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Growth-driven shantytown redevelopment and housing market dynamics in the low-tier cities of China

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[very preliminary and incomplete]

Abstract

We analyze the housing market consequences of a large-scale government-led urban redevelopment program in China that relies on a specialized financial instrument. With a special loan support from the central bank, local governments of low-tier cities purchased a huge number of sub-standard dwellings in their urban areas between 2015 and 2019, accounting for approximately 3.3% of the country's urban housing stock, and then carried out demolition. Resale revenue from the reassembled land is expected to repay the loan. Families whose shantytown homes were collected got generous cash resettlement. The proportion of urban households receiving cash resettlement varies by city. Dealing with the self-selection problem of this policy intensity based on an instrumental variable approach, we find that in cities with a higher proportion of urban households receiving this windfall, housing and residential land prices have fallen relatively despite an increasing demand, while housing oversupply has deteriorated. This is partly caused by the program-induced changes in beliefs, leading to speculative housing demand and, in turn, an exaggerated supply-side response from the government. The latter, seemingly myopic, was prompted by the growth motive of local governments, as the implementation of the program was growth-driven, in addition to welfare-improving oriented.

Keywords: urban redevelopment, belief, housing supply, low-tier cities

JEL codes: R31, R23, H73

1. Introduction

There is a consensus that redevelopment of older neighborhoods enhances their own attractiveness and generates positive externalities for neighborhoods in the vicinity. Due to the existence of this unpriced externality, market-led redevelopment always lags and is scaled below the social optimum. Moreover, neighborhood development requires coordination between developers and residents, without which it may remain vacant or dilapidated even with sound fundamentals (Owens III et al., 2020). The delayed and inadequate redevelopment process has led to the common problem of declining downtowns. Existing studies have found that urban redevelopment triggered by disasters such as fires and earthquakes even brought additional economic returns in the long term compared with the scenario that the disaster was absent (Siodla, 2015, 2017; Hornbeck and Keniston, 2017; Xu and Wang, 2019), because they removed the barriers to redevelopment. Disasters obviously cannot be used as a policy tool, so the feasible mode is to internalize such positive externalities by initiating government-led urban redevelopment.

However, government-led redevelopment is subject to return-on-investment constraints, since expenditures are expected to be compensated with forward fiscal revenue or welfare improvement, while it is technically challenging to evaluate the return in a causal manner (Rossi-Hansberg et al., 2010). In addition, a large-scale urban redevelopment program requires huge, one-time expenditures, which are likely to break the current fiscal balance and disincentivize local governments from promoting such projects. Therefore, the decline of urban centers caused by barriers to redevelopment remains a thorny urban governance problem faced by both developed and developing economies.

This study analyzes the consequences of a large-scale urban redevelopment project, more specifically, a housing improvement scheme, in China, which operates in a manner different from that common in other countries. The project was aimed at improving housing conditions of shantytowns, called the resettlement-based shantytown redevelopment program (CR_SRP), and was intensively implemented by the Chinese government from 2015 to 2019. This is a new mode of financing urban redevelopment that is committed to stimulating the development of local real estate market through the government's centralized purchase and demolition of low-quality housing, removing redevelopment barriers. The government's costs are expected to be covered by the resale

revenue of the reassembled land and growth-induced tax revenue (a thriving real estate market leads to local economic growth). Note that the CR_SRP, backed by a specialized financial instrument offered by the central bank, is expected to not affect local governments' current budget constraint.

The implementation of this program provides us with an ideal setting to conduct a causal analysis of shantytown redevelopment's impact on local economy. First, housing demand is driven exogenously because the liquidity injection is top-down from a special loan support of the central bank to local government. Shantytown demolition and redevelopment have brought a large demand for housing purchases, stemming from the government paying to acquire a huge number of substandard houses at a price well above the market level, but not driven by local economic growth opportunities or population increase.¹ Second, real estate development in China is market-oriented and highly competitive, implying that the observed market responses are more likely to be generalizable to other housing markets.

We first analyze the expansion of demand brought by CR_SRP to the real estate market and the supply-side response of governments and developers, and then examine the impact on local housing supply and government debt. There are differences between cities in the application intensity of this special loan and the CR_SRP. Dealing with self-selection of this intensity based on an instrumental variable (IV) approach, we find that in cities with higher intensity of cash resettlement, that is, the higher proportion of urban residents receiving this windfall, local government accordingly supplied more new residential land to match the expected demand booming for housing purchases, and in turn, real estate developers built more new homes. However, the supply side may have overreacted, because prices have fallen relatively while housing oversupply has deteriorated.

Our empirical results show that government decision-making plays an important role in this process. Local governments' choice of CR_SRP intensity determines the extent of demand growth in the first stage, and it then affects housing supply through determining the scale of new supply of residential land. The increase in the supply of residential land by local governments is significantly higher than the expected increase in demand through cash resettlement, indicating that the

¹ Due to the positive externalities, the scale of market-led urban redevelopment is usually lower than the social optimum (Rossi-Hansberg et al., 2010). Without government intervention, land and houses in shantytowns, even though they may be in desirable locations, cannot be sold at a satisfactory price.

government believes that cash resettlement may bring about changes in market expectations and thus additional demand. This can be verified as we indeed see that the speculative housing purchase has grown rapidly after 2014. Nonetheless, local governments seem to be overly optimistic about the surge in demand, leading to oversupply.

By looking at the heterogeneity between cities, we find that the initial scale of housing inventory and local growth pressures affect the response of local governments to CR_SRP in the supply of residential land. Given the CR_SRP strength of a city, those that had a high inventory scale in 2014 were cautious about launching new supply, while those cities with low initial inventory were likely to carry out aggressive residential land supply. We also consider the growth motivations of local governments. Cities with greater growth pressure, compared with other cities in the same province, are found to be more aggressive in supporting housing supply expansion when faced with real estate-led growth opportunities while overlooking the risk of oversupply. The results of these two sets of sub-sample regression imply short-sightedness in local government decision-making.²

We then analyze the consequences of the CR_SRP on local public finances and welfare. Cash compensation has exacerbated local governments' debt. Although the booming real estate market driven by CR_SRP has brought fiscal revenue including land sales to local governments, lower-than-expected housing demand growth has hindered the realization of this goal.³ In addition, given that a city's scale of urban land development was highly regulated by higher-level governments, excessive residential land supply comes at the expense of compressed other urban land, which in our analysis appears as a decline in public land supply and related investment associated with non-productive welfare facilities (e.g., education, health, elderly care and medical sectors). This inhibits the welfare improvement of local urban residents.

Our study contributes to the existing literature in two ways. First, we systematically estimate various economic consequences of a new mode of promoting urban redevelopment. This mode is different from those analyzed in the existing literature (Rossi-Hansberg et al., 2010; Collins and

² This insight is consistent with a central theme emphasized by Song and Xiong (2024), who argue that the career incentives fostered by economic tournaments within China's state system can cultivate a tendency towards short-sightedness among local government officials, leading to overinvestment and excessive leverage by local governments.

³ Urban land is owned by governments in China, and any entity or individual is only allowed to purchase land use rights rather than ownership from the government. Local governments are responsible for converting rural land into urban land and selling land use rights to real estate developers on the primary market, thereby generating fiscal revenue. As China is undergoing rapid urbanization, land sales revenue accounts for more than 30% of total local governments' fiscal revenue.

Shester, 2013; Guerrieri et al., 2013; Ahlfeldt et al., 2016; Diamond and McQuade, 2019). Its scale is much larger than a city/community-specific program, and its financial amount of government support is much more substantial than the typical expenditure on community maintenance, bringing about broader impacts on the real estate market and local fiscal balance.⁴ Second, we add to the literature on discussing potential mechanisms through which, in a competitive industry, suppliers tend to overreact to an unexpected jump in demand, resulting in overinvestment and oversupply, while future benefits increase less than one might expect. Literature finds that expectations tend to play an important role in driving boom-bust investment cycles in the housing market (Mian and Sufi, 2014; Glaeser and Nathanson, 2015; Burnside et al., 2016; Bordalo et al., 2020; Bordalo et al., 2022; Xu, 2023) or other competitive industries (Greenwood and Hanson, 2015; Gennaioli et al., 2015; Bordalo et al., 2024), and this can be further strengthened in the industries there is a lag between investment plans and their realization (Kydland and Prescott, 1982; Wang et al., 2024), we provide a supporting case from the China's housing sector for this macroeconomic framework. Our findings are most closely related to Rogoff and Yang (2024), who have carefully documented over the past decade, China's low-tier cities have witnessed overinvestment in housing stock during the boom period, resulting in housing supply overhang and a rapid expansion of local government debt.

The rest of the paper is organized as follows. Section 2 describes the cash resettlement-based shantytown redevelopment program. Section 3 discusses our data and empirical methodology, and Sections 4 and 5 present the main findings. Section 6 gives some extension discussions and Section 7 offers concluding remarks. We also include an online appendix that discusses robustness checks of our empirical findings.

2. Background

2.1 A financial instrument aimed at supporting shantytown redevelopment

In April 2014, the central bank of China (People's Bank of China, PBOC) introduced a new

⁴ Several recent studies have analyzed the effects of China's shantytown redevelopment. This mode effectively improves the living standards of low-income residents, creates a situation in which the growth in wealth for the households, and generates substantial positive externalities by promoting inner-city redevelopment (Li et al., 2019; Zhou, 2022). Moreover, it facilitates household migration by unlocking them from the illiquid housing market (He et al., 2024). However, this mode may also bring unintended consequences, such as aggravating the wealth gap within local households in cities with lower initial intra-city wealth inequality (Yi et al., 2024) and decreasing housing affordability for those households not included in the program (Liu, 2023). Other studies focus on its impacts on household and individual behavior. At the micro-level, this program reduces labor market participation (Zhou, 2022), results in lower educational achievement of the children (Li and Xiao, 2020), and increases households' participation in risky financial markets, especially for individuals who choose pure cash compensation (Shi and He, 2022).

structural instrument—the pledged supplementary lending (PSL) —to support specific key areas of socio-economic development including shantytown redevelopment, construction of underground pipelines, and major water conservancy projects.⁵ The main advantages of PSL are significantly lower than market interest rates and relatively long loan terms. Moreover, it can alleviate the structural imbalance of liquidity to support specific areas.

An important reason for injecting PSL into shantytown redevelopment projects was the severe oversupply of real estate in China at the time. Implementing cash resettlement through PSL is expected to effectively remove unsold real estate inventory (we will discuss the process of implementing cash resettlement through PSL in detail in the next section).

The first PSL loan was issued to the CDB in July 2014, and it was then issued to local governments through special loans for shantytown redevelopment. The issuance of this loan was mainly accumulated from 2015 to 2019, and it began to withdraw from the market since then, as a relatively low unsold housing inventory has been achieved (see Appendix Figure OA1) and the central bank realized that the release of liquidity brings heightened financial risks. In this period, the central bank invested approximately 3.6 trillion Yuan in base currency through the PSL.⁶ According to a currency multiplier of five times (a conservative estimate), it released more than 17.5 trillion in derivative currency.⁷

2.2 The cash resettlement-based shantytown redevelopment

Along with the introduction of the PSL, the Chinese government proposed what was perhaps the largest housing support program in world history for low-income urban households. Figure 1 demonstrates the intended mechanism of cash resettlement-based shantytown redevelopment. The solid black lines (from (1) through (7)) reflect the expected flow of funds: the central bank loans to policy banks through PSL, and then loans to local governments through policy banks. The local government pays the residents in shantytowns as cash resettlement, and the residents buy houses from developers in the market. Stimulated by policy-induced housing demand, developers purchase

⁵ Eligible institutions include the China Development Bank (CDB), the Agricultural Development Bank of China (ADBC), and the Export-Import Bank of China (CEXIM). For loans granted under the PSL, the PBOC provides the lenders with funds equal to 100 percent of the principal. See for more details in: <http://www.pbc.gov.cn/en/3688229/3688335/4738114/5241677/index.html>.

⁶ Retrieved from <https://finance.sina.com.cn/cj/2024-01-04/doc-inaahqvq3974555.shtml> (in Chinese).

⁷ Using a currency multiplier of five times as a conservative estimate is based on two considerations. First, since the central bank started issuing PSL, China's currency multiplier has risen rapidly, exceeding five times in 2015 and six times in early 2019. Second, PSL can also leverage private investment through government-led investment, with a leverage ratio of 2-3 times the investment scale.

residential land from the government for new development and pay land transfer fees (it can be the redevelopable land after the demolition of shantytowns, or new residential land from elsewhere). The government receives land transfer funds from developers to repay policy banks, and the funds are ultimately retained back to the central bank. The red dotted lines represent the delivery of land and housing with the flow of funds. Residents of shantytowns give up their original shantytown housing and acquire new housing. Developers sell off housing stock (improvement in liquidity and belief) and then purchase land for new development. Local governments take back the land occupied by shantytowns, demolish it and resell it to developers (the reassembled land can be for other urban uses, such as commercial development, if the government decides to convert the nature of the land).

[Figure 1 about here]

With the support of PSL and other special loans/funds from central/local governments, between 2015 and 2019, local governments in the country purchased a huge number of shantytowns' dwelling units (approximately 11.7 million housing units, accounting for 3.3% of the total urban housing stock in 2020), carried out demolition and urban replanning/redevelopment. In addition, shantytown redevelopment based on physical resettlement (the government is responsible for rebuilding the original site in lieu of cash compensation, thereby not affecting housing demand in the market) demolished approximately 4.5% of the total housing stock in this period. The funds provided by PSL are estimated to account for 72.0% of all investment in this round of government-led shantytown redevelopment, including both cash and physical resettlement; in addition to PSL, local governments are granted certain authority to use other funds or debt financing methods to promote shantytown redevelopment or related infrastructure investments (Shenwan Hongyuan Securities Co., Ltd., 2024).

Families whose shantytown houses were purchased by the government received generous payments, and were encouraged to buy a house of their choice in the market to improve their living conditions.⁸ Differing from the welfare-oriented redevelopment project where local governments are

⁸ During the implementation of cash resettlement, the value of expropriated houses will be determined based on the market value of a standard-quality housing in a similar location and a comparable size. Since the amount of cash resettlement must be higher than the market price of the sub-standard shantytown housing dwellings, the program was welcomed by most homeowners. In addition, to promote the process of cash resettlement and redevelopment, local governments tend to provide financial incentives to individuals who sign the cash-resettlement agreement in due course. Note that in China's urban areas, homeowners only own the building above the land and right of land use. Ownership of urban land belongs only to the government. Therefore, the cost for homeowners to accept cash resettlement is the ownership of the house and the corresponding land use rights. After demolishing these shantytown dwelling units, the local government may transfer the land use rights (usually for 40-70 years) and allow redevelopment.

responsible for repairs or reconstruction on the original building/site, CR_SRP brought tremendous liquidity to the original house owners, helped to solve the severe oversupply of new housing problems in China's urban areas at the time, and was also hoped to promote real estate investment and thereby stimulate economic growth. This expected economic growth effect gives local governments a strong incentive to introduce the CR_SRP, even though it will increase local debt in the short term.⁹

The intensity of CR_SRP was high in 2015-2019, but has exited the market since 2020 (Figure 2). There are significant differences in the intensity of CR_SRP at the city level. Figure 3 shows the distribution of CR_SRP intensity across different cities in our sample, with the color intensity representing the level of CR_SRP intensity reported. It is evident that the cities with the highest CR_SRP intensity are primarily concentrated in inland regions with relatively low economic growth. In contrast, cities located in the eastern coastal regions, as well as top-tier cities (including first-tier, new first-tier, and second-tier cities) such as Beijing, Shanghai, and Shenzhen, generally have the lowest CR_SRP intensity.

[Figures 2 and 3 about here]

This project has been argued to be one of the important reasons for the rise in housing prices in Chinese cities (He et al., 2020; Liu, 2023; Gao et al., 2023), as both top-tier and low-tier cities experienced rapid price surges after 2015. As local housing inventories were rapidly depleted, the cash resettlement scheme was almost stopped after 2019 in an effort to curb the overheating real estate market and nationwide housing price appreciation. Here, we should note that the housing price increase in top-tier cities has been more significant, while the intensity of CR_SRP is lower (see Appendix Figure OA2). Therefore, the positive correlation between CR_SRP intensity and housing price growth is still open to question; Hong Ni, the Deputy Minister of Housing and Urban-Rural Development of China in 2018, insisted that CR_SRP was clearly not a reason for rising house prices in 2015-2018.¹⁰

Note that the origins, ownership, and resident compositions of shantytowns in Chinese cities are

⁹ Special loans obtained by local governments from the PSL or other financial tools will form local debt. Because the CR_SRP-led house demand increase will generate land sales revenue for local governments, they are expected to use it to repay the above debt.

¹⁰ Retrieved from <https://www.gov.cn/xinwen/2018zccfh/36/index.htm> (in Chinese) (Oct. 11, 2018).

different from those of slums or “self-help” housing areas that are prevalent in most other developing countries (Brueckner et al., 2019). A primary distinguishing characteristic is the inherent informality of property rights in slum areas of other countries. These slums have typically emerged on vacant government land, with residents self-constructing their housing and a substantial share of slums originating from squatting on lands (Brueckner, 2013). Given that most residents in slums in other countries lack legal title to their dwellings, they frequently face the threat of eviction, since the legal owner of the land possesses eviction rights (Galiani et al., 2017). In contrast, shantytown residents in China generally hold legal entitlement to land and housing, rendering these settlements more formal in terms of property rights.¹¹ Consequently, when the Chinese government facilitates urban redevelopment through shantytown redevelopment programs, it must compensate residents either through physical resettlement or cash resettlement.

Another key distinction lies in the resident composition. Slums in other countries primarily accommodate the urban poor, with large numbers of informal residents belonging to extremely impoverished population groups and facing insecure tenure (Marx et al., 2013). In Chinese shantytowns, however, the majority of housing rights holders do not necessarily belong to the most impoverished segments, as many property owners are not migrant workers residing in these areas but rather often serve as landlords while maintaining separate dwellings elsewhere in the city.

2.3 What drives the regional variation in the intensity of the CR_SRP

The goal of our study is to estimate the impact of the CR_SRP implementation with the support of the PSL on housing demand and supply, and then the effectiveness of this mode of urban redevelopment. A critical premise for identifying the causal effect is to capture what determined the regional variation in the intensity of the CR_SRP. Although this program was proposed partly because the unsold housing inventory at that time was serious, the central government did not directly intervene and determine the intensity of local governments’ CR_SRP implementation, providing them with great autonomy and flexibility. Local governments can apply to higher-level governments for special loans based on their need for cash resettlement of shantytowns. As shown in Appendix Figure OA3, provinces with more severe housing oversupply did not show to provide

¹¹ The land in Chinese shantytowns is state-owned and the government issues land use certificates and pre-sale permits, with housing purchase and sale contracts requiring registration with land and housing authorities.

more cash resettlements.

Given that the PSL interest rate is significantly lower than market interest rates (and even lower than the yield to maturity of ten-year government bonds; see Appendix Figure OA4), the introduction of PSL provides local governments with an opportunity to significantly increase their available funds, equivalent to an increase in low-cost liquidity. This meets the urgent need of local governments with more severe vertical fiscal imbalances (VFI), who are decentralized many important spending responsibilities but lack sufficient revenue sources, to seek a valuable economic growth opportunity and broaden their fiscal resources, especially when the economy faced downward pressure in 2014.¹²

Consequently, we expect that these local governments may be more inclined to apply for PSL to drive the prosperity of the real estate industry, thereby generating multiplier effects in other productive sectors and boosting economic growth.¹³ Notably, because the repayment terms of PSL loan typically range from 5-10 years and can even extend to 25 years, repayment pressure is significantly delayed and will not impose an excessive burden on the current fiscal operation of local governments.¹⁴

Figure 4 illustrates that cities with higher VFI (mainly low-tier cities) are likely to utilize more CR_SRP intensity (see a formal instruction on variation construction in Section 3).¹⁵ In top-tier cities such as Shanghai and Shenzhen, they have rightly shown their indifference to this program. We then provide more formal evidence of the important impact of the VFI in 2010 on the CR_SRP

¹² The VFI refers to the situation where the main spending responsibilities are decentralized to local governments, while the control of major revenue sources is retained by the central government, thereby compelling local governments to rely on borrowing or transfers from the central government to finance their expenditures (Eyraud and Lusinyan, 2013). Regarding the measurement a city's VFI in our case, we follow the approach proposed by Eyraud and Lusinyan (2013), which quantifies the VFI based on the mismatch between revenue and spending decentralization. Specifically, the VFI is calculated as the share of a city's own spending not financed through own revenues (i.e., the difference between a city's own spending and own revenues) relative to its own spending (for more details, see Box 2 of Eyraud and Lusinyan (2013)).

¹³ In contrast, top-tier cities with lower VFI, such as Shenzhen and Shanghai, may not have a strong incentive to apply for PSL because they already possess relatively mature and diversified economic structures, reducing their reliance on PSL loans for economic growth. Moreover, these cities have consistently strong housing demand, and given the risk of rapid housing price increases, they may be more cautious about engaging in the CR_SRP, which could further stimulate housing demand.

¹⁴ This is undoubtedly an attractive option for local government officials, given that their tenures often last less than 5-10 years.. On one hand, PSL can significantly improve the local fiscal situation in the short term, providing officials with more resources to invest in economic development, accumulating political achievements for future career advancement. On the other hand, as a long-term, low-interest loan, the repayment pressure of PSL is deferred to the future, which may induce some officials to overuse PSL for excessive borrowing, leaving risks to their successors. This relates to Raveh and Tsur (2020), who suggest that incumbent officials of local governments tend to finance expenditures via debt because their time horizon is shorter.

¹⁵ This pattern holds true at the provincial level as well (see Figure 4). According to our data, as well as estimates from some financial institutions (such as Shenwan Hongyuan Securities Co., Ltd.), more than 75% of the cash-resettled housing units during this period occurred in low-tier cities.

intensity. Specifically, we regress the CR_SRP intensity on the time-invariant part of the IV (i.e., the VFI in 2010) plus the control variables, including resident population, GDP per capita, and scale of developer inventory (measured by floor space of newly started residential construction and floor space of construction completion at the city level) in the specification.¹⁶

[Table 1 and Figure 4 about here]

We begin by regressing the CR_SRP intensity on the VFI in 2010 first, and find it to be highly significant (column (1) of Panel A in Table 1). To address the concern that the CR_SRP intensity might be influenced by factors other than the VFI, such as inventories and economic growth, which could call our IV approach (as we discuss in Section 3) into question, we examine the correlation between the VFI in 2010 and these potential confounding factors. Columns (2) to (4) of Panel A show that the coefficients on GDP per capita, completed floor area per capita, and residential construction starts per capita in 2014, the year before the surge of the CR_SRP, do not enter significantly. Moreover, the positive relation between the VFI in 2010 and the CR_SRP intensity continues to hold even when controlling for these potential confounding factors in any of the Panel A regressions. For robustness checks, we perform similar regressions at the provincial level, where we find that it still holds true, as shown in Panel B of Table 1. One advantage of using provincial data is that we can control the scale of developer inventory, a variable that is not available at the city level. The consistent results at both the city and the provincial levels provide additional support for the relevance of our instrument and help rule out other alternative mechanisms.

Taken together, these results confirm that, cities with higher VFI, indicating a greater reliance on borrowing or transfers from the central government, are more strongly incentivized to intensify the CR_SRP. Importantly, the intensity of the CR_SRP is driven by higher initial VFI, rather than by higher levels of economic growth or developer inventory. Against this stylized fact, the initial VFI of local governments would serve as the basis for our identification of CR_SRP's real estate market outcomes, as we will discuss in the next section.

3. Data and empirical strategy

¹⁶ Note that the scale of developer inventory is not reported at the city level. We admit that neither the number of housing starts nor completions in the current year is sufficient to accurately identify the scale of a city's developer housing inventory, we therefore conduct a robustness test based on provincial data to control the developer inventory.

3.1 Data

We use data from various sources to estimate the impact of the CR_SRP on the housing demand and supply. This subsection presents an overview of these data sources and the construction of the variables we use for the analysis.

We construct city-level treatment intensity of the CR_SRP as the ratio of the number of a city's cash resettlement-based shantytown redeveloped housing units to its urban population in 2016. We hand-collect data on the number of cash resettlement-based shantytown redeveloped housing units from various sources, including the Statistical Bulletins on the National Economic and Social Development, government work reports, and relevant news articles at both the provincial and city levels, which are obtained from the official websites of the State Council of the People's Republic of China, the People's Government of provinces and Municipalities, the Municipal Housing and Urban-Rural Development Bureau, and the Municipal Planning and Natural Resources Bureau. Note that only data for the year 2016 is available; most cities have not systematically disclosed this data since 2017. Considering that 2016 was the peak period of cash resettlement, we expect that it can reflect the overall cash resettlement intensity of a city between 2015 and 2019.

We utilize the land transaction data from China's Ministry of National Land and Resources official website (<https://www.landchina.com/>) to explore the consequences of the CR_SRP for land market. This dataset covers the universe of land sales by the local governments in China from 2007 to 2022. For each land transaction, we observe the location (city and district), lot size, designated use type (residential, public, commercial, or industrial use), price, transaction date, and the Floor Area Ratio (FAR), which is the ratio of the building's total floor area to the size of the land parcel.

Presumably, imbalances between supply and demand for housing market should be reflected in price developments. Since there are no official publicly released statistics on the price of China's newly built houses, we obtain data on the newly-built housing price from the website of *Fangtianxia* and *Xitai* data, which are major China's real estate transaction databases.¹⁷ An alternative version of the city-level housing prices data is taken from the website of *Anjuke*,¹⁸ a brokerage platform that publicly discloses microdata on housing prices at the city level, covering real secondhand housing

¹⁷ Retrieved from <https://www.fang.com/> and <https://www.creprice.cn/database.html> (in Chinese).

¹⁸ Retrieved from <https://anjuke.com/fangjia/> (in Chinese).

information in various cities. We collect city-level real estate investment in value and floor area of building construction completion from provincial and prefectural statistical yearbooks. Data on annual housing sales in value and floor space across cities come from the CEIC China premium database. The province-level data on the number of real estate developers in the local market and the floor space of residential buildings for sale are obtained from the China Real Estate Yearbook.

We also gather data on local economic conditions from the websites of the National, Provincial, and Municipal Bureaus of Statistics of China, the City Statistical Yearbook, and the China Statistical Yearbook for Regional Economy. We compile city-year-level (as well as province-year-level) control variables relevant to the housing and land markets, encompassing the scale of residential population, GDP growth rate, the proportion of the secondary industry in GDP, the total newly-supplied land area, the ratio of the loan balances of financial institutions to GDP, and GDP per capita. Moreover, we utilize *Qiyeyujingdong*, the CEIC China premium database and the China Stock Market & Accounting Research (CSMAR) databases, three widely recognized commercial databases, which provide data on general public budget revenue and expenditure (which includes various types of public budget expenditure for the same period), land revenue, and the ratio of the local government debt to the total fiscal resources of local government (debt ratio). In addition, city-level fixed asset investment in the municipal public infrastructure in each city is derived from China Urban Construction Statistical Yearbook.

To isolate the impact of the CR_SRP from the potentially confounding effects of the Covid-19 pandemic, we restrict our sample to the period from 2010 to 2019 in the formal regression analysis.¹⁹ Our final city-level sample consists of a balanced panel dataset spanning 212 cities across 28 out of 31 provinces in China, spanning over the period from 2010 to 2019.²⁰ Summary statistics are reported in Table A1 in the Appendix.

3.2 Empirical strategy

¹⁹ Note that local governments, grappling with the economic repercussions of the COVID-19 pandemic and the necessity to manage their own debt obligations, might have strategically managed housing and land markets. This strategy would be especially pertinent for cities that, prior to the pandemic, were more dependent on revenues from land sales, the use of land as collateral for debt, and borrowing or transfers from the central government to finance their fiscal budgets (Chang et al., 2024). By focusing on the pre-pandemic period, we can assess the effectiveness of the CR_SRP in achieving its intended objectives, such as supporting local government finances, stimulating housing demand, and reducing inventory, without the interference of the exogenous shock that disrupted economic activities across different cities.

²⁰ We also apply this specification to the 2010–2022 samples, and the results are the same.

We use the following econometric framework to estimate housing and land market responses to the CR_SRP:

$$Y_{i,t} = \alpha_0 + \alpha_1 \ln(CR_SRP\ intensity)_i \times D_t + \alpha_2 X_{i,t} + city_i + year_t + \epsilon_{i,t}, (1)$$

where i indexes cities, t indexes year. $Y_{i,t}$ represents outcomes of interest in the housing and land market, including newly-built housing prices and various other outcomes (e.g., housing sales in value and floor space, real estate investment in value, floor area of building construction completion, the number of real estate developers, the ratio of land revenue to general public budget revenue, and debt ratio). $\ln(CR_SRP\ intensity)_i$ is the key policy variable and denotes the natural logarithm of the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016, and D_t is an indicator variable that takes on the value one for years after 2014. Although the PSL has been available since April 2014, the large-scale implementation of cash resettlement began in 2015, as shown in Figure 2, so it is reasonable to set 2014 as the benchmark. Nevertheless, as we can see in the estimates below, some outcome variables showed treatment effects even in 2014 due to the potential expectation effects.

$X_{i,t}$ is a set of time-varying control variables, which are explained in detail below. $city_i$ and $year_t$ are city and year fixed effects, respectively. $\epsilon_{i,t}$ is the error term. We cluster standard errors at the city level to address possible serial correlation across periods (Bertrand et al., 2004). We include the following controls ($X_{i,t}$) to alleviate the concern about omitted variable bias: the natural logarithm of resident population, GDP growth rate, the proportion of the secondary industry in GDP, the natural logarithm of the total newly-supplied land area, and the ratio of the loan balances of financial institutions to GDP. Furthermore, considering the multi-stage pilot background of Value Added Tax (VAT) Reform in multiple regions since 2012, VAT_p is a dummy variable that indicates whether region p in year t implements VAT Reform. It takes the value of one from the year of the arrival of the VAT Reform onwards.²¹ In the preferred specification, we control for time-invariant city characteristics (e.g. geographic conditions) by including city fixed effects $city_i$, and we control for changes over time that affect all cities in the same way (e.g. macroeconomic cycles and macro-level

²¹ As for the VAT variable, this paper uses the special case of implementing VAT Reform in different regions in different years to set the variable VAT. In January 2012, Shanghai took the lead in implementing the pilot of VAT Reform in transportation industry and some modern service industries; In September 2012, the pilot scope of VAT Reform was expanded to 9 provinces and cities, including Shanghai, Beijing, Jiangsu, Anhui, Fujian, Guangdong, Tianjin, Zhejiang and Hubei; In August 2013, the VAT Reform was launched nationwide.

shocks) by adding time fixed effects $year_t$.²²

The main challenge in identifying the causal effect of the CR_SRP on housing and land market outcomes arises from selection bias of the policy's implementation intensity at the city level.²³ On this account, we utilize an IV approach. Specifically, we use the interaction between VFI in 2010, the beginning of our study period, and the post-policy dummy as an instrument for the interaction between the CR_SRP intensity and the post-policy dummy.²⁴ The validity of our IV approach relies on the relevance and exogeneity conditions. That is, we need (i) the VFI in 2010 to have a strong impact on the intensity of the CR_SRP across cities, and (ii) the VFI in 2010 to affect outcomes of interest only through its effect on the CR_SRP intensity.

For condition (i), we have provided formal evidence in Section 2. Regarding condition (ii), several factors support the exogeneity of our IV. First, even if the VFI in 2010 could potentially affect the housing market through other channels, such as infrastructure investment or local fiscal expenditure, these effects are absorbed by the city fixed effects in our specification. This ensures that the instrument captures how cities with high VFI were more motivated to seek and secure stronger CR_SRP intensity, rather than reflecting the direct effect of the VFI on housing market outcomes. This implies that the direct impact of the VFI on housing market performance has been absorbed, and its remaining influence is more likely to operate indirectly through changes in policy intensity. Second, as noted earlier, we construct our instrument as the interaction between the VFI and the post-2014 dummy. While the VFI in 2010 could influence housing market outcomes through various channels, the interaction term between the VFI and the post-policy dummy, along with the city fixed effects, mitigates this concern. For our IV to be threatened, there would need to be another significant policy change or channel that emerged or underwent substantial adjustments around the

²² Although mortgage rates have been steadily declining since 2015, from 6.15% at the end of 2014 to 4.8% at the end of 2019, in China, the effect of national-level mortgage rate changes is absorbed by the time fixed effects in our specification. It is worth noting that in 2014, 41 Chinese cities, primarily second-tier cities, eliminated restrictions on home purchases. Moreover, down payment ratios for home purchases between 2010 and 2019 experienced different levels of reduction between cities regulated and non-regulated by house purchase restrictions. To alleviate potential confounding effects, we conduct robustness checks by excluding top-tier cities and cities regulated by house purchase restrictions in our baseline regressions, respectively, and find that our baseline estimates remain robust.

²³ Note that our identification strategy relies on two key features of the CR_SRP in China. First, the timing of the policy's introduction in early 2015 was largely unexpected and exogenous to city-level economic conditions. Second, the intensity of the CR_SRP implementation across cities was not determined by local housing supply and demand.

²⁴ The choice of the VFI in 2010 as the basis for constructing our IV is based on two considerations. First, the VFI in 2010 precedes the introduction of the CR_SRP in early 2015, ensuring that it is exogenous enough to the program. Second, the VFI in 2010 captures the cross-sectional variation in the initial fiscal conditions of cities, which is crucial for understanding the heterogeneous intensity of the CR_SRP across cities between 2015 and 2019.

introduction of the CR_SRP in early 2015. However, during the same period, there were no other large-scale policy changes besides the CR_SRP when the program was introduced in early 2015. This absence of confounding policy factors further validates that the VFI in 2010 primarily affects the housing market only through its effect on the CR_SRP intensity.

Equation (1) examines the average effect of the CR_SRP on housing market outcomes after its introduction. The underlying assumption for an unbiased estimate of α_1 is that the trends in the outcomes for groups with different levels of treatment intensity prior to the introduction of the CR_SRP are parallel. To formally demonstrate the impact of the CR_SRP on outcomes of interest and illustrate the timing of this impact, we examine the dynamic impact of the CR_SRP intensity on housing market outcomes using an event study approach. Specifically, we estimate the following equation:

$$Y_{i,t} = \alpha_0 + \sum_{t=2010, t \neq 2014}^{2019} \alpha_t \ln(CR_SRP \text{ intensity})_i \times D_t + \alpha_m X_{i,t} + city_i + year_t + \epsilon_{i,t}, \quad (2)$$

in which α_t is a series of estimates from 2010 through 2019. Note that the dummy for the year 2014 ($t=2014$), which serves as the benchmark period, is omitted in equation (2) so that the post-treatment effects are relative to the period immediately prior to the implement of the program in early 2015. The $X_{i,t}$ represent the same city-level control variables in Equation (1). We expect α_t to be significantly positive after 2014, as the CR_SRP in the country soared.

4. The impact on housing and residential land market

4.1 Baseline results

Starting from the perspective of local government's decision-making, we first investigate whether cities with higher CR_SRP intensity experience an increase in available financial resources after the PSL introduction. Figure 5 plots point estimates and 95% confidence intervals for the effect of the CR_SRP on the outcomes of interest, based on estimates of coefficients using IV from Eq. (2). We find no pre-trends before the CR_SRP introduction, corroborating the validity of our research design. Panel A in each table presents the OLS results, and Panel B presents the IV results. The estimated coefficient of the CR_SRP intensity interaction term, $\ln(CR_SRP \text{ intensity})_i \times D_t$, reveals the average change in our outcomes of interest arising from the support of the PSL after 2014.

According to the estimate in column (2) of Panel B in Table 2, as discussed in the background

section, a one-point increase in the number of CR_SRP housing units per 1,000 urban residents (i.e., CR_SRP intensity; mean=4.566) increases the total fiscal resources of local governments by 5.5 percent. In column (1) of Panel B, we present the IV first-stage results. The F-statistic is large, indicating a strong relationship between the IV and the interaction of the CR_SRP intensity and the post-2014 dummy, alleviating concerns regarding weak IV. This confirms the earlier findings that suggest that the intensity of the CR_SRP is driven by higher VFI in 2010. Column (3) of Panel B further shows that the CR_SRP sparks significant increases in land revenues.²⁵ The CR_SRP-induced increase in demand for real estate provides local governments with an opportunity to mitigate their fiscal deficits by selling land-use rights, the most crucial input of real estate projects.

Regarding the most important source of land sale revenues—residential land supply—Panels C and D of Figure 5 reveal that the price of residential land decreases sharply, and this negative impact fades away three years after the CR_SRP introduction, whereas the CR_SRP increases residential land supply.²⁶ Faced with the growth in housing demand brought about by the CR_SRP, local governments adopted this “price-for-volume” strategy. This is most probably because they can tolerate lower residential land prices in exchange for the economic benefits of large-scale residential land supply, such as a booming real estate market and a substantial increase in related economic activities, while still achieving growth in land sale revenues.²⁷

Furthermore, in cities with higher PSL intensity, we observe an increase in the ratio of land sale revenues to local general budgetary revenues in the post-2014 period (Figure 5, Panel E). Local governments’ heavy reliance on land sales for funding public spending creates an environment where real estate becomes too important to fail, which in turn encourages overinvestment and overleverage

²⁵ Consistent with this finding, Xiong (2023) found that during the CR_SRP implementation period from 2015 to 2020, while all city tiers experienced growth in the revenue from residential land sales, the increase was far more pronounced in low-tier cities compared to their top-tier counterparts.

²⁶ These results are also reported in Table 2. Note that in China, the local government sets the annual state-owned construction land use plan, which is usually determined in the previous year and released by the Municipal Bureau of Natural Resources and Planning at the beginning of each year, subject to a hierarchical, top-down land quota regulation. The plan specifies the total supply of construction land and land use structure, i.e., the proportions allocated to residential, commercial, public facility, and industrial land uses. Therefore, the results shown in Panels C and D of Figure 5 reflect similar “expectation effects” mentioned above. In addition, this finding aligns with the policy of prioritizing land allocation for shantytown redevelopment within local land supply plans (The State Council of China, 2013).

²⁷ This, along with the PSL loans brought by the large-scale CR_SRP, alleviates the pressure on the fiscal expenditures of local governments to a certain extent and improves the total fiscal resources of local governments. According to Ming, based on the experience during the 13th Five-Year Plan (2016-20), the leverage effect of PSL on project investments is about 1:2.5, suggesting that the injection of PSL funds is expected to play a significant role in stabilizing growth and boosting market sentiment (Global Times, 2024).

in the sector (Xiong, 2023). Considering this, we next explore the impact of the CR_SRP on the housing market, focusing on how developers respond to it.

[Table 2 and Figure 5 about here]

We find direct empirical evidence supportive of the view described above. Panels A and B of Figure 6 reveal that after 2014, the CR_SRP increases real estate investment in value and floor space of newly started residential construction. These findings suggest that in cities with higher CR_SRP intensity, local developers receive the positive signals released by local governments and attach great importance to them. Driven by optimistic expectations of CR_SRP-induced housing demand and future profits, they choose to actively expand supply in response to the CR_SRP.

However, Panels C to F of Figure 6 provide evidence of a negative effect of the CR_SRP on housing price and second-hand housing price, albeit not significantly, whereas a significant positive effect of the CR_SRP on both housing sale in floor space and value.²⁸ As a result, cities with higher CR_SRP intensity experience an increase in housing demand (an upward shift of the demand curve), and an even larger increase in supply (i.e., the supply curve shifts to the right by a larger magnitude) due to developers' excess enthusiasm for land acquisition and overbuilding, ultimately resulting in a relative decline in housing prices.²⁹

Notably, Panels E and F of Figure 6 reveal a significant jump in housing sales volume and value as early as 2014, the year before the CR_SRP's official implementation. This is reasonable because, as in 2014, the central bank introduced the PSL and explicitly supported shantytown redevelopment, and the central government began to plan and deploy a new round of shantytown redevelopment initiatives. These signals likely altered market expectations, prompting developers to accelerate new housing construction ahead of schedule, leading to an increase in supply even before the CR_SRP was substantially initiated. At the same time, forward-looking homebuyers quickly captured this positive signal and adjusted their purchasing decisions, causing an increase in housing sales in advance. The importance of housing market expectations has always been central to the literature on

²⁸ These results are also reported in Table 3. As an additional robustness check, we run the regression excluding voucher cities in column (4) of Table 3.

²⁹ Appendix Figure OA5 and Table OA1 lend strong support to developers' excess enthusiasm in response to the good signals released by local governments. We observe a significant and consistent increase in real estate developers' entries in regions with higher CR_SRP intensity compared to those with lower CR_SRP intensity after 2014. This surge in entries suggests that developers tend to grasp investment opportunities and gain first-mover advantages while failing to make a rational inference of housing demand.

housing demand and supply, as well as house price fluctuations (Landvoigt, 2017; Murphy, 2018; Kaplan et al., 2020). Thus, this change in expectations plays an important role in creating positive effects of the CR_SRP on housing sales volume and value in 2014.³⁰ The increase in supply brought about by the CR_SRP offset the boost in demand, thereby suppressing the upward trend in housing prices.

[Table 3 and Figure 6 about here]

The results so far generate some questions as to whether the relative decline in housing and land prices stems from an overbuilding on the supply side and, if so, the extent of the supply overhang. To consider the magnitude of the impact of the CR_SRP, we perform a simple calculation. An increase in cash resettlement for one additional household during 2015-2019 can be considered an increase of 0.256 households of cash resettlement in 2016, given that the cases of cash resettlement in 2016 accounted for 25.6% of the total in these five years. Considering that the median urban population size in 2016 was 2106.9 thousand, it would raise the key independent variable (CR_SRP_i), as per Eq. (1), by 0.00012151 ($=1*0.256/2106.9$). According to the estimated coefficient of 0.226 in column (6) of Table 3, this would lead to a 0.01373% ($=0.226*0.00012151*100\%*5$) increase in the scale of housing sales in the five years between 2015 and 2019. Multiplying such an increase by the pre-treatment median value of total housing sales in 2014 (2,637,650 square meters) yields an estimated increase in housing sales of 362 square meters ($=0.01373\%*2,637,650$).³¹

[Table 4 about here]

³⁰ A company's market capitalization reflects the market's expectations of its future profitability, and differences in P/E ratios across stocks proxy for differences in expectations of future growth (Lakonishok et al., 1994). We find that during the CR_SRP implementation, the market capitalization and price-to-earnings ratios of Vanke and Evergrande, two leading Chinese real estate companies at that time, experienced significant increases (see Appendix Figure OA6). This during-CR_SRP period saw positive market expectations for the real estate sector, driven by both the direct impact of the CR_SRP on housing demand and the positive signals released by the government's increased supply of residential land under the CR_SRP, which boosted confidence in real estate investment. The substantial decline in the market capitalization and price-to-earnings ratios of these two leading real estate companies as the CR_SRP began to exit the market in 2020 further demonstrates that market expectations fell after the CR_SRP started to withdraw from the market.

³¹ This confirms the change in market expectations. In fact, many homeowners in China have treated their properties as an investment (Xiong, 2023). The PSL has exacerbated expectations of rising home prices, leading to home purchases by households that have not been directly affected by the PSL. The proportion of speculative property purchases is large. As reflected in Appendix Figure OA7, during 2015-2018, the proportion of speculative (or investment-motivated) housing purchases increased from 27.7% to 55.1% (China Household Finance Survey, 2018). It is also the case that some households decided to purchase homes for their own use earlier than originally planned, fearing that housing prices would rise due to the CR_SRP. Table 4 performs a simple regression analysis, and by identifying the purpose of home purchases, we find that in 2015, 2017 and 2019, the proportion of investment home purchases increased faster in cities with higher PSL intensity than those with lower PSL intensity. This is consistent with evidence in Mian and Sufi (2022), who exploit the sudden acceleration of the private-label mortgage securitization market as a natural experiment to demonstrate that credit supply expansion boosts housing speculation, which amplifies housing boom and bust.

Applying a similar calculation to the estimated coefficient in column (4) of Table 2, we find that a one-unit increase in cash resettlement is associated with a 296 square-meter increase in residential land supply, which translates to an increase of 704 square meters in floor space, assuming a floor area ratio (FAR) of 2.38 (medium value of our sample). It is evident that the supply of the real estate market is growing even more than the demand. Specifically, the cash resettlement of each housing unit will bring about an oversupply of housing with a floor space of 342 ($=704-362$) square meters. As Rogoff and Yang (2024) emphasize, due to housing stock's durability, overinvestment in housing stock leads to an excess supply during the boom period, which results in not only an overhang of housing stock, but inventory keeps piling up and unfinished buildings continue to accumulate on the market, with this effect being driven mainly by China's low-tier cities.

4.2 A conceptual explanation

To illustrate the economic intuition of the above-mentioned results, we introduce a simple conceptual model to describe the changing supply-demand relationship in the housing market during the CR_SRP implementation. We explain the housing market booming and (potentially) bursting by discussing the possible role of credit expansion and belief change (Mian and Sufi, 2014; Glaeser and Nathanson, 2015; Burnside et al., 2016; Mian and Sufi, 2022). Figure 7 shows the mechanism.

[Figure 7 about here]

Suppose there is a housing market in a particular city that starts in equilibria at point A . Considering that the introduction of cheap credit for governments (i.e., PSL) significantly improves households' liquidity constraints in shantytowns, directly stimulating demand for housing purchasing (their shantytown houses were collected and demolished), the demand curve shifts up from D to D' , driving up prices and quantities. Led by optimistic expectations about the continuity of shantytown redevelopment program and prospects of the real estate market, speculative demand increases, further shifting the demand curve to the right to D'' . Considering that the expansion of housing supply takes time, prices rise in the short term (i.e., P_t), which encourages local governments to allocate more land for housing development from the perspective of land finance. Consequently, the supply curve for the housing market shifts to the right (from S to S'), forming a new equilibrium at point B . Note that the new equilibrium price (corresponding to point B) may be higher or lower than

the initial equilibrium price P_0 , depending on the total land supply constraints faced by local governments and the extent to which they rely on land sale revenues.

However, since the CR_SRP began to withdraw from the market and the PSL loan ceased, the belief of persistently rising housing prices changed and speculative housing demand weakened, causing the demand curve to shift down from D'' back to D' . In this process, the supply curve continues to shift to the right because real estate projects that started during the period with optimistic expectations continue their construction. The common price (corresponding to point C) settles at a lower level (i.e., P_2) in the new equilibrium. The quantities in the housing market by which point B exceeds point C reflect the extent of oversupply, which includes both the unsold housing inventory held by developers and the sold but vacant housing.

In a nutshell, when financial instruments and easy money are available to local governments, they tend to fully use the demand-expanding financial instruments and increase supply at the same time, partly ignoring the possibility that expectations may turn pessimistic at some point in the investment cycle. This potential myopia of local governments causes a distortion in their pursuit of supply-side expansion. Subsequently, real estate developers respond to the positive signals from local governments, expanding investment without making a rational inference of real market demand, leading to oversupply. The behaviors of local governments and real estate developers are likely to reinforce each other, with residential land supply stimulating real estate investment and developers' investment, in turn, pushing up the scale of land supply, jointly driving the supply overhang and supply-demand imbalance.³² The withdrawal of the CR_SRP changed buyers' expectations, reduced demand, and resulted in a surplus in the housing market. We next analyze what kind of cities are more likely to over-anticipate the PSL-led growth of housing demand and respond with excess residential land and housing supply.

5. Heterogeneous responses to the CR_SRP

5.1 Developer housing inventory

³² Through these distortions together, the state planning and the market may also exacerbate each other, leading to increased risk-taking by market participants in the real estate sector. This, in turn, can result in excessive leverage and overinvestment, as analyzed by Xiong (2023).

We first look at the initial level of developer housing inventory in 2014. We hypothesize that cities with high initial developer inventory are likely to be more cautious in expanding on the supply side when considering the increase in demand caused by CR_SRP. As indicated by Malmendier and Nagel (2011), individuals who experienced low real stock market returns express a lower willingness to take financial risk in the stock market and invest less in stocks. We expect that the real estate industry may exhibit a similar pattern. Developers who are in areas with higher initial inventory levels may have already recognized the risks associated with inventory overhang and thus adopted a restrained stance to prevent a future recurrence of inventory overhang in the real estate sector.

Following this insight, we split the sample into two groups based on the median value of inventory per capita at the provincial level in 2014. Panels A and B of Table 5 confirm this expectation by revealing that the positive effects of the CR_SRP on housing sales and residential land sales are much more salient in areas with lower initial inventory compared to their counterparts. That is, developers in low-inventory regions have a higher willingness to increase their investment substantially in response to the unexpected demand growth, leading to oversupply and higher inventory. In contrast, investment behavior in high-inventory regions becomes more cautious, as developers want to avoid the pitfalls associated with excess inventory. This resonates with the findings of previous work, which emphasize that past experiences alter risk preferences or beliefs about future returns, and that individuals tend to improve strategies based on feedback from their past trading performance (Malmendier and Nagel, 2016).

The results suggest that although the initial scale of the developer inventory (in 2014) does not affect the local government's decision on the intensity of PSL application (see Table 1 and Appendix Figure OA3), it does affect the government's strategy on the PSL-induced expansion of residential land supply.

[Table 5 about here]

5.2 Promotion pressure of local government officials

We also explore whether the local government's enthusiasm in response to the CR_SRP can be driven by growth incentives. Within China's GDP-centric performance evaluation framework, the promotion of officials was closely linked to local economic growth (Zeng and Zhou, 2024; Song and

Xiong, 2024). It has long been argued that land plays a pivotal role in enabling local governments to attract investments and foster local economic growth in China (Chen et al., 2022). Local officials combine with real estate developers to make “land finance” settle in real estate investment, with an expectation of turning land transfer into real measurable GDP growth (Que et al., 2019). Given that the introduction of the PSL is expected to enhance a city’s economic performance, cities with higher promotion pressure of local officials have a stronger intrinsic motivation to seize this opportunity. Hence, it is reasonable to expect that cities with higher promotion pressure of political leaders are more likely to be more sensitive in responding to the CR_SRP than their counterparts.

Note that competition for city growth is primarily within provinces, not between provinces. For a typical local official, a level of GDP growth that lags behind (or surpasses) that of competing cities within the province is perceived as a loss (or gain) (Qu et al., 2023). Pressure for the promotion of municipal officials is measured by the relative position of each city’s average GDP growth rate of the previous four years within the province. To empirically test this prediction, We categorize cities into two groups—those facing higher and lower promotion pressure—based on whether a city’s average GDP growth rate of the previous four years is above or below the median value of the sample cities within the same province.³³ The outcomes, presented in Panels C and D of Table 5, show that the stimulus effects of the CR_SRP on housing demand and supply tend to be intensified for cities with higher promotion pressure of political leaders.³⁴

By focusing on real estate investment, the leaders of the city-level government increase their GDP growth rate, and thus improve officials’ position in the promotion championship and will obtain more promotion opportunities in the coming future. The higher the promotion pressure of city leaders is, the more extensive activity on the supply side caused by the CR_SRP occurs, resulting in substantial oversupply and inventory overhang. As pointed out by Wang et al. (2020), promotion incentives motivate city leaders to exert efforts to create more residential land sale revenues and thus

³³ The concern here is that if regions facing greater promotion pressure also have higher VFI or stronger CR_SRP intensity, endogeneity issues could arise. Appendix Table OA2 shows how promotion pressure relates to the VFI in 2010 and the CR_SRP intensity in the cross-section of cities. We find that promotion pressure of officials is not significantly correlated with either the VFI in 2010 or the CR_SRP intensity, to some extent, alleviating the endogeneity concerns. Note that this lack of correlation is reasonable in China’s context, as regions with high levels of VFI are often economically underdeveloped, but during the period from 2010 to 2014, many underdeveloped regions experienced higher GDP growth rates than developed ones, which generally faced declining capital return rates.

³⁴ Given that urban development in the four provincial-level cities (Beijing, Shanghai, Tianjin, and Chongqing) may be heavily influenced by the central government and their leaders may have different career horizons (Wang et al., 2020), we run the regressions excluding these four cities in Panels C and D of Table 5.

channel more money into public infrastructure investment, which in turn boosts jurisdictional economic performance and even causes distortion such as excessive outward expansion at the expense of social welfare.

6. Extensions

6.1 The impacts on housing oversupply and vacancy

The previous sections have provided plausibly causal evidence that while the CR_SRP stimulates housing demand, it also triggers a corresponding supply-side response. In this subsection, we attempt to go one step further to investigate whether the CR_SRP leads to an oversupply of housing and housing vacancies. Given the features of housing development, including a long-time lag and investment irreversibility (Wang et al., 2024), we extend the time horizon in our regressions to cover the period from 2010 to 2023, allowing us to capture the impact of the CR_SRP in the longer term. Unfortunately, city-level housing vacancy rates and unsold housing inventory data are unavailable, preventing us from conclusively pinning down the answer to this question. Instead, we use provincial-level data to conduct a preliminary analysis, which points to the positive relationship between the intensity of the CR_SRP and subsequent housing vacancy rate and housing oversupply.

Panel A of Figure 8 shows that during the implementation period of the CR_SRP (2015-2019), cities with higher CR_SRP intensity experienced a decreasing trend in the floor space of residential buildings for sale, whereas this trend reversed and began to increase as PSL loans started to withdraw from the market. This finding suggests that although the CR_SRP, to a certain extent, alleviated the inventory accumulated before 2014, the resurgence of inventory after 2020 is likely the result of developers' oversupply during the 2015-2019 period. In other words, the inventory accumulated from 2010 to 2014 was replaced with new inventory constructed between 2015 and 2019, which is the main reason why inventories have risen again after 2020 in cities with higher CR_SRP intensity. The conclusion is further supported by the similar changing trend observed in the ratio of developers' inventory to residential housing sales for areas with higher CR_SRP intensity, as shown in Panel B of Figure 8. Thus, we provide a possible explanation for the housing vacancy and oversupply in China's low-tier cities in recent years, highlighting that the CR_SRP-induced changes in beliefs, spurring

speculative housing demand and, in turn, an excess supply-side response from the government, which is primarily driven by their growth motive (as we mentioned in Section 5).³⁵

[Figure 8 about here]

Given that regions with lower initial inventory drove the aggregate effect identified in the previous section, our findings above provide a more detailed explanation for the resurgence of inventories after 2020. For regions with higher initial inventory levels, the CR_SRP leads to a reduction in pre-existing accumulated inventory before 2014, and developers in these regions choose a more conservative supply strategy when faced with unexpected demand growth, compared to low-inventory regions. Developers in the latter regions are more likely to overreact to the demand growth caused by the CR_SRP, resulting in oversupply, which in turn drives a new round of inventory overhang after 2020.³⁶

We also provide additional evidence, although not causally identified, on the positive effects of the CR_SRP on housing oversupply and vacancy. First, to the best of our knowledge, only the *Beike Research Institute* has reported housing vacancy rate data at the city level for 28 large and medium-sized cities in China, and these data are only available for 2022. After merging with our data, we are left with 21 cities.³⁷ Figure 9 demonstrates that, even within this limited sample, cities with higher CR_SRP intensity are more likely to experience higher housing vacancy rates (the fitted lines are upward-sloping).

[Figure 9 about here]

Second, considering that urban population growth is one of the primary predictors of local governments' urban land supply (Gan et al., 2019), we present the cross-sectional findings on the relationship between log CR_SRP intensity and the ratio of urban population growth to new

³⁵ Prior studies on reasons for housing oversupply and vacancy have looked at the impact of public housing provision (Xu and Zhou, 2019), an inaccurate account of urbanization (Gan et al., 2019), housing speculation (Gao et al., 2020), and insecure property rights (Gandhi et al., 2022).

³⁶ In a similar vein, Malmendier and Nagel (2011) document that individuals' macroeconomic experiences could also affect risk-taking and investment in the aggregate, and hence the macroeconomy and variation in supply-demand (im)balances.

³⁷ *Beike* is the leading integrated online and offline platform for housing transactions and services in China. To investigate the housing vacancy across Chinese cities, *Beike Research Institute* conducted a study focusing on 30,000 residential communities across 28 cities and released the "2022 Chinese Cities Housing Vacancy Rate Survey Report", providing the first comprehensive assessment of housing vacancy rates in 28 large and medium-sized cities in China. In this report, vacant housing is defined as housing units that have been unoccupied for more than three months, excluding pre-sale houses and newly built houses for sale by developers. Consistent with our findings, this report reveals that housing vacancy rates increase sequentially with city tier: an average of 7% in first-tier cities, 12% in second-tier cities, and 16% in third-tier cities.

residential land supply for two periods: 2010-2015 (pre-CR_SRP period) and 2015-2020 (during-CR_SRP period). Figure 10 reveals that log CR_SRP intensity is not significantly associated with the ratio of urban population growth to new residential land supply in the pre-CR_SRP period (left panel), whereas a highly negative relationship emerges during the CR_SRP implementation (right panel). In particular, a one percent increase in the CR_SRP intensity results in a 0.028 percentage point decrease in the ratio of urban population growth to new residential land supply in 2015-2020. The contrast between the pre-CR_SRP and during-CR_SRP periods suggests that after the PSL introduction, local governments in cities with higher CR_SRP intensity tend to allocate more residential land supply than warranted by urban population growth, thereby leading to the housing oversupply. As Rogoff and Yang (2024) note, the growth of the housing stock has outpaced population growth over the period in China's low-tier cities.

[Figure 10 about here]

6.2 The impacts on local debt

Next, we focus on the impact of CR_SRP on local governments' GDP and debt. In China, real estate investment and local government finance are closely intertwined. The real estate investment boom drives an increase in land sales, enabling local governments to benefit from greater revenues and utilize higher-value land as collateral, which in turn may enhance their debt-carrying capacity and lead to local government debt accumulation (Rogoff and Yang, 2024). Columns (1) and (2) of Panel B in Table 6 suggest that cities with higher treatment intensity experienced higher economic growth and faster increases in the debt ratio of local governments, in comparison to those with lower treatment intensity during the CR_SRP implementation. Considering that CR_SRP-induced land revenues and financial resources are more likely channeled into projects or associated with incentives or subsidies, it is unsurprising that the CR_SRP can help local governments promote economic growth in China.³⁸

[Table 6 about here]

³⁸ Based on the experience during the 13th Five-Year Plan (2016-20), the leverage effect of PSL on project investments is about 1:2.5, suggesting that the injection of PSL funds is expected to play a significant role in stabilizing growth and boosting market sentiment (Global Times, 2024).

At the same time, local governments entrust local government financing vehicles (LGFVs) to undertake various redevelopment-related tasks, such as mobilization, land acquisition, and demolition.³⁹ Getting endorsement from the government, LGFVs obtain easy access to loans or other financing from financial institutions.⁴⁰ This arrangement effectively creates an implicit government guarantee for the implicit debts formed by LGFVs; that is, if there is a risk of defaulting, local governments will step in and offer assistance and bailouts (Pan et al., 2017; Chen et al., 2020). Consequently, this indirect financing method increases the implicit debt of local governments, as they bear the financial risk associated with the loans taken out by the LGFVs. As Xiong (2023) emphasized, with guarantees from the central government, local governments may be more inclined to use real estate-collateralized debt to boost their short-term performance. Such myopia of local governments leads to a cycle of overinvestment and risk-taking in the real estate sector.

According to Shen and Shi (2022), China's implicit debt of local governments reached 35.55 trillion yuan by the end of 2018, a 191.42% increase from the end of 2014. Loans for shantytown redevelopment accounted for 12.15% of this debt, amounting to 4.32 trillion yuan. Similarly, a report from the official website of the Ministry of Finance of the People's Republic of China highlights shantytown redevelopment as a major source of implicit debt of local governments and emphasizes the substantial pressure to resolve the debt problem.⁴¹ Despite the low interest rates associated with these PSL loans, their massive scale, with the outstanding balance of PSL loans reaching approximately 3.6 trillion yuan in November 2019, presents significant implicit debt risks that cannot be overlooked.⁴²

Given that the repayment terms of PSL loans typically range from 5-10 years, we further extend the time horizon in our regressions to cover the period from 2010 to 2023 to examine the impact of the CR_SRP on local debt in the long run. We expect that the impact of the CR_SRP on local

³⁹ LGFVs engage in economic activities that are fiscal in nature, with the government directly or indirectly sharing responsibility for debt servicing and sometimes subsidizing LGFV losses (Liu and Xiong, 2020). Local governments can run implicit deficits by establishing LGFVs and borrowing through them (Chen et al., 2020).

⁴⁰ Note that the projects of shantytown redevelopment typically last for more than ten years, while government budgetary expenditures cannot exceed three years. Hence, although the leverage in the first phase of the CR_SRP appears to be transferred from developers to the LGFVs, it increases the implicit debt of local governments.

⁴¹ Retrieved from https://nb.mof.gov.cn/czjg/dcyj/201805/t20180510_2891553.htm (in Chinese).

⁴² The PSL loan data is sourced from Shengang Securities Co., Ltd. Retrieved from <https://wallstreetcn.com/articles/3730610> (in Chinese). In addition, Zhao Quanhui, director of the Finance Research Office at the Chinese Academy of Fiscal Sciences, emphasizes that most of these loans are borrowed by the LGFVs and belong to local implicit debts, which will most likely require the government to repay them out of its own pocket. Retrieved from <https://www.163.com/dy/article/E87BP1GH05394PTV.html> (in Chinese).

government debt will be smoothed out around 2022, due to the repayment of PSL loans and the CR_SRP-induced resale revenue from the reassembled land and tax revenues at that time. However, Appendix Figure OA8 shows that there has been a persistent and rapid increase in debt ratio in cities with higher CR_SRP intensity relative to those with lower intensity from 2015 to 2023.⁴³ This implies that the circulation of PSL loans in the process of the CR_SRP (as shown in Figure 1) may not have operated perfectly as initially expected by the government.

Moreover, we also find changes in the focus areas of local government use of budget funds. As public land supply decreases after the CR_SRP introduction, government investment in welfare facilities declines, while investment in infrastructure increases (columns (3) and (4) of Panel B in Table 6). This finding suggests that local governments in cities with higher PSL intensity tend to channel “windfall revenue” more toward growth-oriented infrastructure such as urban roads and land for transport stations and public squares.⁴⁴

The reasons behind this preference may be twofold. First, regions with higher CR_SRP intensity face relatively higher VFI, and therefore, their governments may have a greater incentive to prioritize investing in projects that can create more fiscal revenue shortly. These growth-oriented projects are tangible and often labeled as image or signature projects that are launched and built primarily due to the motivation of scoring high in leaders’ performance evaluations (Ding et al., 2014). In contrast, welfare expenditures, such as spending on education, healthcare, and social security, may not necessarily generate output in the short term. Second, as noted earlier, cities with higher PSL intensity experience a faster increase in housing demand and real estate development. To complement real estate market development, local governments may be more inclined to invest in urban infrastructure, improving municipal facilities, and enhancing the value of real estate developments, thereby attracting more developers and homebuyers.

⁴³ As highlighted by Liu and Xiong (2020), real estate-related debt constitutes approximately 25% of banks’ assets in China, with around half of this debt linked to local governments. In the post-2020 period, the series of debt defaults by major Chinese real estate developers such as Evergrande and Country Garden also reflected to some extent debt burdens and an unprecedented downturn of the real estate sector in China (Chang et al., 2024). Several recent studies have pointed out that, in addition to the outbreak of the COVID-19 pandemic, the factors exacerbating this financial distress include a surplus of vacant housing in various cities (e.g., Glaeser et al. (2017) and Liu and Xiong (2020)) and overbuilding, particularly in low-tier cities (Rogoff and Yang, 2024).

⁴⁴ Taking the proportion of land supply for a specific purpose (residential, commercial, industrial, and other (land for parks, hospitals, city roads, public uses and transportation facilities)) to the total urban construction land (new supply) in the year as the dependent variable, in cities with higher PSL intensity, we observe an increase in the supply of residential and commercial land without a significant change in the scale of industrial land supply (columns (1) to (3) of Panel B in Online Appendix Table OA3). The supply of public and transportation land has decreased significantly to compensate for the increase in the supply of residential land (column (4) of Panel B in Online Appendix Table OA3).

7. Concluding remarks

To implement timely urban redevelopment that is in line with social and public interests, government financial support is indispensable. The extent to which the government should intervene and how to implement it are important issues and key to policy formulation. Focusing on a large-scale shantytown redevelopment project in China, our research finds that while government financial support is effective in addressing externalities and coordination issues in redevelopment, complementary policies (or even regulations) are needed to ensure that market responses are in line with policy expectations. In our case, the potential positive outcomes of government-led urban redevelopment were partially offset by suboptimal responses from the supply side (local governments and real estate developers). Future housing oversupply is an unintended consequence of government-led urban redevelopment, and this is because their observations and expectations of future demand are biased.⁴⁵ This result partly stems from the fact that local governments regard the CR_SRP as a growth strategy rather than a welfare-oriented program (The Official Website of the Central People's Government of China, 2015).⁴⁶ Although China's land system is unique, its market-oriented real estate market allows our results to be generalized to other countries.

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⁴⁵ In October 2024, faced with downward pressure on the real estate market, the Chinese government restarted a new round of the resettlement-based shantytown redevelopment program (CR_SRP II), planning to carry out the demolition and urban replanning/redevelopment of one million housing units through cash resettlement. Our results provide insights into the CR_SRP II implementation. First, the scale of the program should be kept relatively balanced with the scale of new residential land supply and the scale of real estate investment by developers. Second, when applying for financial instruments related to CR_SRP II, local governments should fully consider the existing housing inventory levels in their respective localities. In fact, CR_SRP-induced excessive supply reflects the government's short-sighted decision-making prompted by the growth motive of local governments. In other words, supply-side coordination or regulation should be considered when renovating shantytowns with financial support from the government.

⁴⁶ Retrieved from https://www.gov.cn/zhengce/2015-06/17/content_2881090.htm?trs=1 (in Chinese).

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Tables and Figures

TABLE 1 The Impact of VFI on CR_SRP Intensity

	ln(CR_SRP intensity)			
	(1)	(2)	(3)	(4)
Panel A: City-level regression (OLS)				
VFI_2010	2.853*** (0.424)	2.152*** (0.663)	2.838*** (0.719)	3.861*** (0.938)
ln(GDPpc_2014)		-0.254 (0.250)	0.181 (0.272)	0.356 (0.319)
ln(completed floor area per capita_2014)			-0.0195 (0.0989)	-0.0675 (0.150)
ln(residential construction starts per capita_2014)				0.0703 (0.237)
ln(resident population_2014)	-0.427*** (0.0961)	-0.435*** (0.0974)	-0.417*** (0.116)	-0.324* (0.178)
Adj. R ²	0.292	0.291	0.240	0.198
N	212	212	167	80
Panel B: Provincial-level regression (OLS)				
VFI_2010	5.630*** (1.130)	8.000*** (2.413)	5.648*** (1.105)	8.001*** (2.425)
ln(GDPpc_2014)		0.846 (0.708)		0.840 (0.725)
ln(residential floor space for sale per capita_2014)			0.179 (0.311)	0.175 (0.313)
ln(resident population_2014)	-0.256 (0.181)	-0.255 (0.186)	-0.210 (0.222)	-0.209 (0.228)
Adj. R ²	0.530	0.531	0.519	0.518
N	30	30	30	30

Notes: Panels A and B report the OLS estimation results of the impact of VFI in 2010 on CR_SRP intensity at the city and provincial levels, respectively. The control variables include resident population in 2014, GDP per capita in 2014, and scale of developer inventory in 2014 (measured by floor space of newly started residential construction and floor space of construction completion at the city level). Standard errors clustered at the city level (at the provincial level) are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE 2 The impact of CR_SRP intensity on fiscal conditions and residential land supply

	(1)	(2)	(3)	(4)	(5)	(6)
	ln(CR_SRP inten.) \times D _t	ln(local fiscal resources)	ln(land sale revenues)	ln(residential land supply)	ln(residential land price)	land revenue-to-loc al budgetary revenue ratio
Panel A: OLS						
ln(CR_SRP inten.) \times D _t		0.00492 (0.0252)	0.244*** (0.0866)	0.0514* (0.0286)	-0.106*** (0.0217)	0.0194 (0.0200)
N		2,098	1,806	2,108	2,104	1,739
Panel B: IV						
VFI \times D _t	2.945*** (0.469)					
ln(CR_SRP inten.) \times D _t		0.275*** (0.0771)	0.701*** (0.235)	0.215*** (0.0705)	-0.152*** (0.0540)	0.0973* (0.0559)
N	2,098	2,098	1,806	2,108	2,104	1,739
Kleibergen-Paap F-stat.	39.355					
Panel C: IV (Excluding top-tier cities)						
ln(CR_SRP inten.) \times D _t		0.725*** (0.244)	1.462** (0.575)	0.435** (0.173)	0.214 (0.147)	0.310** (0.131)
N		1,718	1,447	1,718	1,714	1,395
Panel D: IV (Excluding cities regulated by house purchase restrictions)						
ln(CR_SRP inten.) \times D _t		0.785*** (0.266)	1.415** (0.603)	0.571*** (0.207)	0.165 (0.131)	0.333** (0.136)
N		1,578	1,331	1,578	1,574	1,281
City-Year Level Controls	Y	Y	Y	Y	Y	Y
City FEs	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y

Notes: Panels A and B report the OLS and 2SLS estimation results of the impact of CR_SRP intensity on fiscal condition and residential land supply, respectively. Panels C and D report the 2SLS estimation results after excluding top-tier cities and cities regulated by house purchase restrictions, respectively. Column (1) of Panel B reports the first-stage results of the 2SLS estimation. The dependent variables in Columns (2) to (6) are local fiscal resources, land sale revenues, residential land supply, residential land price, and the ratio of land sale revenues to local general budgetary revenues respectively. CR_SRP intensity denotes the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016. The instrument (VFI \times D_t) is the interaction of a city's VFI in 2010 and the post-2014 dummy. The regressions control for city-year-level characteristics, city fixed effects, and year fixed effects. Standard errors clustered at the city level are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

TABLE 3 The impact of CR_SRP intensity on real estate investment, housing price and sale

	(1) ln(real estate investmen t)	(2) ln(residenti al construction starts)	(3) lnHP	(4) lnHP	(5) ln(HP second-ha nd)	(6) ln(housing sales in floor space)	(7) ln(housing sales in value)
Panel A: OLS							
ln(CR_SRP inten.) \times D _t	0.0167 (0.0209)	-0.00926 (0.0187)	-0.0189* (0.0109)	-0.0223** (0.0112)	-0.0464*** (0.0124)	0.0240 (0.0212)	0.00002 (0.0229)
N	2,081	883	2,010	1,900	1,124	2,097	2,056
Panel B: IV							
ln(CR_SRP inten.) \times D _t	0.273*** (0.0700)	0.152*** (0.0582)	-0.0179 (0.0250)	-0.0185 (0.0259)	-0.0899 (0.0655)	0.226*** (0.0703)	0.240*** (0.0807)
N	2,081	883	2,010	1,900	1,124	2,097	2,056
Panel C: IV (Excluding top-tier cities)							
ln(CR_SRP inten.) \times D _t	0.693*** (0.206)	0.517** (0.228)	0.0303 (0.0550)	0.0427 (0.0596)	-0.224 (2.448)	0.587*** (0.199)	0.748*** (0.258)
N	1,699	537	1,650	1,580	779	1,712	1,675
Panel D: IV (Excluding cities regulated by house purchase restrictions)							
ln(CR_SRP inten.) \times D _t	0.688*** (0.209)	0.324* (0.168)	0.0141 (0.0595)	0.0239 (0.0650)	1.509 (18.238)	0.572*** (0.205)	0.702*** (0.264)
N	1,562	446	1,510	1,450	706	1,572	1,535
City-Year Level Controls	Y	Y	Y	Y	Y	Y	Y
City FEs	Y	Y	Y	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y	Y	Y	Y
Excluding voucher cities	N	N	N	Y	N	N	N

Notes: Panels A and B report the OLS and 2SLS estimation results of the impact of CR_SRP intensity on real estate investment, housing price and sale, respectively. Panels C and D report the 2SLS estimation results after excluding top-tier cities and cities regulated by house purchase restrictions, respectively. The dependent variables in Columns (1) to (7) are real estate investment, residential construction starts, housing price, second-hand housing price, housing sales in floor space, and housing sales in value, respectively. CR_SRP intensity denotes the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016. The regressions control for city-year-level characteristics, city fixed effects, and year fixed effects. Standard errors clustered at the city level are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

TABLE 4 The impact of CR_SRP on speculative housing purchases at the provincial level

	(1) Share of speculative purchasing	(2) Share of speculative purchasing
$\ln(\text{CR_SRP intensity}) \times \text{Year_2015}$	0.161* (0.0945)	0.208*** (0.0781)
$\ln(\text{CR_SRP intensity}) \times \text{Year_2017}$	0.234* (0.120)	0.363** (0.158)
$\ln(\text{CR_SRP intensity}) \times \text{Year_2019}$	0.220* (0.120)	0.251** (0.117)
N	109	109
Provincial -Year Level Controls	Y	N
Provincial FEs	Y	Y
Year FEs	Y	Y
Lagged Province-Year Level Controls	N	Y

Notes: The dependent variable is the fraction of speculative housing purchases at the provincial level. The data are sourced from the CHFS in 2013, 2015, 2017, and 2019. CR_SRP intensity denotes the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016. We compare the changes in the fraction of speculative purchases in provinces with higher CR_SRP intensity to those with lower intensity, before and after the CR_SRP implementation. The comparison group is the period before the CR_SRP (the omitted benchmark period of 2013). The regressions control for provincial-year-level characteristics, provincial fixed effects, and year fixed effects. Standard errors clustered at the provincial level are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

TABLE 5 Heterogeneity by city type

	(1) lnHP	(2) ln(housing sales in floor space)	(3) ln(residential land price)	(4) ln(residential land supply)
Panel A: High inventory (CR_SRP intensity Mean=3.862)				
ln(CR_SRP inten.) \times D _t	0.00356 (0.0217)	0.0845* (0.0511)	-0.168** (0.0654)	0.0637 (0.0801)
N	1,008	1,028	1,027	1,030
Panel B: Low inventory (CR_SRP intensity Mean=5.231)				
ln(CR_SRP inten.) \times D _t	-0.179 (0.113)	0.574*** (0.196)	-0.159 (0.128)	0.435*** (0.167)
N	1,002	1,069	1,077	1,078
Panel C: High pressure (CR_SRP intensity Mean=4.598)				
ln(CR_SRP inten.) \times D _t	-0.000798 (0.0268)	0.239** (0.0973)	-0.175** (0.0789)	0.250*** (0.0900)
N	1,055	1,083	1,088	1,090
Panel D: Low pressure (CR_SRP intensity Mean=4.474)				
ln(CR_SRP inten.) \times D _t	-0.0498 (0.0522)	0.167 (0.112)	-0.0780 (0.0838)	0.194 (0.148)
N	951	968	968	970
City-Year Level Controls	Y	Y	Y	Y
City FEs	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y

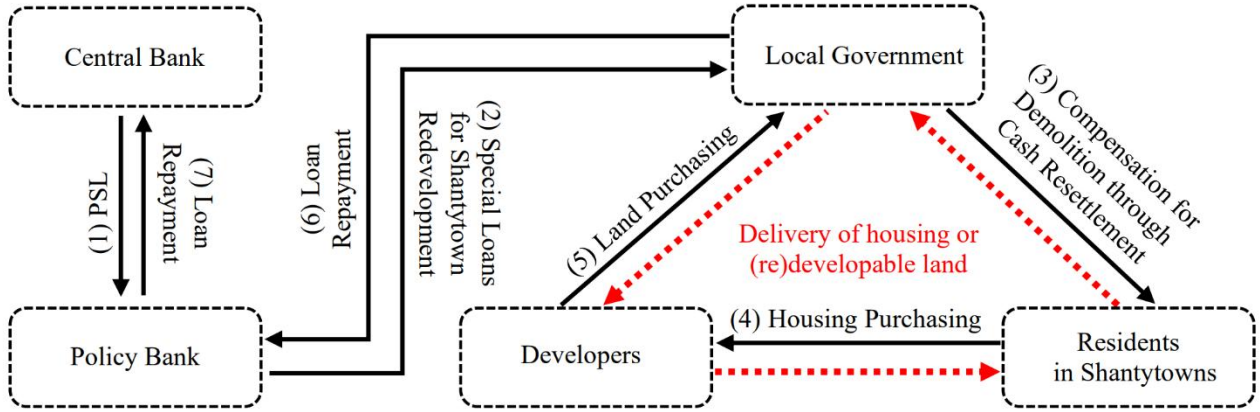
Notes: The dependent variables in Columns (1) to (4) are housing price, housing sales in floor space, residential land price, and residential land supply. CR_SRP intensity denotes the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016. Panels A and B refer to samples in cities with cities with higher and lower initial inventory levels, respectively; Panels C and D refer to samples in cities with higher and lower promotion pressure of local officials, respectively. The regressions control for city-year-level characteristics, city fixed effects, and year fixed effects. Standard errors clustered at the city level are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. For each panel, we also report the mean value of CR_SRP intensity before taking the log.

TABLE 6 The impact of CR_SRP on GDP growth, local debt, and government expenditures

	(1) lnGDP	(2) debt ratio	(3) welfare-related expenditure share	(4) infrastructure investment-to- expenditure ratio
Panel A: OLS				
$\ln(\text{CR_SRP inten.}) \times D_t$	0.0254*** (0.00688)	51.403*** (7.544)	-0.00246 (0.00205)	0.00309 (0.00433)
N	2,108	2,022	1,951	2,093
Panel B: IV				
$\ln(\text{CR_SRP inten.}) \times D_t$	0.0631*** (0.0167)	65.473*** (21.099)	-0.0149*** (0.00541)	0.0334*** (0.0118)
N	2,108	2,022	1,951	2,093
City-Year Level Controls	Y	Y	Y	Y
City FEs	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y

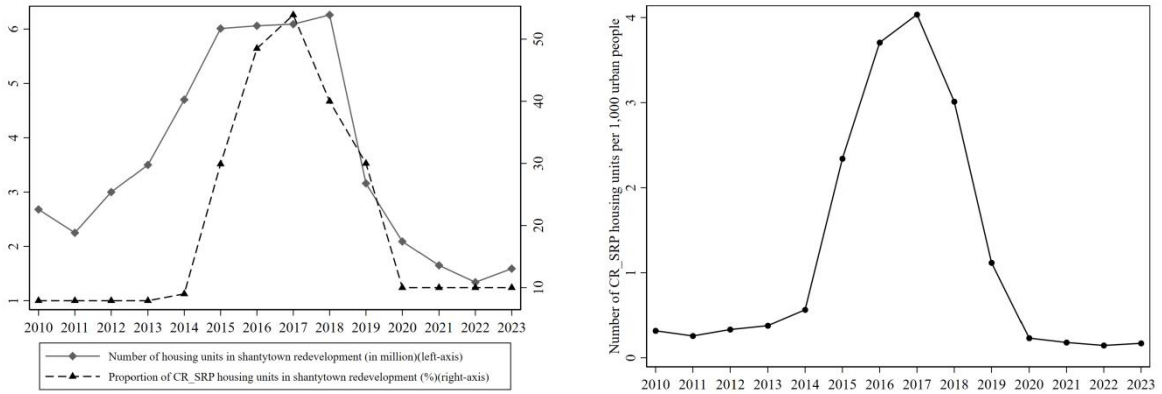
Notes: Panels A and B report the OLS and 2SLS estimation results of the impact of CR_SRP intensity on GDP growth, local debt, and government expenditures, respectively. The dependent variables in Columns (1) to (4) are GDP, debt ratio, welfare-related expenditure share, and the ratio of infrastructure investment to general public expenditure, respectively. CR_SRP intensity denotes the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016. The regressions control for city-year-level characteristics, city fixed effects, and year fixed effects. Standard errors clustered at the city level are reported in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

FIGURE 1: The process of shantytown redevelopment



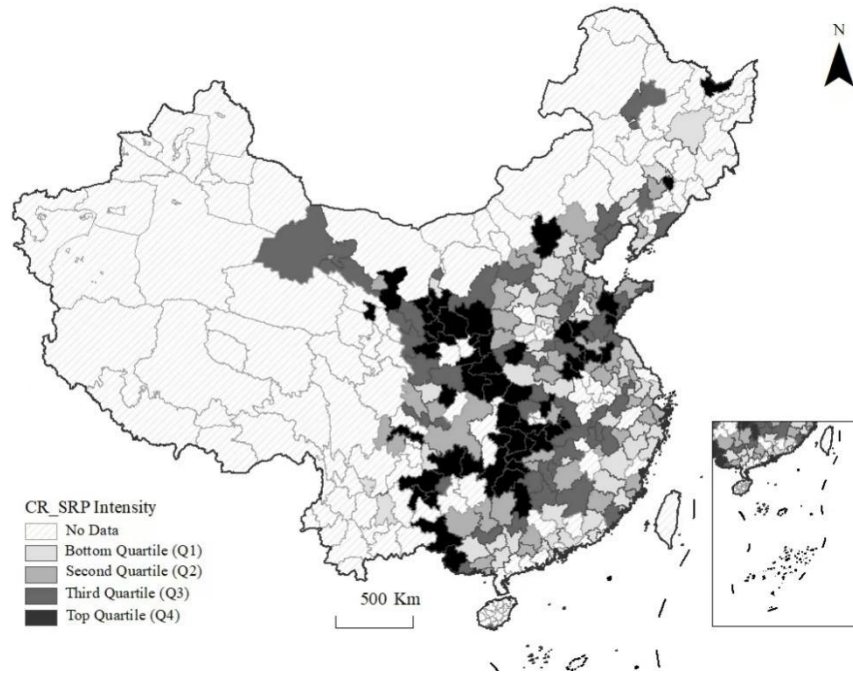
Notes: Numbers (1) to (7) (the black solid lines) represent the expected flow of PSL-related funds; the red dotted lines show the delivery of housing and (re)developable land during this shantytown redevelopment process. Source: Created by the authors. China Development Bank (CDB) and the Agricultural Development Bank of China (ADBC), two state-funded and state-owned policy banks in mainland China, are the targets of PSL funds for the shantytown redevelopment projects.

FIGURE 2: The intensity of CR_SRP by year



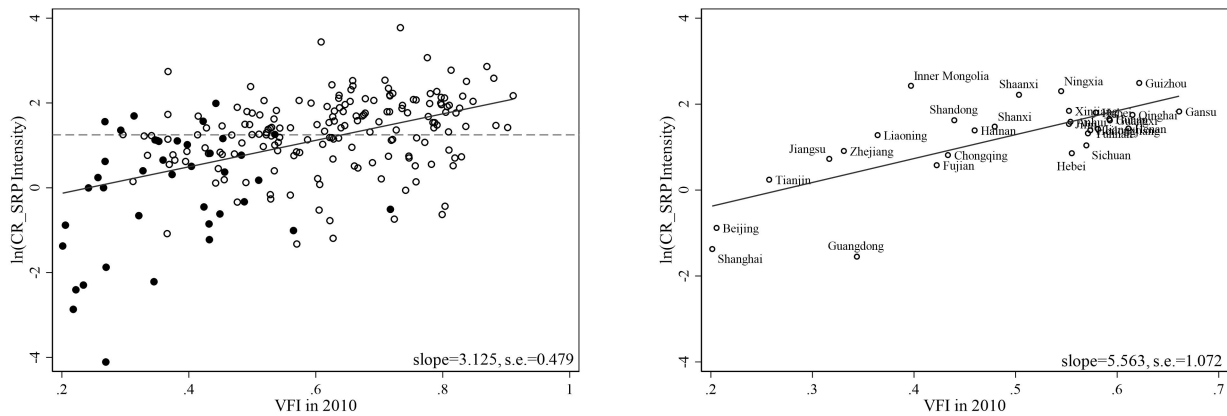
Notes: The diagram on the left-hand side illustrates the time variation in the number of housing units associated with shantytown redevelopment (solid line) and the proportion of these housing units relying on cash resettlement (dashed line). Due to data limitations, we follow the China Index Academy (<https://www.cih-index.com/>), which sets the proportion of cash resettlement-based housing units in total shantytown-redevelopment housing units at 8% for 2008-2013 and 10% for 2020-2023. The diagram on the right-hand side is the number of cash resettlement-based housing units per 1,000 urban residents between 2010 and 2023.

FIGURE 3: The spatial distribution of CR_SRP intensity at the city level



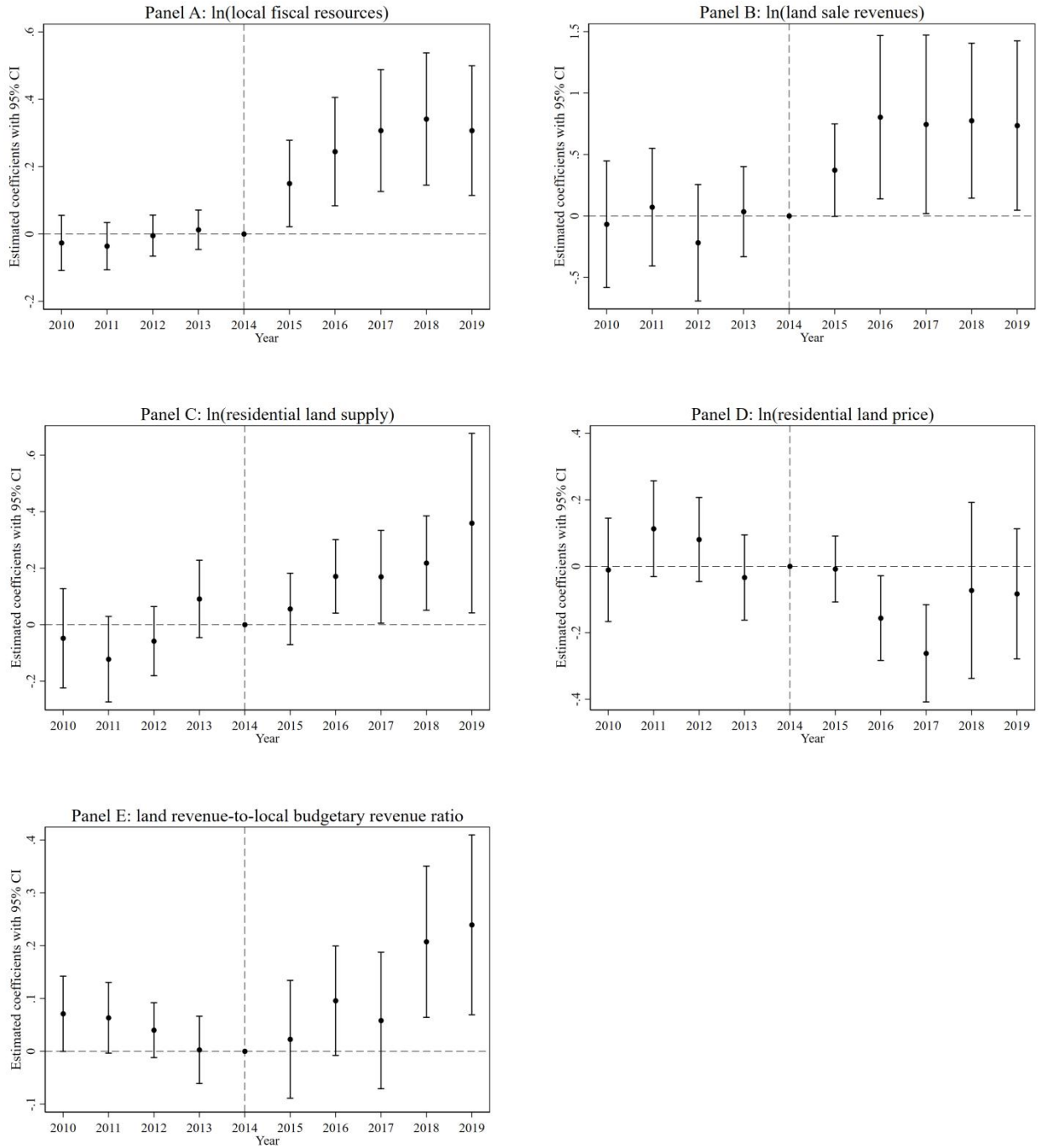
Notes: The reported data refer to the number of CR_SRP housing units per 1,000 urban residents (i.e., CR_SRP intensity) for each of the sample cities.

FIGURE 4: Vertical fiscal imbalance and CR_SRP intensity



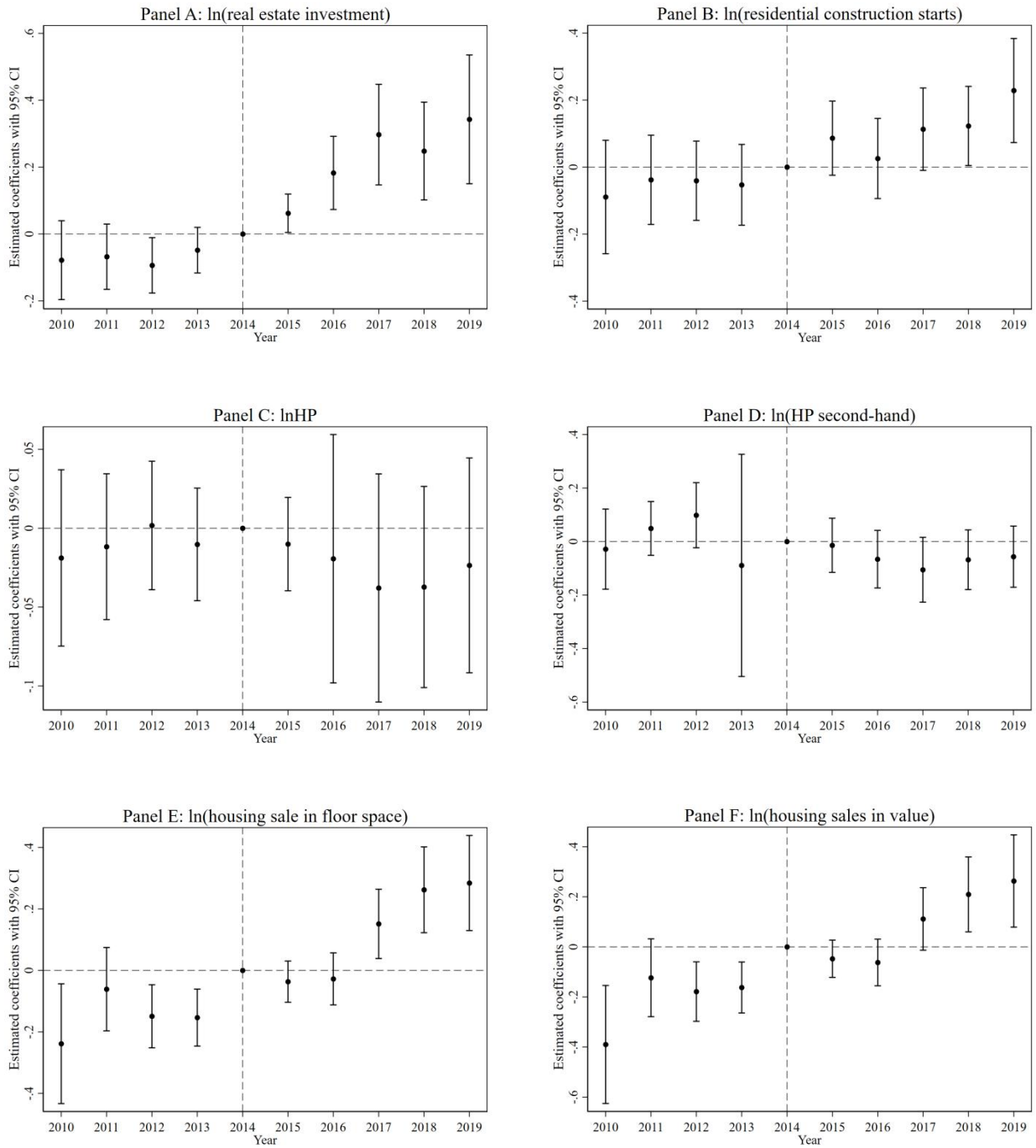
Notes: This figure shows the positive relation between the VFI and log CR_SRP intensity using scatterplots at the city level (left panel) and the provincial level (right panel). In the left panel, solid dots represent top-tier cities, while hollow dots denote low-tier cities (including third-, fourth-, and fifth-tier cities). The gray dashed horizontal line indicates the median value of log CR_SRP intensity. It is evident that the vast majority of top-tier cities lie below the median value, implying that these cities generally have lower CR_SRP intensity compared to low-tier cities.

FIGURE 5: Effects of the CR_SRP on the total fiscal resources of local government, land sale revenues, residential land supply and price, and the ratio of land revenue to general public budget revenue



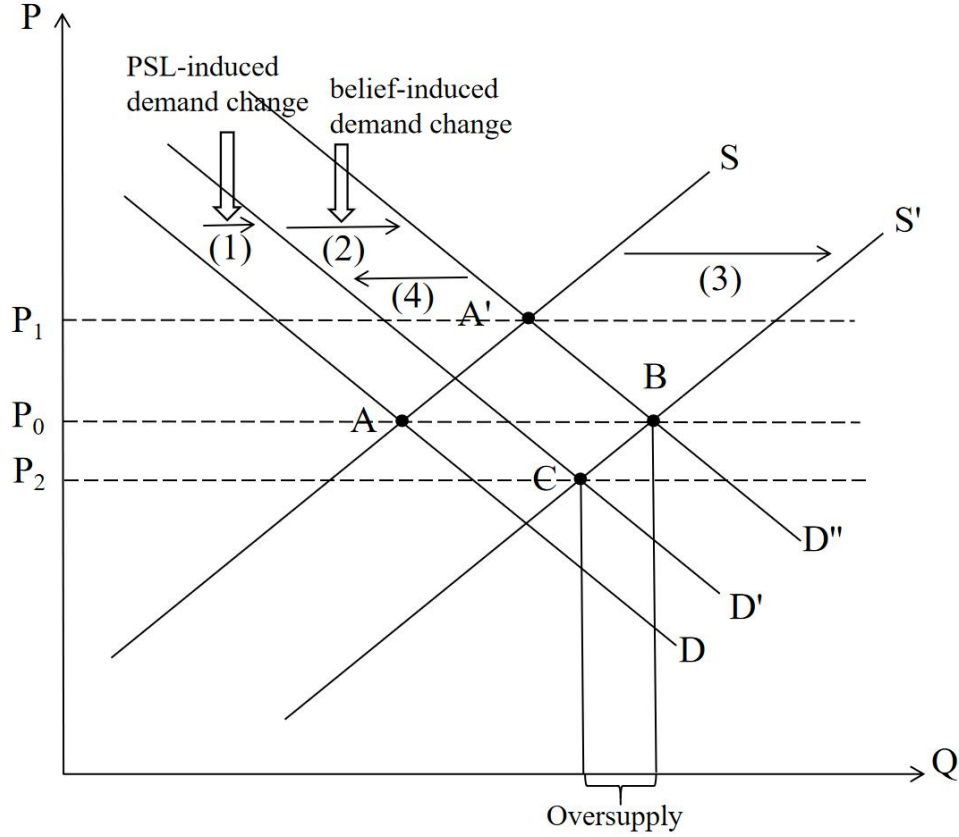
Notes: This figure illustrates the dynamic effects of the CR_SRP intensity on the total fiscal resources of local government, land sale revenues, residential land supply and price, and the ratio of land revenue to general public budget revenue. We use 2014 as the benchmark period and all estimated impacts are relative to this period. The 95% confidence intervals are reported with the coefficient estimates. The specification includes all city-year-level control variables, as well as city fixed effects and time fixed effects.

FIGURE 6: Effects of the CR_SRP on real estate investment, residential construction starts, and housing price and sale



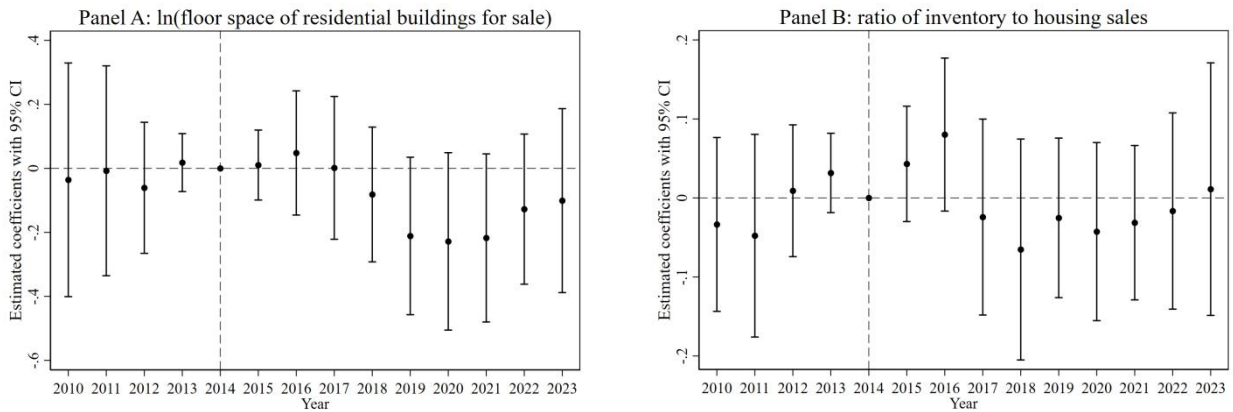
Notes: This figure illustrates the dynamic effects of the CR_SRP intensity on real estate investment, residential construction starts, and housing price and sale. We use 2014 as the benchmark period and all estimated impacts are relative to this period. The 95% confidence intervals are reported with the coefficient estimates. The specification includes all city-year-level control variables, as well as city fixed effects and time fixed effects.

FIGURE 7 A simple conceptual model



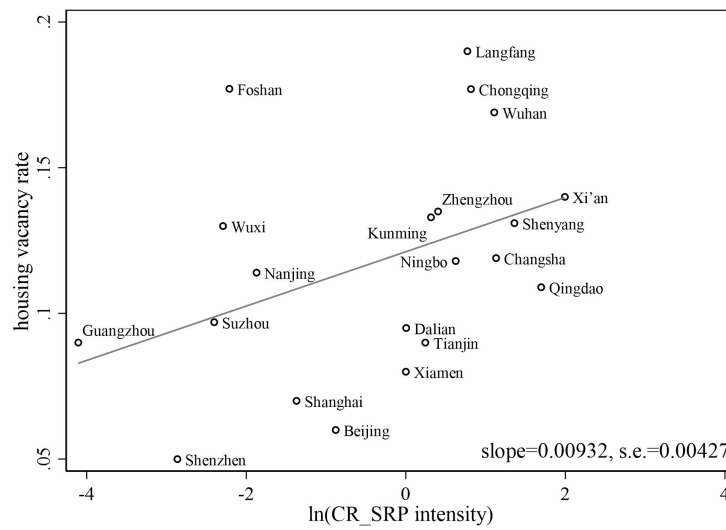
Notes: P_0 , P_1 and P_2 represent the equilibrium housing prices corresponding to points A, A', and C, respectively.

FIGURE 8 Effects of the CR_SRP on developer inventory



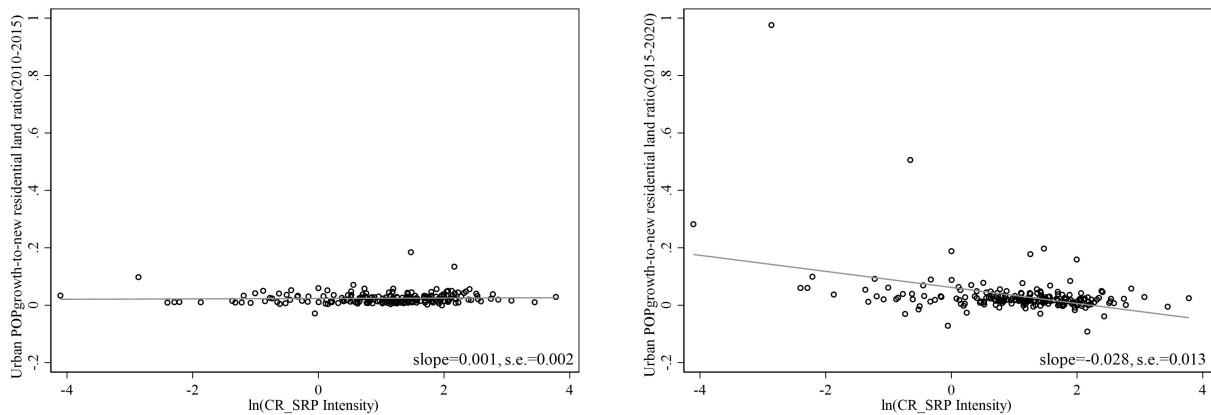
Notes: This figure illustrates the dynamic effects of the CR_SRP intensity on the floor space of residential buildings for sale and the ratio of inventory to housing sales. We use 2014 as the benchmark period and all estimated impacts are relative to this period. The 95% confidence intervals are reported with the coefficient estimates. The specification includes all city-year-level control variables, as well as city fixed effects and time fixed effects.

FIGURE 9 A simple correlation between CR_SRP intensity and housing vacancy rate



Notes: This figure displays the relationship between log CR_SRP intensity and the housing vacancy rate. Due to the data limitations of housing vacancy rate at the city level, we merge our dataset with data from *Beike Research Institute*, which covers 28 large and medium-sized cities in 2022.

FIGURE 10 A simple correlation between CR_SRP intensity and residential land supply strategy



Notes: This figure illustrates the relationship between log CR_SRP intensity and the ratio of urban population growth to new residential land supply for two periods: the pre-CR_SRP period (2010-2015, left panel) and the CR_SRP implementation period (2015-2020, right panel). Note that there are three distinct outliers in the right panel (with the ratio of urban population growth to new residential land supply greater than 0.2), corresponding to the cities of Guangzhou, Shenzhen, and Zhongshan. Even after excluding these three cities, the regression results remain significantly negative.

Online Appendix (Not for Publication)

Table OA1 The impact of the CR_SRP on the number of real estate developers at the provincial level

	(1) ln(number of real estate developers)
Panel A: OLS estimates	
ln(CR_SRP intensity) \times D _t	0.0384 (0.0385)
N	300
Panel B: IV estimates	
ln(CR_SRP intensity) \times D _t	0.111** (0.0497)
N	300
Provincial-Year Level Controls	Y
Province FEs	Y
Year FEs	Y

Notes: Panels A and B report the OLS and 2SLS estimation results of the impact of CR_SRP intensity on the number of real estate developers at the provincial level. CR_SRP intensity denotes the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016. The regressions control for city-year-level characteristics, city fixed effects, and year fixed effects. Standard errors clustered at the provincial level are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table OA2 Exogeneity of promotion pressure of officials

	(1) VFI_2010	(2) CR_SRP Intensity
promotion pressure of officials	0.0108 (0.0081)	0.0276 (0.0586)
N	206	206

NOTES: The dependent variables in Columns (1) and (2) are VFI in 2010 and CR_SRP intensity, respectively. Promotion pressure of officials is measured as the extent to which a city's average GDP growth rate over the previous four years exceeds the median value of the sample cities within the same province. Standard errors clustered at the provincial level are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

TABLE OA3 Effects of the CR_SRP on the proportion of newly sold land by different land use types

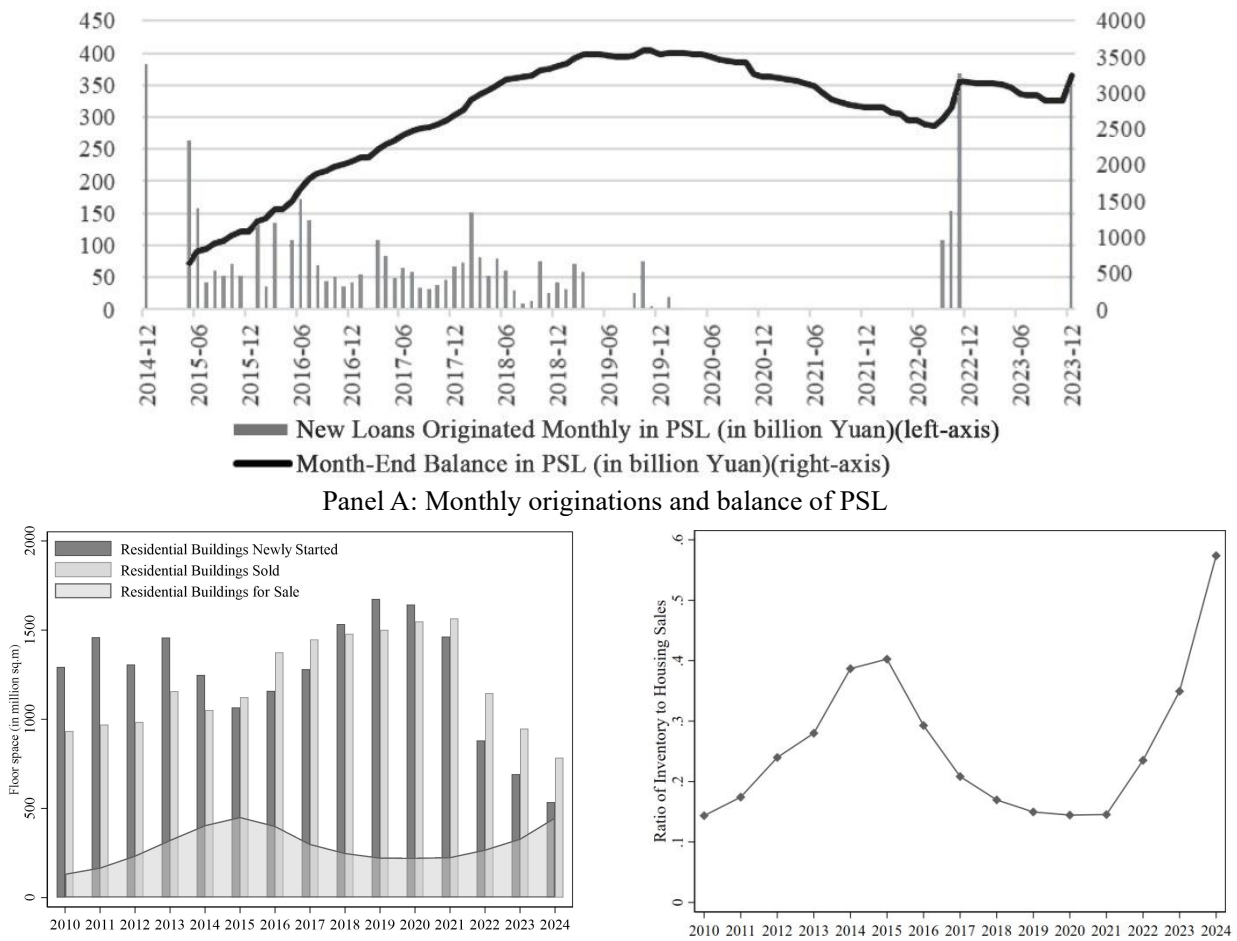
	(1) Rratio	(2) Cratio	(3) Iratio	(4) PTratio
Panel A: OLS estimates				
ln(CR_SRP intensity) \times D _t	0.0062 (0.0037)	0.0046* (0.0025)	0.0016 (0.0041)	-0.0123** (0.0060)
N	2108	2108	2108	2108
Panel B: IV estimates				
ln(CR_SRP intensity) \times D _t	0.0360*** (0.0113)	0.0190*** (0.0062)	0.0078 (0.0106)	-0.0628*** (0.0170)
N	2108	2108	2108	2108
City-Year Level Controls	Y	Y	Y	Y
City FEs	Y	Y	Y	Y
Year FEs	Y	Y	Y	Y

Notes: Panels A and B report the OLS and 2SLS estimation results of the impact of CR_SRP intensity on the proportion of land supply by different land use types. The dependent variables in Columns (1) to (4) are the proportions of land supply for residential, commercial, industrial, and other purposes (land for parks, hospitals, city roads, public uses and transportation facilities), respectively. CR_SRP intensity denotes the number of a city's cash resettlement-based shantytown redeveloped housing units per 1,000 urban residents in 2016. The regressions control for city-year-level characteristics, city fixed effects, and year fixed effects. Standard errors clustered at the city level are reported in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

Table A1 Summary Statistics

Variable		Obs.	Mean	Std. Dev.	Min	Max	Period
Panel A: Outcomes							
City-level	local fiscal resources (million)	2,110	40280.023	94933.548	526.000	1.15e+06	2010-2019
	land sale revenues (million)	1,816	9615.396	24049.954	0.020	2.95e+05	2010-2019
	land revenue-to-local budgetary revenue ratio	2,509	0.518	0.499	0	3.751	2010-2023
	residential land supply (thousand)	2,756	3561.873	3708.668	0	49683.457	2010-2023
	residential land price (yuan/sq.m)	2,752	2688.904	4292.240	0	57352.801	2010-2023
	real estate investment (million)	2,091	33825.230	57270.437	166.650	4.44e+05	2010-2019
	residential construction starts (thousand)	893	7426.372	6776.547	66.981	53875.950	2010-2019
	HP (yuan/sq.m)	2,633	6829.262	5165.342	1746	57691	2010-2023
	HP second-hand (yuan/sq.m)	1,124	7875.081	5547.323	1754	59940.500	2010-2019
	housing sales in floor space (thousand)	2,727	4492.775	5036.923	9	54526.449	2010-2023
	housing sales in value (million)	2,068	30129.200	53701.260	13	523330.200	2010-2019
	GDP (billion)	2,120	262.398	372.130	10.403	3815.600	2010-2019
	debt ratio (%)	2,879	259.214	219.378	0	2166.490	2010-2023
	welfare-related expenditure share	1,961	0.397	0.063	0.148	0.728	2010-2019
	infrastructure investment-to-expenditure ratio	2,105	0.123	0.132	0.00072	1.208	2010-2019
	Rratio	2,120	0.233	0.108	0.000	0.680	2010-2019
	Cratio	2,120	0.351	0.177	0.016	0.915	2010-2019
	Iratio	2,120	0.328	0.138	0.000	0.795	2010-2019
	PTratio	2,120	0.088	0.060	0.004	0.702	2010-2019
provincial-level	speculator share	109	0.490	0.213	0	1	2013-2019
	number of real estate developers	300	3101.207	1866.991	291	9239	2010-2019
	residential buildings for sale (thousand)	420	9500.831	7638.823	462.492	46364.860	2010-2023
	ratio of inventory to housing sales	420	0.325	0.265	0.027	1.552	2010-2023
Panel B: Time-invariant variables							
City-level	CR_SRP intensity (unit per 1,000 urban population)	212	4.566	4.760	0.016	43.718	
	VFI in 2010	212	0.579	0.172	0.201	0.911	
	residential construction starts per capita in 2014	95	1.875	0.800	0.511	4.823	
	completed floor area per capita in 2014	167	5.639	7.206	0.516	68.454	
provincial-level	CR_SRP intensity (unit per 1,000 urban population)	30	4.536	3.017	0.213	12.106	
	VFI in 2010	30	0.483	0.129	0.201	0.661	
	residential floor space for sale per capita in 2014	30	600.215	354.538	203.112	1766.209	
Panel C: Controls							
City-level	landarea (thousand)	2,756	16147.923	13937.423	154.442	1.69e+05	2010-2023
	VAT Reform	2,968	0.736	0.441	0	1	2010-2023
	secondary	2,964	0.449	0.105	0.116	0.819	2010-2023
	GDP growth rate	2,966	0.088	0.074	-0.416	0.479	2010-2023
	ratio of loan balances of financial institutions to GDP	2,889	1.082	0.621	0.233	7.450	2010-2023
	pop	2,740	4813.478	3742.238	231.853	32133.401	2010-2023
provincial-level	landarea (thousand)	420	1.61e+05	1.04e+05	5485.803	5.16e+05	2010-2023
	secondary	420	0.425	0.089	0.149	0.590	2010-2023
	GDP per capita	420	60899.166	32003.097	13119	2.00e+05	2010-2023
	pop	420	45882.143	27942.863	5630	1.27e+05	2010-2023
	openness ratio	420	0.269	0.292	0.008	1.548	2010-2023
	GDP growth rate	420	0.076	0.033	-0.054	0.172	2010-2023

FIGURE OA1: The changes in the scale of PSL issuance, the floor space of housing starts, sold area, and developer inventory, and the ratio of inventory to housing sales

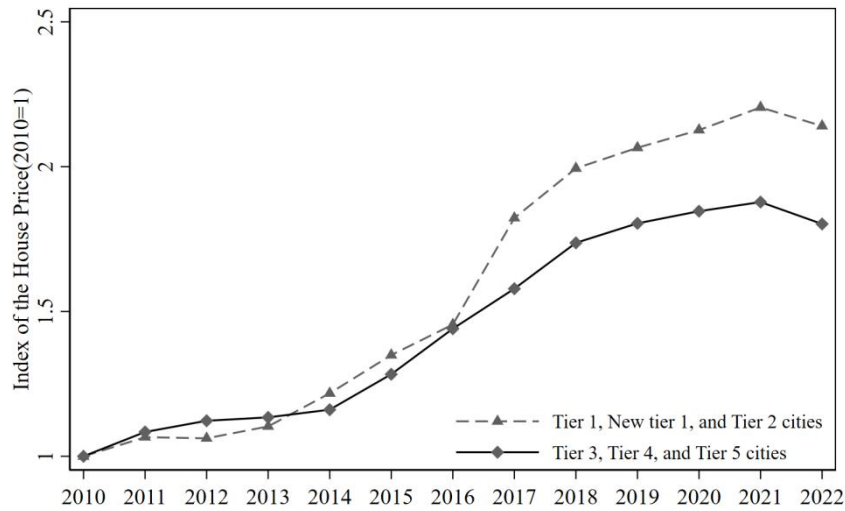


Panel B: Floor space of residential buildings: Newly started, sold, and available for sale

Panel C: Ratio of inventory to housing sales

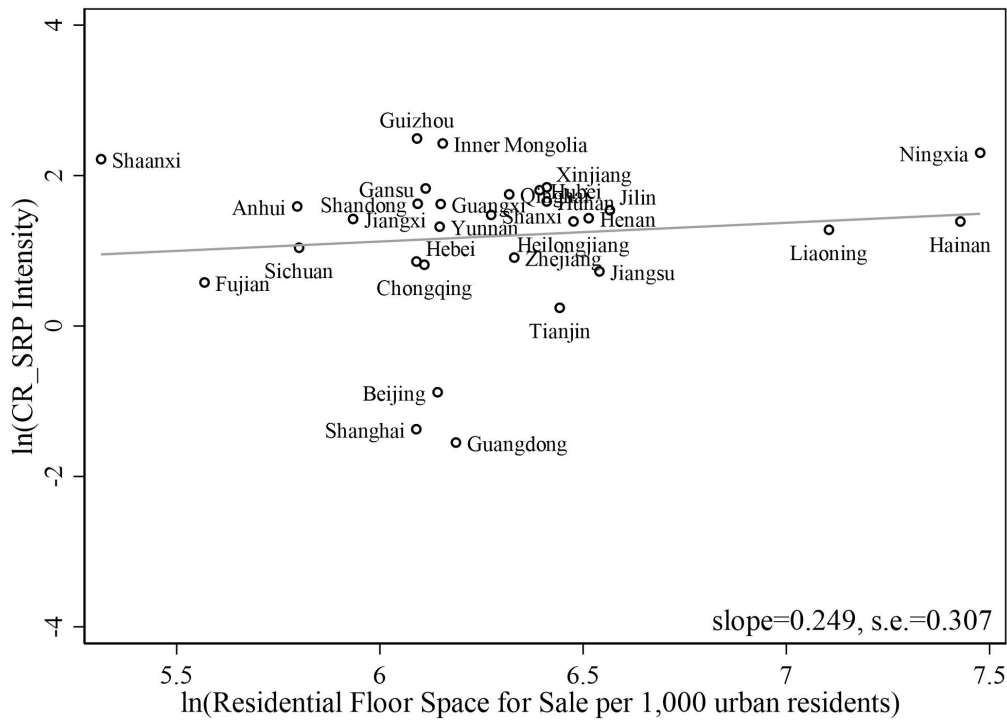
Notes: This figure illustrates the time trends of the scale of PSL issuance, the floor space of housing starts, sold area, and developer inventory, and the ratio of inventory to housing sales. Panel A shows the changes in China's monthly originations and balance of PSL over time, with the black line representing the month-end balance in PSL (right axis, in billion yuan) and the bar chart showing the new loans originated monthly in PSL (left axis, in billion yuan). Panel B presents the time trends of the floor space of housing starts, sold area, and developer inventory, with the dark gray bar chart indicating the annual floor space of newly started residential buildings, the light gray bar chart representing the annual floor space of sold residential buildings, and the area chart depicting the floor space of residential buildings available for sale. Panel C displays the changes in the ratio of developer inventory to housing sales over time.

Figure OA2: House price appreciation



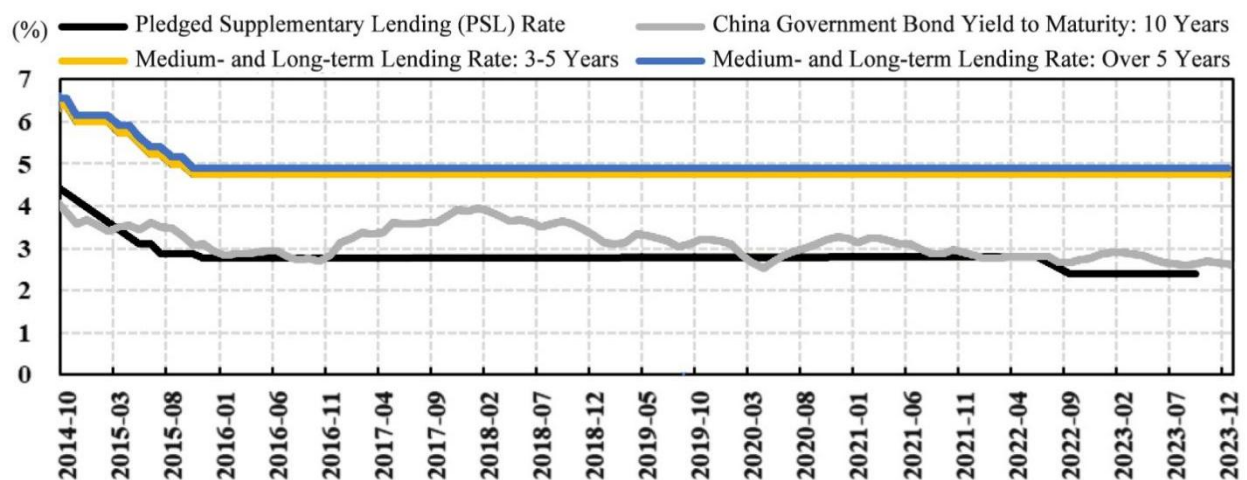
Notes: This figure depicts the time variation in the housing price indices for top-tier cities (dashed line) and low-tier cities (solid line).

Figure OA3: Inventory and CR_SRP intensity



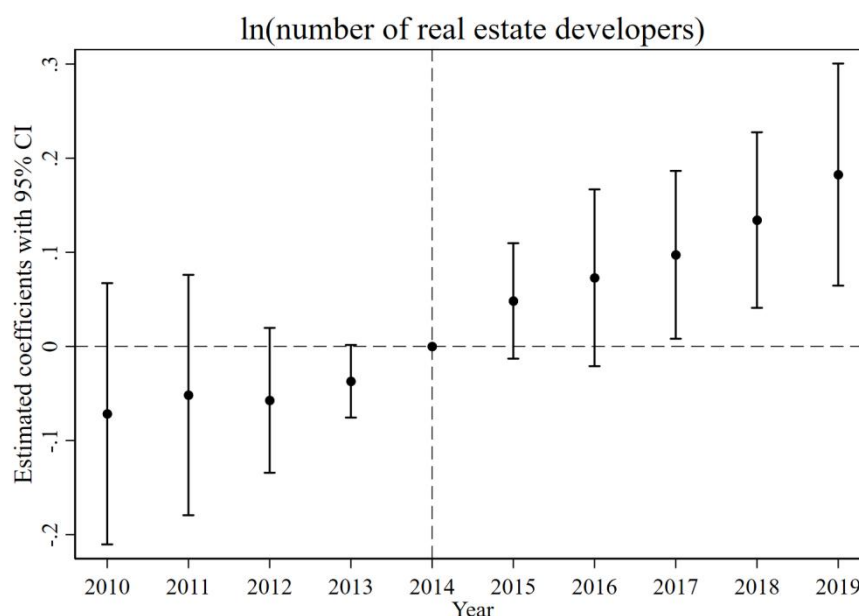
Notes: This figure shows the correlation between the residential floor space for sale per capita and log CR_SRP intensity using a scatterplot at the city level. Log residential floor space for sale per capita is not significantly associated with log CR_SRP intensity.

Figure OA4: Interest rates for PSL, government bonds, and medium- to long-term loans



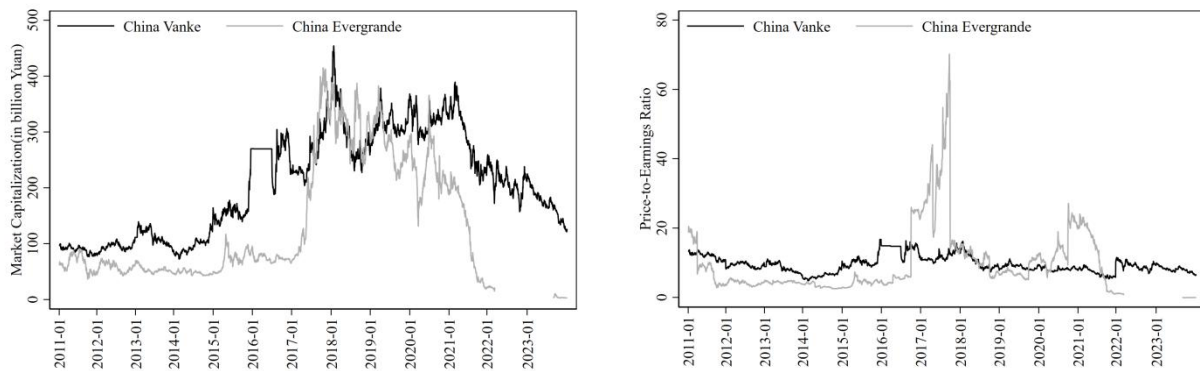
Notes: This figure plots the changes in various types of interest rates in China over time. The black line represents the Pledged Supplementary Lending (PSL) rate, the gray line depicts the yield to maturity of China's 10-year government bonds, the yellow line indicates the medium- and long-term lending rate for loans with a maturity of 3 to 5 years (inclusive), and the blue line represents the medium- and long-term lending rate for loans with a maturity exceeding 5 years. *Source:* Created by the authors, according to the data from Wind and Northeast Securities Co., Ltd.

Figure OA5: Effects of the CR_SRP on the number of real estate developers



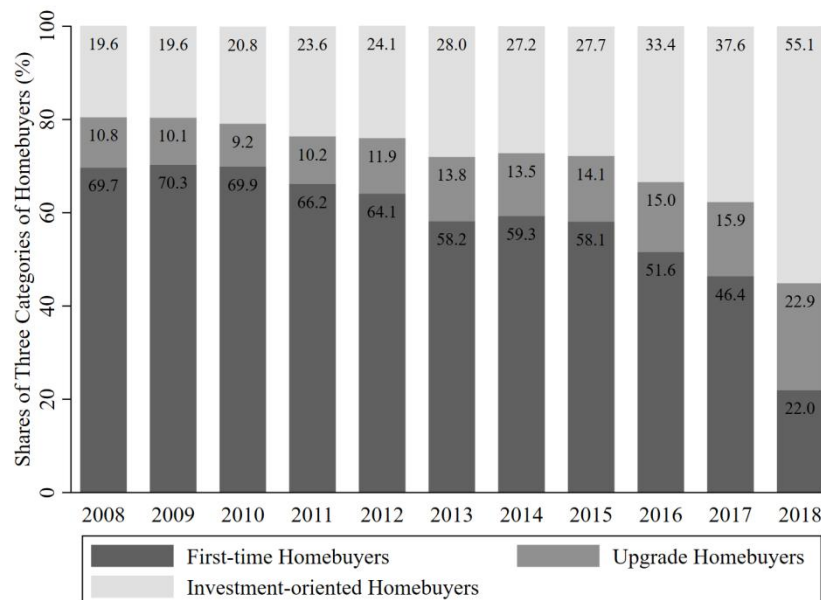
Notes: This figure illustrates the dynamic effects of the CR_SRP intensity on the number of real estate developers. We use 2014 as the benchmark period and all estimated impacts are relative to this period. The 95% confidence intervals are reported with the coefficient estimates. The specification includes all province-year-level control variables, as well as provincial fixed effects and time fixed effects.

FIGURE OA6 Market capitalization and price-to-earnings ratio of Vanke and Evergrande



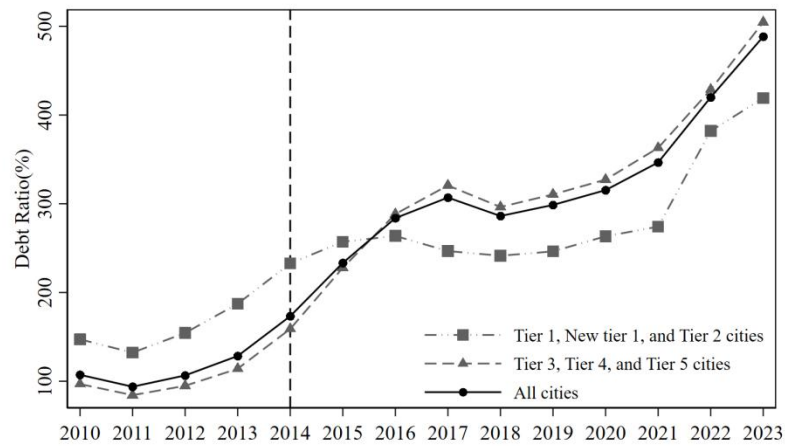
Notes: This figure presents the fluctuations in the market capitalization (left panel) and price-to-earnings ratio (right panel) for two Chinese leading companies in the real estate sector, Vanke (black line) and Evergrande (gray line).
Source: Created by the authors, according to the data from the *Tonghuashun* iFinD and East money (*Dongfangcaifu*) Chioce (<https://www.eastmoney.com/>).

Figure OA7: The proportions of three components of urban housing purchase



Notes: This stacked bar chart illustrates the composition of homebuyers in the housing market. First-time homebuyers (dark gray segment) denote that the house owner purchased his/her first house and has only one house. Upgrade Homebuyers (medium gray segment) denote that the house owner replaced his/her original house with an upgraded housing unit. Investment-oriented homebuyers (light gray segment) denote that the house owner purchased this housing units for speculative purposes (e.g., buying low and selling high, or purchasing for rental purposes).

FIGURE OA8 Debt ratio across Chinese city tiers



Notes: This figure presents the time trend of the average debt ratio across different city tiers in China. The dashed line with square symbol represents average debt ratio of first-tier, new first-tier, and second-tier cities. The dashed line with triangle symbol depicts average debt ratio of third-tier, fourth-tier, and fifth-tier cities. The solid line with circle symbol illustrates average debt ratio for all sample cities.