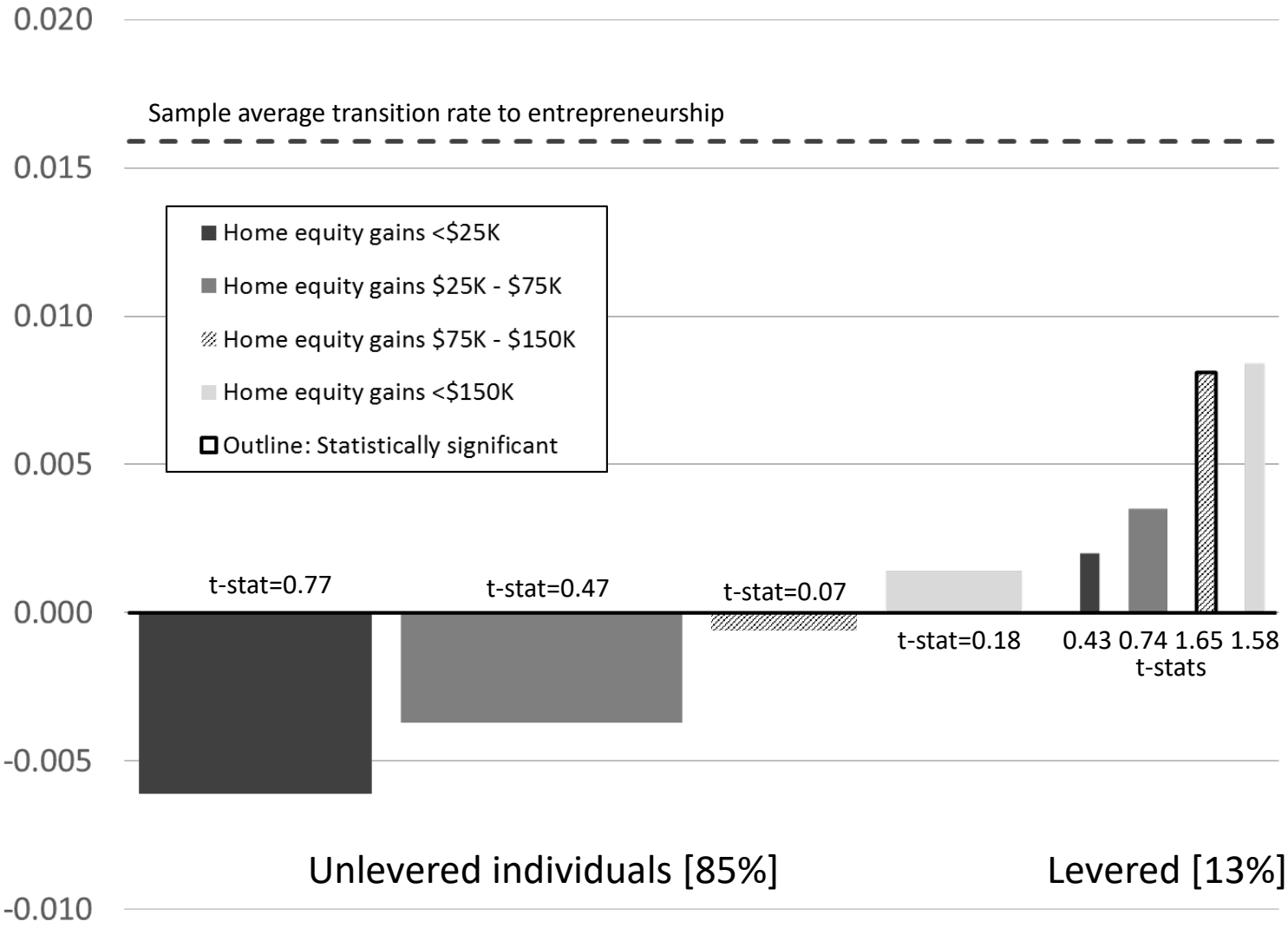
Transition increase measured relative to lending-constrained control group



Notes: Figures plots coefficients from Column 2 of Table 9. Effects are measured relative to a lending-constrained control group that faced either local price declines or legal limits for borrowing [2% of sample]. Sample is restricted to home owners in 2000 who are working as a wage employee in a firm that they did not found or join within the first three years. Group size indicated by bar width.

Figure 1b: Entry response with individual controls

Transition increase measured relative to lending-constrained control group



Notes: See Figure 1a. Figures plots coefficients from Column 3 of Table 9.