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The Influence of Housing Purchase Restrictions on Consumer Expenditure

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Abstract: ***Since 2024, there have been significant adjustments in housing purchase restriction policies, with many cities completely abolishing or optimizing these measures. As one of the key measures used by the Chinese government to regulate the real estate market, it is important to consider whether housing purchase restriction policies affect consumer spending among residents and what pathways this influence might be. On the basis of panel data from prefecture-level cities in China from 2008--2013, this thesis employs the method of multiperiod difference-in-differences to empirically study the impact and mechanism of the "first round" of housing purchase restriction policies on consumer spending. The results indicate that the implementation of housing purchase restriction policies helps increase consumer spending by residents, and research on regional heterogeneity reveals that the promotion of these policies is more evident in eastern China. On the basis of the results of the empirical analysis, this thesis proposes relevant policy recommendations: the government needs to comprehensively consider various factors and adopt more refined and targeted regulatory measures to achieve healthy development of both the real estate market and the consumer market.***

Keywords: Housing Purchase Restrictions; Consumer Spending; Multiperiod Difference-in-Differences.

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1. Introduction

The 14th meeting of General Secretary Xi Jinping in the Central Finance and Economics Leading Group emphasized that "accurately grasp the living attributes of housing to meet the needs of new citizens' housing as the main starting point." Houses are for living, not for speculation. High housing prices do not mean speculation in housing, but the housing market bubble must be the result of real estate speculation. Beginning in 2024, China's real estate market policy underwent important adjustments. It aims to stabilize market expectations and promote the stable and healthy development of the property market. First, many cities, such as Chengdu and Hangzhou, have announced a comprehensive cancellation or optimization of housing purchase restriction policies. At the level of the first and second sets of housing loans. In addition, some cities have attracted talent and populations by issuing new favorable policies to attract more talent and optimizing real estate market policies to promote the long-term healthy development of the real estate market. During the National Two Sessions in 2024, NPC deputies and CPPCC members proposed a number of proposals for housing prices and consumption, mainly focusing on promoting the steady and healthy development of the real estate market and increasing consumption. These proposals aim to meet the diverse housing and consumption needs of residents and promote stable economic growth.

To address the rapid increase in housing prices in some cities and regions, the State Council successively introduced the "New National Ten Articles" and the "New National Eight Articles". Measures such as increasing the cost of purchasing a second home and restricting the number of homes purchased were aimed at curbing market speculation. In 2010 and 2011, a total of 46 cities implemented housing purchase restriction policies. However, given the changes in market supply and demand, the need for economic growth, and the optimization of real estate regulatory policies, most cities canceled purchase restriction policies in 2013. Currently, existing research evaluating housing purchase restriction policies has focused mainly on the impact on housing prices (Wu 2018). Some scholars have theoretically and empirically proven that housing purchase restriction policies effectively curb the growth of housing prices (Wu 2023) while also significantly reducing government land supply (Wu and Li

2018) and alleviating household debt (Chen 2022). According to the changes in the income effect, substitution effect, and wealth effect (Waxman 2020), residents' expectations of housing prices (Qian 2023; Gohl 2024) and the joint action of the above effects adjust their own consumption structure. According to recent studies on how changes in housing prices affect residents' consumption, residents' willingness to consume is limited for various reasons, and the empirical results of related studies are not unified. Does the housing purchase restriction policy affect the level of residents' consumption? What is the mechanism of influence? This is of great theoretical value and practical significance for the stable and healthy development of the real estate market, meeting the diverse housing and consumption needs of residents, and promoting stable economic growth.

This paper selects macro panel data from 255 prefecture-level cities in China from 2008--2013 as the research sample, which is divided into 46 cities with purchase restrictions and 219 cities without purchase restrictions. Owing to missing data for some prefecture-level cities in some years, the research did not include statistics. The housing price data in the mechanism test come from housing transaction websites such as Fang.com and the Housing Price Network, and other data come from the prefecture-level city data collected by the National Bureau of Statistics. The dependent variable is chosen as the total retail sales of consumer goods at the city level as a substitute.

Core Independent Variable: The core variable of this study is whether a city is affected by the purchase restriction policy. If affected, it is recorded as 1; otherwise, it is recorded as 0.

Control Variables: To clarify the impact factors of the housing purchase restriction policy on residents' consumption and further measure the impact effect of the housing purchase restriction policy on residents' consumption, this paper draws on existing related research and the content of the collected data and uses income, the consumer price index, population density, the tertiary industry, government intervention and the resident education level as control variables.

2. Research Design

Studying the impact of the housing purchase restriction pilot policy on consumer spending can involve observing changes in consumer spending in pilot cities before and after the implementation of the housing purchase restriction policy to determine whether there are any significant changes. However, such a comparison cannot eliminate the impact of other factors, such as monetary policy and social operation conditions, on consumer spending. Therefore, to reasonably estimate the implementation effect of the policy and effectively eliminate the interference of other factors, the difference-in-differences (DID) method is commonly used for research. The specific idea of DID is to regard the implementation of the policy as a "quasinatural experiment": First, the areas where the policy is implemented are taken as the experimental group, and the areas where the policy is not implemented are taken as the control group, assuming that the grouping is random and that the data indicator trends of the two groups are consistent; then, by calculating the difference in the data indicator trends of the two groups after the policy is implemented, the impact of the policy shock is estimated. Therefore, DID is widely used in the analysis of policy effects.

This study uses a panel data model to select consumer spending data before and after the implementation of the housing purchase restriction policy in prefecture-level cities in China as research samples. By constructing a two-way fixed effects model, it controls for the heterogeneity between cities and over time and analyzes the impact of the purchase restriction policy on consumer spending.

2.1 Multitime-point DID Model Setting

$$\ln cost_{it} = \beta_0 + \beta_1 did_{it} + \gamma X_{it} + \alpha_i + \delta_t + \varepsilon_{it} \quad (1)$$

Let did_{it} be the main explanatory variable of the model, with subscripts i and t representing the i-th city and t-th year, respectively; the dependent variable $cost_{it}$ represents the consumption level of the city. did_{it} represents the interaction term between after and treat, where after represents the dummy variable for time, which is 0 before the policy is implemented and 1 after the policy is implemented; treat represents the dummy variable for the region, which is 1 for the region where the policy is implemented and 0 for the region where the policy is not implemented. X_{it} represents the control variables, where α_i is the regional fixed effect, δ_t is the time fixed effect, and ε_{it} is the disturbance term.

2.2 Data Sources and Description

This study selects macro panel data from 255 prefecture-level cities in China from 2008--2013 as the research sample, which is divided into 46 cities with purchase restrictions and 219 cities without purchase restrictions. Owing to missing data for some prefecture-level cities in some years, the research did not include statistics. The housing price data in the mechanism test come from housing transaction websites such as Anjuke, Fang.com, and the Housing Price Network, and other data come from the prefecture-level city data collected by the National Bureau of Statistics.

To ensure data stability and overcome nonlinear issues between variables, this thesis takes the natural logarithm of the relevant control variables and uses them to represent each variable.

The descriptive statistics of the above variables are shown in Table 1.

Table 1: Descriptive statistics.

Variable	N	Mean	p50	SD	Min	Max
lncost	1590	15.06	15.02	1.028	12.10	18.24
lninc	1590	9.802	9.791	0.298	8.869	10.71
lncpi	1590	4.634	4.633	0.021	4.574	4.699
lnpd	1590	5.802	5.940	0.851	1.588	7.869
lnthird	1590	3.545	3.548	0.252	2.149	4.342
lngov	1590	-1.911	-1.925	0.418	-3.155	0.396
lnele	1590	-1.708	-1.672	0.436	-15.59	-0.974

3. Empirical Analysis

3.1 Regression Results

On the basis of the model design and variable selection in the previous section, this part of the quantitative study examines the extent of the impact of the housing purchase restriction policy on the consumption of the population, and the baseline regression results are shown in Table 2. Table 2 reports the regression results of the effect of the housing purchase restriction policy on the level of social consumption. Column (1) is the benchmark regression controlling for city and time individual effects, and columns (2)-(7) are the estimation results of adding the control variables in a stepwise manner. The results show that the regression coefficients of lncost are significantly positive in all cases and that the housing purchase restriction policy increases the consumption level of the population by 1.9% and 1.5% before and after adding the control variables in the two-way fixed effects model.

Table 2: Baseline regression results.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	lncost	lncost	lncost	lncost	lncost	lncost	lncost
did	0.019***	0.019***	0.019***	0.018***	0.017***	0.015***	0.015***
	(4.981)	(4.981)	(4.981	(4.981)	(4.981)	(4.981)	(4.981)
lnIncome		0.045***	0.045***	0.027***	0.036***	0.031***	0.032***
		(8.712)	(8.712)	(8.712)	(8.712)	(8.712)	(8.713)
lnCPI			-0.095**	-0.107**	-0.105**	-0.100**	-0.100**
			(1.709)	(1.707)	(1.708)	(1.708)	(1.708)
lnPD				0.464***	0.474***	0.476***	0.477***
				(5.155)	(5.156)	(5.156)	(5.156)
lnTI					0.048***	0.052***	0.052***
					(10.064)	(10.065)	(10.065)
lnGI						-0.018**	-0.019**
						(1.837)	(1.838)
lnREL							-0.002***
							(9.011)
Constant	15.063***	14.625***	15.068***	17.987***	17.778***	17.773***	17.754***
	(12.193)	(12.193)	(12.193)	(12.395)	(12.412)	(12.412)	(12.415)
Observations	1,590	1,590	1,590	1,590	1,590	1,590	1,590
R-squared	0.981	0.981	0.981	0.982	0.982	0.982	0.982
yearfix	YES	YES	YES	YES	YES	YES	YES
idfix	YES	YES	YES	YES	YES	YES	YES

Note: t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1.

3.2 Parallel Trend Testing

The premise of using a multitemporal DID model is that the experimental and control groups maintain a consistent trend of change before the policy occurs, i.e., the parallel trend test assumption is satisfied. The parallel trends test is a key step in assessing the effects of policies in economics, especially when the multitemporal DID model is used, which verifies whether the experimental and control groups exhibit similar trends of change prior to the policy, which is the basis for ensuring the accuracy of causal inferences. For the analysis of the experimental and control groups, the parallel trend test provides a way to ensure that the two groups show consistent trends in their outcome variables (e.g., consumption levels) in the absence of the policy intervention. This consistency means that any differences in postpolicy implementation can be more reliably interpreted as an effect of the policy.

Since the pilot cities differ in the timing of the policy shock, it is not possible to simply set a time dummy variable for a particular year as the tipping point at which the policy occurs; rather, it is necessary to set a dummy variable for each pilot city for the corresponding time value of the implementation of the purchase restriction policy. The results are shown in Figure 1.

The results show that none of the coefficients of the relative time dummy variables before the occurrence of the policy are significant and have small values, which suggests that there is no significant difference between the disposal group and the control group in terms of the level of consumption before the policy occurs, i.e., the housing restriction policy is in line with the parallel trend hypothesis. After the policy was implemented, the results show that the fact that it started in the second half of 2010 resulted in an increase in the time variable dummy coefficients for that year, but they are still not significant. From the beginning of 2011 onward, the impact coefficient of the housing purchase restriction policy was significantly positive and increasing, indicating that the housing purchase restriction policy significantly increased the consumption level of residents.

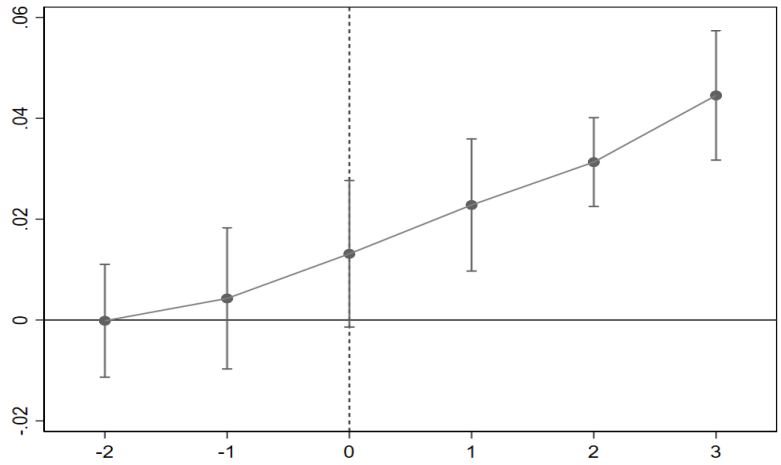

Figure 1: Parallel trend test

3.3 Heterogeneity Treatment Effect Test

The heterogeneity in treatment effects across groups and over time is an important reason for the bias in the two-way fixed effects model. When there is heterogeneity in treatment effects, even if the parallel trends assumption is met, the estimated results of the treatment effects will still be biased, and this bias may still exist in research scenarios such as the same policy implementation point in this thesis. The latest theoretical econometric literature has proposed several robust estimators to address heterogeneous treatment effects. This thesis, which is based on the multiperiod, multiindividual difference-in-differences model and the corresponding estimator proposed by de Chaisemartin and D'Haultfoeuille, diagnoses the possible heterogeneity in treatment effects in the baseline regression.

Individuals whose policy treatment status changes before and after the policy event are regarded as the treatment group, and individuals whose policy treatment status does not change are regarded as the control group. By comparing the actual results of the treatment group after the treatment with their counterfactual results, the treatment effect can be obtained, and after weighted averaging, it becomes an unbiased estimate of the policy switch effect.

Before the implementation of the housing purchase restriction policy, the policy effect was not significant, but after the implementation of the housing purchase restriction policy, the policy effect gradually emerged. The results in Figure 2 are basically consistent with the sign, size, and trend of the treatment effect in the baseline regression, indicating that the baseline regression has passed the test for heterogeneity in treatment effects, and the main conclusions remain unchanged.

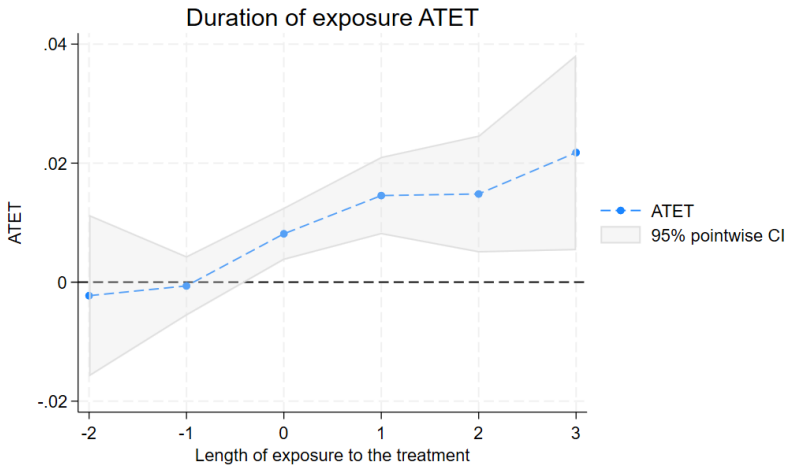

Figure 2: Heterogeneity treatment effect test

3.4 Robustness test

3.4.1 Synthetic difference-in-differences regression results

In the field of policy evaluation, the difference-in-differences (DID) method is often used to measure policy effects, but its effectiveness is highly dependent on the assumption of parallel trends. This assumption requires that the potential outcome trends of the treatment and control groups are parallel before and after the policy implementation. However, this assumption is often difficult to verify in practice because the counterfactual situation where the policy did not occur is unobservable. Although researchers have attempted to support the assumption of parallel trends by comparing the consistency of pretrends, this method has inherent uncertainty because the consistency of pretrends does not guarantee the continued parallelism of trends after policy implementation.

This limitation of the DID method has prompted researchers to explore other methods, such as the synthetic control method (SC), which simulates the possible outcome of the treatment group in the absence of policy intervention by constructing a weighted average of the control group. Although the synthetic control method has significant advantages in case studies, it also faces its own limitations. When the characteristics of the treated unit differ greatly from those of other potential control units, the synthetic control method may struggle to find the appropriate weight combination to simulate the counterfactual state of the treated unit accurately.

The synthetic difference-in-differences (SDID) method proposed by Arkhangelsky and others is an important supplement to existing policy evaluation tools. SDID combines the advantages of the DID method and the synthetic control method, reduces the dependence on the assumption of parallel trends, and enhances the robustness of the estimation by reweighting pretrends. In addition, SDID improves the applicability of the method by introducing fixed effects, allowing it to adapt to different numbers of treated individuals. The SDID estimator shows significant advantages in the identification and estimation accuracy of treatment effects and is applicable to a wider range of policy evaluation scenarios, including but not limited to the evaluation of the effects of housing purchase restriction policies. In practical applications, the SDID method can provide policy makers and researchers with more reliable and accurate evaluation results.

In accordance with the methods of (Arkhangelsky, 2021), a robustness test using the SDID method was conducted, and the results are shown in Table 3 below. The average treatment effect of the SDID estimator is 0.01812, which is significant at the 1% level, indicating that the housing purchase restriction policy can generally effectively increase the consumption level of residents.

Table 3: Synthetic difference-in-differences test

lncost	ATT	Std. Err.	t	p>|t|	[95% Conf. Interval]	
did	0.01812	0.01290	1.41	0.006	-0.00715	0.04340

3.4.2 Bacon decomposition

In accordance with the research of Goodman-Bacon (A., 2021), two-way fixed effects with multiple periods and time-varying treatment timing are divided into two good control groups and one bad control group. The effect estimate is the weighted average of the three types of DID treatment effects mentioned above, making the weight ratio of the three types of DID treatment effects very important. Therefore, Bacon decomposition is used for the diagnosis of bias, and the results are shown in Table 4 below. The "Later T vs. Earlier C," which represents the bad control group, has a weight ratio of 0.14%, which is sufficient to indicate the stability of the model.

Table 4: Bacon decomposition

DD Comparison	Weight	Avg DD Est
Earlier T vs. Later C	0.010	0.015
Later T vs. Earlier C	0.014	0.007
T vs. Never treated	0.976	0.015

T = Treatment; C = Comparison

3.4.3 PSM-DID regression results

To better simulate the treatment group with the control group, propensity score matching is first applied to the sample data. It is well known that there is no superiority or inferiority among matching methods, but owing to certain estimation biases inherent in different matching methods, even the same sample data can produce heterogeneous measurement results. There is no consensus in the academic community on which method should be used for matching to achieve the best results. However, if similar or even consistent results are obtained after multiple matching methods are used, the matching results are robust, and the sample validity is good. Therefore, to increase the reliability of the research conclusions, this thesis uses four mainstream methods for matching. 1) k-nearest neighbor matching, which matches by finding the k nearest individuals from different groups on the basis of the propensity score. In this thesis, k is set to 2 for a one-to-two match to minimize the mean square error. 2) Caliper matching, which restricts the absolute distance of the propensity score. After calculation, the caliper range is set to 0.07 in this thesis. 3) Caliper-within k-nearest neighbor matching, which looks for k-nearest neighbor matches within a given caliper range. In this thesis, the caliper range is set to 0.07 for a one-to-two match. 4) Kernel matching. The default kernel function and bandwidth are used in this thesis. The results of the four matching methods are almost identical upon inspection, so the third method, caliper-within k-nearest neighbor matching, is chosen for robustness testing. The regression results are shown in Table 5(1). The regression results in the table are all significantly positive and are essentially no different from the baseline regression results, which to some extent indicates that the housing purchase restriction policy is robust in promoting the consumption level of residents.

3.4.4 Excluding municipalities

To avoid the impact of the scale effect of municipalities directly under the central government on the regression results, Beijing, Tianjin, Shanghai, and Chongqing, the four municipalities, were excluded. The regression results are shown in Table 5(2). After exclusion, the coefficient of the core explanatory variable remains significantly positive, which is essentially no different from the baseline regression results, indicating to some extent that the housing purchase restriction policy is robust in promoting the level of consumption of residents.

Table 5: Other robustness tests

VARIABLES	(1)	(2)
did	0.021**	0.013**
	(1.710)	(1.702)
Constant	0.351***	0.732***
	(10.004)	(10.214)
Observations	642	1566
R-squared	0.012	0.861
controls	YES	YES
yearfix	YES	YES
idfix	YES	YES

Note: t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1.

3.4.5 Placebo test

Despite the aforementioned propensity score matching process and related tests having mitigated the impact of omitted variable bias, it is still impossible to completely rule out the possibility that the increase in residents' consumption is caused by unobservable factors. We construct a virtual policy implementation city and time to verify the findings in the preceding text to determine if they are caused by the housing purchase restriction policy. The logic is as follows: if the increase in residents' consumption is not due to the housing purchase restriction policy but to other unobserved city and regional characteristics, then even if we change the cities and years where the purchase restriction policy is implemented, we should still obtain the result of a significant increase in residents' consumption; in contrast, it can exclude the possibility of other cities and regional characteristics having a significant impact on the estimation. The selection of control variables and fixed effects is the same as before. To ensure the credibility of the results, we conducted 1000 simulations. Figure 2 shows the distribution of regression coefficients from the abovementioned placebo test. The figure shows that the simulated regression coefficients are normally distributed, and the mean is approximately 0, with a perfect fit. This finding indicates that the increase in residents' consumption is indeed caused by the housing purchase restriction policy, not by omitted variables.

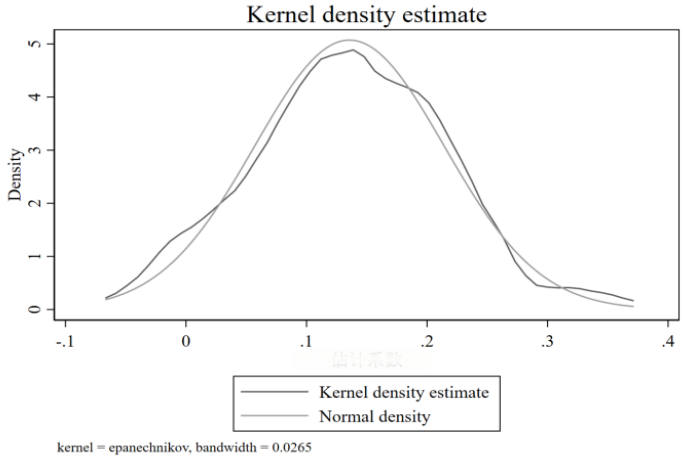

Figure 3: Placebo test

4. Mechanism testing

The previous analysis indicates that the housing purchase restriction policy significantly enhances the consumption level of residents. Therefore, how does the restriction policy affect residents' consumption? On the basis of the hypotheses of the previous section, this study analyzes the impact pathways from three aspects: housing prices, household debt, and the government land supply. This thesis uses the bootstrap method to study the mediating effect of the housing purchase restriction policy on residents' consumption. This thesis employs the bootstrap method to resample with replacement from the given sample 1000 times, and the results are shown in Table 9 below.

When the mediating effect is housing prices, the indirect effect is 0.326, with a confidence interval of 0.141--0.414. The confidence interval does not include 0, indicating a significant mediating effect, and Hypothesis A is established; when the mediating effect is household debt, the indirect effect is 0.307, with a confidence interval of 0.240--0.413. The confidence interval does not include 0, indicating a significant mediating effect, and Hypothesis B is established; when the mediating effect is government land supply, the indirect effect is 0.277, with a confidence interval of 0.167--0.447. The confidence interval does not include 0, indicating a significant mediating effect, and Hypothesis C is established.

In conjunction with the content of Hypothesis A and the results of the mediating effect of housing prices, it is concluded that the housing purchase restriction policy can increase the consumption level of residents by suppressing housing prices. In conjunction with the content of Hypothesis B and the mediating effect of household debt, it is concluded that the housing purchase restriction policy can increase the consumption level of residents by reducing household debt. In conjunction with the content of Hypothesis C and the mediating effect results of

government land supply, it is concluded that the housing purchase restriction policy can increase the consumption level of residents by reducing the government land supply.

In summary, housing prices, household debt, and the government land supply all positively promote the consumption level of residents, with housing prices contributing the most, followed by household debt and the government land supply. This suggests that in the future development process, policymakers should comprehensively consider the impacts of housing prices, household debt, and land supply on residents' consumption when real estate market policies are formulated. Through multidimensional policy regulation, they should promote the stable growth of the economy and improve residents' consumption levels. Moreover, they should also be aware of the risks caused by fluctuations in the real estate market to ensure the sustainable development of the economy.

Table 6: Mechanistic analysis

VARIABLES	Housing prices	Household debt	Government land supply
Indirect effect	0.326*** (0.141-0.414)	0.307*** (0.240-0.413)	0.277*** (0.167-0.447)
Observations	1590	1590	1590

Note: t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1.

5. Results Analysis

This study, which is based on the pilot policy of housing purchase restrictions, empirically tests the impact of the housing purchase restriction policy on the consumption level of residents. The study revealed that the housing purchase restriction policy helps improve the consumption level of residents, mainly through channels such as housing prices, the wealth effect, the income effect, household debt, and the government land supply. In particular, while conducting the pretest of parallel trends, an important assumption for the difference-in-differences model, this paper also applies a synthetic difference-in-differences model, effectively avoiding the bias issues inherent in the method itself, and uses Bacon decomposition for component decomposition of the two-way fixed effect model, making the empirical results more rigorous. The conclusions of this paper provide more theoretical support and empirical data for the government to use housing purchase restriction policies reasonably to stabilize the real estate market and stimulate the economy.

On the basis of the above research conclusions, this paper proposes the following policy recommendations. First, they adhere to the rationality of the purchase restriction policy. Second, city-specific policies should be implemented for refined regulation. Third, the structure of the land supply should be optimized.

Disclosure Statement

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