

Article

The Impact of Curbing Housing Speculation on Household Entrepreneurship in China

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Abstract: We document a speculation channel and complement the well-documented collateral channels by offering novel evidence about the effect of curbing housing speculation policies. We estimate the positive effect of discouraging housing speculation on household entrepreneurship in China. By exploiting the city-level variations in the stringency of home purchase restrictions between 2011 and 2019 and five waves of China Household Finance Survey (CHFS) data, we find that discouraging housing speculation significantly increases the likelihood of local households starting a business. To address endogeneity concerns, we exploit plausibly exogenous variation using IV estimations and DID research design. The positive effect is stronger for local multiple-home owners, homeowners without mortgage debt, households with previous entrepreneurial experience, households of risk-loving, and households with large assets. This conclusion is robust with city-level evidence. In the mechanism discussion, we find that discouraging housing speculation significantly reduces the likelihood and the plans of local households to purchase new homes and lowers the house price expectations of local households (thus the opportunity cost of starting a business). We also provide evidence supporting the view that discouraging housing speculation increases entrepreneurial opportunities, innovative development, and local households' social network investments, all of which contribute to starting a business. The results imply that policies to curb housing speculation can lead to beneficial spillover on entrepreneurship and the local economy, as well as contribute to the sustainability of economic growth.

Keywords: entrepreneurship; housing speculation; home purchase restrictions; house price expectation; Innovative development



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1. Introduction

Entrepreneurship is an important driver of economic development (Household entrepreneurship is recognized as vital to sustainable economic development and reducing unemployment. Household entrepreneurship is usually defined by criteria or combinations of criteria including household ownership, management by a household member, operational involvement of household members, and household member involvement across generations [1–3]. Many studies emphasize the important role of factors such as local social and economic endowments [4], wealth level [5], liquidity constraints [6], education level [7], and social capital [8] on entrepreneurship. With the global housing market boom in recent years, the relationship between housing and household entrepreneurship has attracted the attention of many scholars. On the one hand, rising housing prices may promote household entrepreneurship through the wealth channel or collateral channel [9–11]. On the other hand, housing mortgage debt diminishes the likelihood of entrepreneurship by amplifying risk aversion [12].

Existing studies commonly associate rising house prices with increased entrepreneurship in the U.S. and France, primarily through the established collateral channel, as noted by [9,10,13]. This framework suggests that entrepreneurs can leverage their housing assets to secure home equity loans, alleviating the credit constraints imposed by informational asymmetries encountered when launching new ventures [14] (Robb and Robinson, 2014), a concept originally articulated by [15] (Nevertheless, certain studies indicate that the observed relationship may be either non-linear or of limited economic significance, as summarized by [16], who utilized different data sets or examined periods of housing market booms). There are some other studies suggesting that a household's preference for housing investment or speculation may also crowd out household entrepreneurship, especially in developing countries like China, where housing is considered an important way to accumulate wealth [17,18]. However, few studies in the literature explicitly examine the causal relationship between housing speculation and household entrepreneurship (While this beneficial impact of house price growth on the initiation of new businesses has been validated by subsequent studies, the investigation mainly focuses on how homeownership facilitates alleviating credit restrictions, but the effect of speculation channels such as curbing housing speculation policies is under-explored). To fill this gap, we exploit a quasi-natural experiment on home purchase restrictions in China, to examine household entrepreneurship choices when their housing speculative demand is suppressed. We note that the speculation channel does not contradict but rather supplements the existing body of entrepreneurship literature focused on the collateral channel.

In the mid-2000s, driven by low interest rates, housing speculation emerged as a widespread activity [19,20]. This trend in housing speculation contributed to housing market dynamics and is also a widely recognized contributor to the expansion of credit to subprime borrowers during the same period—a factor identified by [21,22] as a primary catalyst of the housing market boom. Refs. [23,24] examine the role of zoning laws, land-use regulations, and other factors that restrict housing supply, leading to increased prices and potentially encouraging speculative investment in housing markets. Ref. [25] investigates the link between housing supply elasticity and the propensity for encountering housing bubbles, suggesting that markets characterized by substantial supply limitations are more prone to experience speculative bubbles. Ref. [26] explores how the shift towards treating housing as a financial asset affects urban development, housing policies, social inequalities, and financial instability. This shift contributes to speculative investment practices that inflated housing markets and led to the crisis [27]. Ref. [20] posits that housing speculation significantly impacted the economy both during the boom and the recession. During the boom, it led to higher housing prices and stimulated local economies. In the recession, it had detrimental effects, including a decline in residential construction jobs due to excess supply and a decrease in local household demand.

While there are common drivers behind housing speculation globally, the manifestation and impact of these trends can vary widely between countries. Following the global financial crisis, a significant surge in housing prices was observed across many Chinese cities, initiated by policies aimed at stimulating the economy since 2009. This phenomenon was particularly pronounced in mega cities like Beijing, where the price-to-rent ratios soared above 50 by 2012, indicating substantial market risk [28].

To curb housing speculation, in April 2010, the Chinese central government urged cities where housing prices were rising rapidly to limit the number of houses a household could purchase (home purchase restriction, HPR hereafter). The HPR has been adopted in major cities in China for over ten years and has been shown to be effective in cooling down the heated housing market [29,30] (In response to these escalating housing prices and to cool down the overheated markets, the central government of China explicitly required the local governments of cities with overheated housing markets to implement the HPR policy [31,32]). The HPR policy imposes different rules on local households and non-local households. Generally, local households could buy up to two houses in the local city, while non-local households are allowed to buy up to one house if they have paid local social

insurance or income tax for at least 1 to 5 years. We focus on the entrepreneurship response of local households rather than non-local households because the non-local households' willingness to stay in the local city is heterogeneous and unobservable, which directly affects their decisions about home purchases and entrepreneurship choices. We further limit the urban local households to the local households who had been registered with local *hukou* before 2010, the initial adoption year of HPR, since the self-selection of city *hukou* by households may correlate with local HPR stringency (If the family wants to buy a house in the city, the higher the city's HPR stringency on non-local households is, the more likely the family wants to obtain local *hukou*. Meanwhile, the city's HPR stringency on local households is usually correlated with the city's HPR stringency on non-local households).

We use the city-level stringency on home purchase restrictions on local households as a measurement of restraining housing speculation. We focus on the period from 2010, the landmark year of curbing housing speculation, up until the spread of COVID-19 pandemic (The onset and spread of COVID-19 have left few households' entrepreneurship unaffected. While a large number of start-ups have suffered during the pandemic, COVID-19 has also led to an increase in entrepreneurial activity [33,34], which could potentially contaminate our results). Since the home purchase restrictions were introduced in 2010, there are seven dimensions of policy stringency differences that shape the overall HPR stringency level of different HPR cities over the years between 2010 and 2019, including (1) whether the purchase restriction is applied to additional houses regardless of the number of houses a household currently owns or applied to the maximum number of houses a household could purchase in a city; (2) whether the purchase restriction is applied to houses located in all districts of a city or designated areas of a city; (3) when checking the maximum number of houses a household could purchase, whether a household's houses located in all districts of a city count or only houses located in designated areas of a city count; (4) whether the households holding *hukou* in suburban districts of a city could purchase houses located in the municipal districts of a city (To curb housing speculation, since 2011, a few cities, such as Hangzhou, have stated in a HPR announcement that local households holding *hukou* of suburban districts in Hangzhou were not allowed to buy houses located in municipal districts of Hangzhou unless they had proof of paying social insurance or income tax for a certain number of years in municipal districts of Hangzhou); (5) whether the purchase restriction is applied to both newly-built and second-hand houses or only to newly-built houses; (6) whether the purchase restriction is applied to houses of any size or those with a floor area below a certain size; and (7) whether there is a stricter restriction on household heads who have single marital status. We measure the stringency value in each dimension based on details of each HPR city in each year; then, we use several methods to weigh these seven dimensions and obtain an overall HPR stringency level for each HPR city in each year from 2010 to 2019.

The exogenous change in curbing housing speculation since 2010 provides an excellent opportunity to study how curbing housing speculation affects household entrepreneurial activities. It will help predict how household entrepreneurship is affected during the curb-relax cycles in the coming decades, which is particularly important for the largest developing country in the world. In alignment with the exogenous change in housing speculation, this study will leverage data pertaining to the local households in the HPR cities.

Based on five waves of household-level data from the China Household Finance Survey (CHFS) between 2011 and 2019, we use the city-level HPR stringency on local households as the key explanatory variable and exploit two-way fixed-effect specifications to identify the causal relationship between the HPR and household entrepreneurship. We control household-fixed effects and year-fixed effects, as well as a set of household-level and city-level variables. Considering that China's housing regulation policies from 2010 to 2019 also include housing mortgage down payment limits, housing resale limits, and housing taxation measures, all of which may affect household entrepreneurship, we further control two city-level variables: the housing mortgage limit and the housing resale limit (From 2010 to 2015, the policy changes for deed taxes and housing capital gain taxes

were unified across the nation. We control year-fixed effects to mitigate any possible bias. On 17 February 2016, the central government announced that all cities, except Beijing, Shanghai, Guangzhou, and Shenzhen, would implement new deed tax preferential policies and capital gain tax preferential policies without distinguishing ordinary housing (Caishui [2016] No. 23), while the deed tax and capital gain tax provisions of these four first-tier cities are still implemented following the provisions on distinguishing ordinary housing (Caishui [2015] No. 39). Ordinary housing generally means dwelling units with a floor area equal to or less than 144 square meters in China. In the robustness check, we try to remove samples of four first-tier cities and keep samples between 2011 and 2015 to re-estimate. Both results are robust. A major challenge in the entrepreneurship literature is the omitted variable concern that entrepreneurship is likely endogenous with unobservable local economic fundamentals such as economic conditions and local demand (Kerr et al., 2015). The causality might also run from entrepreneurial activities to the housing speculation, i.e., intensive entrepreneurial behavior leads to employment expansion and real estate markup, and further results in speculating behavior. We address these concerns by instrumenting the local HPR stringency with the above two instrumental variables. In addition, we focus on the period 2010–2019 to eliminate the possible other confounding effects of other factors such as the onset and spread of the COVID-19 pandemic). Furthermore, to mitigate a concern that some unobserved common factors that correlate with the local HPR stringency and household entrepreneurial choices may cause estimation bias, we use two instrumental variables for the local HPR stringency, including the interaction of city housing supply elasticity and long-term interest rate, and the lagged city construction land supply per capita (A major challenge in the entrepreneurship literature is the omitted variable concern that entrepreneurship is likely endogenous with unobservable local economic fundamentals, such as economic conditions and local demand (Kerr et al., 2015). The causality might also run from entrepreneurial activities to the housing speculation, i.e., intensive entrepreneurial behavior leads to employment expansion and real estate markup, and further results in speculating behavior. We address these concerns by instrumenting the local HPR stringency with the above two instrumental variables. In addition, we focus on the period 2010–2019 to eliminate the possible other confounding effects of other factors such as the onset and spread of the COVID-19 pandemic).

Both two-way fixed-effect results and IV results indicate that the HPR significantly increases the likelihood of local households starting a business. For heterogeneous households, this effect is bigger for multiple-home owners, homeowners without mortgages, households with entrepreneurial experiences, households of risk-lovers, and households with large assets. In the mechanism discussion, we find that discouraging housing speculation significantly reduces the likelihood and the plans of local households to purchase new homes and lowers the house price expectations of local households (thus the opportunity cost of starting a business). We show that discouraging housing speculation significantly increases the opportunities for entrepreneurship and innovative entrepreneurship, suggesting that discouraging housing speculation increases entrepreneurial opportunities and innovative development. We provide additional evidence supporting the view that discouraging housing speculation increases local households' social network investments, which contribute to starting a business.

Our conclusion is robust with a series of robustness checks. We find that discouraging housing speculation significantly increases the enterprise income, the enterprise assets, the number of projects, and the number of employees of local households that have already been operating businesses. We also provide city-level evidence demonstrating that the impact of curbing housing speculation significantly increases the number of urban newly registered industrial and commercial enterprises.

As a robustness check, we use another identification strategy, the difference in difference method. We regard the local households in third- or fourth-tier cities that did not implement the HPR from 2011 to 2015 but implemented the HPR on local households from 2016 to 2019 as the treatment group. The local households in third- or fourth-tier

cities that never imposed the HPR on local households from 2011 to 2019 are regarded as the control group (With this research design, firstly, we can obtain a relatively long pre-treatment period (2011–2015) to perform a parallel trend test between the treatment group and the control group when the CHFS data have been available since 2010. Secondly, the economic development level, house price level, and household characteristics among third- or fourth-tier cities are more comparable. The first- and second-tier cities in China mostly started the HPR in the first round of the HPR policy (2011–2015) and resumed the HPR in the second round of the HPR policy (since 2016). Some third- or fourth-tier cities began to adopt the HPR in 2016, while others did not. Considering this situation, a comparison among third- or fourth-tier cities is more appropriate). The DID estimation results are consistent with our main results, suggesting that our conclusion is robust.

The main contributions of this paper are as follows. Firstly, this paper expands the literature on the economic effects of housing regulation policies, especially home purchase restrictions in China. The existing literature focuses on the housing market responses to the HPR [29,30,32,35,36], the firm innovation responses to the HPR [37,38], and the labor market responses to the HPR [39](Sun et al., 2021). This study is among the first to link home purchase restrictions to household entrepreneurship. The positive impact of the HPR on household entrepreneurship adds to the understanding of the economic stimulus effects of housing speculation interventions.

Second, this paper provides empirical evidence on the speculation channel between the relationship of housing and household entrepreneurship. The existing literature mainly emphasizes the positive wealth effect or collateral effect of housing prices on household entrepreneurship [9–11], and the crowding-out effect of mortgage debt on household entrepreneurship [12]. In China, many studies suggest that households' preferences about housing investment or speculation play a crucial role in crowding out household entrepreneurship. Ref. [17] argue that high housing prices would increase the attractiveness of real estate investment to homeowners and crowd out their entrepreneurial choices. Ref. [18] find that for households that own houses, the expected rise in housing price significantly reduces the probability of starting a business. By exploiting a quasi-natural experiment on home purchase restrictions in China, this paper provides strong empirical evidence that housing speculation crowds out household entrepreneurship.

Third, this paper enriches the literature on the negative economic consequences of housing speculation. Many studies in the literature reveal that housing speculation in the United States causes more drastic fluctuations in housing prices [40], higher mortgage default rates [41], and higher fluctuations of local economic activities during the housing boom and bust [20]. In China, the over-investment in the real estate industry brought on by the housing boom discourages corporate innovation [38,42] and reduces corporate total factor productivity [43,44]. Our study indicates a strong positive effect of home purchase restrictions on household entrepreneurship. By providing evidence at the household-level, our study works as a necessary supplement to the literature regarding the negative economic impact of housing speculation.

The remainder of the paper is organized as follows. Section 2 introduces the institutional background of the HPR in China and the measurement of HPR stringency. Section 3 describes the data and empirical methods. Section 4 presents the empirical results, heterogeneity analysis, and potential explanations. Section 5 conducts a series of robustness checks. Section 6 reports the DID method estimations. Section 7 concludes the paper.

2. Institutional Background and the Measurement of HPR Stringency

2.1. Institutional Background of HPR Policy in China

With the introduction of China's CNY four trillion stimulus package in 2008 and a series of housing stimulus policies in 2009, housing prices in some Chinese cities rose rapidly [45,46]. To curb the overheated housing market, On 14 April 2010, the central government announced the "New National Tenth" (Guofa [2010] No.10) to urge cities where housing prices were rising rapidly to limit the number of houses a household could

purchase. Following this directive, around seventeen Chinese cities began to restrict local households from buying an additional house.

On 27 January 2011, the central government strengthened home purchase restrictions (Guofa [2011] No.1). Cities with rapidly increasing housing prices are required to restrict local households from buying a third home and non-local households from buying a second home. Moreover, non-local households need to provide proof of paying social insurance or income tax in the local city for at least one to five years to qualify for their first home purchase. Up to the end of 2011, there was a total of 46 Chinese cities (mostly the first-tier and second-tier cities) adopting home purchase restrictions.

With the austere home purchase restrictions and other tightening financial and transaction-tax restrictive measures, the housing market in most HPR cities experienced a cooling down at the end of 2013. Except for the four first-tier cities (Beijing, Shanghai, Shenzhen, and Guangzhou) and a tourist city (Sanya), all other HPR cities cancelled home purchase restrictions in 2014.

In 2015 and the first half of 2016, the central government introduced a series of housing policies to stimulate the housing market. On 30 March 2015, Individuals would be exempt from the housing business tax if they were to sell an ordinary house (The ordinary house generally refers to a home unit with floor area below 144 square meters in a residential area with FAR above 1.0, and with a transaction price less than 1.2 times the average transaction price of housing on the same level of land. For more specified standards of an ordinary house, see State Council document 26 from 2005) that has been held for more than two years (Caishui [2015] No. 39). On 30 September 2015, in cities without HPR measures, the minimum down payment ratio of first-home buyers purchasing an ordinary house was adjusted to no less than 25%. On 2 February 2016, in cities without HPR measures, the minimum down payment ratio of first-home buyers and second-home buyers was reduced to 20% and 30%, respectively. On 22 February 2016, except for the four first-tier cities, individuals in other cities would be exempt from housing capital gain tax if they were to sell a house that has been held for more than two years (Caishui [2016] No. 23). Meanwhile, in cities other than the four first-tier cities, a deed tax would be levied at a reduced rate of 1% for individuals who purchased a second home with an area of 90 square meters or less; if the area is more than 90 square meters, the deed tax would be levied at a reduced rate of 2% (Caishui [2016] No. 23).

Affected by these relaxed policies, housing prices in some major cities had shown a trend of rapid rise. Since 2016, many second-tier cities have resumed home purchase restrictions, and some third- and fourth-tier cities have begun to adopt home purchase restrictions to curb overheated local housing markets. Overall, this round of local HPR policies, though generally restricting the third-home purchase of local households, have relatively more relaxed and diversified restrictions.

2.2. The Measurement of HPR Stringency

By manually collecting the official documents of HPR cities that adopted the HPR on local households between 2010 and 2019, we find that there are seven dimensions of differences in home purchase restrictions on local households in the Table 1.

Firstly, for the restrictions on the number of houses a household could purchase, we sort and order the five types of local restrictions and assign stringency values 1, 2, 3, 4, and 5, respectively: allow the purchase of two additional houses regardless of the number of houses a household currently owns; allow the purchase of one additional house regardless of the number of houses a household currently owns; prohibit the purchase of a fourth home; prohibit the purchase of a third home; and prohibit the purchase of a second home (From the perspective of curbing housing speculation, it is assumed that allowing the purchase of additional houses is less stringent than prohibiting the purchase of a fourth home). A higher value indicates a higher stringency on this dimension.

Secondly, for the restrictions on the location of houses, we sort and order the two types of local restrictions and assign stringency values 1, 2, and 3, respectively: the purchase

restriction only applies to houses located in designated areas of the municipal districts of a city (The size of designated areas cannot be compared directly. For example, the HPR of Shenyang city in 2011 only applies to houses located inside the second ring road; the HPR of Chengdu city in 2011 only applies to six selected districts of the city); the purchase restriction only applies to houses located in the municipal districts of a city; and the purchase restriction applies to houses located in all districts of a city (all municipal and suburban districts). A higher value indicates a higher stringency on this dimension.

Table 1. Quantifying rules of home purchase restrictions on local households.

Dimensions	Requirements
(1) The restriction on the number of houses a household could purchase	1: allow purchase of two additional houses, regardless of the number of houses a household currently owns. 2: allow purchase of one additional house, regardless of the number of houses a household currently owns. 3: prohibit the purchase of a fourth home. 4: prohibit the purchase of a third home. 5: prohibit the purchase of a second home.
(2) The restriction on the location of houses	1: the purchase restriction is only applied to houses located in designated areas of the municipal districts of a city. 2: the purchase restriction is only applied to houses located in the municipal districts of a city. 3: the purchase restriction applies to houses located in all districts of a city.
(3) The restriction on the scope of checking houses owned by households	1: only houses owned by households located in designated areas of the municipal districts of a city count (For the type of home purchase restrictions that are applied to additional housing units regardless of the number of housing units a household currently owns, there is no need to look into the number and location of houses in a household. In this dimension, we assign a value of 1 to this type in order to represent the lowest stringency compared with the type of home purchase restrictions that are applied to the maximum number of housing units a household can own in a city). 2: only those located in the municipal districts of a city count. 3: those located in all districts of a city count.
(4) The restriction on local households holding <i>hukou</i> in suburban districts of a city	1: households holding <i>hukou</i> in suburban districts of a city are allowed to purchase houses in municipal districts of a city. 2: households holding <i>hukou</i> in suburban districts of a city are not allowed to purchase houses in municipal districts of a city unless they have proof of income tax or social insurance payment in municipal districts of a city for certain years.
(5) The restriction on the type of houses	1: the purchase restriction only applied to newly built houses. 2: the purchase restriction applies to both newly built and second-hand houses.
(6) The restriction on the size of houses	1: the purchase restriction applies to houses with a floor area less than or equal to 90 square meters. 2: the purchase restriction applies to houses with a floor area less than or equal to 144 square meters. 3: the purchase restriction applies to houses with a floor area less than or equal to 180 square meters. 4: the purchase restriction applies to houses of any size.
(7) The restriction on households with household heads being single	1: there is no further restriction on households with a household head who is single. 2: there is a further restriction on households with a household head who is single.

Notes: Detailed information on the HPR is manually collected by the authors from the official websites of 60 local governments. A higher assigned value indicates a higher stringency on each dimension.

Thirdly, when checking the maximum number of houses a household could purchase, for the restrictions on the scope of checking on houses owned by households, we sort and order the three types of local restrictions and assign stringency values 1, 2, and 3, respectively: only a household's houses located in designated areas of the municipal districts of a city count; only houses located in the municipal districts of a city count; and houses located in all districts of a city (all municipal and suburban districts) count. A higher value indicates a higher stringency on this dimension.

Fourthly, for the restrictions on the local households holding *hukou* in suburban districts of a city, we sort and order the two types of local restrictions and assign stringency

values 1 and 2, respectively: households holding *hukou* in suburban districts of a city are allowed to purchase houses in the municipal districts of a city; households holding *hukou* in suburban districts of a city are not allowed to purchase houses in the municipal districts of a city unless they have proof of income tax or social insurance payment in municipal districts of a city for a certain number of years. A higher value indicates a higher stringency on this dimension.

Fifthly, for the restrictions on the type of houses, we sort and order the two kinds of local restrictions and assign stringency values 1 and 2, respectively: the purchase restriction only applies to newly built houses; and the purchase restriction applies to both newly built and second-hand houses. A higher value indicates a higher stringency on this dimension.

Sixthly, for the restrictions on the size of houses, we sort and order the four types of local restrictions and assign stringency values 1, 2, 3, and 4, respectively: the purchase restriction only applies to houses with a floor area less than or equal to 90 square meters; the purchase restriction only applies to houses with a floor area less than or equal to 144 square meters; the purchase restriction only applies to houses with a floor area less than or equal to 180 square meters; and the purchase restriction applies to houses with a floor area of any size. A higher value indicates a higher stringency on this dimension.

Lastly, for the restrictions on local households with household heads who are single, we sort and order the two types of local restrictions and assign stringency values 1 and 2, respectively: there is no further restriction on households with household heads who are single, and there is a further restriction on households with household heads who are single (Specifically, several cities put a restriction on the second-home purchase of a household head who is single and restrict the purchase of a third home for household heads who are married). A higher value indicates a higher stringency on this dimension.

Combining the seven-dimension stringency of local HPR cities, we are able to measure the local HPR stringency for each year between 2010 and 2019. We mainly use the entropy method to construct the local HPR stringency value and use the other three constructing methods as robustness checks: the PCA method (principal component analysis), the equal-weight method, and the multiplication method (principal component analysis (PCA) is a statistical method that converts the seven dimensions of the purchase restriction policy into a set of linearly uncorrelated principal components through an orthogonal transformation and carries out objective weighting. The equal-weight method is a statistical method that assigns equal weights to the seven dimensions and performs a weighted average. The multiplication method regards the first dimension (restrictions on the number of housing units a household could purchase) as the most important indicator while the other six dimensions are additional indicators; thus, we use the value of dimension (1) multiplied by the sum of the values of the other six dimensions). The entropy method is a commonly used technique to determine the weights of different indicators based on their information entropy. The smaller the information entropy value of the indicator is, the greater the dispersion degree is, and the greater the weight of the indicator on the comprehensive evaluation is. Among the seven indicators in this study, the entropy method assigns the highest weight (0.162) to “the location of houses under purchase restriction”, and the lowest weight (0.133) to “the restriction on the size of houses”.

Table 2 reports the summary statistics of local HPR stringency values between 2010 and 2019.

Table 2. 2010–2019 average HPR stringency for local households in HPR-cities.

Year	(1) Number	(2) Area	(3) Checked Area	(4) Suburban <i>hukou</i>	(5) Type	(6) Size	(7) Single	Entropy	PCA	Equal- Weight	Multipli- cation	Number of HPR-Cities
2010	2.29	2.65	1.35	1.00	2.00	4.00	1.00	0.68	1.80	0.65	28.00	17
2011	3.81	2.10	2.43	1.07	1.98	3.88	1.00	0.75	1.98	0.72	47.62	42
2012	3.76	2.09	2.41	1.07	1.96	3.89	1.02	0.75	1.98	0.72	47.04	46
2013	3.76	2.13	2.41	1.07	1.96	3.89	1.04	0.75	1.99	0.72	47.30	46

Table 2. Cont.

Year	(1) Number	(2) Area	(3) Checked Area	(4) Suburban <i>hukou</i>	(5) Type	(6) Size	(7) Single	Entropy	PCA	Equal- Weight	Multipli- cation	Number of HPR-Cities
2014	4.00	2.33	2.67	1.00	2.00	4.00	1.33	0.80	2.13	0.77	53.33	6
2015	4.00	2.60	3.00	1.00	2.00	4.00	1.40	0.84	2.21	0.80	56.00	5
2016	3.83	2.11	2.72	1.06	1.72	3.67	1.22	0.76	2.01	0.72	47.78	18
2017	3.82	2.03	2.39	1.03	1.82	3.85	1.27	0.75	2.00	0.72	47.21	33
2018	3.85	1.92	2.28	1.03	1.82	3.82	1.21	0.73	1.96	0.70	46.23	39
2019	3.85	1.92	2.28	1.03	1.82	3.82	1.23	0.73	1.96	0.70	46.33	39

Notes: Detailed information on the HPR is manually collected by the authors from the official websites of local governments. The HPR cities here do not include cities that only set restrictions to non-local households.

3. Data and Method

3.1. Data and Summary Statistics

The household-level data used in this study are from the China Household Finance Survey (CHFS), a nationally representative survey based on a stratified three-stage probability proportional to size (PPS) random sampling design. This survey has been conducted every other year since 2011. We use household samples from the 2011, 2013, 2015, 2017, and 2019 waves of the CHFS, which cover 8438, 28,143, 37,289, 40,011, and 34,643 households, respectively. The CHFS contains rich information on household occupational status and entrepreneurial activities, and detailed household finance information, including housing status, housing assets, mortgage information, income, expenditure, business assets, financial assets, and debt. This survey also provides rich demographic information such as household size, old dependent ratio, young dependent ratio, and detailed demographic characteristics of household heads such as age, gender, marriage status, and years of schooling. Compared with other micro databases, the CHFS encompasses more detailed information on the housing status of households, which provides strong support and facilitates our research.

We restrict our sample to urban local households in cities that adopted the HPR on local households between 2010 and 2019. The sample only includes urban households since rural households face different housing situations when their homes are mostly self-built on land that is collectively owned by village communities. We further restrict the urban local households to the local households who had been registered with local *hukou* before 2010, the initial adoption year of the HPR, since the self-selection of city *hukou* by households may correlate with the local HPR stringency and cause estimation bias (If the family wants to buy a house in the city, the higher the city's HPR stringency on non-registered households is, the more likely it is that the family wants to obtain local household registration. Meanwhile, the city's HPR stringency on local households is usually positively correlated with the city's HPR stringency on non-local households). To focus on the population of working age, we restrict the sample to households whose head is between 18 and 65 years old. We define household entrepreneurship based on the CHFS question "Does the family operate any industrial and commercial production and management projects". We construct a binary variable that equals 1 if the answer is "Yes" and equals 0 with "No" answers. This definition of entrepreneurship includes self-employment, small handicraft businesses, and other businesses.

We use data on household characteristics from the CHFS to generate a set of control variables that may correlate with household entrepreneurial activities. The household characteristics include total income, housing assets, non-housing assets, housing debt, non-housing debt, household size, the proportion of old dependents (over the age of 65), the proportion of young dependents (under the age of 18), the health status of household members (a binary variable equals 1 if there is any unhealthy household member), and household head information including age, years of schooling, gender, marriage, and health insurance (a binary variable equals 1 if the household head has health insurance). We also control a series of city-level characteristics such as the average housing price, GDP

per capita, population density, fixed investment per capita, investment in real estate as a share of GDP, the proportion of the tertiary industry, and college enrollments as a share of the population. The data on city average housing prices are from the China Real Estate Index System (CREIS); other city-level data are from the China City Statistical Yearbook (2011–2018).

Besides the home purchase restrictions, China's housing regulation policies from 2010 to 2019 also included housing mortgage limits, housing resale limits, and housing taxation measures, all of which may have an impact on household entrepreneurship. We add two city-level control variables to mitigate the possible impact of these regulation policies on our empirical identification, including the housing mortgage limit and the housing resale limit. We define the variable of housing mortgage limit as the average minimum down payment of two types of housing loans (second-home purchase with an outstanding mortgage on the first home, and second-home purchase without an outstanding mortgage on the first home) in each city from 2011 to 2019 (The central government required that a housing mortgage not apply to a third-home purchase. From 2010 to 2014, the limits on the down payment ratio were homogeneous nationwide (Guofa [2010] No. 10, Guofa [2011] No. 1). In 2015, in cities without an HPR policy, the minimum down payment ratio of the second home without the outstanding mortgage of the first home was adjusted to no less than 30%. Since 2016, there has been more variation in the down payment ratio of housing loans among HPR cities). The policy of housing resale limit has been adopted in some cities since 2017, which prohibits homeowners from selling their properties within a lock-in period (1–5 years) upon purchase. We define the variable of housing resale limit as the product of lock-in years (a numerical variable) and a binary variable of resale limit scope (which equals 0.5 if the policy is limited in some districts of a city and equals 1 if the policy is limited in all districts of a city). Finally, housing taxation measures from 2010 to 2019, which include capital gain tax (*Ying Ye Shui* or *Zeng Zhi Shui*) on house transfers and transaction tax (*Qi Shui* or deed tax) on house purchases, are relatively uniform nationwide (From 2010 to 2015, the policy changes on deed tax and capital gain tax on housing transfers were homogeneous nationwide. On 17 February 2016, the central government announced that all cities except Beijing, Shanghai, Guangzhou, and Shenzhen would implement new deed tax preferential policies and capital gain tax preferential policies without distinguishing ordinary housing (Caishui [2016] No. 23), while the deed tax and capital gain tax provisions of these four first-tier cities are still implemented following the provisions on distinguishing ordinary housing (Caishui [2015] No. 39). Ordinary housing generally means dwelling units with a floor area equal to or less than 144 square meters in China. In the robustness check, we try to drop samples after 2015 or remove samples of four first-tier cities and obtain consistent results with baseline results). We control year-fixed effects in the model specification to mitigate possible effects of these policies on the identification of the HPR on household entrepreneurship.

Table 3 presents the summary statistics of all variables used in our empirical analyses. We drop samples with missing core variables and samples with extreme values of income, assets, and debt. After data cleaning, we obtained 27,616 household samples.

Table 3. Summary statistics.

Variable	Obs.	Mean	S.D.	Min	Max
Entrepreneurship (engage in business project)	27,616	0.146	0.353	0	1
Entrepreneurship (self-employment)	27,616	0.191	0.393	0	1
HPR stringency (entropy method)	27,616	0.597	0.351	0	0.905
HPR stringency (principal component analysis)	27,616	1.580	0.934	0	2.440
HPR stringency (equal-weight method)	27,616	0.570	0.350	0	0.9
HPR stringency (multiplication method)	27,616	37.90	23.75	0	60
Housing mortgage limit	27,616	0.492	0.100	0.3	0.7
Housing resale limit	27,616	0.121	0.516	0	4

Table 3. Cont.

Variable	Obs.	Mean	S.D.	Min	Max
Household annual income (RMB 10 thousand)	27,616	14.053	41.800	0	3852.2
Household size	27,616	3.354	1.874	1	26
Household assets (RMB 10 thousand)	27,616	193.560	338.355	0	10,270
Household housing assets (RMB 10 thousand)	27,616	105.677	203.289	0	6297.4
Household non-housing assets (RMB 10 thousand)	27,616	87.884	249.624	0	10,220
Household debt (RMB 10 thousand)	27,616	9.418	51.958	0	5190.4
Household housing debt (RMB 10 thousand)	27,616	6.832	32.020	0	2500
Household non-housing debt (RMB 10 thousand)	27,616	2.587	39.437	0	5190.4
Old dependent ratio	27,616	0.048	0.124	0	0.8
Young dependent ratio	27,616	0.115	0.157	0	0.75
Unhealthy family member	27,616	0.305	0.461	0	1
Household-head age	27,616	48.686	11.052	18	65
Household-head gender	27,616	0.679	0.467	0	1
Household-head marriage status	27,616	0.874	0.332	0	1
Household-head years of schooling	27,616	11.709	3.632	0	22
Household-head health insurance	27,616	0.960	0.196	0	1
City average housing price (RMB 10 thousand)	27,616	1.806	1.270	0.460	5.489
City GDP Per capita (RMB 10 thousand)	27,616	103174	28,708.05	3.863	20.074
City proportion of the tertiary industry	27,616	0.601	0.099	0.325	0.810
City population density	27,616	981.279	591.582	112.291	2305.63
City fixed investment per capita (RMB 10 thousand)	27,616	55,587.8	26,018.36	0.365	13.502
City real estate investment share of GDP	27,616	0.193	0.106	0.0214	1.198
City college enrollments share of population	27,616	0.061	0.034	0.00003	0.126

3.2. Empirical Strategy

We estimate the following regression equation:

$$Y_{ijt} = \beta_0 + \beta_1 \text{Stringency}_{jt} + \beta_2 \mathbf{X}_{ijt} + \beta_3 \mathbf{Z}_{jt} + \varphi_i + \phi_t + \mu_{ijt} \quad (1)$$

where Y_{ijt} is a binary variable which equals 1 if the local household i in the city j at year t owns a business. Stringency_{jt} is the local HPR stringency in the city j at year t . β_1 is the variable of interest which reflects the effect of the HPR policy on entrepreneurship. $\mathbf{X}_{ijt}$ is a vector of household-level and head-level characteristics. $\mathbf{Z}_{jt}$ is a vector of city-level characteristics. φ_i is the household-fixed effects that captures household-level time-invariant characteristics. ϕ_t is the year-fixed effects that captures the effects of time-varying factors common to all households. μ_{ijt} is the error term. To manage potential heteroscedasticity and serial correlation, we cluster standard errors at the city level.

A possible endogeneity source is that there may be unobserved common factors that correlate with the local HPR stringency and household entrepreneurial activity. We address this concern by instrumenting the local HPR stringency with two instrumental variables. The first instrumental variable is the interaction of city housing supply elasticity and long-term interest rates, which is commonly used as the IV of local house prices [47,48]. Since the HPR aims to curb the fast-growing local housing price, we expect that this IV could be an appropriate IV for the local HPR stringency. The data on housing supply elasticity in 35 cities in China are from [49], which are calculated with a similar method as in [25]. The long-term interest rate is measured by the difference between the long-term mortgage interest rate of commercial banks and the inflation rate, which are collected from the China People's Bank and the China Statistical Yearbook.

To mitigate this possible endogeneity concern, we also find the second instrumental variable: the lagged city construction land supply per capita, which is commonly used as the IV of local house prices in the literature regarding China [50]. Since the HPR aims to curb the fast-growing local housing price, we expect that this IV could also be an appropriate IV for the local HPR stringency. The lagged city construction land supply per capita is

measured by dividing the annual leased land area by the permanent urban population, which is collected from the City Statistical Yearbook.

4. Results

In this section, we first present the baseline results and the IV estimation results. Then, we report the heterogeneity analysis and mechanism discussions.

4.1. Main Results

Table 4 reports the two-way fixed-effect estimation results of the impact of restraining housing speculation on the entrepreneurial choices of urban households with local hukou. We tried different model settings with various sets of control variables. Column (1) only controls household and year-fixed effects. Column (2) adds household-level and household-head-level control variables. Column (3) further controls city-level variables that are closely related to the HPR, including average house prices, housing mortgage limits, and housing resale limits. Column (4) further controls other relevant variables at the city level. With different sets of control variables, the HPR stringency coefficients are all positive and significant. The results show that curbing housing speculation significantly promotes household entrepreneurial activities. Holding other things constant, a one unit increase in the HPR stringency raises the probability of household entrepreneurship by 6.45 percentage points. This result is of strong statistical and economic significance.

Table 4. Baseline results.

Dependent Variable: <i>Entrepreneurship</i>				
	(1)	(2)	(3)	(4)
HPR stringency	0.0519 *** (0.0187)	0.0623 *** (0.0185)	0.0557 *** (0.0185)	0.0645 *** (0.0250)
Ln Household income	/	0.00925 *** (0.00176)	0.00927 *** (0.00176)	0.00926 *** (0.00176)
Household size	/	0.00644 ** (0.00322)	0.00637 ** (0.00322)	0.00647 ** (0.00322)
Ln Housing assets	/	0.000483 (0.000457)	0.000435 (0.000460)	0.000506 (0.000462)
Ln Non-housing assets	/	0.0416 *** (0.00236)	0.0415 *** (0.00237)	0.0415 *** (0.00237)
Ln Housing debt	/	−0.000721 (0.000662)	−0.000713 (0.000662)	−0.000718 (0.000663)
Ln Non-housing debt	/	0.00454 *** (0.000778)	0.00453 *** (0.000779)	0.00453 *** (0.000780)
Old dependent ratio	/	0.00196 (0.0277)	0.00218 (0.0277)	0.00291 (0.0276)
Young dependent ratio	/	0.00734 (0.0285)	0.00782 (0.0285)	0.00779 (0.0285)
Unhealthy family member	/	−0.00797 (0.00598)	−0.00796 (0.00598)	−0.00822 (0.00598)
Age	/	0.00379 (0.00383)	0.00382 (0.00383)	0.00346 (0.00384)
Age squared	/	$−5.01 \times 10^{-5}$ (4.10×10^{-5})	$−5.03 \times 10^{-5}$ (4.11×10^{-5})	$−4.64 \times 10^{-5}$ (4.12×10^{-5})
Gender	/	0.00361 (0.00747)	0.00385 (0.00749)	0.00335 (0.00747)
Married	/	−0.0170 (0.0133)	−0.0168 (0.0133)	−0.0166 (0.0133)
Years of schooling	/	−0.00141 (0.00186)	−0.00145 (0.00186)	−0.00145 (0.00187)

Table 4. Cont.

Dependent Variable: <i>Entrepreneurship</i>				
	(1)	(2)	(3)	(4)
Health insurance	/	0.00501	0.00495	0.00410
	/	(0.0152)	(0.0152)	(0.0152)
Ln housing prices	/		−0.0133	−0.0145
	/		(0.0303)	(0.0322)
Housing mortgage limit	/		−0.00174	0.0174
	/		(0.0386)	(0.0403)
Housing resale limit	/		−0.00386	−0.000359
	/		(0.00442)	(0.00473)
Ln GDP per capita	/			0.0735 **
	/			(0.0343)
Tertiary industry share	/			0.0570
	/			(0.108)
Ln Population density	/			0.0657 **
	/			(0.0292)
Ln Fixed investment per capita	/			0.0275 **
	/			(0.0129)
Real estate share of GDP	/			−0.143 *
	/			(0.0811)
College enrollments share	/			−0.281
	/			(0.516)
Household fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Constant	0.143 ***	−0.526 ***	−0.400	−0.271
	(0.00556)	(0.0964)	(0.300)	(0.652)
Observations	27,616	27,616	27,616	27,616
R-squared	0.719	0.733	0.733	0.733

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The HPR stringency is constructed with the entropy method, and the results with the other three methods are robust.

As mentioned above, some unobservable omitted variables that correlate with both the HPR stringency and household entrepreneurial activity may lead to an estimation bias. To mitigate this concern, we exploit two instrumental variables of the HPR stringency, the interaction of urban land supply elasticity and long-term interest rate, as well as the lagged city construction land supply per capita. The first-stage results in columns (1) and (3) of Table 5 show that both two instrumental variables are significantly correlated with the HPR stringency. The F statistics in the weak identification tests also support the view that the two variables are appropriate instruments for HPR stringency. The 2SLS results presented in columns (2) and (4) of Table 5 show that a one unit increase in the HPR stringency significantly increases the probability of household entrepreneurship by 5.21–7.11 percentage points. Both coefficients are very close to the two-way fixed-effect result (6.45%), suggesting that our estimation results are robust. Finally, in the exogeneity test, the DWH test accepted the null hypothesis at a significance level of 10%, indicating that the HPR stringency as the explanatory variable tends to be exogenous.

The results are also consistent when using both instrumental variables in columns (5) and (6) of Table 5. The Hansen-J statistics fail to reject the null hypothesis, indicating that there is no over-identification problem. The 2SLS estimation shows that a one unit increase in the HPR stringency significantly increases the rate of household entrepreneurship by 5.03 percentage points. In addition, the DWH test accepts the null hypothesis, suggesting that the HPR stringency tends to be exogenous. Therefore, both the results of the two-way fixed-effect and IV estimation indicate a positive and significant impact of curbing housing speculation on household entrepreneurship.

Table 5. IV results.

Instrumental Variables	Dependent Variable: <i>Entrepreneurship</i>					
	Housing Supply Elasticity $\times$ Long-Term Interest Rate		Land Supply Area per Capita		Both IVs	
	First-Stage	2SLS	First-Stage	2SLS	First-Stage	2SLS
HPR stringency	/	0.0521 ** (0.0279)	/	0.0711 ** (0.0354)	/	0.0503 ** (0.0248)
Housing supply $\times$ rate	10.79 *** (0.375)	/			9.886 *** (0.382)	/
Land supply per capita	/	/	−0.132 *** (0.00611)		−0.0640 *** (0.00609)	/
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Household fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25,891	25,891	25,891	25,891	25,891	25,891
R-squared	0.781	0.364	0.778	0.360	0.785	0.364
Cragg-Donald Wald F statistic	791.190	/	338.114	/	802.773	/
Kleibergen-Paap rk Wald F statistic	432.673	/	174.807	/	293.072	/
Hansen J statistic	/	/	/	/	/	0.181
DWH test	/	0.133	/	0.163	/	0.149

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The HPR stringency is aggregated with the entropy method, and the results with the other three methods described in Section 2 are robust.

4.2. Heterogeneity Analysis

Firstly, we examine the heterogeneous impact of discouraging housing speculation on the entrepreneurial choices of multi-home and single-home households. We stratify the sample based on whether the local homeowner has multiple homes in the local city and conduct the regression as represented by Equation (1). The results in columns (1) and (2) of Table 6 show that curbing housing speculation significantly promotes the entrepreneurial activities of both multi-home households and single-home households. This positive effect is more significant and larger on multi-home households than on single-home households. The results are consistent with the evidence that households with higher housing investments are more likely to start a new business [51]. The positive effect (possible positive effect comes from the “wealth effect” and “collateral effect” while negative effect comes from “crowding-out effect”) on household entrepreneurial activity is that multi-home ownership has a certain value that can be either sold or mortgaged, to provide financial support for household entrepreneurial activities [52]. On the one hand, since the HPR set direct restrictions on the number of houses a local household could buy, households with multiple homes are faced with stricter purchase restrictions than households with a single home. On the other hand, households with multiple homes own more housing wealth than those with a single home. These two factors may both contribute to the entrepreneurship choices of multi-home households in response to curbing housing speculation policies.

Secondly, we examine the heterogeneous effects based on whether the local homeowner has outstanding mortgages or not. The results in columns (3) and (4) of Table 6 indicate that curbing housing speculation has a significantly positive effect on homeowners without mortgages while exerting no significant effect on homeowners with outstanding mortgages. These results are consistent with the study of Bracke et al. (2018), which shows that housing mortgage debt reduces the probability of starting a business by amplifying risk aversion.

Thirdly, we examine the heterogeneous effects based on whether the household has previously engaged in entrepreneurial activity. The results in columns (5) and (6) of Table 6 show that curbing housing speculation significantly promotes the entrepreneurial activities

of both households with and without entrepreneurial experiences. This positive effect is more significant and larger on households with previous entrepreneurship experiences, consistent with a series of studies which show that previous entrepreneurial experiences can positively influence entrepreneurial intention. Direct entrepreneurial experience gained by previous business ownership experience can contribute to entrepreneurship-specific human capital [53–55]. Entrepreneurial experience can also add to human capital through enhanced reputation and a better understanding of the requirements of finance institutions [56,57]. Entrepreneurs can demonstrate entrepreneurial, managerial, and technical skills that are applicable to the identification and exploitation of entrepreneurial opportunities and further entrepreneurial activity [58,59].

Table 6. Heterogeneous effects by multiple-home status, mortgage status, and previous entrepreneurship experiences.

Dependent Variable: <i>Entrepreneurship</i>						
Group	Multiple-Home	Single-Home	No Mortgage	With Mortgage	With Previous Experiences	No Previous Experiences
	(1)	(2)	(3)	(4)	(5)	(6)
HPR stringency	0.0836 *** (0.0248)	0.0186 * (0.00983)	0.167 ** (0.0828)	0.0295 (0.0284)	0.137 *** (0.0441)	0.00910 ** (0.00427)
Household and city controls	Yes	Yes	Yes	Yes	Yes	Yes
Household and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5071	17,795	18,099	4767	4187	23,429
R-squared	0.790	0.749	0.751	0.777	0.794	0.713

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. All specifications in Table 6 are the same as in model (1). The HPR stringency is aggregated with the entropy method, and the results with other three methods described in Section 2 are robust.

Fourth, we examine the heterogeneous impact of discouraging housing speculation on the entrepreneurial choices of households with different risk preferences. The sample is divided into three groups, risk-loving, risk-neutral, and risk-averse groups, based on the household responses to questions about the degree of preference for investment risk and return in the CHFS questionnaire. The results in columns (1)–(3) of Table 7 show that the entrepreneurial choice of households in the risk preference group is significantly positively affected by the policy to curb housing speculation, while the entrepreneurial choice of households in the other two groups is not significantly affected, which is consistent with several studies. Individuals with a higher risk tolerance and lower risk aversion are more likely to start their own businesses [60]. Entrepreneurship often involves uncertainty and the potential for both high rewards and significant losses [61]. A higher willingness to accept risk and subjective risk assessment enables individuals to pursue opportunities despite the uncertainty associated with new ventures [62].

Finally, we also examine the heterogeneous effects of discouraging housing speculation on households with different asset levels. According to the total assets per capita of the household in each year, the sample households are equally divided into three groups of low assets, medium assets, and high assets. The results in columns (4)–(6) of Table 7 show that the entrepreneurial choices of high-asset households are significantly positively affected by the policy to curb housing speculation, while the entrepreneurial choices of medium-asset and low-asset households are not significantly affected. These results are consistent with the work of [6,63], who find that wealthier people are more likely to become entrepreneurs.

Table 7. Heterogeneous effects by risk attitude and the level of assets.

Dependent Variable: <i>Entrepreneurship</i>						
Variables	Risk-Loving (1)	Risk-Neutral (2)	Risk-Averse (3)	Large-Asset (4)	Medium-Asset (5)	Small-Asset (6)
HPR stringency	0.227 ** (0.105)	0.0401 (0.0561)	0.0726 (0.0607)	0.174 *** (0.0637)	0.0530 (0.0496)	0.0213 (0.0382)
Household and city controls	Yes	Yes	Yes	Yes	Yes	Yes
Household and year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1003	5632	10,315	9205	9205	9206
R-squared	0.782	0.789	0.764	0.829	0.813	0.674

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. All specifications in Table 6 are the same as in model (1). The HPR stringency is aggregated with the entropy method, and the results with other three methods described in Section 2 are robust.

4.3. Possible Mechanism

The above estimation results show that discouraging housing speculation significantly increases the entrepreneurial activities of urban local households. In this section, we further explore potential mechanisms.

First, we examine whether curbing housing speculation significantly reduces the likelihood or plans of local homeowners to purchase new homes. As in [17], the strong housing investment preferences of Chinese households tend to squeeze out household entrepreneurship. Less housing investment may save funds for starting a business. In columns (1) and (2) of Table 8, we replace the dependent variable with whether a local household purchased new homes during the survey year and conduct our main regression as represented by Equation (1). The results show that discouraging housing speculation significantly reduces the likelihood of local multiple-home and single-home households purchasing new homes, and the magnitude is smaller for single-home households.

Table 8. Mechanism discussion.

Dependent Variables	Purchase New Home		Plan to Purchase		Self-Assessed Home Values		Self-Assessed Home Equity	
	Multi-Home (1)	Single-Home (2)	Multi-Home (3)	Single-Home (4)	Multi-Home (5)	Single-Home (6)	Multi-Home (7)	Single-Home (8)
HPR stringency	−0.0586 *** (0.0167)	−0.0108 *** (0.00398)	−0.0580 *** (0.0116)	−0.0152 (0.00997)	−0.0120 (0.445)	−0.438 (0.576)	0.508 (0.323)	−0.410 (0.591)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9133	16,886	9133	16,886	9133	16,886	9133	16,886
R-squared	0.546	0.443	0.547	0.561	0.886	0.874	0.898	0.902

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The dependent variable in columns (5)–(8) is the log value of the self-estimated housing wealth level. The controls include all household-level, head-level, and city-level control variables as in model (1). Fixed effects include household fixed effects and year fixed effects. The HPR stringency is aggregated with the entropy method, and the results with the other three methods described in Section 2 are robust.

In columns (3) and (4) of Table 8, we replace the dependent variable with whether a local household plans to purchase new homes during the survey year and conduct our main regression as represented by Equation (1). The results show that discouraging housing speculation significantly reduces the willingness of multi-home households to purchase a new home but has no significant effect on the willingness of single-home households to purchase a new home. Therefore, these results provide evidence supporting the view that discouraging housing speculation promotes household entrepreneurship by reducing the likelihood and willingness of households to purchase a new home.

Second, we examine whether discouraging housing speculation influences household entrepreneurship by affecting local households' housing wealth or housing equity. The entrepreneurial behavior of households may be positively affected by the increase in housing wealth through collateral or wealth effects [11,64]. In columns (5) and (6) of Table 8, we replace the dependent variable with the self-assessed home values of local homeowners and perform our main regression as shown in Equation (1). The estimation results show that the HPR has no significant impact on the housing wealth of households. Similarly, the results in column (7) and (8) of Table 8 indicate that the housing equity of households are not affected by the HPR significantly. These results rule out the channel that the positive effect of curbing speculation on household entrepreneurship may be driven by affecting the housing wealth of households. The findings align with two recent studies [17,65], despite their sole reliance on data from a single cross section in one year and lack of focus on the identification issue. We use longitudinal panel data covering 10 years to explore the speculation channel and the dynamics between speculation and business creation.

Third, we examine whether discouraging housing speculation lowers local households' house price expectations, thus lowering the opportunity cost of starting a business. Since the direct question about the housing price expectation appears only in the CHFS 2011 questionnaire, we first use the question "How do you expect the housing price to change in the next year" in the 2011 questionnaire and assign values of 1, 0, and -1 to a variable of house price expectation with the answers of rise, flat, and decline, respectively. For the house price expectation from 2013 to 2019, we use the tracking household samples who did not change their self-owned primary residence and compare their self-estimated value of primary residence between two consecutive surveys. If the value rises, equals, or declines compared with the value of last survey, we assign a value of 1, 0 or -1 to the variable of house price expectation, respectively.

Then, using Equation (1), we replace the dependent variable with house price expectation and conduct our main regression. The results in columns (1) and (2) of Table 9 show that discouraging housing speculation significantly reduces the house price expectations of multi-home households but exerts no significant effect on the house price expectations of single-home households. This evidence suggests that the HPR increases the entrepreneurial activities of multiple-home households by reducing their expected return on housing investments as well as the expected opportunity cost of starting a business.

Table 9. Mechanism discussion (continued).

Dependent Variables	House Prices Expectation		Type of Entrepreneurship		
	Multi-Home (1)	Single-Home (2)	Opportunity (3)	Necessity (4)	Innovation (5)
HPR stringency	-0.245^{**} (0.121)	-0.0201 (0.0803)	0.0363^{***} (0.0118)	-0.0960 (0.105)	0.0216^{**} (0.00908)
Household and city controls	Yes	Yes	Yes	Yes	Yes
Household and year fixed effects	Yes	Yes	Yes	Yes	Yes
Observations	4059	7937	27,616	27,616	25,051
R-squared	0.472	0.474	0.576	0.517	0.534

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The HPR stringency is aggregated with the entropy method, and the results with the other three methods described in Section 2 are robust.

Fourth, we examine whether the HPR promotes household entrepreneurship by increasing entrepreneurial opportunities. Over-investment in the real estate sector caused by the rapid rise in housing prices makes more capital flow into the real estate sector, which leads to various negative economic consequences such as financing constraints in other sectors [38], the reduction of total factor productivity of enterprises [43,44], and reduced corporate innovation [37,42]. Therefore, curbing housing speculation may increase entrepreneurial opportunities by reducing overinvestment in real estate and op-

timizing the efficiency of capital or resource allocation. To verify this channel, we examine the impact of discouraging housing speculation on different types of household entrepreneurial motivations.

We define the variable of entrepreneurial motivation as opportunity entrepreneurship if local households respond to the CHFS question “Why you choose to start a business in industry and commerce” with answers including “to earn more money”, “dream job/want to be the boss”, “more flexibility and freedom”, or “social responsibility, to solve employment problems”. We define the variable of entrepreneurial motivation as necessity entrepreneurship if local households respond with the answer “cannot get employed”. Then, we replace the dependent variable with entrepreneurial motivation and conduct our main regression as represented by Equation (1). The results in columns (3) and (4) of Table 9 show that discouraging housing speculation significantly increases the opportunity entrepreneurship of local households while exerting no significant effect on the necessity entrepreneurship of local households.

In addition, we define the binary variable of innovative entrepreneurship as 1 if local households respond to the CHFS question “whether the project has innovative activities (such as R and D, etc.)” with the answer “Yes”. The result in Column (5) of Table 9 shows that discouraging housing speculation significantly increases the innovative entrepreneurship of local households. These results in columns (3)–(5) of Table 9 provide evidence suggesting that discouraging housing speculation increases entrepreneurial opportunities and innovative development.

Finally, we examine whether discouraging housing speculation promotes entrepreneurial activities by increasing households’ social network investments. Both physical capital and social capital are important factors for entrepreneurship [5,8,66]. On the one hand, local households in the same city face the same housing market situation when their demand for housing investment or speculation is suppressed. For investment returns, they may choose to jointly start a business to meet minimum capital requirement for new projects. On the other hand, when households do not save for house purchases, the extra funds could be used to increase social network spending, which contributes to sharing business ideas and starting a business. That is to say, discouraging housing speculation may promote households to actively build and invest in social networks to obtain business opportunities, knowledge, financial capital, and emotional support, all of which are conducive to household entrepreneurship [8].

Based on the relevant questions in the CHFS questionnaire, we use two variables, gift exchange value (income and expenditures of cash and non-cash gifts for social networks) and gift-giving value (expenditures of cash and non-cash gifts for social networks), to measure social network investments, respectively. Then, we use the measurement of social network investments as the dependent variable and run our main regression as shown in Equation (1). The results in columns (1) and (2) of Table 10 show that discouraging housing speculation significantly increases the gift exchange and gift-giving values of local households. In columns (3) and (4) of Table 10, we use the gift exchange and gift-giving values to regress household entrepreneurship, with the model specification as represented by Equation (1). The results show that higher gift exchange and gift-giving values significantly lead to a higher probability of local households starting a business. Therefore, the results in Table 10 suggest that the increase in social network investments could be a potential channel for the causal relationship between discouraging housing speculation and household entrepreneurship.

In addition, we examine the heterogeneity effects of discouraging housing speculation based on the level of households’ social networks. The kinship-based social network belongs to the strong tie network, which provides physical capital and emotional support for entrepreneurs [66,67]. The non-kinship network based on friends and colleagues belongs to the weak tie network, which provides entrepreneurs with a large amount of important information, and promotes entrepreneurs to obtain business, increase operating income, and improve business performance [68].

Table 10. Potential mechanism of social networks channel.

Dependent Variables	Gift Exchange (1)	Gift-Giving (2)	Entrepreneurship (3)	Entrepreneurship (4)
HPR stringency	0.888 *** (0.0684)	0.583 *** (0.0890)		
Gift exchange			0.00725 *** (0.00171)	
Gift-giving				0.00907 *** (0.00185)
Household and city controls	Yes	Yes	Yes	Yes
Household and year fixed effects	Yes	Yes	Yes	Yes
Observations	27,050	25,642	27,050	25,642
R-squared	0.345	0.354	0.555	0.556

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The HPR stringency is aggregated with the entropy method, and the results with the other three methods described in Section 2 are robust.

The level of households' weak tie social network is measured by the gift exchange value (sum of gift income and gift expenditures), and the level of households' strong tie social network is measured by the number of siblings of the household head. We divide the sample into two subgroups based on the median value of social networks of weak or strong ties. Specifically, we define local households as having a high-level social network if the gift exchange value is no less than CNY 3000 or if the head of household has no fewer than three siblings. The results in Table 11 show that discouraging housing speculation has a significantly positive impact on the entrepreneurial choices of households with high levels of weak or strong tie social networks. Households with a low-level of social networks are not significantly affected. This evidence also supports the social networks channel.

Table 11. Potential mechanism of social networks channel (continued).

Dependent Variable: <i>Entrepreneurship</i>				
	High Gift Exchange (1)	Low Gift Exchange (2)	More Siblings (3)	Few Siblings (4)
HPR stringency	0.0933 ** (0.0438)	0.0374 (0.0275)	0.0271 ** (0.0123)	−0.0707 (0.133)
Controls	Yes	Yes	Yes	Yes
Household and year fixed effects	Yes	Yes	Yes	Yes
Observations	15,990	11,060	13,373	13,068
R-squared	0.486	0.594	0.566	0.534

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The HPR stringency is aggregated with the entropy method, and the results with the other three methods described in Section 2 are robust.

5. Robustness Checks, Intensive Margin Estimates, and City-Level Evidence

5.1. Robustness Checks

Firstly, we check whether our conclusion is robust to alternative ways of constructing the HPR stringency. In the above results, we use the HPR stringency constructed with the entropy method. Columns (1)–(3) of Table 12 present the results using the HPR stringency constructed with the principal component method, the equal-weight method, and the multiplication method (The HPR stringency constructed with the multiplication method is the value of dimension 1 multiplied by the sum of the values of the other six dimensions), respectively. The results are all positive and significant, indicating that our conclusion is robust with alternative definitions of the HPR stringency.

Table 12. Robustness checks.

Dependent Variable: <i>Entrepreneurship</i> .									
	PCA (1)	Equal- Weight (2)	Multiplication (3)	Self-Em- ployed (4)	Operating Assets (5)	Operating Income (6)	11–15 (7)	Non-First- Tier Cities (8)	Tracking Samples (9)
HPR stringency	0.0696 ** (0.0286)	0.0529 ** (0.0237)	0.00256 ** (0.00107)	0.0550 *** (0.0188)	0.0481 *** (0.0223)	0.0442 ** (0.0223)	0.0738 *** (0.0268)	0.0422 ** (0.0206)	0.102 ** (0.0452)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	27,616	27,616	27,616	27,616	27,616	27,616	15,062	18,572	8242
R-squared	0.734	0.734	0.734	0.688	0.691	0.705	0.756	0.740	0.733

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The controls include all household-level, head-level, and city-level control variables as in model (1). Fixed effects include household fixed effects and year fixed effects.

Secondly, we examine whether our conclusion is consistent with alternative definitions of household entrepreneurship. The first alternative definition comes from the CHFS question, “What is the nature of your current job?” If the surveyed households choose the answer “operate a personal or private business; self-employment”, they are regarded as entrepreneurial households. We also regard the household as an entrepreneurial household if they have any operating projects with non-zero assets or non-zero income. The estimation results in columns (4)–(6) of Table 12 show that our conclusion is robust with alternative definitions of household entrepreneurship.

Thirdly, to mitigate a concern that the differences in housing taxation policies between the first-tier cities (Beijing, Shanghai, Guangzhou, and Shenzhen) and non-first-tier cities since 2016 may bias our estimations (On 17 February 2016, the central government announced that all cities except Beijing, Shanghai, Guangzhou, and Shenzhen would implement new deed tax preferential policies and capital gain tax preferential policies without distinguishing ordinary housing (Caishui [2016] No. 23), while the deed tax and capital gain tax provisions of these four first-tier cities are still implemented following the provisions on distinguishing ordinary housing (Caishui [2015] No. 39). Ordinary housing generally means dwelling units with a floor area equal to or less than 144 square meters in China), we conduct two robustness checks. Firstly, in column (7) of Table 12, we keep samples from 2011 to 2015 and conduct our main regression as represented by Equation (1). Secondly, in column (8), we exclude samples from the first-tier cities and conduct our main regression as represented by Equation (1). The results in columns (7) and (8) of Table 12 are both consistent with our main results.

In column (9) of Table 12, we keep the tracking samples in four consecutive surveys from 2013 to 2019 (The sample size in CHFS 2011 is very limited compared with those in 2013–2019, so we keep the tracking samples in 2013–2019 to obtain a larger sample size) to conduct a robustness test, to mitigate a possible estimation bias caused by the heterogeneity of unobservable characteristics of households in the pool cross-section data. The result shows a consistent, strong positive effect (We also assess the consistent results using the full sample from the HPR cities’ urban household, making our regression results more reliable. All results are available upon request).

To further check that the relationship between discouraging housing speculation and household entrepreneurship is not driven by omitted variables, we conduct a falsification test. Following [69], we construct a false treatment variable, i.e., *FalseStringency_{it}* by randomly assigning HPR stringency values to HPR cities, then use this false treatment variable to regress on household entrepreneurship as represented by Equation (1). This randomization process ensures that the variable *FalseStringency_{it}* should have no effect on entrepreneurship if there are no significant omitted variables. We conduct this randomization process 500 times. Figure 1 presents the results of the coefficient distribution obtained by using the entropy method (left) and the principal component method (right). The

results show that the distribution of the coefficients of the false HPR stringency is centered at zero, while the true estimator lies outside the distribution (the black-dot vertical line denotes the true estimator). This indicates that this paper identifies a causal relationship between discouraging housing speculation and household entrepreneurship, rather than a correlation driven by unobserved omitted variables.

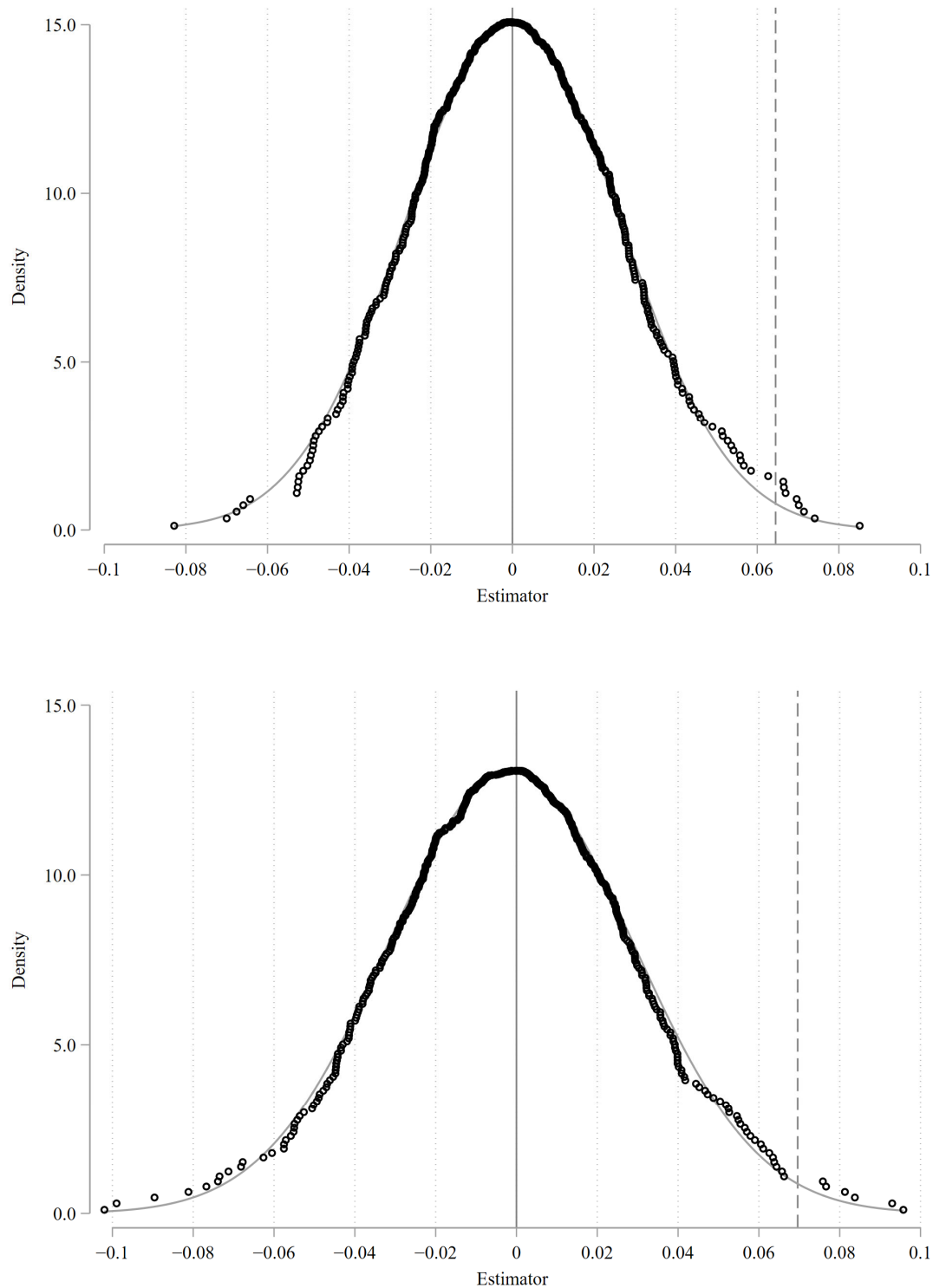


Figure 1. False treatment of HPR stringency on household entrepreneurship. (Up: HPR stringency with the entropy method; Down: HPR stringency with PCA method).

5.2. Discussion on Intensive Margin

Since we have discussed the extensive margin results of discouraging housing speculation on household entrepreneurship, in this section, we further examine the intensive margin effects on local households that have already been operating businesses. The results in Table 13 show that discouraging housing speculation significantly increases the enterprise income, the enterprise assets, the number of projects, and the number of employees of local households that have already been operating businesses. This implies that discouraging housing speculation has a significant impact on the intensive margin of household entrepreneurship.

Table 13. Intensive margin discussion.

Dependent Variables	Enterprise Income (1)	Enterprise Assets (2)	Project Numbers (3)	Employee Numbers (4)
HPR stringency	0.159 ** (0.0619)	0.242 *** (0.0679)	0.0199 *** (0.00765)	0.0121 ** (0.00595)
Controls	Yes	Yes	Yes	Yes
Household and year fixed effects	Yes	Yes	Yes	Yes
Observations	27,341	27,341	27,341	27,341
R-squared	0.707	0.744	0.652	0.660

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. The controls include all household-level, head-level, and city-level control variables as in model (1). The HPR stringency is aggregated with the entropy method, and the results with the other three methods described in Section 2 are robust.

5.3. Evidence at the City Level

We also provide city-level evidence for the impact of curbing housing speculation on household entrepreneurship. Using city-level data from 2010 to 2019, the two-way fixed-effect, as well as IV estimation method, we further estimate the causal relationship between discouraging housing speculation and household entrepreneurship. The city-level entrepreneurial activity is measured by the number of urban newly registered industrial and commercial enterprises, which is collected from the National Enterprise Credit Information Publicity System. The estimated model is as follows:

$$Y_{ijt} = \alpha_0 + \beta Stringency_{ijt} + \gamma Z_{ijt} + \Phi_t + \varphi_i + \mu_{ijt} \quad (2)$$

where Y_{ijt} represents the logarithmic value of the number of newly registered urban industrial and commercial enterprises in city j of province i at year t ; $Stringency_{ijt}$ is the local HPR stringency in the city j of province i at year t ; Z_{ijt} refers to city characteristics as in estimation Equation (1). ϕ_t is the year-fixed effect; φ_i is the province-fixed effect. μ_{ijt} is the error term. To manage potential heteroscedasticity and serial correlation, we cluster standard errors at the city level.

Table 14 reports the estimation results at the city level. Column (1) shows the fixed effect results. The results show that curbing housing speculation significantly increases the number of urban newly registered industrial and commercial enterprises, which is significant at the statistical level of 1%. Columns (2)–(4) show the estimation results of instrumental variables at the city level. We use the same two instrumental variables as in the household level evidence above: the interaction of urban land supply elasticity and long-term interest rate as well as the lagged city construction land supply per capita. The 2SLS results are consistent with the fixed effects estimates. These results are consistent with the results at the household level, suggesting that curbing housing speculation significantly increases entrepreneurial activities at the city level.

Table 14. Curbing housing speculation and the number of new enterprises at the city level.

Dependent Variables	Logarithmic Value of the Number of New Enterprises			
	Two-Way Fixed Effect	IV1	IV2	Both IVs
	(1)	(2)	(3)	(4)
HPR stringency	0.117 *** (0.0419)	0.671 * (0.381)	0.865 * (0.490)	0.881 ** (0.438)
Controls	Yes	Yes	Yes	Yes
Household and year fixed effects	Yes	Yes	Yes	Yes
Observations	459	302	302	302
R-squared	0.971	0.163	0.355	0.411

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses. IV 1 is the interaction of urban land supply elasticity and long-term interest rate. IV 2 is the lagged city construction land supply per capita. A series of tests on instrumental variables all show the rationality of using these two instrumental variables.

6. DID Estimation Results

To further check the robustness of our conclusions, we adopt another research design, the DID method. The local households in third-tier and fourth-tier cities that did not implement home purchase restrictions from 2011 to 2015 (the first round of purchase restrictions) but implemented home purchase restrictions on local households from 2016 to 2019 (the second round of purchase restrictions) are regarded as the treatment group (The treatment group includes the following: Tangshan, Qinhuangdao, Baoding, Cangzhou, Yangzhou, Ningde, Jiujiang, Ganzhou, E'zhou, and Zhongshan. The treatment cities meet the following criteria: the HPR policy has been adopted for the local households in the second round, and the CHFS survey covers these cities. Therefore, only the above 10 cities can be selected as the treatment group). The local households in third-tier and fourth-tier cities that have never imposed home purchase restrictions on local households from 2011 to 2019 are regarded as the control group (The control group includes the following: Handan, Hengshui, Yancheng, Nanping, Ji'an, Yichun, Jingmen, Huangshi, and Shantou. The control cities are selected based on the following criteria: being covered in the CHFS survey, being non-HPR cities located in the same provinces as the treatment cities, and having a comparable economic growth rate and housing prices as the treatment cities. In order to further ensure the reliability of the DID approach, we find one more corresponding control group city for each treatment group city according to the above selection criteria and form another control group. Another twenty-city control group includes the following cities: Handan, Hengshui, Changzhou, Yancheng, Zhangzhou, Nanping, Putian, Sanming, Ji'an, Yichun, Fuzhou, Shangrao, Huangshi, Yichang, Jingmen, Yichang, Jingzhou, Shantou, Zhanjiang, Maoming, and Meizhou).

The effectiveness of the chosen DID identification strategy hinges on the comparability between the treatment and control group. Most first-tier and second-tier cities began to implement the purchase restriction policy during the first round of purchase restriction, while few third-tier and fourth-tier cities implemented the purchase restriction policy during the first round of purchase restriction. If the households in the first-tier and second-tier cities with purchase restrictions are compared with those in the third-tier and fourth-tier cities without purchase restrictions, there will be strong endogeneity problems due to the large differences in consumption, income and asset levels of households between the two types of cities, as well as the differences in unobservable factors such as household entrepreneurial preference and risk preference. In relation to the comparison of households in first-tier and second-tier cities with those in third-tier and fourth-tier cities, the comparison of households in third-tier and fourth-tier cities which adopted the HPR policy with those in third-tier and fourth-tier cities which did not adopt the HPR policy is more appropriate. In addition, since the CHFS has been available since 2010, this research design can also obtain a relatively long pre-treatment period (2011–2015) to perform parallel trend tests.

Figure 2 presents the results of the parallel trend test. As we can see, before 2016, the entrepreneurial rates of urban local households in the treatment group and the control group

show a parallel trend. After 2016, there is a significant difference in the entrepreneurship rate of the treatment group and the control group: the entrepreneurship rate of the treatment group rises more than that of the control group.

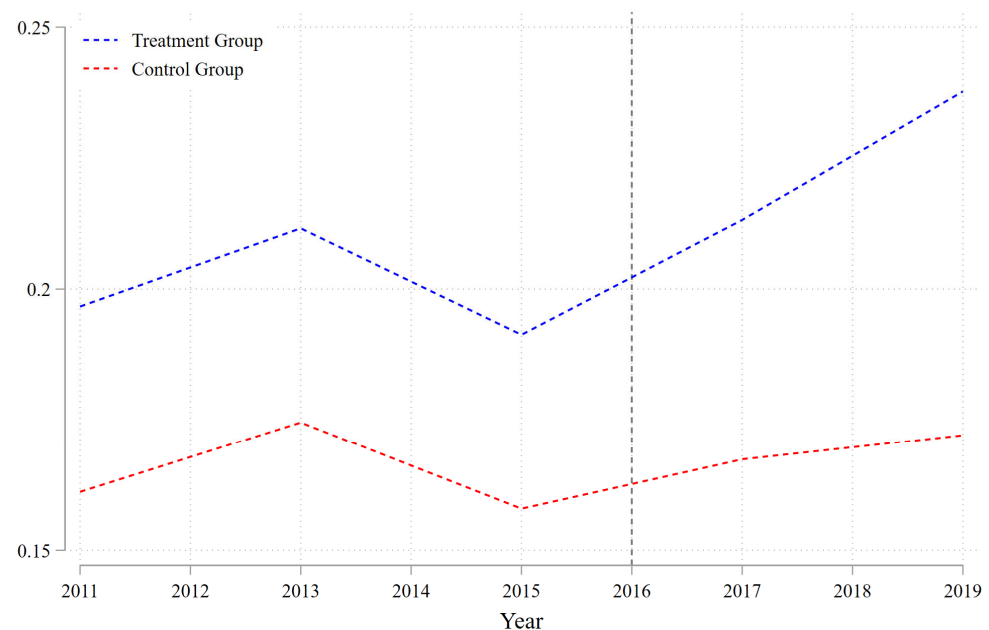
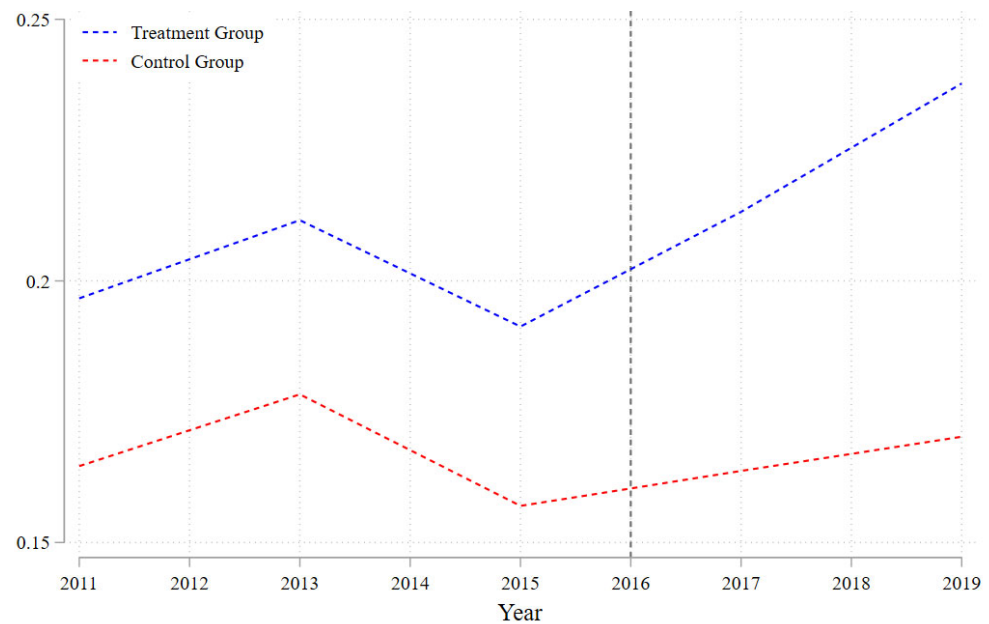


Figure 2. Parallel trend test (Up: 10 control cities; Down: 20 control cities).

In the DID method, we estimate the following regression equation:

$$Y_{ijt} = \beta_0 + \beta_1 HPR_{jt} + \beta_2 X_{ijt} + \beta_3 Z_{jt} + \varphi_i + \phi_t + Trend_t + \mu_{ijt} \quad (3)$$

where Y_{ijt} is a binary variable which equals 1 if the local household i in the city j at year t owns a business. HPR_{jt} is a binary variable which equals 1 if the city j at year t implements the HPR policy on local households. β_1 is the variable of interest which reflects the effect of the HPR policy on entrepreneurship. X_{ijt} is a vector of household-level and head-level control variables as in Equation (1). Z_{jt} is a vector of city-level control variables as in Equation (1). φ_i is the household fixed effects that captures household-level time-

invariant characteristics. ϕ_t is the year-fixed effects that captures the effects of time-varying factors common to all households. μ_{ijt} is the error term. We additionally include province-specific linear time trends $Trend_t$ to probe for the robustness of whether the estimated effects of interest are unchanged by the inclusion of these trends. To manage potential heteroscedasticity and serial correlation, we cluster standard errors at the city level.

Table 15 reports the DID regression results of the HPR on household entrepreneurship. Columns (1)–(3) present the results of the 10 control cities; columns (4)–(6) present the results of the 20 control cities. Both results indicate that discouraging housing speculation has a significantly positive effect on household entrepreneurship. Compared with local households in the non-HPR cities, the entrepreneurship rate of local households in the HPR cities increases by 5.28–5.36 percentage points, with a significant level at 1%. These results are very close to the baseline results and IV results, suggesting that our identification results are robust.

Table 15. DID estimations on household entrepreneurship.

Dependent Variable: <i>Entrepreneurship</i>						
	10 Control Cities			20 Control Cities		
	Entrepreneurship			Entrepreneurship		
	(1)	(2)	(3)	(4)	(5)	(6)
HPR	0.0316 *** (0.0108)	0.0626 *** (0.0201)	0.0536 *** (0.0171)	0.0234 *** (0.0070)	0.0579 *** (0.0184)	0.0528 *** (0.0203)
Controls	No	Yes	Yes	No	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Trends	No	No	Yes	No	No	Yes
Observations	8772	5749	5749	14,498	8351	8351
R-squared	0.587	0.590	0.597	0.424	0.426	0.434

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses.

In Table 16, we examine the effects of the HPR on different types of entrepreneurial behaviors of local households. The results show that the HPR considerably promotes the opportunity entrepreneurship and innovative entrepreneurship of the local household but has no significant impact on necessity entrepreneurship. These results are consistent with the results with the HPR stringency.

To further test that the DID method identifies a real causal relationship, we conduct a placebo test following [69]. We construct a false treatment variable $FalseHPR_{jt}$ by randomly assigning HPR_{jt} (1 or 0) to treatment and control cities. This randomization process ensures that the variable of $FalseHPR_{jt}$ should have no effect on household entrepreneurship if there are no significant omitted variables. We conduct this randomization process 500 times, and the distribution of the false coefficient is shown in Figure 3. Obviously, the distributions center around zero and the true estimator lies outside the distribution (the black-dot vertical line denotes the true estimator), indicating that the coefficient of $FalseHPR_{jt}$ is not different from 0 and its absolute value is much smaller than we have estimated under the actual circumstances. Therefore, this evidence supports the fact that our results are not significantly biased due to any omitted variables.

Table 16. DID estimations on different entrepreneurship types.

Dependent Variable: <i>Entrepreneurship</i>						
Dependent Variable	10 Control Cities			20 Control Cities		
	Opportunity	Necessity	Innovation	Opportunity	Necessity	Innovation
	(1)	(2)	(3)	(4)	(5)	(6)
HPR	0.0211 ** (0.00862)	0.00938 (0.0127)	0.0466 *** (0.0148)	0.0106 ** (0.00476)	0.00240 (0.0104)	0.0399 *** (0.0118)

Table 16. Cont.

Dependent Variable: <i>Entrepreneurship</i>						
Dependent Variable	10 Control Cities			20 Control Cities		
	Opportunity	Necessity	Innovation	Opportunity	Necessity	Innovation
	(1)	(2)	(3)	(4)	(5)	(6)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Time Trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5749	5749	5749	8351	8351	8351
R-squared	0.539	0.512	0.512	0.546	0.518	0.512

Notes: *, **, and *** represent significance at 10%, 5%, and 1% levels, respectively. Cluster standard errors at the city level are shown in parentheses.

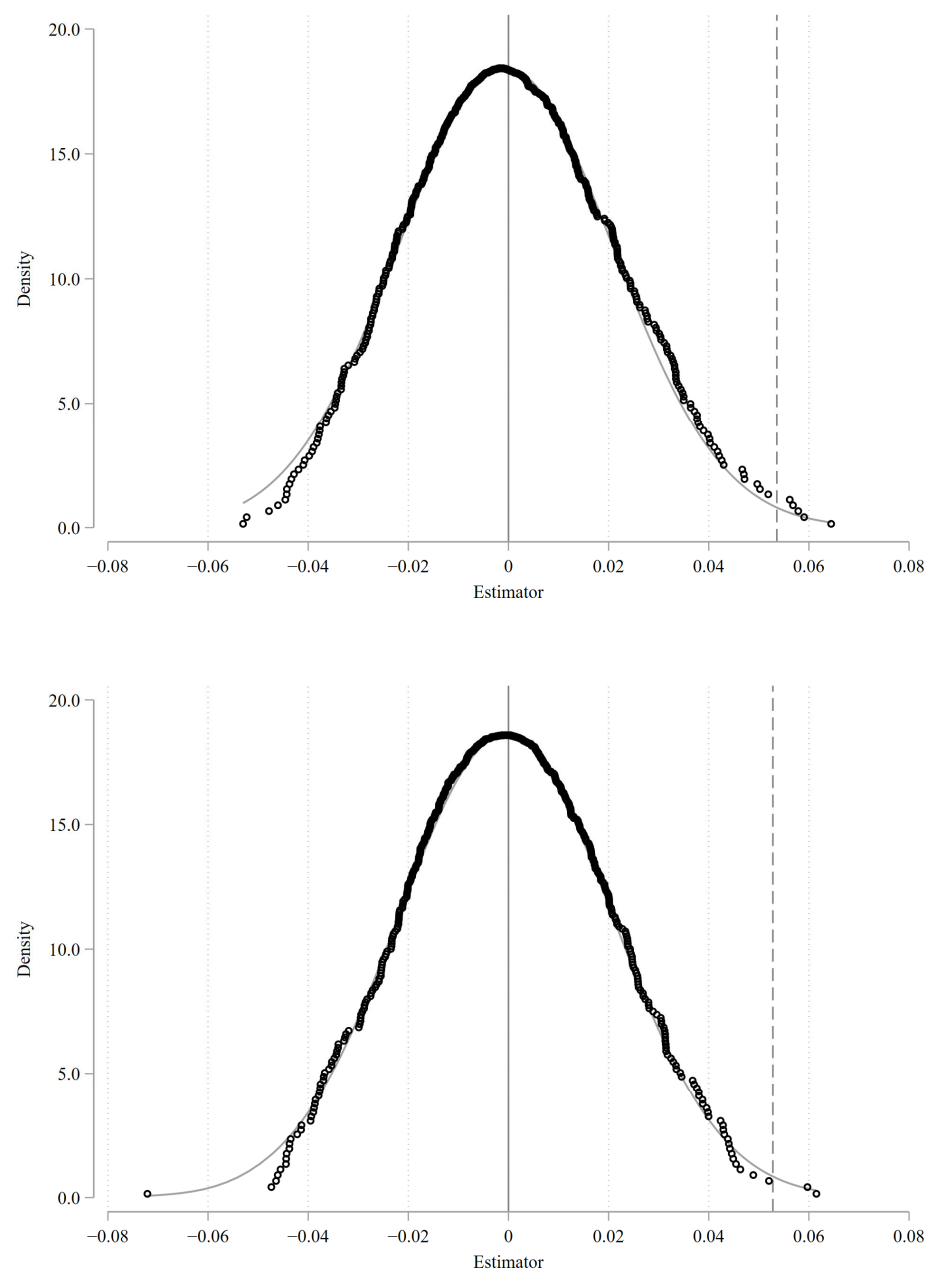


Figure 3. False treatment of the HPR on household entrepreneurship. (Up: 10 control cities; Down: 20 control cities).

7. Conclusions

We estimate the effect of discouraging housing speculation on household entrepreneurship in China. By exploiting the city-level variations in the stringency of home purchase restrictions between 2011 and 2019 and five waves of China Household Finance Survey (CHFS) data, we find that curbing housing speculation significantly increases the likelihood of local households starting a business. The positive effect is stronger for local multiple-home owners, homeowners without mortgage debt, households with previous entrepreneurial experience, households of risk-loving, and households with large assets. This conclusion is robust with IV estimations, city-level evidence and a DID research design. We also provide the intensive margin evidence. In the mechanism discussion, we find that curbing housing speculation significantly reduces the likelihood and the plan of local households to purchase new homes and lowers the house price expectations of local households (thus the opportunity cost of starting a business). We show that discouraging housing speculation significantly increases the opportunity entrepreneurship and innovative entrepreneurship, suggesting that discouraging housing speculation increases entrepreneurial opportunities and innovative development. Additional evidence also supports the view that discouraging housing speculation increases local households' social network investments, which contribute to starting a business. This study adds to the understanding of the positive spillover effects on the entrepreneurship of housing policies that curb housing speculation.

Finally, our paper has important policy implications: while real estate booms could initially stimulate local economic growth, prolonged booms may lead to increasing speculation, eventually shifting the economy towards a more pro-cyclical and less sustainable pattern. The results imply that policies to curb housing speculation can lead to beneficial spillover on entrepreneurship and the local economy, as well as contribute to the sustainability of economic growth.

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