

Housing wealth changes and entrepreneurship: Evidence from urban China



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ABSTRACT

This paper studies the impact of household-level housing wealth changes on entrepreneurship in urban China. Exploiting the 2011–2015 China Household Finance Survey, we control for lagged proxies for wealth, city-by-year fixed effects, and other household attributes and directly estimate the magnitude of homeowner's response to housing capital gains net of home maintenance and upgrading expenditures. We also instrument for housing wealth changes with structural breaks in city housing price trend. We find that a 10,000 RMB increase in housing wealth increases the propensity of a household becoming a business owner by about 0.7 percentage points in IV estimation. In addition, we provide new evidence for underlying channels that housing capital gains alleviate household credit constraints, reduce risk aversion and increase awareness of financial information.

1. Introduction

Entrepreneurship plays a crucial role in the economic growth of both developed and developing economies. New businesses often come with new products, innovations, and job opportunities (De Mel, McKenzie, & Woodruff, 2008). Housing wealth, the largest component of household wealth, has been demonstrated to be important in household decisions about entrepreneurship (Harding & Rosenthal, 2017; Kerr, Kerr, & Nanda, 2015). However, the impact of housing wealth shocks on entrepreneurship remains unclear, especially in the developing countries.¹ Most existing studies focus on the developed countries, such as the U.S. and European countries. More important, the underlying mechanisms account for such impact are especially difficult to identify. In this study, we attempt to investigate the effects of housing capital gains on entrepreneurship decisions in the context of urban China, and to provide evidence on several potential mechanisms.

Using the China Household Finance Survey (CHFS), we first examine whether and how housing wealth changes impact on entrepreneurship decisions in urban China. Relative to previous work in this area, we consider various econometric and measurement issues with the detailed household information in the CHFS. For example, the panel feature and rich financial information in the CHFS allow us to consider home maintenance and upgrading expenditures and control for household wealth.² We also use the structural

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¹ Existing literature has found both positive and negative impact of housing capital gains on entrepreneurship. See the literature review section for details.

² Harding and Rosenthal (2017) point out the importance of controlling for home maintenance and upgrading expenditures and household wealth.

break in housing price index to instrument household-level housing wealth changes. We then shed lights on several potential underlying mechanisms that account for the impact. Our empirical analysis provides evidence for possible channels that housing capital gains alleviate household credit constraints, reduce risk aversion and affect attitude for financial information. We also explore the heterogeneity of the impact across demographic groups and the robustness of our conclusions on several dimensions.

This study contributes to the literature in the following ways. First, we examine the causal relationship between housing wealth changes and entrepreneurship in urban China. China has achieved miraculous economic growth in the past few decades. The booming economy, along with policy reforms, caused a dramatic housing boom and structural changes in the housing and labor markets since the early 2000s. The exogenous variations in housing wealth caused by the housing boom provide a unique opportunity to study the causal impact of housing capital gains on entrepreneurship. In addition, China has many unique institutional and cultural features. For example, the formal financial institutions do not take real estate with a mortgage loan as collateral in China. Thus, it is important to understand whether the relationship found in the literature between housing wealth and entrepreneurship holds in China.

Second, exploiting rich household-level information in the CHFS, we provide new evidence for several potential channels through which housing wealth shocks affect household entrepreneurship decisions in the biggest developing country in the world. Existing literature mainly focuses on the collateral channel that housing capital gains provide additional collateral to obtain a business loan. We present evidence for the collateral channel exploiting the unique institutional features in China. In addition, we show evidence that housing capital gains can influence household risk preference and awareness of financial knowledge.³ All of those are potentially important factors in household entrepreneurship decisions.

Empirically, it is challenging to identify the causal impact of housing wealth changes on entrepreneurship. There exist both household-level unobservables (e.g., risk preference) and regional unobservables (e.g., labor demand shocks) that could bias the estimates. The identification strategy we take is to directly estimate the impact of household-level housing capital gains net of maintenance and upgrading expenditures on entrepreneurship decisions in a lagged dependent variable model. We control for a rich set of household attributes including housing and non-housing wealth and city by year fixed effects. Most important, we instrument for housing wealth changes with an instrument of structural breaks in city housing price trend. We also conduct robustness checks with alternative definitions of entrepreneurship and alternative instruments. These identification efforts allow us to draw careful conclusions based on our estimates and to compare and reconcile research results based on data from other countries and China.

We reach several conclusions. First, we find that housing capital gains significantly increase households' propensity of becoming entrepreneurs. A 10,000 RMB increase in housing wealth increases the propensity of households becoming business owners by about 0.7 percentage points in IV estimation. Housing capitals gains boost business entry but do not have significant effects on business exit. Second, we provide evidence for several underlying mechanisms that housing capital gains alleviate household credit constraints, reduce risk aversion and increase awareness of financial information. Third, the impact of housing wealth changes is heterogeneous across demographic groups. The effect is larger for households that are older, higher educated, wealthier, previously employed or holding local *Hukou*. Finally, comparison between homeowners and renters suggests that homeowners are less likely to become entrepreneurs when housing price increases relative to renters.

Understanding the linkage between housing wealth changes and entrepreneurship and the underlying mechanisms has important policy implications. Becoming a homeowner is an "American dream". In China, the social value of owning a house is even higher. For example, owning a house means a higher status in the marriage market ([Wei, Zhang, & Liu, 2017](#)). The results in this paper provide additional incentives for the government to promote a healthy housing market. In addition, because of the importance of having a welcoming environment for startups, governments around the world provide various incentives and assistance to promote entrepreneurship and help small businesses to grow.⁴ The evidence for different mechanisms in our paper justifies the efforts and hint at other possibilities to promote entrepreneurship.

The rest of the paper is organized as follows. The next section reviews the relevant literature. Section 3 discusses empirical challenges and econometric models. Section 4 describes the data and summary statistics. Section 5 presents the empirical results and section 6 concludes the paper.

2. Literature review

Several studies have examined the relationship between housing wealth changes and entrepreneurship (or self-employment) in developed countries. [Bracke, Hilber, and Silva \(2018\)](#) document a negative impact of homeownership on self-employment. [Hurst and Lusardi \(2004\)](#) and [Disney and Gathergood \(2018\)](#) find a weak link between housing wealth shocks and entrepreneurship decisions in the United States and United Kingdom, respectively. [Kerr et al. \(2015\)](#) and [Corradin and Popov \(2015\)](#) exploit regional variation in aggregate house price changes to quantify the effects of housing wealth on self-employment and judge the impact to be positive and important. [Schmalz, Sraer, and Thesmar \(2017\)](#) show that an increase in housing collateral value leads to a higher probability of becoming an entrepreneur. Using the 1985–2013 American Housing Survey, [Harding and Rosenthal \(2017\)](#) directly measure the magnitude of homeowner responses in self-employment to household-level housing capital gains net of home maintenance expenditure and find that a 20% real increase in hosing wealth increases the probability of transitioning into self-employment by 1.5

³ The CHFS asks households about their risk preference and attitude for economic and financial information.

⁴ For example, in the U.S., the Small Business Development Center provides free business consulting, low-cost training services, lending assistance, and market research help to startups. The Internal Revenue Service (IRS) allows several tax deductions on small business expenses. In China, the government provides various assistance to entrepreneurs ranging from tax deduction, legal support to microfinance.

percentage points.

There are also studies exploring the underlying mechanisms that account for the link between housing wealth and entrepreneurship. For example, [Hurst and Pugsley \(2011, 2017\)](#) and [Kerr et al. \(2015\)](#) argue that positive housing wealth changes reduce risk aversion and increase entrepreneurship. Another channel is that housing capital gains provide collateral to credit constrained households and make home equity borrowing feasible when starting new businesses. Examples of studies documenting such a mechanism include [Adelino, Schoar, and Severino \(2015\)](#), [Jensen, Leth-Petersen, and Nanda \(2015\)](#), [Corradin and Popov \(2015\)](#), and [Harding and Rosenthal \(2017\)](#).

Recently, there is a growing literature on the impact of housing wealth or housing price on entrepreneurship in China. [Djankov, Qian, Roland, and Zhuravskaya \(2006\)](#) find a positive relationship between preexisting wealth and propensity of becoming self-employed. [Wang \(2012\)](#) uses a difference-in-difference approach to identify the causal effect of the 1994 housing reform using the China Household Nutrition Survey. This privatization reform offered state employees the opportunity to purchase their rental homes at subsidized prices. She finds that housing reform significantly increases entry into self-employment. [Fu, Liao, and Zhang \(2016\)](#) examines the effect of housing wealth on labor force participation with self-employment as one of the examined labor force outcomes using the 2011 CHFS. They find a weak evidence that housing capital gains reduces the likelihood of owning a business, using housing capital gains of other communities in the same city as instrument.

Using the 2005 China inter-Census Population Survey and 2008–09 Chinese Family Panel Studies, [Li and Wu \(2014\)](#) find that higher housing price at the city level discourages entrepreneurship in urban China. We differ from their paper by focusing on household level housing wealth changes instead of city-level housing price change. We also focus on a different set of potential mechanisms underlying the focal relationship. [Hu, Su, and Ye \(2019\)](#) finds that rising housing price has a negative effect on entrepreneurship in 2002–2009. Using Chinese General Social Survey 2010–2015, [Xiang, Liu, and Li \(2021\)](#) finds that the amount of real estate a family owns significantly increases the likelihood of self-employment.

Two other studies examine the effect of different types of homeownership acquisition on entrepreneurship. Using the 2009 Urban Household Survey, [Chen and Hu \(2019\)](#) find that owners of inherited housing are associated with larger likelihood of entrepreneurship, while owners of privatized housing through housing reform are associated with lower likelihood of entrepreneurship. Use 2011 and 2013 CHFS, [Li and Li \(2016\)](#) find that owning a home with full property right increases the likelihood of entrepreneurship, compared to homeownership with partial property right, and the effect is stronger in areas with faster housing price increase. As inherited housing or houses with full property right generally implies larger housing capital gains, these studies provide evidence that larger housing capital gains are associated with higher likelihood of entrepreneurship.

Some studies also explore the role of financial knowledge or risk preference in entrepreneurship. [Ying, Song, Wu, and Peng \(2015\)](#) find that financial knowledge significantly increases entrepreneurship using the 2013 CHFS. [Hu \(2014\)](#) finds that risk neutral individuals are more likely to be entrepreneurs, while risk averse and risk loving individuals prefer salary jobs.

Our paper is also related to the literature that addresses the endogeneity of housing wealth in estimating the impact of housing wealth on various economic outcomes. These studies either use instrumental variable approach or regression discontinuity. We mainly focus on the studies that also use CHFS. [Li, Li, Lu, and Xie \(2020\)](#) examines the effect of housing wealth on labor force participation and use regression discontinuity to address the endogeneity of housing wealth. Unexpected housing policies caused housing wealth to grow faster for housing units with floor areas under 90 m² than that of larger houses. [He, Ye, and Shi \(2020\)](#) use CHFS 2013 and 2015 and find that a 10% increase in housing wealth increases consumption by about 3%. They use city level housing supply elasticity as an instrument in the 2SLS regression, and they also use discontinuity in housing floor areas under and above 90 m² in the regression discontinuity estimation. [Fu et al. \(2016\)](#) use the average housing capital gains of other homes in the same community as an instrument for housing wealth of the focal household to study the effect of housing wealth on labor force participation. In our robustness checks, we also use land supply elasticity and discontinuity in housing size as instruments and we find that our main results are robust to alternative instruments.

3. Empirical strategy

There are several important empirical challenges we need to consider in the efforts to properly identify the link between housing wealth changes and entrepreneurship. The first two identification challenges are the typical endogeneity issues. One is that certain unobserved family attributes can be correlated with both housing wealth changes and the tendency to transition into entrepreneurship. Some typical unobserved household characteristics include financial literacy, risk preference, and household non-housing wealth. For example, wealthy families typically occupy more expensive homes, which implies a larger extent of housing wealth changes for a given rate of housing price inflation. Wealthy families are also more likely to open new businesses as documented in [Hurst and Lusardi \(2004\)](#). Similarly, families with better financial knowledge are more likely to open their own businesses. The familiarity of financial knowledge is also highly correlated to the level and changes of housing wealth. Failing to control for the variables of household wealth and financial knowledge may cause biased estimates of the impact of housing wealth changes on entrepreneurship.

Another endogeneity issue is that unobserved labor market shocks could affect both local entrepreneurship decisions and local housing prices. For example, when a city experiences a huge increase in labor demand, this would cause higher housing prices and an undetermined impact on the tendency to become entrepreneurs in the city. This could also result in biased estimates although the direction of bias is not clear.

The third challenge is a measurement issue. In the housing market, house maintenance and upgrading could significantly increase house value and household housing wealth. However, house maintenance and upgrading merely transfers non-housing wealth to housing wealth within the household. Thus, this action should have a limited impact on total household wealth and entrepreneurship.

It is important to subtract house maintenance and upgrading expenditures from house value changes when calculating housing wealth changes over time. [Harding and Rosenthal \(2017\)](#) point out the importance of considering house maintenance and upgrading expenditures when measuring household-level housing wealth changes. However, most publicly available datasets do not contain such detailed information. Theoretically, ignoring house maintenance and upgrading costs will attenuate the estimates of the impact of housing wealth changes on entrepreneurship.

We mitigate those identification issues in the following ways. First, we use instrumental variables to address the endogeneity of housing wealth change, which we explain in more detail later. Second, following [Harding and Rosenthal \(2017\)](#), we directly estimate the impact of household-level housing wealth changes net of maintenance and upgrading expenditure on dynamics of entrepreneurship decisions. This is possible because that the CHFS contains a panel component and that the CHFS provides detailed information on household wealth portfolio and home maintenance and upgrading expenditures. Third, exploiting the rich financial information in CHFS that are previously not available in other studies on China, we directly control for household housing and non-housing wealth. To avoid simultaneity issues, those variables enter the regression models in two-year lags. Those variables provide reasonable control for unobserved household attributes such as wealth and financial literacy. Last but not least, we further account for unobserved local labor market and housing market shocks by controlling for city by year fixed effects. This ensures any endogenous problem in our regression model that might bias the estimates is within city and year.

We conduct two-stage least squares (2SLS) regressions by exploiting three instrumental variables. The main instrument is the estimated structural breaks in city-level housing price index ([Charles, Hurst, & Notowidigdo, 2018](#)). This instrument is justified by the fact that housing market fundamentals generally do not change abruptly and should be smoothly incorporated into prices when they change. Thus, the abrupt change in price trend is most likely be caused by factors exogenous to unobserved changes in fundamentals in the labor market. Those factors include speculative real estate investment activities and sharp policy shocks (e.g., home purchase restriction policy in China).

China's housing market is still nascent and rapidly evolving ([Wu, Deng, & Liu, 2014](#)). As a result, comparing to the housing market in the developed countries, China's housing market can be more volatile. However, housing price changes caused by the changes in housing market fundamentals are still much slower relative to the price changes caused by speculative activities and policy shocks. This is especially true in China because of the large size of the housing market. Thus, by observing sharp structural breaks of housing price in a certain month, we identify relatively exogenous changes in the housing market rather than more endogenous changes in fundamentals, such as amenities and population flows. We explain this instrument in more detail when we introduce Eq. (3).

The second instrument is the interaction between city developable land and change in housing price index. The city developable land is used as a proxy for local land supply elasticity in the spirit of [Saiz \(2010\)](#). The rationale of using this instrument is that when experiencing the same housing market shock, households in cities with more inelastic land supply would have larger housing wealth changes.⁵ We only use this instrument as a robustness check because (1) developable land is a very rough proxy for local land supply elasticity; (2) [Davidoff \(2016\)](#) suggests land supply constraints may not be valid instruments for home price changes; (3) the first-stage F-statistics for this IV in our specification is below 10.

The third instrument is whether the household's primary house is below 90 square meters. This IV is first proposed in [Li et al. \(2020\)](#) and is based on exogenous household-level variation. Specifically, as pointed out in [Li et al. \(2020\)](#), the discontinuity in house size generated by Chinese housing policies can be used as an instrument for housing wealth changes. Houses with floor areas less than or equal to 90 square meters subject to lower down payment and property deed tax, and thus potentially have higher growth rate in price. This creates exogenous variation in housing wealth changes that is caused by the policy. Because the nature of the IV is a regression discontinuity, we restrict the sample to households whose primary house's floor area is between 75 and 105 square meters. We use this instrument as a robustness check.

The main regression specification is of the following form:

$$Y_{ict} = \beta_1 X_{ict} + \beta_2 wealth_{t-1} + \beta_3 ch_value_{t,t-1} + \beta_4 Y_{ic,t-1} + d_{tc} + \epsilon_{ict} \quad (1)$$

where Y_{it} is the outcome variable for individual i in city c at time t . In the main regressions, the outcome variable is a dummy variable which equals 1 if the household owns a business. In other related regressions, the outcome variable is defined accordingly. X_{ict} is a vector of household-level and individual-level characteristics that can potentially affect the tendency to own a business. The set of control variables include survey respondent's age, age squared, whether is female, whether is married, number of elderly (age above 60) in the household, number of children under age 13 in the household, survey respondent's education (junior high school, high school degree and some college, college degree and above, with less than junior high school as the omitted category), whether the household has a disabled person, whether the household has a local *Hukou*. $wealth_{t-1}$ is the lagged household wealth in the previous wave (two years in the past). We control for both lagged housing wealth and non-housing wealth. $ch_value_{t,t-1}$ is the change in house value net of maintenance and upgrading costs between two adjacent survey years. $Y_{ic,t-1}$ is the lagged one-survey-period outcome variable. d_{tc} represents city by year fixed effects. The key parameter of interest is β_3 , the coefficient of $ch_value_{t,t-1}$.

We conduct the regression of Eq. (1) for the sample of homeowners because only homeowners would incur housing wealth changes and home maintenance and upgrading costs. In related regressions where we use the transition into or out of entrepreneurship as the dependent variable (i.e., start or close a business between two survey years), we do not control for the lagged dependent variable.

⁵ Other studies using similarly constructed instruments include [Himmelberg, Mayer and Sinai \(2005\)](#), [Mian and Sufi \(2011\)](#), [Chaney, Sraer, and Thesmar \(2012\)](#), and [Chetty, Sandor and Szeidl \(2017\)](#).

In another set of regressions, we use renters as a comparison group for homeowners to identify the impact of housing wealth changes on entrepreneurship. The regression equation is as follows:

$$Y_{ict} = \beta_1 X_{ict} + \beta_2 \text{Tenure}_{t-1} + \beta_3 (\text{Tenure}_{t-1} * \Delta HPI_{t,t-1}) + \beta_4 Y_{ic,t-1} + d_{ic} + e_{ict} \quad (2)$$

where Tenure_{t-1} is whether the household owns a house; $\Delta HPI_{t,t-1}$ is the change in housing price index in the city between two survey years. All other variables are defined in the same way as in Eq. (1). We still control for lagged household non-housing wealth. The regression is conducted with both homeowners and renters. Because the very high homeownership rate in urban China, renters might not serve as a good control group. Nevertheless, we use this set of regressions to compare with other studies because the most relevant study (Li & Wu, 2014) uses specifications resemble Eq. (2).

As explained earlier, estimating Eqs. (1) and (2) requires careful consideration of the endogeneity issues and we use 2SLS as our final safeguard of identification. We fill in details of the IV of structural break in housing price index here. We follow Charles et al. (2018) in the estimation of city structural break in HPI, and assume that there is no more than one structural break in HPI in each city between two adjacent surveys. We search for the exact date of the structural break by maximizing the R-squared of the following regression specification (Bai & Perron, 1998):

$$P_k^H(t) = \omega_k + \tau_k t + \lambda_k (t - t_k^*) \mathbb{1}\{t > t_k^*\} + \xi_{k,t} \quad (3)$$

In Eq. (3), $P_k^H(t)$ denotes the log of local house price at month t in city k . t_k^* is the year and month of structural break in city k . We restrict the break time to be between two adjacent survey periods. To be more specific, we assume the break point is within a two-years period that is from the survey month two years earlier to the survey month in the current survey year. τ_k captures the linear time trend before the structural break in each city. λ_k represents the magnitude of each city's structural break in house price trend.

The intuition for this process is that cities with a larger and more abrupt change in housing price are associated with a larger structural break. The magnitude of a city's structural break measures the extent to which a city's housing price growth rate deviates from its previous trend at the break point.⁶ We use the estimates of λ_k as the IV for proxies for housing wealth changes in Eq. (1) and (2). In Eq. (2), the IV for the interaction term is the interaction between the structural break and household tenure status. The identification assumption is that an abrupt change in local housing price is not caused by market fundamentals, but is from some dramatic and exogenous activities such as speculative real estate investments and sharp policy shocks. Note that because the IVs are city-specific, so we can only control for province and year fixed effects in the 2SLS regressions.

4. Data and summary statistics

4.1. Data

The main data used in this study are the 2011, 2013 and 2015 waves of the China Household Finance Survey (CHFS), which is the first micro-level dataset focusing on household finance in China.⁷ The CHFS is a nationally representative survey that is based on a stratified three-stage probability proportional to size (PPS) random sampling. The starting year of the survey is 2011 and the initial sample in the 2011 CHFS contains 8438 households and 29,324 individuals. The 2013 CHFS covers 28,143 households and 97,906 individuals. The 2015 CHFS includes 37,289 households and 133,183 individuals, covering 1439 communities, 363 counties and 29 provinces. The CHFS contains detailed information on household finance including financial assets, business assets, other nonfinancial assets, and debts. Most important to our study, the CHFS also provides detailed information on housing, such as self-reported current value, mortgage information, and maintenance and remodeling expenditures for all housing units. The CHFS also identifies the primary residence and contains rich information on demographics at the individual and household level.⁸

The CHFS is a panel that follows households over time. This is an important feature because it allows us to observe the changes in housing wealth and business ownership and control for lagged housing wealth and other lagged attributes. The survey also collects information on total maintenance and remodeling expenditures on all houses in the last year.⁹ In particular, our key variable of interest, household housing wealth change, is defined as the change in total housing wealth between two adjacent survey years net of total maintenance and remodeling expenditures. The consideration of housing maintenance and remodeling expenditures is important and unique in the literature as suggested in Harding and Rosenthal (2017).

We define entrepreneurship by identifying household business ownership. The CHFS asks “Is the family engaged in any industrial and commercial production and management projects?” If the answer is “yes”, we define the household as entrepreneurs. Thus, the

⁶ For cities with a smooth housing price growth rate, the estimate is close to 0.

⁷ The CHFS is administered by the Southwestern University of Finance and Economics and is designed in a way similar to the Survey of Consumer Finance (SCF) in the U.S. For more information on the CHFS and its sampling scheme, see <https://chfs.swufe.edu.cn/>.

⁸ Survey questions are answered by the household member who is familiar with household economic and financial situation the most, we refer to him or her as “respondent”.

⁹ Unfortunately, we only know the home maintenance and remodeling cost for the last year rather than for the two years between two survey periods. We tried to multiply the home maintenance and remodeling cost for the last year by two as a proxy for the total cost for the two years. The results are quite robust. Because home maintenance and remodeling are not very frequent in China, we choose to simply subtract the cost for the last year in our main specifications.

entrepreneurship we define includes self-employment, small handicraft business and other businesses. The survey also collects information on whether there are any associated bank loans for the mentioned business activities. In a robustness check, we also conduct analysis using an alternative definition of entrepreneurship, which is based on whether the household is associated with self-employment.

We also obtain measures of financial awareness and risk preference from the survey. The question on financial awareness asks the extent to which the respondent is concerned about economic and financial information. The first risk preference question asks what the respondent would choose between a lottery with 100% shot at 4000 RMB and another with 50% shot at 10,000 RMB and 50% shot at 0. The second risk preference question asks whether the respondent would choose to make high risk and high return investments or low risk and low return alternatives. We exploit those variables to explore possible changes in households' financial awareness and risk preference as potential mechanisms through which housing wealth changes affects entrepreneurship. For the same purpose, we also use a real-life proxy for risk preference and financial knowledge, which is whether the household owns any stock assets.

In most regressions, our sample includes all households that can be observed more than once in the three waves of the CHFS. However, the 2011 data do not have certain variables such as financial awareness and risk preference. Thus, in part of the descriptive and regression analyses we only use the sample that can be observed in the 2013 and 2015 data. We restrict our main sample to urban residents, as the housing market and entrepreneurship considerations in rural areas are very different from that of the urban areas.¹⁰ To focus on the population that is most attached to the labor force, we restrict our sample to households with the respondent's age between 20 and 60. All income and wealth values are in 2015 RMB, deflated using the Urban Consumer Price Index (CPI) from the National Bureau of Statistics (NBS) of China.

We use two additional data sources in the construction of instrumental variables and the regressions using renters as a comparison group. The first dataset is a prefectural level monthly housing price index (HPI) developed by the NBS of China for 70 major cities from 2006 and onward. About 46% of the main analysis sample can be matched to this housing price index. In the regression models using renters as a comparison group, we use this index to measure city-level housing price changes between two adjacent survey years. We also use the index to estimate structural breaks in each city's housing price series over the sample periods of July 2011 to June 2013 and July 2013 to June 2015. The estimates of structural break are used as the main IV for housing wealth changes as explained in the empirical framework section. The other dataset is the city-level developable land for 266 cities (Tan, Wang, & Zhang, 2020). An area is defined as developable if it is not covered by water body and has a slope smaller than 15%. We use this measure as a proxy for land supply elasticity in the spirit of Saiz (2010). The interaction of this measure with changes in housing price index is used as another IV as a robustness check. We successfully match 93.1% of the analysis sample with the measure of developable land.

4.2. Descriptive statistics

Fig. 1 presents monthly housing price index in urban China between 2006 and 2018 for eight major cities and an average of 70 cities using the HPI data from the NBS of China. The housing market is booming during the period. We observe a dramatic housing price appreciation in all major cities and for the 70-city average. In many large cities, housing price is more than doubled during the period of 2006–2018. This dramatic trend causes large exogenous housing wealth increases for homeowners, which we exploit to identify the impact of housing wealth changes on entrepreneurship.

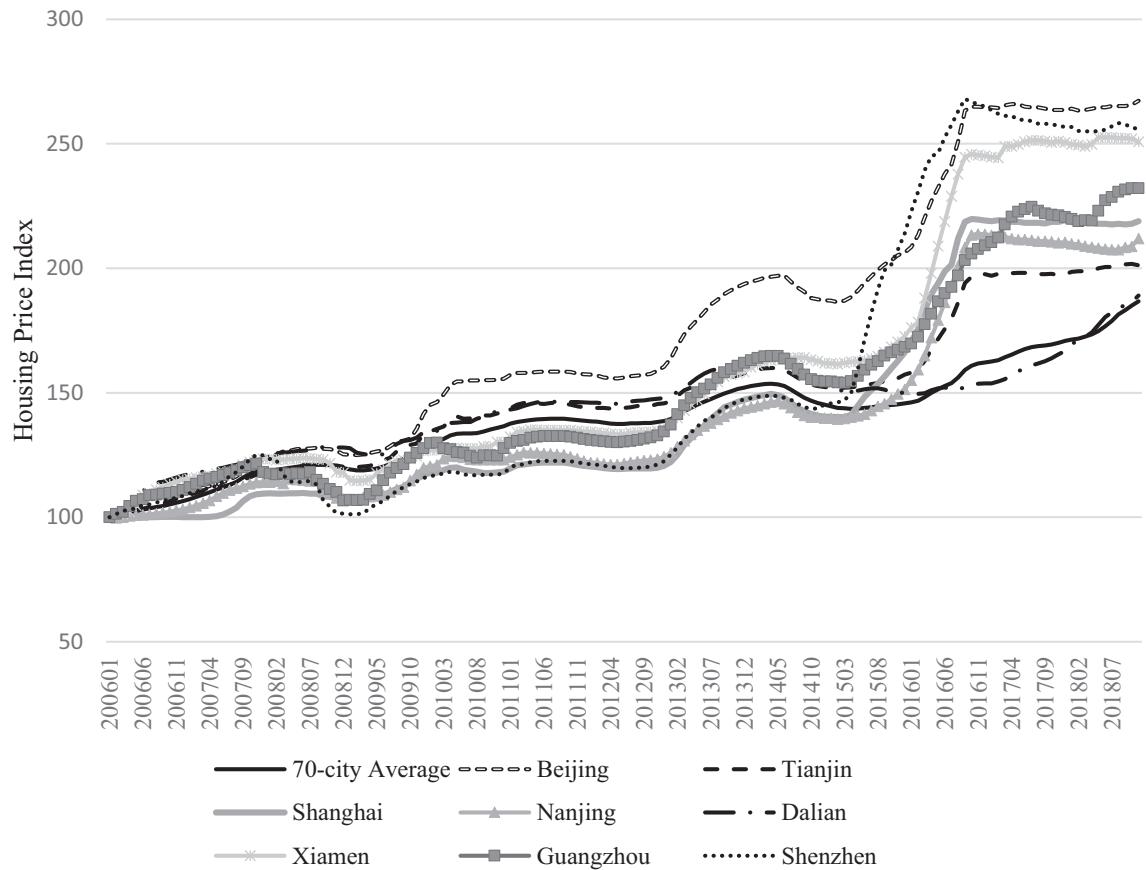
Table 1 reports summary statistics on several key variables including homeownership, house values and business ownership for the main sample used in this study. In our CHFS analysis sample, homeownership rate in urban areas increases from 84.0% in 2013 to 89.0% in 2015. The homeownership rate is extremely high in urban China, compared with other countries. This is partly due to an underdeveloped and unstable rental market and partly due to the social norm that Chinese families believe one should own a home to get married (Wei & Zhang, 2011). In addition, prior to the privatization housing reform in 1998, most state-owned enterprises (SOEs) provide public housing to their employees and the employees can purchase their homes at a very low cost during the housing reform. The percentage of households owning a second home is large—about one in five households owns a second home in 2015 in our sample. This high rate of owning a second house suggests the importance of accounting for the non-primary housing units when considering the impact of housing wealth changes in China.

The average house value among owner-occupied houses in urban China increased from 713,880 RMB in 2011 to 825,164 RMB in 2013 and 837,924 RMB in 2015, a 15.6% increase between 2011 and 2013 and 1.5% increase between 2013 and 2015. This is consistent with the aggregate statistics in **Fig. 1**, which shows a larger increase in HPI in 2011–13 but more cyclical fluctuations and thus a smaller increase in HPI in 2013–15. The average home maintenance and upgrading costs among homeowners is about five thousand RMB, less than 1% of the home value. Unlike in the U.S. where most home purchases come with a mortgage loan, there are only 17.4% households hold a home mortgage in 2015 in urban China.

Accompanying the increase in housing wealth during our sample period of 2011–2015, business ownership rate also increases. Households who own a business increased from 20.0% to 24.0% between 2011 and 2015. The simultaneous upward trends in housing assets and business ownership rate point to a possible relationship between household housing wealth and entrepreneurship. The average number of employees (excluding family members) of those businesses does not show a clear increase pattern over time.

Table 2 presents summary statistics on business ownership transitions and changes in housing assets between two survey waves. We

¹⁰ In many rural areas, there is no formal housing transaction market. Thus, it is difficult to estimate housing values accurately. Agricultural land value changes could also affect entrepreneurship decisions, which is beyond the scope of this paper. Including the rural sample does not compromise our conclusions.

**Fig. 1.** Monthly Housing Price Index for Selective Cities during 2006–2018.

Note: This figure presents monthly housing price index for eight major cities and a 70-city average in China. Data are from the National Bureau of Statistics of China.

Table 1
Summary statistics on housing tenure status and business ownership.

	2011		2013		2015	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Own a house	89.3%	0.309	84.0%	0.367	89.0%	0.313
Own a second house	18.1%	0.385	15.7%	0.364	20.8%	0.406
House value	637,276	1,121,827	690,823	1,180,163	730,902	1,193,912
House value for homeowners	713,880	1,164,085	825,164	1,246,112	837,924	1,242,769
Maint. costs for homeowners	–	–	5857	42,595	4983	34,012
Hold a mortgage	–	–	12.6%	0.332	17.4%	0.379
Own a business	20.0%	0.400	21.8%	0.413	24.0%	0.427
Number of employees	3.6	14.2	5.2	28.0	2.3	10.2
Observations	3205		13,996		17,488	

Note: Authors' calculation using the 2011, 2013 and 2015 CHFS. The sample includes all urban households with the survey respondent aged 20 to 60. Mortgage information and maintenance costs are not available in 2011. House values and maintenance costs are in RMB. Maintenance costs for homeowners refer to the home maintenance and upgrading costs occurred in the previous year.

restrict the sample to households that we can follow over time and present the statistics by housing tenure status. This sample is also our main regression sample. The median house value increased by 8.46% during 2011–13 then decreased slightly during 2013–15. Around 37.27 and 29.69% of homeowners experienced housing wealth gains of more than 25% in 2011–13 and 2013–15, respectively. During the sample periods when housing wealth gains are larger (i.e., 2011–13), homeowners are more likely to become business owners and less likely to exist business ownership than renters. The pattern is not so clear for the sample period of 2013–15. Business ownership dynamics are active during our sample period. Between two survey years, about 15% of households change their business ownership status either by starting new businesses or closing existing businesses. However, only a small portion of existing firms are

Table 2

Changes in business ownership status and house value.

	2011–13	2013–15	2011–13	2013–15
	Homeowners	Homeowners	Renters	Renters
Start a new business	9.67%	8.61%	9.17%	8.24%
Close an existing business	6.52%	6.18%	7.99%	5.20%
Whether firm size increases	16.43%	13.53%	13.79%	10.87%
Median house value change	8.46%	−2.20%	—	—
House value increase over 25%	37.27%	29.69%	—	—
Observations	2867	7919	338	1250

Note: Authors' calculation using CHFS 2011, 2013, and 2015. The sample includes all urban households with the survey respondent aged 20 to 60. House value changes are defined as the changes in house value between two adjacent survey years subtracting maintenance and upgrading costs among households that own a house in the prior survey.

expanding over time. Among homeowners, only 16.4% and 13.5% of business owners increase the number of employees hired between 2011 and 13 and 2013–15, respectively.

In Fig. 2, we provide some examples of the estimated structural breaks in city-level housing price index between July 2013 and July 2015. The estimates of structural breaks are used as our main instrumental variable for household-level housing wealth changes. We present a few examples of large structural breaks and small structural breaks. The structural break happens at different time in different cities. In Shenzhen, a first-tier provincial level city in China, an upward large structural change in HPI occurred in April 2015. In Wenzhou, a third-tier city in Zhejiang province of China, a small structural change in HPI occurred in February 2014.

In Fig. 3, we test the validity of the identification assumption that the structural break instrument is not correlated with latent city characteristics that may drive entrepreneurship decisions. We plot the relationship between the estimated structural breaks and several pre-existing city characteristics: housing price index in the city in 2006; housing price growth in the city between 2006 and 2010; log GDP per capita in 2010; change in GDP per capita between 2010 and 2011; percentage of employment in the secondary industry in 2010, change in percentage of employment in the secondary industry between 2010 and 2011; percentage of employment in the tertiary industry in 2010, change in percentage of employment in the tertiary industry between 2010 and 2011. These pre-existing observable variables are likely closely related to latent factors that would raise endogeneity concerns. All correlations are statistically insignificant except that the correlation with the change in HPI is statistically significant at 10% level. The results suggest that the structural break does not systematically vary with the pre-existing city attributes. This pattern supports our identification assumption.

5. Empirical results

5.1. Main results

In this subsection, we present our main regression results of the impact of housing wealth changes on entrepreneurship and explore possible channels. Table 3 presents the OLS estimation results of the effect of household-level housing wealth changes on business ownership. Because we only observe housing wealth changes for homeowners but not renters, the regressions in Table 3 and other tables using household-level housing wealth changes as the key variable of interest only consider the sample of homeowners. We use linear probability model as our main specification in all tables.¹¹ In all tables, we control for survey respondent's age, age squared, whether is female, whether is married, number of elderly (age above 60) in the household, number of children under age 13 in the household, survey respondent's education (junior high school, high school degree and some college, college degree and above, with less than junior high school as the omitted category), whether the household has a disabled person, whether the household has a local *Hukou*.

We experiment with different specifications in Table 3. In column 1, we control for province and year fixed effects and use housing value change net of home maintenance and upgrading expenditures as the key variable of interest. The estimation results suggest that an increase of 10,000 RMB in housing wealth increases the propensity of household business ownership by 0.12 percentage point. The effect is both statistically (at 1% level) and economically significant. For homeowners in our sample, the average house value appreciation from 2011 to 2015 is more than 120,000 RMB. The estimate suggests the average homeowner would be more likely to become a business owner by 1.44 (0.12 times 12) percentage point within four years.

In column 2, we use the housing value changes as the proxy for housing wealth changes between two survey years without considering recent home maintenance and upgrading expenditures. This is the typical way to measure housing wealth changes in the literature as most data provide no information on home maintenance and upgrading expenditures. We also control for city and year fixed effects like the literature usually does. The estimated magnitude of the impact increases to 0.13 percentage point for an increase of 10,000 RMB in housing value with this model specification. In column 3 we switch back to our preferred proxy for housing wealth changes—housing value changes net of home maintenance and upgrading expenditures. We control for city and year fixed effects to allow comparison to column 2. The estimate suggests that an increase of 10,000 RMB in housing wealth statistically significantly

¹¹ The main conclusions are robust to alternative probability models such as the logit and probit models.

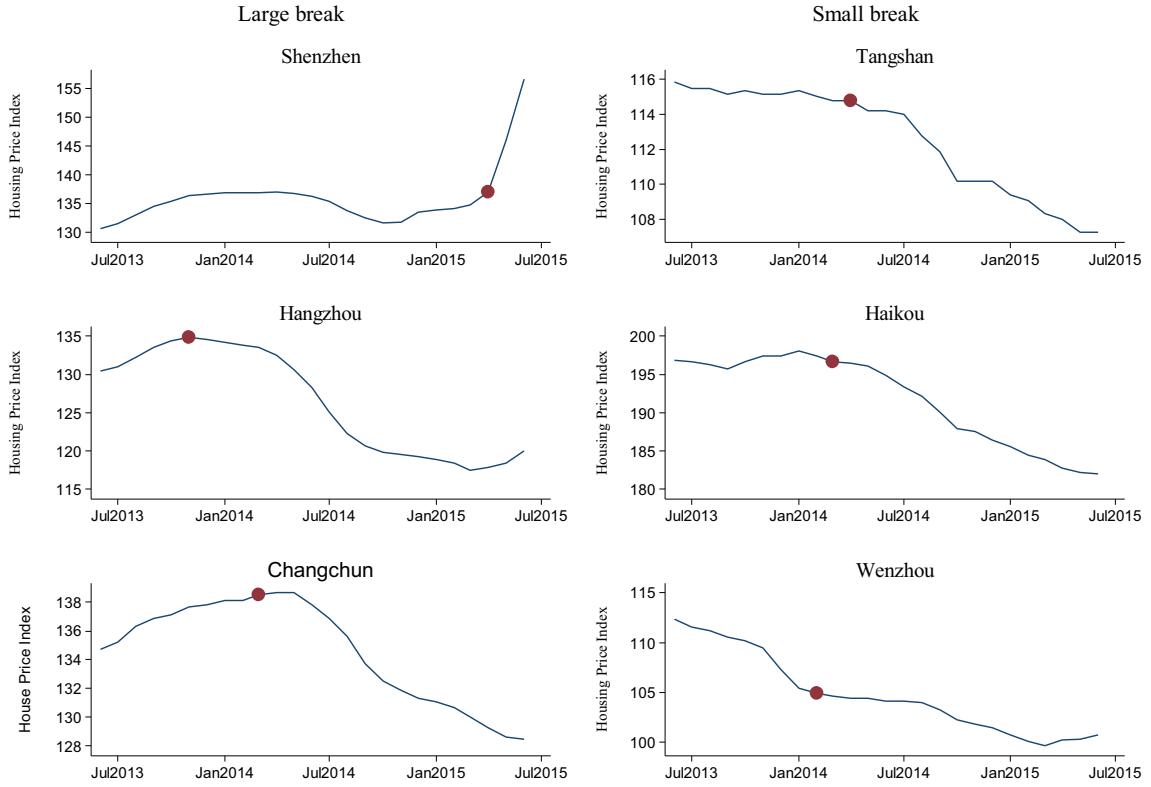


Fig. 2. Estimates of structural breaks for selective cities during 2013–2015.

increases the propensity of owning a business by 0.12 percentage points. The results in columns 1–3 confirm that accounting for home maintenance and upgrading expenditures in measuring household housing wealth changes can improve the accuracy of the estimated impact of housing wealth changes on entrepreneurship. This highlights the advantage of using the CHFS in this study.

In column 4, we control for city by year fixed effects instead of city and year fixed effects. This is essentially the model specification in [Harding and Rosenthal \(2017\)](#). The results are very similar to column 3. Column 5 further controls for non-housing wealth in the previous survey year. This becomes our most preferred model specification without instrumenting the key variable of interest. The result suggests that an increase of 10,000 RMB in housing wealth statistically significantly increases the propensity of owning a business by 0.12 percentage points—a robust estimate across specifications.

In [Table 4](#), we present 2SLS estimates using two city-level instrumental variables for housing value changes net of home maintenance and upgrading expenditures. We use the same set of control variables as in [Table 3](#), but now we can only have province and year fixed effects instead of city by year fixed effects.¹² Column 1 uses the interaction between city developable land and change in housing price index as the IV. The estimate suggests that a 10,000 RMB increase in housing wealth increases business ownership by 0.68%age points. This is much larger than the OLS estimate, suggesting possible omitted variable bias in the OLS estimates. However, we also note that the first-stage F-statistics is only 4.48, casting doubt on the quality of this IV. For this reason and others mentioned in the empirical framework section, we only treat this estimate as a robustness check.

In column 2, we use the estimated structural breaks in city-level housing price index from Eq. (3) as the IV. The first-stage F-statistics now exceeds 10, indicating minimum weak-IV bias. We use this IV in the following tables. The estimate suggests that a 10,000 RMB increase in housing wealth increases business ownership by 0.74 percentage points. This is very similar to the estimate in column 1. The fact that the estimates using two different IVs (and thus two different sources of exogenous variations) are similar is promising as this is what it should be if the instruments are valid. In column 3 we use both IVs at the same time and this permits an over-identification test. The Hansen-J over-identification test statistic shows that our IVs pass the test by failing to reject the null hypothesis of an over-identified instrumental variable model. Overall, the OLS and 2SLS estimates suggest a significant impact of housing wealth changes on entrepreneurship.¹³ These results are consistent with literature that higher housing capital gains are associated with a larger likelihood of entrepreneurship (e.g., [Chen & Hu, 2019](#); [Wang, 2012](#)).

¹² Note that in [Table 3](#), controlling for province and year fixed effects or city by year fixed effects makes essentially little change to our key estimates.

¹³ [Appendix Table A.1](#) reports the full first-stage regression estimates for the 2SLS regressions in [Table 4](#).

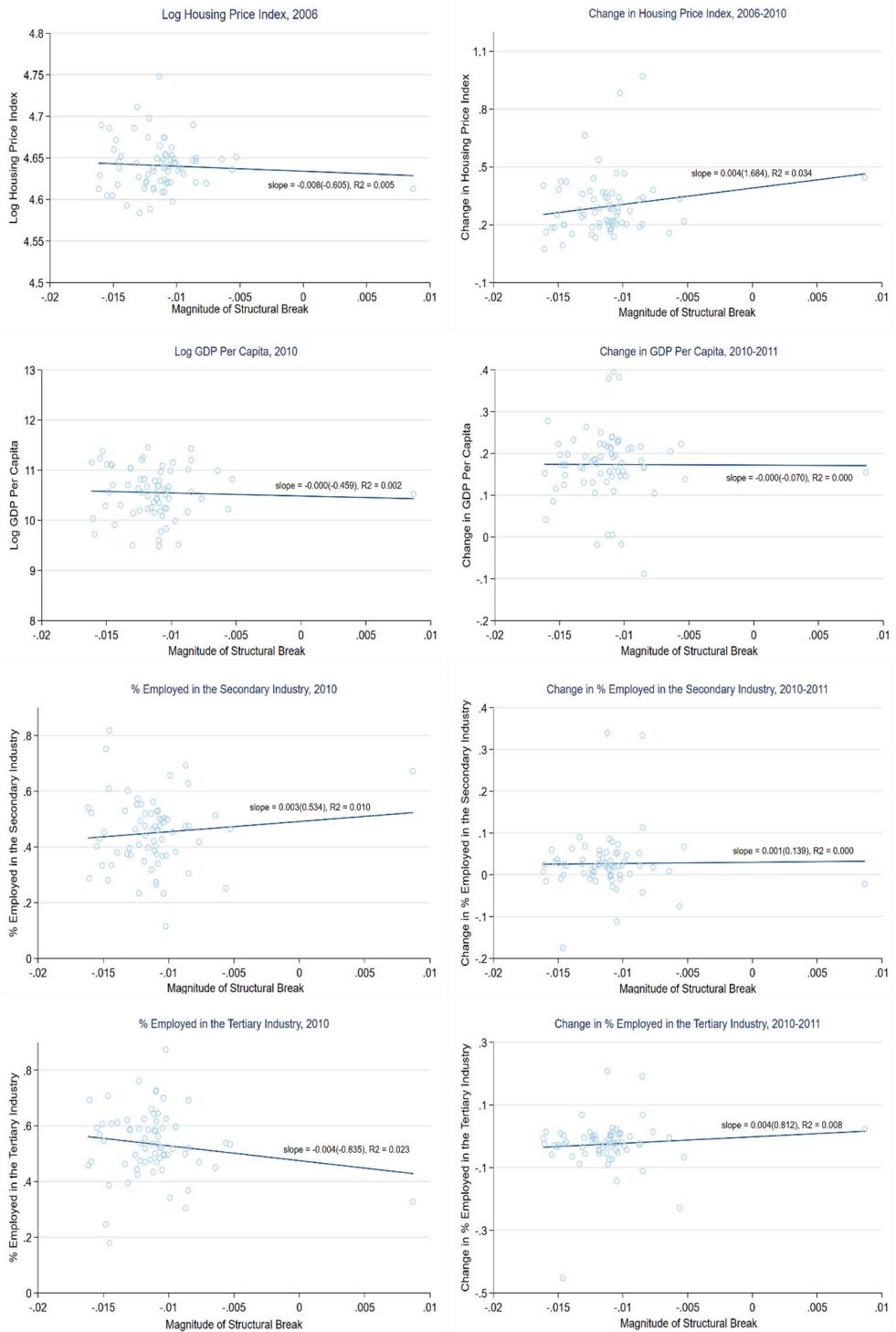


Fig. 3. Correlations between Structural Break and Lagged City Attributes.

In Table 5, we further investigate whether housing wealth changes impact on transition into and out of entrepreneurship differently. In columns 1–2, we look at the impact on transition into entrepreneurship. The results suggest that housing capital gains statistically significantly increase the chance of households starting a new business, with the IV estimate larger than the OLS estimate. The IV results suggest that a 10,000 RMB increase in housing wealth increases the chance of starting new businesses by 0.65 percentage points. In column 3–4, we estimate the impact on transition out of entrepreneurship. The OLS and IV estimates implies that housing

Table 3

Housing wealth changes and entrepreneurship (OLS).

	(1)	(2)	(3)	(4)	(5)
Own business 2 years earlier	0.52713*** (12.84)	0.51471*** (12.43)	0.51422*** (12.40)	0.51426*** (12.36)	0.52150*** (12.84)
Change in house value	– –	0.00128*** (3.05)	– –	– –	– –
Change in house value net of maintenance	0.00115*** (2.99)	– –	0.00118*** (3.00)	0.00118*** (3.00)	0.00120*** (3.02)
House value 2 years earlier	−0.0004 (−0.34)	0.00004 (0.31)	0.00004 (0.26)	0.00004 (0.25)	0.000335 (1.58)
Non-housing wealth 2 years earlier	– –	– –	– –	– –	−0.00021** (−2.35)
Province Fixed Effects	Y	N	N	N	N
City Fixed Effects	N	Y	Y	N	N
Year Fixed Effects	Y	Y	Y	N	N
City by Year Fixed Effects	N	N	N	Y	Y
Observations	8812	8812	8812	8812	8812
R-squared	0.317	0.341	0.338	0.339	0.339

Note: The dependent variable equals 1 if the household owns a business in current year and 0 otherwise. T-statistics in parentheses are based on standard errors clustered at the city level. Additional control variables include survey respondent's age, age squared, whether is female, whether is married, number of elderly (age above 60) in the household, number of children under age 13 in the household, survey respondent's education (junior high school, high school degree and some college, college degree and above, with less than junior high school as the omitted category), whether the household has a disabled person, whether the household has a local Hukou. House value and change in house value are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

Table 4

Housing wealth changes and entrepreneurship (2SLS).

	(1)	(2)	(3)
Change in house value net of maint.	0.00676*** (4.36)	0.00741*** (2.62)	0.00669*** (4.42)
Own business 2 years earlier	0.61958*** (6.37)	0.59917*** (6.81)	0.60995*** (6.50)
House value 2 years earlier	0.00089 (1.38)	0.00102* (1.88)	0.00092 (1.47)
Non-housing wealth 2 years earlier	−0.00083*** (−3.17)	−0.00059** (−2.35)	−0.00083*** (−3.28)
Province Fixed Effect	Y	Y	Y
Year Fixed Effect	Y	Y	Y
First Stage F-stat.	4.48	13.89	7.58
Hansen-J test statistic	–	–	0.168
Hansen-J P value	–	–	[0.682]
Observations	3720	4135	3720
Root MSE	0.396	0.428	0.394

Note: The dependent variable equals 1 if the household owns a business in current year and 0 otherwise. T-statistics in parentheses are based on standard errors clustered at the city level. Column 1 instruments housing value change net of maintenance and remodeling expenditures using the interaction of city developable land with HPI change; column 2 uses city structural break in HPI as the instrument; column 3 uses both instruments. Additional control variables include survey respondent's age, age squared, whether is female, whether is married, number of elderly (age above 60) in the household, number of children under age 13 in the household, survey respondent's education (junior high school, high school degree and some college, college degree and above, with less than junior high school as the omitted category), whether the household has a disabled person, whether the household has a local Hukou. House value and change in house value are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

capital gains would decrease the chance of closing existing businesses, but the effects are very small (0.091 percentage points) and statistically insignificant. Together, the impact on transition into and out of entrepreneurship make up the overall impact in Table 4 ($0.65 + 0.091 = 0.741$).

Overall, we find a significant impact of housing capital gains on entrepreneurship, and the impact mostly comes from encouraging households to start new businesses. We now provide some evidence on possible mechanisms. One channel through which such effects can happen is that housing capital gains provide collateral to credit constrained households and make home equity borrowing feasible (e.g., Jensen et al., 2015; Schmalz et al., 2017). Table 6 provides some suggestive evidence for this channel. Columns 1–2 report results from linear probability regressions of whether the household has or needs a business loan and whether the household uses real estate as

Table 5

Housing wealth changes and transition into and out of entrepreneurship.

	Start new business		Close business	
	OLS	IV	OLS	IV
Own business 2 years earlier	-0.16644*** (-8.24)	-0.14533** (-2.14)	0.31206*** (8.42)	0.25558*** (3.70)
Change in house value net of maintenance	0.00087** (2.52)	0.0065*** (3.61)	-0.00033 (-1.54)	-0.00091 (-0.77)
House value 2 years earlier	-0.00021 (-1.00)	0.00023 (0.54)	-0.00054*** (-3.59)	-0.00078*** (-3.94)
Non-housing wealth 2 years earlier	0.00015 (1.38)	0.00002 (0.10)	0.00036*** (2.96)	0.00061*** (4.68)
City by Year Fixed Effect	Y	N	Y	N
Province Fixed Effect	N	Y	N	Y
Year Fixed Effect	N	Y	N	Y
First Stage F-stat.	—	13.89	—	13.89
Observations	8812	4135	8812	4135
R-square	0.115	—	0.317	—
Root MSE	0.289	0.368	0.196	0.180

Note: The dependent variable in columns 1 and 2 is whether the household starts a new business between year t-2 and t. The dependent variable in columns 3 and 4 is whether the household closes an existing business between year t-2 and t. T-statistics in parentheses are based on standard errors clustered at the city level. The instrument for house value change net of maintenance and remodeling expenditures is the city structural break in HPI. We use the same set of control variables as in the main [Tables 3–4](#). House values are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

collateral to obtain a business loan.¹⁴ Column 1 implies that owning a business is positively associated with having a demand for business loans. Column 2 suggests that owning a business is positively associated with using housing assets as collateral for business loans. Although these two regressions do not establish any causal impact, they provide suggestive evidence that are consistent with the story that housing capital gains can provide collateral for business owners and relieve credit constraints.

In China, a unique institutional feature is that houses with mortgage cannot be used as collateral for other loans ([Liu & Xiong, 2018](#)). Thus, if the collateral channel is playing an important role, we expect the impact of housing capital gains would be larger for households without mortgages. In columns 3–6, we stratify the sample by mortgage status and conduct our main regressions as represented by Eq. (1). Columns 3–4 represent the OLS and IV results for households with mortgages and columns 5–6 for households without mortgages. While the OLS estimates show a significant impact of housing capital gains on entrepreneurship for both households with and without mortgages, the IV estimates suggest that only households without mortgages benefit from a statistically significant impact of housing capital gains. Together, the results in [Table 6](#) provide suggestive evidence for the collateral channel.

Another potential mechanism through which housing wealth changes might affect business ownership is by affecting households' taste for risk. Typically, risk-loving individuals are more likely to become entrepreneurs and risk preference increases with wealth. Existing studies show that changes in wealth could alter risk aversion ([Flavin & Nakagawa, 2008](#); [Paravisini, Rapoport, & Ravina, 2017](#); [Zanetti, 2014](#)). Similarly, changes in housing wealth could alter people's preference for risk. We explore this mechanism in [Table 7](#) by exploiting the information on household risk preference in CHFS. The specification is similar to our main specification except now the dependent variable becomes indicators for risk preference.

Columns 1–2 test whether housing capital gains make households more likely to choose high risk and high return investments over low risk and low return alternatives. The OLS results in column 1 show that housing capital gains increase the chance of choosing high risk and high return investments at the conventional significance level. While the IV estimate in column 2 is slightly larger with the expected sign, it is not statistically significant. Columns 3–4 test whether housing capital gains make households more likely to choose a lottery with a larger expected return over a fixed return of 4000 RMB. Again, we see a statistically more significant impact with OLS estimation, and a larger but statistically less significant impact with IV estimation (with a t-statistic of 1.42). Taken together, we find moderate evidence that housing capital gains increase household's preference for risk, but the conclusion is not definitive. Another thing we notice is that lagged risk preference two year earlier has a strong correlation with the current risk preference. This is consistent with our expectation that people's taste for risk is relatively sticky over time.

We also test whether housing capital gains can increase entrepreneurship by affecting people's awareness of financial information. Starting a business often requires certain level of knowledge on economic and financial information. People who like to keep up with financial news and knowledge could be better at coming up with business ideas. At the same time, housing capital gains may change the degree to which households care about financial knowledge and information. In columns 5–6, we study whether households are more concerned of financial knowledge and information when they experience housing capital gains. The OLS estimate suggests that housing wealth gains increase household's awareness of financial information, while the IV estimate is positive but statistically insignificant.

The indicators of risk preference and concern on financial knowledge we explore so far are based on households' self-evaluation. Next, we explore a real-life proxy—whether the household owns any stock assets. Holding stock assets, to a degree, reflects higher risk

¹⁴ Due to data limitation, we only use the 2013–2015 sample for the regressions in columns 1–2.

Table 6
Housing wealth changes and collateral channel.

	Has/need business loan	House as collateral	Own Business (mortgage, OLS)	Own Business (mortgage, IV)	Own Business (No mortgage, OLS)	Own Business (No mortgage, IV)
Own a business	0.19975*** (16.07)	0.05479*** (7.12)				
Non-housing wealth 2 years earlier	0.00030*** (3.01)	0.00024*** (3.18)	-0.00149** (-2.61)	0.00354 (0.57)	-0.00021** (-2.17)	-0.00055** (-2.12)
Own a business 2 years earlier			0.79950*** (5.77)	0.93368*** (4.99)	0.51842*** (12.31)	0.58967*** (6.64)
Change in house value net of maintenance			0.00192*** (3.46)	-0.00469 (-0.44)	0.00113*** (2.78)	0.00717*** (2.67)
House value 2 years earlier			0.00084 (1.35)	-0.00483 (-0.56)	0.00035 (1.38)	0.00094 (1.59)
City FE	Y	Y	N	N	N	N
City by Year FE	N	N	Y	N	Y	N
Province and Year FE	N	N	N	Y	N	Y
First Stage F-stat.	-	-	-	0.27	-	13.35
Observations	8294	8294	1137	689	7675	3446
R-squared	0.217	0.106	0.686	-	0.337	-
Root MSE	0.201	0.120	0.260	0.367	0.349	0.421

Note: The dependent variable in column 1 is whether the household has or needs a business loan; in column 2 is whether the household uses real estate as collateral to obtain a business loan; in column 3–6 is whether the household owns a business. Columns 1 and 2 only use 2013–2015 data because the dependent variables are only available in 2015. Columns 3 and 4 use the sample of homeowners with mortgages; columns 5 and 6 use the sample of homeowners without mortgages. T-statistics in parentheses are based on standard errors clustered at the city level. We use the same set of control variables as in the main Tables 3–4. House values are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

preference and financial knowledge. We present the results in columns 7–8. Again, we find that housing wealth gains increase the chance of holding stock assets, even though the IV estimate is not statistically significant. Together, the results in Table 7 provide moderate evidence that housing capital gains change people's risk preference and attitude for financial information, but we need to take the results with caution.

5.2. Heterogeneity analysis

In this set of empirical exercises, we explore the heterogeneity of the impact of housing capital gains on entrepreneurship across different demographic subgroups. In Table 8a, we stratify the sample based on whether the survey respondent's age is under or above 40 in columns 1–4. Columns 1 and 3 are the OLS estimates and columns 2 and 4 are the IV estimates. In a similar format, columns 5–8 present results with the sample stratified based on whether the survey respondent's education level is high school and below or above high school.

In columns 1–4, the OLS results suggest the impact is larger for younger households, but the IV estimates imply the opposite. The mixed results could be driven by two factors interplay with household-level unobservables. First, younger households are typically less wealthy and more credit constrained. Housing capital gains should be more important for younger households to alleviate credit constraints through collateral channel. Second, as studies find that wealthy families are more likely to open new businesses (e.g., Hurst & Lusardi, 2004), the connection between housing wealth changes and entrepreneurship could be stronger among older families that have more wealth accumulation. In columns 5–8, both the OLS and IV estimates suggest that the impact of housing wealth changes is larger and statistically more significant for households with higher education level. The IV results show that a 10,000 RMB increase in house value net of maintenance cost increases business ownership by 0.97 percentage points for households with above high school education, while the effect is only 0.45 percentage points for those with lower education level.¹⁵ This result shows that our main results are not driven by low-skill workers transitioning into low-skill self-employment.

In Table 8b, we examine heterogeneity by wealth level and employment status. In columns 1–4, we stratify the sample based on whether the household's non-housing wealth two years ago is above or below the median. We find a stronger relationship between housing capital gains and entrepreneurship for wealthier households. This is consistent to our priori that wealthy families are more likely to open new businesses in general. Less wealthy households may still face financial constraints even when they experience housing capital gains, and they are more risk aversion. In columns 5–8, we stratify the sample based on whether the household respondent was employed or not two year earlier. The results suggest that the effect mainly comes from previously employed workers transitioning into business owners when they experience housing capital gains.

¹⁵ Part of this difference could be because that high-educated households report more accurate financial information and thus subject to less attenuation bias. We thank a referee for pointing this out.

Table 7

Housing wealth changes and preference for risk and financial information.

	Invest risky project	Invest risky project	Lottery over Fixed return	Lottery over Fixed return	Concern on Finan. info.	Concern on Finan. info.	Own Stock	Own Stock
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Lagged Risk loving or finan. Knowledge	0.16214*** (6.15)	0.21105*** (5.61)	0.16489*** (7.93)	0.13782*** (4.95)	0.28764*** (10.98)	0.32686*** (11.15)	0.58324*** (24.82)	0.56870*** (24.49)
Change in house value net of maintenance	0.00052** (2.22)	0.00077 (0.60)	0.00041* (2.02)	0.00177 (1.42)	0.00058*** (3.52)	0.00024 (0.42)	0.00077*** (4.63)	0.00103 (1.07)
Lagged House value	0.00025* (2.07)	0.00015 (1.37)	-0.00020 (-1.45)	-0.00017 (-1.07)	0.00027*** (2.93)	0.00012 (1.23)	0.00014 (1.13)	0.00007 (0.75)
Lagged Non-housing wealth	0.00021** (2.20)	0.00015 (1.37)	0.00004 (0.28)	0.00006 (0.30)	0.00026** (2.21)	0.00026 (1.57)	0.00005 (0.71)	0.00001 (0.09)
Province fixed effects	N	Y	N	Y	N	Y	N	Y
City fixed effects	Y	N	Y	N	Y	N	Y	N
First Stage F-stat.	-	16.57	-	12.92	-	13.29	-	10.34
Observations	6128	3198	6212	3203	6424	3320	5515	3024
R-squared	0.100	-	0.078	-	0.167	-	0.403	
Root MSE	0.329	0.343	0.438	0.451	0.318	0.330	0.311	0.340

Note: The dependent variable in columns 1–2 is whether the household chooses high risk and high return investments over low risk and low return alternatives; in columns 3–4 is whether the household chooses a lottery with a higher expected return over a fixed return of 4000 RMB; in columns 5–6 is whether the household cares about economic and financial information; in columns 7–8 is whether the household holds stock assets. This table only uses 2013–2015 data because the risk preference variables are not available in 2011. T-statistics in parentheses are based on standard errors clustered at the city level. We use the same set of control variables as in the main Tables 3–4. House values are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

Table 8a

Housing wealth changes and entrepreneurship—heterogeneity analysis.

	Age under 40		Age above 40		High school and below		Above high school	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Change in house value net of maint.	0.00191*** (2.69)	0.00223 (1.63)	0.00061* (1.66)	0.01844* (1.81)	0.00088* (1.87)	0.00446 (1.48)	0.00126*** (2.76)	0.00966*** (3.12)
House value 2 years earlier	0.00078*** (3.47)	0.00106*** (3.19)	0.00004 (0.07)	0.00185 (1.27)	0.00099*** (4.14)	0.00167*** (5.47)	-0.00030 (-1.14)	0.00118 (1.62)
Own business 2 years earlier	0.48229*** (9.65)	0.63122*** (9.97)	0.53935*** (9.48)	0.51539*** (3.55)	0.52176*** (9.81)	0.54650*** (5.35)	0.51589*** (12.31)	0.83889*** (6.52)
Non-housing wealth 2 years ago	-0.00038** (-2.56)	-0.00066*** (-4.43)	-0.00002 (-0.07)	-0.00140 (-1.34)	-0.00049*** (-4.41)	-0.00077*** (-4.53)	0.00017 (1.02)	-0.00110** (-2.05)
City by year FE	Y	-	Y	-	Y	-	Y	-
Prov. and Year FE	-	Y	-	Y	-	Y	-	Y
First Stage F-stat.	-	27.6	-	3.46	-	22.08	-	12.21
Observations	2747	1390	6065	2745	4277	1706	4535	2429
R-squared	0.353	-	0.381	-	0.368	-	0.384	-
Root MSE	0.376	0.319	0.328	0.776	0.349	0.336	0.332	0.530

Note: In columns 1–4, the sample is stratified based on whether the survey respondent's age is under or above 40. In columns 5–8, the sample is stratified based on whether the survey respondent's education level is high school and below or above high school. T-statistics in parentheses are based on standard errors clustered at the city level. We use the same set of control variables as in the main Tables 3–4. House values are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

Table 8b

Housing wealth changes and entrepreneurship—heterogeneity analysis.

	Wealth above median		Wealth below median		Employed		Unemployed	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Change in house value net of maint.	0.00117*** (2.77)	0.00770** (2.45)	0.00188 (1.09)	-0.00015 (-0.30)	0.00116*** (3.16)	0.01022*** (3.10)	0.00115 (1.56)	-0.00034 (-0.19)
House value 2 years earlier	0.00029 (1.18)	0.00093* (1.70)	0.00014 (0.18)	-0.00029 (-0.96)	0.00030 (1.15)	0.00133** (2.23)	0.00005 (0.08)	-0.00032 (-0.52)
Own business 2 years earlier	0.51797*** (12.33)	0.58835*** (6.45)	0.44409*** (4.81)	0.73519*** (7.87)	0.57745*** (12.36)	0.68449*** (5.83)	0.31451*** (4.94)	0.20980 (1.45)
Non-housing wealth 2 years earlier	-0.00020** (-2.29)	-0.00060** (-2.38)	0.01486* (1.85)	0.01696*** (3.70)	-0.00032** (-2.02)	-0.00108*** (-3.03)	0.00045 (0.80)	0.00082** (1.96)
City by Year FE	Y	-	Y	-	Y	-	Y	-
Prov. and Year FE	-	Y	-	Y	-	Y	-	Y
First Stage F-stat.	-	10.61	-	22.01	-	13.13	-	3.85
Observations	4726	2278	4086	1857	6328	2929	2482	1205
R-squared	0.349	-	0.328	-	0.411	-	0.259	-
Root MSE	0.357	0.446	0.272	0.193	0.338	0.490	0.354	0.298

Note: In columns 1–4, the sample is stratified based on whether the household's non-housing wealth two years earlier was above or below the median. In columns 5–8, the sample is stratified based on whether the survey respondent was employed or not two years earlier. T-statistics in parentheses are based on standard errors clustered at the city level. We use the same set of control variables as in the main Tables 3–4. House values are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

In Table 8c, we examine heterogeneity by whether the household holds a local *Hukou*. Columns 1–2 report the estimates for local residents and columns 3–4 for migrants. Migrants are an important group that draw special social and policy attention in China. Because of the financial burden, family ties in their hometown, and housing purchase restrictions from the *Hukou* system, many migrants choose to purchase their houses in their hometown instead of where they currently work and live. Thus, the behavioral response of migrants to housing wealth changes could be different. As expected, we find that the relationship between housing capital gains and entrepreneurship only holds for local residents. Overall, we show differential impacts of housing wealth changes on entrepreneurship across different demographic groups.

5.3. Robustness and additional specifications

In this subsection, we first conduct a set of exercises that further explore the robustness of our main results. Then, we experiment with alternative regression specifications that allow us to directly compare with several relevant studies.

In columns 1–2 of Table 9, we explore whether our main results are robust to alternative definitions of entrepreneurship. The dependent variable is defined as whether the respondent is self-employed.¹⁶ With this new definition of entrepreneurship,

¹⁶ The CHFS asks “What is the nature of your job?”. We treat the respondent as self-employed if the answer is “self-employed, start-up”.

Table 8c

Housing wealth changes and entrepreneurship—heterogeneity analysis.

	Local Residents		Migrants	
	OLS	IV	OLS	IV
Change in house value net of maint.	0.00132*** (3.32)	0.00920*** (2.61)	-0.00046 (-0.42)	-0.00021 (-0.05)
House value 2 years earlier	0.00048* (1.87)	0.00137* (1.69)	-0.00123*** (-3.03)	-0.00074 (-1.49)
Own business 2 years earlier	0.50657*** (11.69)	0.56146*** (5.97)	0.67508*** (10.40)	0.85089*** (6.02)
Non-housing wealth 2 years earlier	-0.00025** (-2.38)	-0.00079** (-2.03)	0.00078*** (3.36)	0.00039 (1.26)
City by Year FE	Y	-	Y	-
Prov. and Year FE	-	Y	-	Y
First Stage F-stat.	-	7.80	-	2.053
Observations	7706	3358	1106	777
R-squared	0.337	-	0.714	-
Root MSE	0.347	0.472	0.265	0.233

Note: The sample is stratified based on whether the household holds a local Hukou. T-statistics in parentheses are based on standard errors clustered at the city level. We use the same set of control variables as in the main Tables 3–4. House values are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

Table 9

Housing Wealth Changes and Entrepreneurship-Robustness.

	Self-employed		Alternative IV	
	OLS	IV	OLS	IV
Own business or self-employed 2 years earlier	0.43492*** (8.48)	0.46832*** (7.00)	0.54698*** (8.51)	0.60774*** (9.38)
Change in house value net of maintenance	0.00125*** (3.19)	0.00674** (2.38)	0.00123** (2.52)	0.00651 (1.49)
House value 2 years earlier	0.00060*** (3.41)	0.00128*** (2.75)	-0.00034 (-0.60)	0.00063 (0.66)
Non-housing wealth 2 years earlier	-0.00047** (-2.49)	-0.00091*** (-3.32)	-0.00030 (-1.35)	-0.00072** (-2.01)
City by Year Fixed Effect	Y	N	Y	N
Province Fixed Effect	N	Y	N	Y
Year Fixed Effect	N	Y	N	Y
First Stage F-stat.	-	14.24	-	5.97
Observations	8812	4135	2268	2268
R-square	0.281	-	0.386	-
Root MSE	0.310	0.396	0.361	0.403

Note: The dependent variable in columns 1–2 is whether the respondent is self-employed. The dependent variable in columns 3–4 is whether the household owns a business and we use a new IV of whether the household's primary house is below 90 square meters. We restrict the sample in columns 3–4 to households whose primary house's floor area is between 75 and 105 square meters. The sample T-statistics in parentheses are based on standard errors clustered at the city level. We use the same set of control variables as in the main Tables 3–4. House values are in 10,000 RMB. Significant at *10%, **5%, and ***1%.

entrepreneurship rate is about 13.8 percent. The OLS and 2SLS estimates are both very similar to our main results. In columns 3–4 of Table 9, we explore a new instrument that is based on exogenous household-level variation. Specifically, as pointed out in Li et al. (2020), the discontinuity in house size generated by Chinese housing policies can be used as an instrument for housing wealth changes. Houses with floor areas less than or equal to 90 square meters subject to lower down payment and property deed tax, and thus potentially have higher growth rate in price.¹⁷ Thus, we construct a new instrument of whether the household's primary house is below 90 square meters. This is essentially a regression discontinuity design. Following Li et al. (2020), we also restrict the sample to households whose primary house's floor area is between 75 and 105 square meters. The OLS and 2SLS estimates are very similar in magnitude to our main results, although the 2SLS estimate is only marginally significant.

Table 10 presents the results using various specifications based on Eq. (2). The sample includes both homeowners and renters. In column 1, we study how homeownership and city-level housing price level affect entrepreneurship. This is the model specification used in Li and Wu (2014). Similar to their study, we also find that higher city-level housing price discourages entrepreneurship overall.¹⁸

¹⁷ We refer the readers to Li et al. (2020) for details of the policy and construction of IV.

¹⁸ Note that in Li and Wu (2014), they either do not include fixed effects or use province fixed effects. Because we use city-level housing price index instead of actual housing price, the magnitude of the estimates cannot be compared directly.

Table 10
Housing Price and Entrepreneurship—Homeowners and Renters.

	OLS	OLS	OLS	IV
Own business 2 years earlier	– –	0.44120*** (7.06)	0.44365*** (6.79)	0.44807*** (6.83)
Own home 2 years earlier	–0.04665 (−0.81)	0.05892 (0.92)	0.08968 (1.29)	0.07658 (0.82)
Change in HPI	– –	0.65683 (0.51)	– –	5.28277 (1.26)
ΔHPI*Own home 2 years earlier	– –	– –	−0.84083** (−2.21)	−0.19459 (−0.08)
Non-housing wealth 2 years earlier	0.00024*** (3.78)	−0.00000 (−0.03)	−0.00007 (−0.89)	−0.00010 (−0.82)
HPI	−0.00626** (−2.33)	– –	– –	– –
Province and Year FE	Y	Y	–	Y
City by Year FE	–	–	Y	–
First Stage F-stat.	–	–	–	11.41
Observations	5908	5908	5908	5908
R-squared	0.189	0.322	0.334	–
Root MSE	0.394	0.361	0.359	0.361

Note: T-statistics in parentheses are based on standard errors clustered at the city level. We use the same set of control variables as in the main Tables 3–4. The sample includes both homeowners and renters. The first three columns are linear probability regressions, the last column instruments the change in HPI and the interaction between the change in HPI and homeownership using the structural break and the interaction between the structural break and homeownership. Significant at *10%, **5%, and ***1%.

The impact is statistically significant. Relative to renters, homeowners are less likely to own a business, but the difference is not statistically significant. The negative impact of housing price could be caused by city-level unobservables in this specification. In column 2, we slightly adjust the specification by controlling for lagged business ownership and looking at the impact of the change in HPI. This specification controls for lagged business ownership and is more similar to the model in Harding and Rosenthal (2017). We find that city-level housing price changes increase entrepreneurship overall, even though it is not statistically significant. This is more consistent to our expectation. In general, columns 1–2 show that the difference between studies is caused by specification difference.

In columns 3–4, we follow the specification in Harding and Rosenthal (2017). Column 3 further includes the interaction between the change in HPI and homeownership and controls for city by year fixed effects. The results suggest that homeowners are less likely to become entrepreneurs when housing price increases relative to renters. Column 4 instruments the change in HPI and the interaction between the change in HPI and homeownership using the structural break in HPI and the interaction between the structural break and homeownership. The IV results show that homeowners do not respond to housing price appreciation differently relative to renters. Overall, there is some evidence that homeowners are less likely to become entrepreneurs when housing price increases relative to renters. Note that the coefficient estimates on lagged business ownership and lagged homeownership are very similar to those in Harding and Rosenthal (2017), which is assuring.

In sum, the results in Table 10 suggest two things. First, the different results between studies are mainly due to the difference in specifications. Thus, it is important to consider potential confounding factors and how to address them with proper econometric modeling. Second, renters are not a good comparison group for homeowners in China because of the very high homeownership rate. Thus, we need to consider alternative identification strategies when studying this topic in the context of China.

6. Conclusions

China's housing market has experienced substantial structural changes in recent decades including housing privatization reform and subsequent continuous and dramatic housing price appreciation. Those structural changes in the housing market are believed to have profound consequences on various household decisions and spillovers outside of the housing market. In this paper, we study the impact of household-level housing wealth changes on entrepreneurship in urban China. Exploiting the 2011–2015 China Household Finance Survey, we show that a 10,000 RMB increase in housing wealth increases the propensity of households becoming business owners by about 0.7 percentage points in IV estimation. Housing capital gains boost business entry but do not have significant effects on business exit. The effect we find is larger for households that are older, higher educated, wealthier, previously employed or holding local *Hukou*. In addition, we provide evidence for several underlying mechanisms that housing capital gains alleviate household credit constraints, reduce risk aversion and increase awareness of financial information.

The results in our paper suggest that the linkage between housing wealth changes and entrepreneurship that other studies find in developed countries is also important in China. We think the housing boom in China since the early 2000s generates significant spillovers on business startups and has important implications on economic growth. The institutional features of China and rich information from the CHFS data also provide opportunities for us to shed light on the underlying mechanisms. Our results provide incentives for the government to promote a healthy housing market and justify the government's efforts in providing accessible credit, business consulting, and financial training to startups.

Note: The figures are based on the authors' estimation of structural breaks in HPI for selective cities using monthly HPI from the

National Bureau of Statistics of China. The left column shows cities with relatively large estimated structural breaks, and the right column shows cities with relatively small breaks.

Note: This figure presents the correlations between the estimated structural break and lagged levels of or changes in city attributes. T-statistics in parentheses.

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Appendix A

Table A.1
First-stage Regressions for [Table 4](#).

	(1)	(2)	(3)
Structural break in HPI		1977.54297*** (3.73)	2779.39169*** (3.23)
Developable land*HPI	-0.03093** (-2.12)		-0.00528 (-0.86)
Own business 2 years earlier	-2.02761 (-0.28)	-7.44459 (-1.00)	-1.97119 (-0.28)
House value 2 years earlier	-0.10367 (-0.92)	-0.11390 (-1.57)	-0.11925 (-1.04)
Non-housing wealth 2 years earlier	0.06153 (1.13)	0.04773* (1.69)	0.05590 (1.15)
Age	-3.51549** (-2.28)	-4.17213*** (-2.96)	-3.65280** (-2.40)
Age Squared	0.03419** (2.05)	0.04137*** (2.75)	0.03578** (2.18)
Female	-3.42513 (-0.63)	-3.44446 (-0.71)	-2.97339 (-0.57)
Married	7.37320 (1.27)	10.06974** (2.23)	7.72738 (1.37)
Number of children under 13	-3.61781 (-0.76)	-0.44800 (-0.09)	-4.05677 (-0.85)
Number of elderlies	-0.60685 (-0.41)	1.58361 (1.26)	-0.80450 (-0.56)
Junior high school	-4.13051 (-1.35)	0.29130 (0.12)	-3.95058 (-1.30)
High school and some college	13.44499** (2.09)	13.03274* (1.90)	13.32524** (2.10)
College and above	14.65084* (1.89)	12.62115 (1.55)	13.35305 (1.66)
Has a disabled member	7.58276 (0.97)	6.79555 (1.19)	7.63318 (0.99)
Local Hukou	6.50501 (0.64)	4.35681 (0.47)	9.09382 (0.91)
Province Fixed Effect	Y	Y	Y
Year Fixed Effect	Y	Y	Y
Observations	3720	4135	3720
R-squared	0.216	0.204	0.228

Note: This table reports the first-stage regression estimates for the 2SLS regressions in [Table 4](#). The dependent variable is the change in housing value net of maintenance and remodeling expenditures. T-statistics in parentheses are based on standard errors clustered at the city level. Significant at *10%, **5%, and ***1%.

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