



From premium to discount: A quasi-natural experiment in Shanghai's judicial auction housing market

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ABSTRACT

This study investigates the impact of Home Purchase Restrictions (HPR) on housing prices by exploiting a quasi-natural experiment in Shanghai's judicial auction housing market. While previous studies of HPR policies face challenges from non-random treatment assignment and spatial heterogeneity between treatment and control groups, our research design circumvents these challenges by leveraging the extension of HPR to previously exempt judicial auction properties on January 24, 2021. Using a difference-in-differences approach, we document a novel phenomenon: judicial auction properties commanded a premium over resale properties before the HPR extension, despite the typical discount found in foreclosed property markets worldwide. This premium suggests buyers used auctions to circumvent purchase restrictions, indicating substitution between the two markets. After the policy change, auction properties reverted to selling at a discount, with prices declining by 16.2% relative to the resale market.

1. Introduction

Housing market significantly influences investment decisions, consumption patterns, and labor market participation. Recognizing the far-reaching implications of housing market stability on overall economic health and social well-being, governments worldwide implement diverse policies to regulate and stabilize real estate markets. For instance, in August 2018, New Zealand enacted the Overseas Investment Amendment Bill, prohibiting foreigners from buying residential land. China also introduced the Home Purchase Restriction (HPR) to curb speculation and enhance affordability.

Our main objective is to investigate the impact of HPR on housing prices. We utilize a policy change on January 24, 2021, when Shanghai extended its existing HPR policy, previously applied only to regular housing transactions, to include judicial auction properties. Using hand-collected data from Lianjia for regular resale properties and Taobao for judicial auction properties, we employ a difference-in-differences approach. We find that auction properties, which previously sold at a premium, began selling at a discount after the policy change, with prices falling by 16.2%.

In China, judicial auction housing and regular housing are not separate markets. Foreclosures here go through a quick and standardized judicial process. Auctions are held on a public online platform, with property details and potential defects published 15–30 days in advance. Courts also manage evictions if necessary, rendering judicial auction housing a practical choice for buyers. [Qu and](#)

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Huang (2024) found an inverse relationship between the demands in the judicial auction and regular housing markets, indicating a level of substitutability. Zheng et al. (2023) also explored this substitution, studying how policies like purchase restrictions in the regular market can influence the judicial auction market.

Our study makes three contributions to the literature. First, we provide the first analysis of HPR policy directly targeting judicial auction properties, whereas existing studies focus on the regular housing market with mixed findings. Using regression discontinuity design, Sun et al. (2017) documented that Beijing's HPR policy led to a decrease in resale prices. In contrast, Jia et al. (2018) found that HPR had positive effects on housing prices in Guangzhou. Somerville et al. (2020), exploiting within-city variation, concluded that HPR did not lead to relative changes in housing prices. Further research by Lu et al. (2021) demonstrated that overall housing demand in most cities became less price elastic after HPR implementation.

Second, we uncover a novel phenomenon. Prior research consistently finds that judicial auction properties sell at a discount, ranging between 9% and 21% in the United States (Shilling et al., 1990; Mayer, 1998) and approximately 5% with appraisal fixed effects (Conklin et al., 2023). In China, the discount is around 14% (Qu and Huang, 2024). However, we find that Shanghai's judicial auction properties were sold at a premium before the HPR policy, only switching to a discount afterward. This finding provides evidence of a substitution relationship between resale housing and auctioned housing within a city (see our discussion below Table 3), complementing the cross-city analysis by Zheng et al. (2023).¹ While both Qu and Huang (2024) and Zheng et al. (2023) emphasize subjective "stigma effects" where buyers view foreclosed properties as inherently less desirable, our results suggest market policy can override such psychological biases.

Third, our research design offers methodological advantages over existing HPR studies. Previous research, including cross-city comparisons (Lu et al., 2021; Zheng et al., 2023) and within-city analyses (Somerville et al., 2020), typically relies on spatial variation to identify policy effects. Their spatial treatment assignment can introduce two potential biases: endogeneity from non-random policy implementation and spatial heterogeneity between treatment and control groups. Our study addresses these challenges by examining HPR implementation on judicial properties. The treatment assignment through ownership defaults is more plausibly random, reducing endogeneity concerns. Moreover, by focusing on complexes with both transaction types and employing propensity score matching, we minimize systematic differences between treatment and control groups.

The remainder of this paper is organized as follows. Section 2 provides the policy background. Section 3 outlines our data and methodology. Section 4 details the empirical results. Section 5 presents the robustness checks. Section 6 concludes.

2. Background

The Chinese government has long been committed to the principle of "housing is for living, not for speculation", a policy stance that has shaped real estate regulations across cities. This fundamental approach, introduced in 2016, aims to ensure that properties serve their primary purpose of providing homes rather than functioning as investment vehicles. The policy has led to the implementation of various measures, including HPR, mortgage lending curbs, and land supply regulations.

During the timeframe of our research, Shanghai's HPR policy required that prospective buyers either have a continuous history of social insurance payments for at least five years or possess a local household registration (*Hukou*). Initially, auctioned houses were exempt from HPR regulations. In early 2021, Shanghai's housing market experienced a significant surge in activity, with sales volumes reaching a four-year high. This buying frenzy was driven by factors including pent-up demand following the COVID-19 pandemic and the city's enduring appeal as a prime real estate market. The heated market conditions raised concerns about the potential for a housing bubble and housing speculations.

Consequently, Shanghai expanded its HPR on January 24, 2021, to include properties sold at judicial auctions. Under the new rules, bidders participating in judicial auctions were required to confirm their eligibility to purchase homes in Shanghai before participation.

3. Data and methodology

3.1. Data description

We hand collected and matched two distinct sets of data spanning from January 2020 to January 2022: one on resale transactions from Lianjia,² the leading housing brokerage, and the other on judicial auctions from "Taobao Online Judicial Auction", the largest online trading platform in China for foreclosed properties. For property characteristics, we gathered information including transaction prices, with a focus on unit prices, floor space, and floor levels.

To account for neighborhood characteristics, we include complex fixed effects in our estimation model. These fixed effects absorb location-related variables, such as the distance to the city center (People's Square in Shanghai) and the nearest subway station,

¹ Zheng et al. (2023) also employ data from auctioned properties, yet their focus differs significantly from ours. Primarily, they conduct a cross-city analysis of HPR implementation on resale properties, examining its indirect effect on auctioned property prices. In contrast, we conduct a within-city analysis, exploring the direct consequences of HPR on auctioned properties within a single city. Their finding that auction prices increased in cities implementing HPR on resale housing market (due to auctioned housing's HPR-exempt status) supports a "value of access" effect, which is particularly relevant given Shanghai's status as a prime real estate market.

² Lianjia is the largest resale housing brokerage platform in Shanghai, with a market share of approximately 25% in terms of home transactions. Its transaction data effectively represent Shanghai's overall resale housing market.

Table 1
Summary Statistics.

Variables	Full Sample (N = 100,196)		Judicial auction housing (N = 1556)		Resale housing (N = 98,640)	
	Mean	S.d.	Mean	S.d.	Mean	S.d.
Unit price (¥10,000 /m ²)	5.53	2.35	5.60	3.08	5.53	2.33
Floor space (m ²)	76.29	35.52	115.90	57.50	75.67	34.70
Floor level						
Whether high floor ¹	0.37	0.48	0.43	0.50	0.37	0.48
Whether middle floor	0.34	0.48	0.28	0.45	0.35	0.48
Whether low floor	0.28	0.45	0.28	0.45	0.28	0.45
Treat	0.02	0.12				
Post	0.38	0.49	0.50	0.50	0.38	0.49

Note: This table shows the summary statistics of the sample from January 2020 to January 2022.

¹ High floor level equals 1 if the unit is located in the upper third of the building's total floors (0 otherwise). Middle and low floor levels are defined similarly for the middle and lower thirds, respectively.

Table 2
Means and observation counts.

Variables	Resale housing		Judicial auction housing	
	Before	After	Before	After
Full sample				
Unit price (¥10,000 /m ²)	5.38	5.78	5.61	5.59
Floor space (m ²)	76.28	74.64	117.33	114.48
Floor level				
High floor level	0.37	0.37	0.45	0.42
Middle floor level	0.34	0.35	0.27	0.29
Low floor level	0.28	0.28	0.28	0.29
Observations	61,129	37,511	773	783
Doubly-Matched sample				
Unit price (¥10,000 /m ²)	5.38	5.78	5.89	5.86
Floor Space (m ²)	102.65	100.35	117.05	113.63
Floor level				
High floor level	0.40	0.41	0.45	0.41
Middle floor level	0.30	0.33	0.28	0.29
Low floor level	0.30	0.26	0.27	0.30
Observations	1851	1112	565	582

Note: This table presents summary statistics comparing resale housing and judicial auction housing before and after HPR implementation, across both full and doubly-matched samples.

computed using ArcGIS based on the latitude and longitude coordinates. We use these distance measures for propensity score matching, as discussed in Section 3.3. Table 1 presents the summary statistics.

3.2. Econometric model

We adopt a difference-in-differences specification to assess the effect of the HPR policy. The treatment group includes transactions through judicial auctions, while the control group consists of resale housing transactions. We estimate the following model:

$$\ln \text{unitprice}_{it} = \beta_0 + \beta_1 (\text{Treat}_i \times \text{Post}_t) + \beta_2 \text{Treat}_i + \beta_3 \text{Controls}_{it} + \gamma_c + \delta_t + \varepsilon_{it}$$

where the subscript i represents each sold property, t represents the associated transaction date, $\ln \text{unitprice}_{it}$ is the natural logarithm of its unit price; $\text{Treat}_i = 1$ indicates property i sold through judicial auctions, while $\text{Treat}_i = 0$ otherwise; $\text{Post}_t = 1$ represent a property transacted on or after January 24, 2021 and $\text{Post}_t = 0$ otherwise; Controls_{it} represents control variables; γ_c captures complex fixed effects; δ_t represents time (year by month) fixed effects; ε_{it} is the error term. Standard errors are clustered at the complex level.

Notably, we incorporate Treat_i in our estimation equation as judicial auctions are independent from complex fixed effects. We omit Post_t as it is largely captured by time fixed effects.

3.3. A two-stage matching procedure

To address potential differences between treatment and control groups, we employ a two-stage matching procedure. First, we restrict our sample to residential complexes with transactions in both resale and foreclosed properties. Second, we estimate propensity scores using a logit model with covariates consisting of floor space, floor level, latitude, longitude, distance to city center, distance to the nearest subway station, and administrative district dummies. We then perform 3-nearest-neighbor matching based on the

Table 3
Impact of HPR policy on judicial auction prices in Shanghai.

	Full sample		Doubly-matched sample	
	(1)	(2)	(3)	(4)
Treat*Post	−0.176*** (0.013)	−0.176*** (0.012)	−0.161*** (0.018)	−0.162*** (0.016)
Treat	0.077*** (0.009)	0.105*** (0.009)	0.091*** (0.011)	0.098*** (0.010)
Floor space		−0.001*** (0.000)		−0.001*** (0.000)
High floor level		−0.007*** (0.001)		0.032*** (0.008)
Middle floor level		0.022*** (0.001)		0.041*** (0.009)
Constant	1.621*** (0.0001)	1.728*** (0.004)	1.639*** (0.004)	1.758*** (0.018)
Complex fixed effects	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
N	100,196	100,196	4110	4110
R ² _adjusted	0.950	0.956	0.923	0.933
F statistics	93.75	457.4	44.81	38.73

Note: The sample period is from January 2020 to January 2022. The dependent variable is the log price per square meter. $Treat_t = 1$ represents a property sold through a judicial auction and $Treat_t = 0$ represents a resale property; $Post_t = 1$ represents a property resold transacted on or after January 24, 2021 and $Post_t = 0$ otherwise. Standard errors clustered at the residential complex level are reported in parentheses. *** denotes significance at the 1% level.

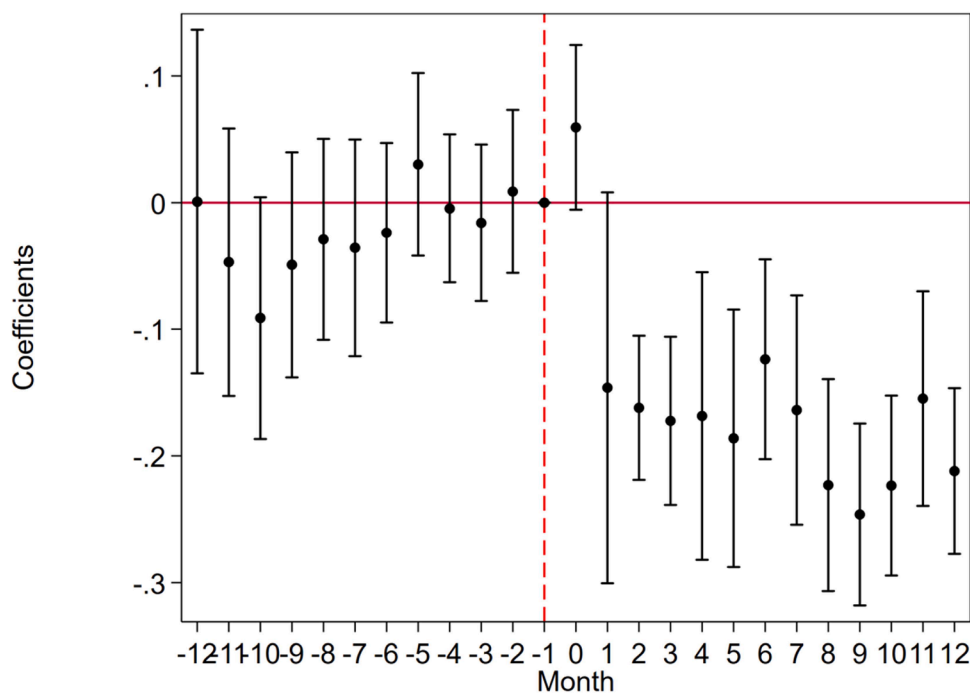


Fig. 1. Parallel trend test. Note: dots represent the coefficient estimates and vertical line segments indicate the 95% confidence intervals for each estimate.

estimated propensity scores. We refer to the resulting subsample as the “doubly-matched sample”. Table 2 reports means and observation counts for both the full sample and the doubly matched sample.

4. Results

Our analysis encompasses both the full and the matched sample, with results presented in Table 3. Columns (1) and (3) present findings without control variables, while columns (2) and (4) include controls. Findings are consistent across both samples, revealing a

Table 4
The placebo test with a counterfactual policy date.

	Doubly-matched sample
Treat*Post ^{cf}	0.014 (0.022)
Treat	0.081*** (0.020)
Constant	1.708*** (0.025)
Control variables	Yes
Complex fixed effect	Yes
Time fixed effect	Yes
N	1952
R ² _adjusted	0.961
F statistics	25.93

Note: The sample period is from January 2020 to December 2020. The dependent variable is the log price per square meter. $Treat_i = 1$ represents a property sold through a judicial auction and $Treat_i = 0$ represents a resale property; $post_t^{cf} = 1$ represents a property resold transacted on or after July 1, 2020 and $post_t^{cf} = 0$ otherwise. Standard errors clustered at the residential complex level are reported in parentheses. *** denotes significance at the 1% level.

significant price reduction of approximately 16.2% for judicial auction properties compared to resale properties following the implementation of the HPR policy.

The coefficients reveal an interesting reversal in judicial auction property pricing. Prior to the HPR policy, these properties commanded a premium in the market, as evidenced by the consistently positive coefficients on $Treat_i$ in each column. However, after the policy implementation, the sum of the coefficients on $Treat_i$ and $Treat_i \times Post_t$ turns negative. This indicates that judicial auction properties shifted from selling at a premium to trading at a discount.

Initially, Shanghai's HPR policy exclusively targeted regular housing transactions while exempting judicial auction properties. This selective implementation created a price premium for judicial auctioned properties, reflecting buyers' willingness to pay more for the opportunity to circumvent HPR restrictions and enter Shanghai's housing market through judicial auctions. Once HPR policy was extended to include auctioned properties, this price premium dissipated.

5. Robustness tests

5.1. Parallel trend test

We perform a parallel trend test by estimating the following:

$$\ln \text{unitprice}_{it} = \beta_0 + \beta_1 \text{Treat}_i + \sum_{k=-12}^{12} \beta_k \text{Treat}_i \times \text{Month}(k) + \beta_j \text{Controls}_{it} + \gamma_c + \delta_t + \varepsilon_{ict},$$

where $\text{Month}(k)$ represents the number of months starting from January 2021, with $k > 0$ if the property sale occurs after January 2021, and $k < 0$ for sales before January 2021. For instance, if a property is sold in November 2020, then $\text{Month}(k) = 1$ for $k = -2$ and 0 otherwise. The parameters of β_k capture the dynamic impacts of the HPR policy.

The results are shown in Fig. 1. Monthly coefficients with 95% confidence intervals show log price changes relative to the baseline (represented by the dashed line) one month before the policy implementation. Stable pre-policy trends support the parallel trends assumption between treated and control groups.

5.2. Placebo tests

We conduct two placebo tests to validate our findings.

In the first test, we assign a hypothetical HPR policy implementation date of July 1, 2020, and analyze only transactions from 2020 to avoid interference from the actual policy effects. As shown in Table 4, the resulting coefficient is small (1.4%) and statistically insignificant, supporting the robustness of our main results.

In our second placebo test, we generate counterfactual judicial auction transactions by randomly permuting the treatment variable across observations. We repeat this permutation process 500 times and estimate the coefficient for each iteration. Fig. 2 displays the distribution of these permuted coefficients, which centers near zero. The actual coefficient (-0.162), indicated by the dashed line, lies well outside this distribution, further validating the causal impact of the HPR policy.

Both placebo tests yield economically negligible and statistically insignificant effects, reinforcing that our observed price declines

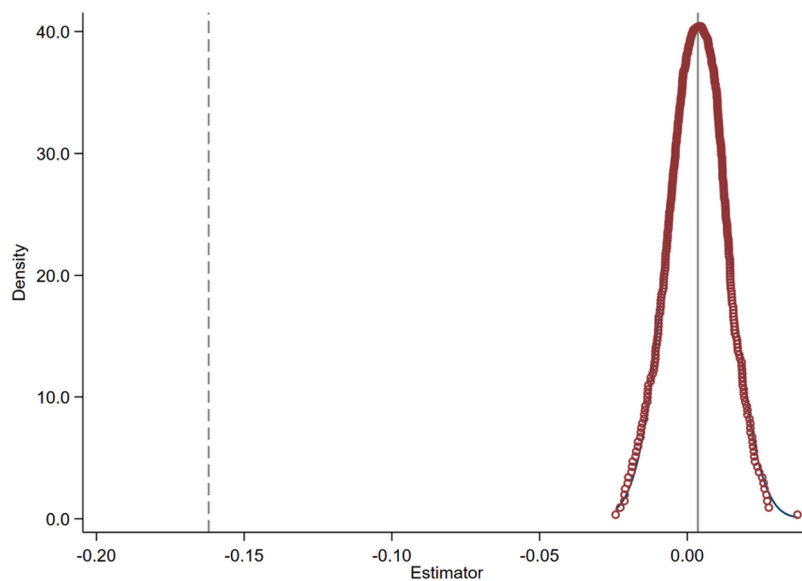


Fig. 2. The placebo test with counterfactual treatment. Note: The histogram in the figure represents the distribution of these permuted coefficients.

can be confidently attributed to the implementation of the HPR policy.

6. Conclusion

In conclusion, this study provides compelling evidence of the significant impact of the HPR policy's significant on housing prices. As the first study to utilize the setting of the HPR directly targeting judicial auction properties, we leverage the more random treatment introduced by ownership defaults. By focusing on complexes involving both types of transactions and employing propensity score matching, we effectively reduce spatial heterogeneity. As a result, our findings offer a more reliable estimate of the HPR policy's effects. Our study demonstrates that HPR can effectively reduce housing prices. Given the ongoing decline in the market, policymakers may consider removing the HPR in both the regular market and the judicial auction market in Shanghai.

CRedit authorship contribution statement

Nanyang Bu: Writing – original draft, Writing – review & editing, Validation, Project administration, Methodology. **Wen Shen:** Visualization, Software, Data curation. **Xiangyu Guo:** Writing – review & editing, Supervision, Methodology, Conceptualization, Formal analysis.

Data availability

Data will be made available on request.

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