The Journal of Real Estate Finance and Economics
https://doi.org/10.1007/s11146-024-09981-4

All That Glitters is Not Gold: Examining the Negative Impact of Real Estate Value on Companies' Market Competitiveness

Fangzhi Liang[1] · **Gary Gang Tian**[2] · **Zhihua Wei**[1] · **Aimin Zeng**[3]

Accepted: 5 February 2024

Abstract

This paper introduces and investigates the hypothesis that the crowding-out effect surpasses the collateral effect, suggesting that an increase in the value of real estate holdings by companies hinders their competitiveness in the product market within emerging economies. Through our analysis, we elucidate the underlying mechanism, demonstrating that although Chinese listed companies benefit from their real estate holdings in terms of debt financing, these financial resources are predominantly reinvested in real estate projects rather than other productive endeavors. This effect is particularly pronounced when companies face significant financial constraints, operate in highly monopolistic industries, and are situated in regions where local governments heavily rely on land finance and face substantial pressure for GDP growth. By shedding light on the adverse implications of companies' real estate holdings and uncovering the factors contributing to the crowding-out effect, our research underscores the importance of enhanced regulations in the real estate markets of developing nations during the periods of irrational housing booms.

Keywords Real estate holding value · Product market competitiveness · Crowding-out effect · Chinese real estate market crisis

✉ Gary Gang Tian
gary.tian@mq.edu.au

Fangzhi Liang
fangzhiliang@stu.xmu.edu.cn

Zhihua Wei
finjoy@126.com

Aimin Zeng
chasingsun@126.com

[1] School of Economics, Xiamen University, No. 422 Siming South Road, Xiamen, China

[2] Macquarie Business School, Macquarie University, Macquarie Park, NSW 2113, Australia

[3] School of Accountancy, Zhejiang Gongshang University, No. 18 Xuezheng Street, Hangzhou, China

Published online: 27 February 2024

JEL Classification D21 · G32 · R32

Introduction

Real estate assets within companies hold significant strategic importance, recognized by various stakeholders such as global investors, entrepreneurs, policymakers, and scholars (Apgar, 1995). Extensive scholarly research, as evidenced by Alimov (2016), Ambrose et al. (2017), Bahaj et al. (2020), Chaney et al. (2012), Mao (2021), and Sun and Gunia (2018), has explored the beneficial collateral effects of these holdings on core business operations. However, it's essential to acknowledge empirical evidence suggesting a negative crowding-out effect stemming from rising housing prices. This effect has been linked to resource misallocation, hindrances to corporate innovation (Aghion et al., 2013; Stein, 2003), and reduced overall productivity (Lu et al., 2019). This adverse phenomenon is commonly referred to as the crowding-out effect on a company's investment structure.[1] While existing literature, primarily focused on mature Western markets, tends to emphasize the positive collateral effects outweighing the crowding-out effect, there is a notable dearth of empirical research addressing the impact of real estate holdings in emerging markets, signifying a significant research gap in this domain.

Research, such as the study conducted by Diop in 2018, shows that the impact of real estate holdings on firms varies with their competitive context. Specifically, a positive correlation exists between real estate investments and stock returns in competitive industries, while the correlation turns negative in more concentrated industries. Based on this, we suggest that the influence of real estate holdings can differ greatly depending on the institutional environment. In developed countries, where social capital is strong and business and investment climates are mature, the collateral effect of real estate usually outweighs the crowding-out effect, enhancing the positive contribution of real estate investment to firms' primary operations. However, in emerging markets, the effects of real estate investment might differ.

In emerging markets, particularly within traditional manufacturing industries, we posit that the crowding-out effect may prevail over the collateral effect. Several factors support this assertion. Firstly, manufacturing in developing countries often operates within the lower tiers of the global industry value chain, yielding lower returns. Secondly, the key factor of abundant social capital, which leads to the rapid attenuation of the crowding-out effect in Western countries (Martin et al., 2021), is in short supply in emerging markets. Thirdly, these markets frequently experience extensive government intervention, possess less mature business environments, and exhibit less rational investor behavior compared to developed markets. Consequently, the

[1] Chakraborty et al. (2018) found that banks increase mortgages and reduce commercial loans during housing booms, indicating a real estate-driven crowding-out effect on companies' core operations. However, this effect diminishes rapidly due to the wealth accumulation of banks from real estate investments (Martin et al., 2021). Our research specifically delves into the crowding-out effect on firms' investment structure.

environment in emerging markets tends to promote resource misallocation (Chang et al., 2015; Chen et al., 2015b). Therefore, it's important to acknowledge the possibility that the crowding-out effect might outweigh the collateral effect in emerging markets. Notably, this scenario is also documented in some situations in developed countries, as indicated in the literature (referencing Alimov, 2016; Chaney et al., 2012). Thus, our paper introduces two mutually exclusive hypotheses. One posits a positive effect of real estate holdings on market competition, while the other postulates the opposite scenario. The influence of companies' real estate holdings on product market competition remains a significant and open question, particularly within the context of emerging markets.

China serves as an ideal setting for examining the influence of real estate holdings on companies' product market competitiveness for several compelling reasons. Firstly, a significant proportion of listed companies in China, nearly half, held substantial investments in real estate in 2019, amounting to over 1.6 trillion yuan at book value. This unique context provides an opportune environment for evaluating whether the collateral effect or the crowding-out effect prevails within the Chinese market. Furthermore, it is essential to note that China's real estate industry has been grappling with a financial crisis since 2020, primarily attributed to its high leverage.[2]This crisis has raised concerns, as it has been widely anticipated that the repercussions of a potential collapse in China's real estate sector could be felt acutely by the banking system and government finances. Moreover, there is a looming risk that the adverse effects stemming from this real estate crisis could permeate into the broader economy.

It is noteworthy that the direct impact of a real estate downturn on the real economy is often underestimated. During irrational housing booms, many non-real-estate companies tend to invest in real estate. Whether these real estate assets align with a company's core business is a critical consideration. If they complement a company's core operations, the impact during a real estate crisis may be mitigated. However, if they do not align, they can potentially become an additional source of economic risk. Consequently, it is imperative and worthwhile to explore the impact of real estate holding value on companies' product market competitiveness within the Chinese context, given the unique dynamics and challenges presented by China's real estate industry and its potential ramifications for the broader economy.

Secondly, the economic environment in China is markedly different from that of the United States. Various factors, including limited capital resources, a scarcity of high-return investment opportunities, government intervention, and others, render real estate investments particularly appealing for companies in China (as discussed in Chakraborty et al., 2018; Kumar & Vergara-Alert, 2020). These elements have a significant influence on resource allocation. This divergence in economic conditions suggests the need for a distinct examination within China's emerging market. Thirdly, it is crucial to address the challenges of establishing causality and identifying the underlying mechanisms involved in this context (Chen et al., 2015a; Saiz,

[2] The 2020–2023 Chinese property sector crisis in Wikipedia. https://en.wikipedia.org/wiki/2020%E2%80%932023_Chinese_property_sector_crisis

2010; Wu et al., 2015). Fortunately, China's diverse real estate restriction policies provide a favorable setting for undertaking such investigations, offering a relatively convenient framework for conducting research in this area.

Our study, based on data from Chinese listed companies spanning 2003 to 2020, reveals a negative link between increasing real estate holdings and these companies' product market competitiveness. This finding supports the dominance of the crowding-out effect over the collateral effect, rejecting the alternative hypothesis. Our results remain robust even after rigorous testing and causal identification methods. In our mechanism analysis, we find that real estate holdings are indeed used as collateral. However, the loans obtained are not channelled into marketing, research and development (R&D), or other productive activities. Instead, the funds are reinvested in real estate, crowding out productive fixed assets and labor within the companies.

Heterogeneity analysis further uncovers insightful findings. Firstly, we observe that the negative impact of real estate is more pronounced for companies facing high financial constraints. This suggests that intense resource competition exacerbates the dominance of the crowding-out effect. Secondly, the effect is stronger in relatively monopolistic industries, indicating that such companies have limited incentives to enhance their product competitiveness and are more likely to opt for real estate investments as a form of arbitrage. Thirdly, the effect is more significant in cities where local governments heavily rely on land finance and face considerable pressure for GDP growth. These findings highlight the influential role of government preferences for rising house prices in fueling irrational real estate booms. Additional analysis reveals that excessive real estate holdings lead to the erosion of companies' long-term market value.

This study contributes to the literature on the microeconomic impact of real estate investments in several ways. Firstly, empirical evidence from Chinese listed firms demonstrates a negative association between real estate holding value and companies' product market competitiveness, providing insights into the detrimental consequences of real estate investments in emerging markets. Secondly, it complements existing research by examining the crowding-out effect of real estate holdings on product market competition, expanding beyond the predominant focus on the collateral effect (Cvijanović, 2014). Thirdly, the study challenges the common reliance on local house prices as the key independent variable to define the crowding-out effect (Jia et al., 2021; Lu et al., 2019; Wang et al., 2017; Wu et al., 2015), as it finds no significant impact of house prices on companies' product competitiveness. Instead, the misallocation of resources arises from companies' reinvestment in real estate rather than productive activities.

China's ongoing economic recession, triggered by a real estate downturn, highlights additional economic risks. Companies holding excessive real estate assets and using them as collateral for further real estate investments, instead of focusing on their core business expansion, are exacerbating economic leverage. Our study underscores the importance of effective real estate market regulations in emerging markets to prevent such diversions (Lichtenberg & Ding, 2009; Mao & Shen, 2019) during the irrational housing boom period. While the study focuses on China as the representative country, its findings have relevance to other emerging economies

facing similar economic challenges, such as limited capital resources, diversion from core business activities, and government intervention (Chang et al., 2015; Chen et al., 2015a). By examining real estate holding behaviors of Chinese companies, this study offers valuable implications for policy-making in other emerging markets (Kumar & Vergara-Alert, 2020).

The subsequent sections of the paper are organized as follows: second section introduces the institutional background and develops hypotheses, third section presents the research design, fourth section describes the empirical results, and fifth section concludes the study.

Institutional Background and Hypotheses

Institutional Background

Since the initiation of China's reform and opening up in 1978, the government has pursued market-oriented reforms in the real estate industry (China National Bureau of Statistics). Prior to 1998, urban residents' housing allocation was primarily controlled by government-controlled institutions, resulting in limited real estate demand and inefficient resource allocation. In response to the housing shortage and the aim of developing a market-oriented economy, the State Council of China abolished the housing allocation system in 1998. However, during this period, the land transactions were still controlled by government (China National Bureau of Statistics).

The market-oriented land transaction system was introduced in May 2002 with the implementation of a competitive bidding, auction, and listing system for land use rights transactions (China National Bureau of Statistics). Following this market reform, housing demand surged significantly. According to the China Real Estate Statistical Yearbook, the price of commercial comprehensive houses in Beijing increased from around 4,800 yuan per square meter in 2002 to approximately 36,000 yuan per square meter in 2019. Similarly, in Shanghai, house prices rose from approximately 4,100 yuan to around 31,000 yuan per square meter. Other cities also experienced substantial increases in house prices. As depicted in Fig. 1, China's real estate boom lasted nearly two decades.

The rapid increase in house prices has the potential to drive irrational investments in the real estate sector, diverting companies from their core activities. This phenomenon, known as the "crowding-out effect," is the focus of our study. In 2019, almost half of China's listed companies held real estate investments, totaling over 1.6 trillion yuan at book value. Many companies allocated more than 70% of their total assets to real estate investments, leading to investor dissatisfaction.[3] Figure 2 depicts the trends in real estate investments by Chinese listed companies, showing the total book value and the number of companies involved. The number of companies with

[3] Some financial news reports the phenomenon of companies' overholding of investment real estate: https://sh.focus.cn/zixun/2616ed72d433dd6c.html

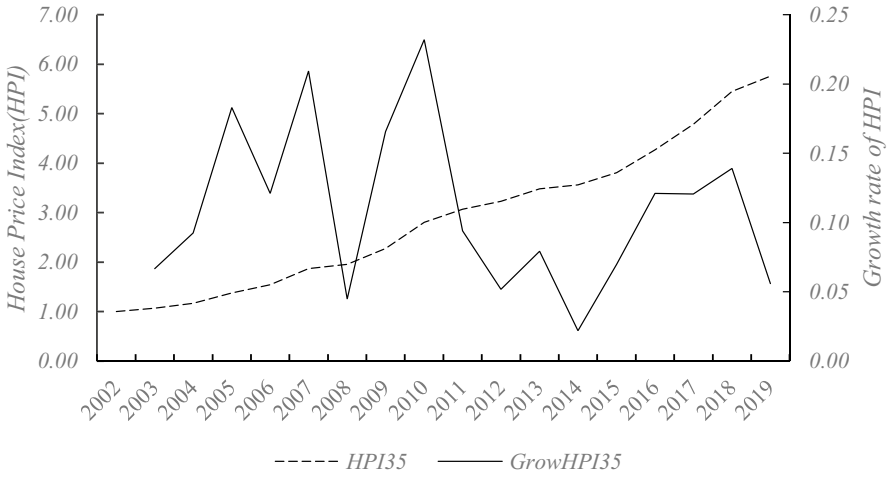

Fig. 1 House Price Index (*HPI*) and its Growth Rate for 35 Chinese Large and Medium-Sized Cities. *Notes*: This figure plots the time trend of house prices from 2002 to 2019. The solid line is the average house price index (*HPI*) for 35 Chinese large and medium-sized cities. The dashed line is the growth rate of *HPI*. The definition of *HPI* is given in Table 1. The left y-axis represents the value of *HPI* and the right y-axis represents the growth rate of *HPI*

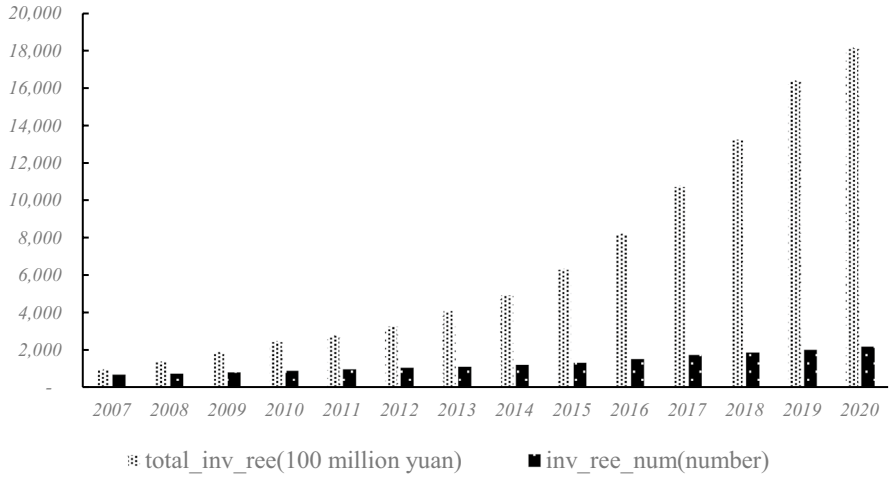

Fig. 2 Real Estate Investment Holdings of Listed Companies in China. *Notes*: This figure plots the total real estate investment holdings of Chinese A-share listed companies for each year. The light bar represents the total book value of real estate investments held by all Chinese listed companies. The dark bar represents the total number of Chinese A-share listed companies that hold investment real estate. As China's accounting standards only established an item for real estate investments in 2007, the chart begins at 2007

real estate investments increased from 681 in 2007 to 2,187 in 2020. During the same period, the total investment by listed companies surged from 96.5 billion yuan to 1,816.7 billion yuan. Notably, the growth rate of total investments outpaced the

increase in the number of companies, indicating an intensified focus on real estate investments during housing booms.

To address the real estate bubble, both the central and local governments in China have implemented various policies aimed at stabilizing house prices. For example, in 2018 and 2019, cities like Xian, Changsha, Hangzhou, Shanghai, Shenzhen, Nanjing, Jiangyin, and Haikou introduced policies that either prohibited or restricted house purchases by enterprises and public institutions. These policy interventions offer an opportunity to investigate the causal relationship between a company's real estate holdings and its product market competitiveness. To analyze the treatment effect resulting from this policy shock, we employ a Difference-in-Differences-in-Differences (DDD) strategy. Focusing on the crowding-out effect from the corporate perspective, we assume that this effect is driven by companies' real estate purchasing behaviors. If a company's real estate holding value positively influences its product market competition following the implementation of these policies, we can conclude that this effect is a result of companies reallocating their resources into real estate investments, thereby leading to the crowding-out effect.

Hypotheses

As highlighted in the introduction, we identified two mutually exclusive possibilities regarding the relationship between the collateral and crowding-out effects of real estate within the Chinese context. Consequently, we have formulated two competing hypotheses to examine each of these possibilities independently.

The first hypothesis posits that the collateral effect outweighs the crowding-out effect, a scenario extensively studied in Western countries, suggesting that companies' real estate holdings enhance their financial flexibility and positively impact their product market competitiveness (Alimov, 2016). We hypothesize that these findings may also hold true in the Chinese context. While Wu et al. (2015) argue against the existence of a collateral effect for Chinese real estate, it's important to note that their study focuses on the influence of property value on companies' investments rather than the loan amount. In China, real estate serves as valuable collateral for bank loans, indicating the presence of a collateral effect. Holding real estate can bolster companies' financing capabilities (Chen et al., 2015a; Wang et al., 2017).

The collateral effect, resulting from financial slack induced by real estate collateral, can enhance product market competitiveness through several channels. First, companies with higher real estate collateral value can improve their pricing power in the product market, allowing them to gain market share from competitors. Predation theory suggests that companies with ample financial resources can offer goods or services at lower prices, thereby reducing their competitors' profits and forcing financially weaker competitors to exit the market (Bolton & Scharfstein, 1990).

Second, loans secured by real estate collateral can be invested in marketing efforts to expand product influence. Companies with abundant financial resources can increase their product influence by increasing advertising expenditure, expanding distribution networks, and strengthening promotional activities. Classical marketing

theory suggests that promotion enhances product influence and, consequently, improves competitiveness (Alimov, 2016).

Third, financial resources can be allocated to research and development (R&D) activities, as suggested by classical technology innovation theory. New products resulting from R&D efforts satisfy consumer demands and can help companies access new markets within their respective industries. Ample financial resources strengthen companies' R&D capabilities, thereby enhancing their product market competitiveness (Alimov, 2016).

Fourth, financial resources can be invested in labor expenditure, which aligns with the efficiency wage theory. Higher wages increase employees' labor productivity, and competitive wages attract highly skilled employees, thus improving product market competitiveness. Additionally, sufficient capital enhances companies' financial flexibility, protecting them from shocks associated with debt or credit defaults (Kumar & Vergara-Alert, 2020). Based on the above discussion, we propose our first hypothesis:

H1a: An increase in the value of real estate held by companies positively impacts their product market competitiveness.

The other possible scenario is that the crowding-out effect prevails over the collateral effect. In an emerging market like China, it remains uncertain whether companies will allocate their resources toward product market competition despite the collateral effect of real estate. We argue that companies obtaining high returns from real estate investments may continue to prioritize real estate projects, thus diverting resources away from productive activities. Several factors support this argument.

Firstly, China, as a prototypical emerging market, faces a scarcity of high-return investment opportunities and a lack of incentives for investments in conventional industries. Its manufacturing sectors, often at a lower technological level, are positioned at the lower end of the global industrial chain. This positioning leads to reduced profitability and limited investment prospects, as noted by Dallas (2014), Breznitz and Murphree (2011), and Steinfeld (2010). Our data shows that the average return on equity (ROE) for Chinese listed companies is around 6%, in contrast to an annualized average growth rate of housing prices of about 10%. Kumar and Vergara-Alert (2020) have shown that in scenarios of scarce investment opportunities, financially flexible companies tend to increase dividend payouts. Building on this, our theory suggests that companies with limited high-return investment opportunities in traditional manufacturing sectors and possessing financial leeway are more likely to increase their investments in real estate. This shift in investment focus could further amplify the crowding-out effect from a corporate behavior standpoint, as discussed by Chakraborty et al. (2018).

Secondly, in the context of an emerging market, Chinese companies face capital shortages and operate within an immature business environment, which could magnify the crowding-out effect. Unlike many Western countries with well-developed capital markets, China's capital market is evolving slowly and faces supply shortages (Jiang et al., 2020). In such conditions, the crowding-out effect

of real estate becomes more likely. Additionally, China's business environment is relatively underdeveloped, with many industries subject to heavy regulation, resulting in strong non-natural monopolies. Companies in these industries may have less incentive to explore their product markets further and may find real estate investments more attractive.

Thirdly, local governments in China have a strong preference for rising house prices, reinforcing investors' unrealistic expectations regarding real estate. Research indicates that Chinese local governments heavily rely on land finance (Lichtenberg & Ding, 2009), and the career advancement of local officials is linked to local GDP performance (Li & Zhou, 2005). This incentivizes local officials to drive up land prices, which in turn depend on house price growth. Despite the central government's attempts to control house prices, their effectiveness has been limited. With local governments capable of intervening in the market easily and favoring rising house prices, investors may hold the misconception that house prices will continue to rise, motivating them to invest in real estate.

Ultimately, driven by companies' irrational preference for real estate, they collaborate with third-party firms to undertake an excessive number of real estate projects or acquire an abundance of commercial real estate, including offices, factories, dormitories, and more.[4] As a result, their real estate holdings deviate significantly from their optimal level, leading to the displacement of other productive assets and adversely impacting firms' product market competitiveness. Based on the above discussion, we propose a competing hypothesis to H1a:

H1b: An increase in the value of real estate held by companies negatively impacts their product market competitiveness.

Research Design

Sample and Data

For our empirical analysis, we collect data from various sources. We start by acquiring house price data from the China Real Estate Statistical Yearbook and the CEIC database. The China Real Estate Statistical Yearbook provides province-level commercial business and commercial comprehensive house prices for 35 large and medium-sized cities, while the CEIC database offers commercial comprehensive house prices for over 200 Chinese cities. These data sources enable us to capture house price dynamics across different regions.

[4] We have excluded companies operating in the real estate and construction industries. Consequently, the majority of these companies in our sample do not possess the qualifications to undertake real estate development on their own. Table 15 in the appendix reveals that only a small fraction of companies opt for independent development of their real estate projects, which can lead to changes in their employee composition.

Next, we merge the house price data with firm-level information extracted from the China Stock Market & Accounting Research (CSMAR) database, focusing on Chinese A-share listed companies spanning from 2003 to 2020. We select this time frame as it aligns with the transition towards a market-oriented real estate market following the implementation of the land use right bidding, auction, and listing system in 2003. We refine our sample through several steps. Firstly, we exclude companies operating in the finance, insurance, construction, and real estate industries. Secondly, we remove special treatment (ST) and *ST companies facing delisting risks. Thirdly, we exclude companies listed after 2003 to maintain a balanced panel dataset for computing the market value of real estate holdings. Lastly, we eliminate observations with missing values, resulting in an unbalanced panel dataset comprising 13,501 observations. To mitigate the impact of extreme values, we apply winsorization at the 1% and 99% tails for all continuous variables.

By utilizing these datasets and employing rigorous data refinement procedures, we aim to ensure the reliability and validity of our empirical analysis.

Empirical Strategy

To assess the impact of companies' real estate holding value on their product market competitiveness, we estimate the following regression model, following the methodology outlined by Alimov (2016):

$$Comp_{i,t} = \alpha_0 + \alpha_1 REvalue_{i,t-1} + \alpha_2 HPI_{t-1} + \alpha_3 \Sigma CVs_{i,t-1} + Firm\&YearFixedEffects + \varepsilon_{i,t} \quad (1)$$

where the dependent variable *Comp* represents a firm's product market competitiveness and the key independent variable *REvalue* represents its real estate market value in PPE items. A significant and positive coefficient α_1 indicates that an increase in companies' real estate holding value improves product market competitiveness, supporting H1a (collateral effect dominates crowding-out effect). Conversely, a significant and negative α_1 indicates that an increase in companies' real estate holding value damages product market competitiveness, supporting H1b (crowding-out effect dominates collateral effect). *HPI* is the local house price index (*HPI*), calculated based on company headquarters addresses. *CVs* is a vector of control variables lagged by 1 year. Following Alimov (2016), the control variables are 1-year lagged product market competitiveness ($Comp_{t-1}$), size ($Size_{t-1}$), leverage (Lev_{t-1}), cash flow (CF_{t-1}), total asset turnover ($TATO_{t-1}$), and Tobin's Q ($TobinQ_{t-1}$). Controlling for the 1-year lagged dependent variable can weaken the autocorrelation problem and control for the influence of some unobservable omitted variables. We ignore the bias of the coefficient of lagged $Comp_{t-1}$ because we only use it as a control variable to ensure that the coefficient of *REvalue*, α_1, is unbiased. The definitions and measurements of *Comp* and *REvalue* are described below.

Additionally, we include firm and year fixed effects in our model to account for the influence of firm-specific and time-invariant omitted variables. We also compute the estimated standard errors while clustering them at the firm level to address potential correlations within the same firm's observations.

Measurement of Key Variables

Measurement of Product Market Competitiveness

Consistent with Alimov (2016), we assess firms' product market competitiveness using the methodology developed by Campello (2003) and Campello (2006). This method involves calculating the growth rate of a company's main business income adjusted by the annual industrial median. The specific calculation is detailed below.

$$Comp = (lnM_t - lnM_{t-1}) - med_{ind,t}(lnM_t - lnM_{t-1}) \tag{2}$$

where M is the main business income of the company. The industrial classification system was issued by the China Securities Regulatory Commission in 2012. The manufacturing industry is coded by two digits and other industries are coded by one digit. As the value of *Comp* is relatively small, we multiply it by 100 for scaling.

Measurement of the Market Value of Real Estate Holdings

Following the approach outlined in Chaney et al. (2012), we initially calculate the annual market value of companies' real estate holdings. However, our available data is limited to the book value of real estate from their financial reports. To bridge this gap, we transform the book value into market value through the following procedure:

Firstly, we identify the year of purchase for companies' real estate holdings at the beginning of 2003, which corresponds to the end of 2002. We extract relevant real estate holding information from fixed asset items, such as the original value and accumulated depreciation. Assuming a straight-line depreciation method and a 30-year lifetime for real estate, we utilize Eq. (3) to estimate the age of a company's real estate in 2002. Subsequently, we estimate the year of purchase using Eq. (4).

$$\text{The age of real estate in 2002} = 30 \times \frac{\text{accumulated depression of real estate in 2002}}{\text{original value of real estate in 2002}} \tag{3}$$

$$\text{Purchase year of real estate} = 2003 - \text{The age of real estate in 2002} \tag{4}$$

Second, we estimate the market value of companies' real estate holdings at the beginning of 2003 ($HV_{i,2003}$), i.e., the end of 2002, using local house prices for every year. However, house prices before 1999 are not available, so we use the consumer price index instead. For real estate purchased after 1999 and before 2003, we use province-level house prices because these are the only data available. The equation used to calculate $HV_{i,2003}$ is shown below.

$$HV_{i,2003} = \frac{\text{original value of real estate in2002} \times \text{local house price in 2002}}{\text{local house price in purchasing year}} \tag{5}$$

As companies may purchase new houses after 2002, it is necessary to transform the book value of these newly purchased houses to market value based on 2002

house prices, and to add them to $HV_{i,2003}$ to obtain the real number of real estate investments for each year. The real number of real estate investments is the market value of real estate, measured as house prices in the baseline period of 2002. This is similar to the concept of real GDP. $HV_{i,t}$ is calculated using Eq. (6).

$$HV_{i,t} = HV_{i,2003} + \frac{NewHV_{i,2003}}{HPI_{i,2003}} + \cdots + \frac{NewHV_{i,t}}{HPI_{i,t}} \tag{6}$$

Finally, we transfer the real number of real estate investments for each year to market value using HPI. $REvalue_{i,t}$ is calculated using Eq. (7).

$$REvalue_{i,t} = HV_{i,t} \times HPI_{i,t} \tag{7}$$

To increase the credibility of our empirical results, we use five *HPI*s to calculate $REvalue_{i,t}$: commercial business *HPI*s for 35 large and medium-sized cities (*HPI1*), commercial comprehensive *HPI*s for over 200 cities (*HPI2*), commercial comprehensive *HPI*s for 35 large and medium-sized cities (*HPI3*), province-level commercial business HPI (*HPI4*), and province-level commercial comprehensive HPI (*HPI5*). *HPI2* is obtained from the CEIC database and the others are obtained from the *China Real Estate Statistical Yearbook*. We use the first two for our basic empirical regressions and the remainder for robustness tests because *HPI1* and *HPI2* are the most accurate house price data available.

We align local house prices with our firm-level dataset by utilizing firms' headquarters addresses. In cases where city-level house prices are unavailable for the entire sample period, we substitute them with province-level house prices. When city-level house prices are missing for specific years, we impute them by considering the temporal trends of local house prices, employing a time series regression approach. For a comprehensive understanding of the variables employed in our analysis, please refer to Table 1 for their definitions.

Descriptive Statistics

Table 2 provides descriptive statistics for our variables. Concerning the dependent variable, *Comp*, both the mean and median values are slightly negative at approximately -1.555 and -1.556, respectively. The standard deviation, at 28.081, indicates a significant variation in *Comp*, with values ranging from a maximum of 121.398 to a minimum of -96.415. This substantial variation suggests that the competitiveness measure exhibits considerable fluctuations, potentially influenced by the rapid development of the Chinese market.

Regarding the key independent variables, *Revalue1* and *Revalue2*, we observe a wide range of values. The maximum values, 43.20 and 55.42, indicate that a firm's real estate holding value can be as much as 50 times its net fixed assets value in 2002. Conversely, the minimum values are merely 0.1 or 0.2. The variations in real estate market value can be attributed to fluctuations in house prices and companies' real estate purchasing behaviors. As for the House Price Index (*HPI*), we find maximum values ranging from 7.2 to 9.5, signifying that house prices have surged by 7

Table 1 Definitions of the Variables Used to Obtain the Baseline Results

Variable	Definition
Comp	Product market competitiveness, calculated using Eq. (2) and scaled by multiplying by 100
REvalue1	Market value of real estate scaled by net value of fixed assets in 2002; market value is measured with commercial business house prices for 35 large and medium-sized cities
REvalue2	Market value of real estate scaled by net value of fixed assets in 2002; market value is measured with commercial comprehensive houses price for over 200 Chinese cities
HPI1	Commercial business house prices in year *t* scaled by commercial business house prices in 2002, for 35 large and medium-sized cities
HPI2	Commercial comprehensive house prices in year *t* scaled by commercial comprehensive house prices in 2002, for over 200 Chinese cities
Size	Logarithm of the book value of total assets
Lev	Total liabilities / total assets
CF	Net cash flow from operating activities / total assets
TATO	Sales income / total assets
TobinQ	Market value of company stock / book value of company equity assets

This table shows how we construct each variable used to obtain our baseline results. It consists of dependent variables, key independent variables, and control variables. The data we use are obtained from the CSMAR database, CEIC database, and the *China Real Estate Statistical Yearbook*. For the definitions of other variables, please refer to Table 14 in the appendix

Table 2 Descriptive Statistics of the Variables Used for the Baseline Regressions

VarName	Obs	Mean	SD	Min	P25	Median	P75	Max
Comp	13,501	-1.555	28.081	-96.415	-13.306	-1.556	9.877	121.398
REvalue1	13,496	5.110	6.635	0.102	1.412	2.997	5.938	43.199
REvalue2	13,501	6.240	8.205	0.195	1.722	3.661	7.307	55.423
HPI1	13,496	2.722	1.376	0.770	1.592	2.567	3.526	7.263
HPI2	13,501	3.270	1.775	0.955	1.764	3.106	4.240	9.419
Size	13,501	22.117	1.253	19.537	21.209	21.975	22.891	25.693
Lev	13,501	0.498	0.186	0.077	0.366	0.508	0.636	0.932
CF	13,501	0.051	0.072	-0.167	0.010	0.048	0.091	0.259
TATO	13,501	0.714	0.517	0.064	0.369	0.586	0.895	2.938
TobinQ	13,501	1.796	1.155	0.847	1.120	1.386	1.991	7.998

This table presents the descriptive statistics of the variables used for the baseline regressions. It shows the number of observations (Obs), mean value, standard deviation (SD), maximum (Max) and minimum (Min) values, 25% quantile (P25), 75% quantile (P75), and median value. All of the continuous variables are winsorized at the 1% and 99% tails

to 10 times since 2002, indicating rapid growth. However, the mean values of companies' real estate holding value (ranging from 5.1 to 6.3) exceed the corresponding mean values of *HPI* (ranging from 2.7 to 3.3). This implies that fluctuations in house prices alone cannot fully account for the increase in companies' real estate holding value and suggests that companies are actively engaged in acquiring new real estate.

The descriptive statistics for the other control variables fall within reasonable ranges and are consistent with findings from prior studies.

Empirical Tests

Baseline Results

We conducted estimations using Eq. (1) to assess the impact of companies' real estate holding value on their product market competitiveness. The results are presented in Table 3. In column (1), employing companies' real estate market value based on commercial business house prices for 35 large and medium-sized cities as the key independent variable, we observe a significant coefficient of -0.463 at the 1% level. This suggests that a one standard deviation increase in the value of real estate holdings, moving from 5.11 to 11.745, leads to a decline in companies' product market competitiveness by 3.07 points. This decrease represents 10.9% of the sample's standard deviation, calculated as 3.07 divided by 28.081.

In column (2) of Table 3, using companies' real estate market value based on commercial comprehensive house prices for over 200 Chinese cities as the key independent variable, we find a significant coefficient of -0.352 at the 1% level. This means that an increase of one standard deviation in real estate holding value, going from 6.24 to 14.45, results in a 2.89-point decrease in a company's product market competitiveness. This reduction is equivalent to 10.3% of the sample's standard deviation, calculated as 2.89 divided by 28.081. The size of this effect is economically significant.

Our baseline findings diverge significantly from those reported in Alimov (2016) and other related studies. The consistent presence of a negative effect, irrespective of the measure employed for real estate holding value, aligns with our hypothesis H1b, which posits the prevalence of the crowding-out effect over the collateral effect in China. One plausible explanation for the disparity between our study and prior research (Alimov, 2016; Ambrose et al., 2017; Diop, 2018) lies in the distinct institutional backgrounds of emerging markets and developed countries. For instance, Chakraborty et al. (2018) propose that in the United States, the crowding-out effect of real estate is transitory, as banks augment credit supply to companies once they accumulate sufficient wealth from real estate investments. However, in China, as an emerging market constrained by limited capital resources, the negative impact of the crowding-out effect may be more pronounced when compared to the United States.

Causality Identification and Robustness Tests

Our study makes a significant contribution to the existing literature by explicitly addressing identification challenges and measurement issues related to companies' real estate holding value. Endogeneity concerns primarily stem from two areas: housing prices and a company's behavior in purchasing real estate. In the case of

Table 3 Real Estate Holding Value and Product Market Competitiveness

	(1) *Comp*	(2) *Comp*
$REvalue1_{t-1}$	-0.463***	
	(-5.188)	
$HPI1_{t-1}$	0.677	
	(1.294)	
$REvalue2_{t-1}$		-0.352***
		(-5.126)
$HPI2_{t-1}$		0.889*
		(1.846)
$Comp_{t-1}$	5.988***	6.046***
	(4.214)	(4.276)
$Size_{t-1}$	-3.730***	-3.946***
	(-4.232)	(-4.541)
Lev_{t-1}	3.443	3.377
	(1.171)	(1.148)
CF_{t-1}	1.963	1.869
	(0.400)	(0.380)
$TATO_{t-1}$	-21.275***	-21.314***
	(-13.113)	(-13.139)
$TobinQ_{t-1}$	3.655***	3.650***
	(8.066)	(8.083)
_cons	87.682***	92.004***
	(4.631)	(4.936)
firm	Yes	Yes
year	Yes	Yes
N	13,496	13,501
adj. R^2	0.061	0.061

This table presents the results of fixed-effects panel regressions to test the relationship between companies' real estate holding value and their product market competitiveness. The dependent variable is companies' product market competitiveness, computed using Eq. (2). The key independent variable is the market value of a company's real estate holdings. In column (1), we use commercial business house prices for 35 large and medium-sized cities to compute companies' real estate holding value. In column (2), we use commercial comprehensive house prices to compute companies' real estate holding value. The control variables are *HPI*, $Comp_{t-1}$, *Size*, *lev*, *CF*, *TATO*, *TobinQ*. We also control for firm and year fixed effects. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

housing prices, endogeneity may largely be due to unobservable variables. For example, reduced product market competitiveness could signal intense local product market competition, potentially indicative of a high degree of marketization.

This increased marketization could, in turn, positively impact local housing prices. Regarding the quantity of real estate, the key source of endogeneity could be reverse causality. For instance, a decline in product market competitiveness might lead companies to increase their focus on real estate investments, thereby raising their real estate holdings.

To address the endogeneity issue related to house prices, prior research on the US real estate market has employed an instrumental variable (IV) approach, using the interaction between housing supply elasticities and the national interest rate (Alimov, 2016; Chaney et al., 2012; Lin, 2016; Mao, 2021). However, in the case of Chinese cities, readily available data on housing supply elasticity have been scarce, making the adoption of this IV approach less common for Chinese house prices. To surmount this challenge, we adopt the methodology outlined by Saiz (2010) and calculate housing supply elasticities at the city level for over 200 Chinese cities. Through the decomposition of house holding value into house prices and the quantity of house holdings, we construct a Shift-Share IV (Goldsmith-Pinkham et al., 2020) for house holding value, utilizing the IV for house prices. Detailed explanations of the process for estimating Chinese city-level housing supply elasticities and constructing the IV are provided in subsequent sections of this paper.

To mitigate potential reverse causation issues arising from companies' real estate purchasing behaviors, as suggested in prior studies (Chaney et al., 2012), it has been recommended to account for the amount of real estate held by companies in the initial sample period while excluding real estate acquired in subsequent years. This approach attributes variations in real estate value solely to fluctuations in house prices, thus addressing endogeneity concerns. However, the long-term impact of real estate holdings on current decision-making remains uncertain. To tackle this issue, we employ an exogenous policy shock as a natural experiment to construct a Difference-in-Difference-in-Differences (DDD) identification strategy. Specifically, we examine the effects of policies enacted in 2018 and 2019 by eight Chinese cities that prohibited or restricted enterprises and public institutions from purchasing houses. The DDD strategy enables us to investigate whether real estate projects displace companies' productive inputs.

Shift-Share IV

In this section, we construct a Shift-Share IV for companies' real estate holding value. The "Share" component represents the actual number of real estate investments held by companies, while the "Shift" component captures the fluctuations in house prices. Researches by Borusyak et al. (2022) and Goldsmith-Pinkham et al. (2020) have shown that whether the Shift or Share part is exogenous, the Shift-Share IV remains exogenous. We identify an exogenous IV for the Shift component and utilize it to construct our Shift-Share IV.

Following the established literature (Alimov, 2016; Chaney et al., 2012; Cvijanović, 2014; Lin, 2016; Mian & Sufi, 2011), we employ the interaction between the national interest rate of loans with a term over 5 years (*Interest*) and city-level housing supply elasticities (*Elasticity*) as instruments for Chinese city-level house prices. The interest rates are sourced from the People's Bank of China's

website, and housing supply elasticities are estimated using the equation proposed by Saiz (2010).

$$LnP_{k,t} = C + \beta_1 LnH_{k,t} + \beta_2\left(1 - undevelopable_k\right) \times LnH_{k,t} + \sum R_k + \varepsilon_{k,t} \quad (8)$$

We obtain the coefficient $\beta_1+\beta_2(1\text{-}undevelopeable)$, which represents housing supply elasticities. The subscript k represents the city and t represents the year. The dependent variable is the logarithm of commercial house prices (*LnP*) for each city, and the key independent variable is the logarithm of house sales (*LnH*). The house sales (*H*) is measured using annual commercial comprehensive house sales areas for each city, which is an equilibrium result of housing supply and demand. In economics terms, the correlation coefficient between *LnP* and *LnH* is the housing supply elasticities. However, this method treats all urban elasticities as identical, which is not in line with reality. Saiz (2010) argues that housing supply elasticities are constrained by local geographical and natural conditions. Therefore, the elasticity coefficient can be divided into two parts, one of which is common to all cities (β_1). The other is related to the difficulty of land development in each city ($\beta_2(1\text{-}undevelopable)$). Thus, total elasticity is $\beta_1+\beta_2(1\text{-}undevelopable)$. The variable *undevelopable* represents the proportion of land that cannot be developed in the city, calculated using remote sensing data[5] obtained from the website of National Aeronautics and Space Administration (NASA).

To address the potential reverse causality issue in Eq. (8), we employ instrumental variables (IVs) to account for the influence of housing demand (H) on house prices (P). Following the methodology proposed by Saiz (2010), we utilize the ratio of sunny days in January and the population growth rate in each city as our IVs for housing demand. The number of sunny days in January reflects the comfort of cities, with a greater number indicating higher housing demand. Additionally, population growth can stimulate local housing demand. Importantly, since weather is exogenous and population growth affects house prices only through housing demand, the exogeneity of the IVs is ensured.

For delineating undevelopable areas, we follow the methodology used by Saiz (2010). Firstly, we employ ArcGIS to create a circular boundary with the city's geographical center as its center point and a radius of 30 km (the average radius of all cities in China is approximately 26 km). Secondly, we calculate the proportion of steep-slope areas (undevelopable areas) with a slope greater than 15 degrees, as defined by Meng et al. (2021), within these undeveloped areas where nighttime light intensity is less than 20. This helps us construct the variable *undevelopable*. R represents regional fixed effects, categorized into East, Middle, and West regions.

We obtain city-level weather data from the website, ip138[6] and process them as follows. For each day, if the weather is categorized as "sunny," we assign a weight of

[5] Source website for remote sensing data: https://www.usgs.gov/centers/eros/science/usgs-eros-archive-digital-elevation-shuttle-radar-topography-mission-srtm-1-arc?qt-science_center_objects=0#qt-science_center_objects

[6] Source website for weather data: https://qq.ip138.com/weather/history.htm. This website queries weather data from 2012 to 2020. We take the mean value of the January sunny ratio from 2012 to 2020 to measure the local comfort level and merge it with other economic datasets to estimate elasticities.

Table 4 Test of the Sunny Ratio and the Population Growth Rate as the IVs in Eq. (8)

Statistics	Weak IV (Cragg–Donald Wald F statistic)	Overidentification (Sargan)
Value	43.558 ***	0.520

This table presents the results of the IV tests. The Cragg–Donald Wald F value tests the correlation between the IVs and the endogenous variable. The Sargan value tests the exogeneity of the IVs. These results of Eq. (8) are used to estimate housing supply elasticities. This means that the IVs of the sunny ratio in January and the population growth rate are valid and that the endogenous variable is housing demand

1. If the weather description includes the term "sunny," such as "cloudy to sunny," we assign a weight of 0.5. In all other cases, we assign a weight of 0. We sum up these weights and divide the result by 31 to calculate the proportion of sunny days in January for each city. Population growth rate data are obtained from the CSMAR database. Given that our model has one endogenous variable and two IVs, resulting in overidentification, we conduct the Sargan test to examine the exogeneity of the IVs. The results of the Sargan test are presented in Table 4, which provides an assessment of the instrument validity.

The results presented in Table 4 provide important insights into the validity of our instrumental variables (IVs). The Sargan statistic, with a value of 0.520, is not statistically significant. This outcome implies that we do not have sufficient evidence to reject the null hypothesis, suggesting that the IVs used in our analysis are not correlated with the residual term. Consequently, we can confidently assert that the exogeneity assumption of the IVs holds in our model. Furthermore, the F statistic is computed to be 43.558, and it is statistically significant at the 1% level. This indicates that the IVs possess substantial explanatory power for the key explanatory variable, housing demand. The significance of the F statistic underscores that our IVs are not weak instruments and are indeed statistically valid. Therefore, the proportion of sunny days in January and the local population growth rate serve as suitable IVs for capturing local housing demand, and the coefficients estimated using these IVs are statistically consistent. As a result, we can proceed to employ the elasticity data to construct our Shift-Share IV for real estate holding value, ensuring the robustness of our estimation approach.

IV–Two-Stage Least Squares (2SLS) Regression

As city-level commercial business house price data are not available for every cities, we estimate housing supply elasticities for commercial comprehensive houses in over 200 cities. This estimation serves as the instrumental variable (IV) in our analysis. Following Lin (2016), we create the interaction term between the instrument variable of house prices index (IV) and the real amount of companies' real estate holdings (*HV2*), denoted as *IV_HV2*, which serves as the shift-share instrumental variable for *REValue2*. Additionally, we use the IV as the instrumental variable for the house price index (*HPI*). Consequently, our two-stage least squares (2SLS)

Table 5 IV-2SLS Regression Results

	IV-First $HPI2_{t-1}$	IV-First $REvalue2_{t-1}$	IV-Second *Comp*
$REvalue2_{t-1}$			-0.492***
			(-3.220)
$HPI2_{t-1}$			6.030
			(1.004)
$IV_{t-1}\_HV2_{t-1}$	-0.046***	2.808***	
	(-3.772)	(25.289)	
IV_{t-1}	-1.945**	-4.721**	
	(-2.023)	(-2.127)	
$Comp_{t-1}$	0.013	-0.476***	5.655***
	(0.579)	(-3.576)	(3.942)
$Size_{t-1}$	0.099***	0.597***	-3.440***
	(3.219)	(3.857)	(-3.118)
Lev_{t-1}	-0.008	-0.234	3.012
	(-0.072)	(-0.455)	(1.000)
CF_{t-1}	-0.010	0.900	1.235
	(-0.095)	(1.191)	(0.247)
$TATO_{t-1}$	-0.018	-0.024	-20.780***
	(-0.464)	(-0.092)	(-12.893)
$TobinQ_{t-1}$	0.013	0.086*	3.696***
	(0.974)	(1.723)	(7.954)
_cons	2.078	-8.666**	0.498**
	(1.303)	(-2.022)	2.40
firm	Yes	Yes	Yes
year	Yes	Yes	Yes
N	13,201	13,201	13,196
R^2	0.873	0.732	-0.050

This table reports the IV-2SLS regression results, which test the relationship between companies' real estate holding value and their product market competitiveness. We use the interaction of housing supply elasticities and national interest rates of long-term loans to instrument house prices in our baseline regression. Column (1) reports the results of one of the first-stage regressions, wherein *HPI* is regressed on the IV constructed earlier. Column (2) reports the other first-stage results, wherein companies' real estate holding value is regressed on the product of *HV* and *IV*. Column (3) reports the second-stage results, wherein two IVs, *IV* and *IV_HV*, are used to instrument two endogenous variables, *HPI* and *REvalue*. Because we only estimate housing supply elasticities for *HPI2*, we only report the IV-2SLS results obtained using *HPI2*. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

regression consists of two first-stage regressions. The results of these regressions are presented in Table 5.

In column (1) of Table 5, we regress *HPI2* on IV in the first-stage regression. The coefficient of IV t-1 is -1.945, which is statistically significant at the 5% level, indicating that the IV has a strong explanatory power for *HPI2*. In column (2), we conduct the other first-stage regression, regressing *REValue2* on *IV_HV2*. The coefficient of $IV_{t-1}\_HV2_{t-1}$ is 2.808, which is statistically significant at the 1% level, suggesting that the shift-share instrument variable has a high explanatory power for *REValue2*. Column (3) presents the second stage of the 2SLS regression. By addressing the endogeneity problem using the IV approach, the coefficient of *REValue2* is estimated as -0.492, which is statistically significant at the 1% level. Comparing this result with the baseline regression, we observe that the absolute value of the coefficient increases by approximately 0.030. This confirms the robustness of our baseline results. Overall, the IV-2SLS regression results support the findings obtained from the baseline regression, reinforcing the validity and reliability of our empirical analysis.

DDD Identification Strategy Using a Policy Shock

While our instrumental variable (IV) approach effectively deals with the endogeneity problem associated with house prices, it is important to acknowledge that it may not completely resolve the issue arising from companies' real estate purchasing behaviors and their potential impact on product market competitiveness. The presence of reverse causality can add complexity to the analysis of the crowding-out effect.

Unfortunately, we were unable to identify a suitable instrumental variable (IV) to address the endogeneity problem associated with companies' real estate purchasing behaviors. However, we identified a relevant policy shock in the Chinese context that allows us to construct a difference-in-differences-in-differences (DDD) strategy to overcome this challenge. In 2018 and 2019, eight cities in China (Xian, Changsha, Hangzhou, Shanghai, Shenzhen, Nanjing, Jiangyin, and Haikou) implemented policies that prohibited or restricted real estate purchases by enterprises and public institutions.[7]This policy shock is expected to weaken the crowding-out effect of real estate as it directly impacts companies' ability to acquire real estate. In theory, after the government's ban on real estate purchases by local enterprises, we anticipate that capital previously tied up in real estate investments will be redirected towards product market competition. As a result, we expect that companies with high real estate values in these eight cities before the policy implementation will experience significant improvements in their market competitiveness after the policy comes into effect. This relationship is captured in Eq. (9) of our model.

[7] Haikou issued this policy in 2019 and the other seven cities issued it in 2018.

$$Comp_{i,t} = \alpha + \beta_1 REvalueb_i \times policy \times after + \beta_2 REvalueb_{i,} \times policy + \beta_3 REvalueb_i \times after + \beta_4 policy \times after + \beta_5 REvalue_{i,t} + CVs + Firm\&YearFixedEffects + \varepsilon_{i,t} \quad (9)$$

The treatment effect in our model is represented by the coefficient β1, which is expected to be both statistically significant and positive. The variable REvalueb reflects the real estate holding value of firms in the year before the policy implementation, with higher values indicating a greater impact of the policy shock. The variable "policy" is a dummy variable that equals 1 if the firm is located in one of the eight cities affected by the policy and 0 otherwise. The variable "after" is a time dummy variable that equals 1 if the observation is in or after the policy year and 0 otherwise. In addition to the three-way interaction term, we include two-by-two interaction terms and individual terms (excluding those absorbed by the fixed effects) as control variables. We apply fixed effects to account for individual-specific characteristics, and standard errors are clustered at the firm level.

The results of our DDD identification strategy are shown in Table 6. In columns (1) and (2), the coefficients of the three-way interaction term are 0.403 and 0.383, respectively, and they are statistically significant at the 1% level. These coefficients are quite similar, indicating that firms with higher real estate holding values in the policy-affected areas experience greater improvements in their market competitiveness after the policy implementation compared to firms unaffected by the policy. Specifically, a one standard deviation increase in a firm's real estate holding value results in an approximate increase of 2.654 points in product market competitiveness following the policy implementation. This is calculated as 0.4 multiplied by 6.635. These findings suggest that, following the policy implementation, companies are unable to redirect their capital towards real estate projects. Instead, the collateral effect becomes dominant, positively influencing firms' product market competitiveness. The results obtained through the DDD empirical strategy support our hypothesis and enhance the reliability of our conclusions.

To validate our DDD strategy, we conducted a test for the parallel trend assumption. We grouped all observations from more than three years before policy implementation into a default group to avoid excessive use of dummy variables. Year-specific dummies were created for the remaining years. Using these year dummies, we reconstructed the three-way interaction term. The results of the parallel trend test are presented in Fig. 3.

Whether in the left or right panel of Fig. 3, we observed that the coefficient of REvalueb_policy_year became significant after policy implementation, while it was not significant before the policy. This finding supports the parallel trend assumption, indicating that there were no systematic differences in the pre-policy trends between the treated and control groups. Meanwhile, this change in the coefficient suggests that, post-policy implementation, financial resources are no longer invested in real estate projects, leading to the dominance of the collateral effect of real estate.

Issues of Real Estate Investments

In this section, we address the issue of companies investing in real estate outside their headquarters' locations and its potential impact on our regression results. We employ two methods to tackle this concern.

Table 6 Results of the DDD Identification Strategy

	(1) Comp	(2) Comp
REvalueb1_policy_after	0.403***	
	(2.688)	
REvalueb2_policy_after		0.383***
		(3.030)
REvalueb1_policy	1.739***	
	(12.837)	
REvalueb2_policy		20.401***
		(16.653)
REvalueb1_after	0.074	
	(0.962)	
REvalueb2_after		0.090
		(1.224)
policy_after	-3.809*	-5.197**
	(-1.654)	(-2.220)
$REvalue1_{t-1}$	-0.584***	
	(-5.706)	
$REvalue2_{t-1}$		-0.476***
		(-5.441)
$HPI1_{t-1}$	0.838	
	(1.501)	
$HPI2_{t-1}$		1.062**
		(2.110)
$Comp_{t-1}$	5.925***	5.961***
	(4.166)	(4.215)
$Size_{t-1}$	-3.631***	-3.821***
	(-4.118)	(-4.383)
Lev_{t-1}	3.401	3.376
	(1.155)	(1.145)
CF_{t-1}	1.870	1.750
	(0.381)	(0.356)
$TATO_{t-1}$	-21.346***	-21.399***
	(-13.121)	(-13.169)
$TobinQ_{t-1}$	3.634***	3.633***
	(8.001)	(8.029)
_cons	81.954***	32.077*
	(4.330)	(1.671)
firm	Yes	Yes
Year	Yes	Yes

Firstly, we adjusted our sample composition by retaining only those companies whose headquarters are located in major cities. We used two criteria to define these major cities. The first criterion includes the 35 large and medium-sized cities, where

Table 6 (continued)

	(1) Comp	(2) Comp
N	13,496	13,501
Adj. R^2	0.061	0.061

This table presents the results of the DDD identification strategy that examines the policy effect of prohibiting companies from purchasing houses. The dependent variable is companies' product market competitiveness. The key independent variable is the three-way interaction term, *REvalueb_policy_after*, which captures the average treatment effect of the policy. The variable *REvalueb* represents companies' real estate holding value at the end of the last year before policy implementation, which captures companies' exposure to the policy. *policy* is a cross-sectional dummy variable that marks whether the cities where companies are located issue the real estate regulation policy. *after* is a time-based dummy variable that indicates whether the time is before or after the policy year. In our regression analysis, we do not incorporate single items because they can be absorbed by fixed effects. Instead, we control for the variable *REvalue*, which is used to capture the impact of real estate on competitiveness in non-treated areas before the implementation of the policy. The control variables and fixed effects are the same as in the baseline regressions. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

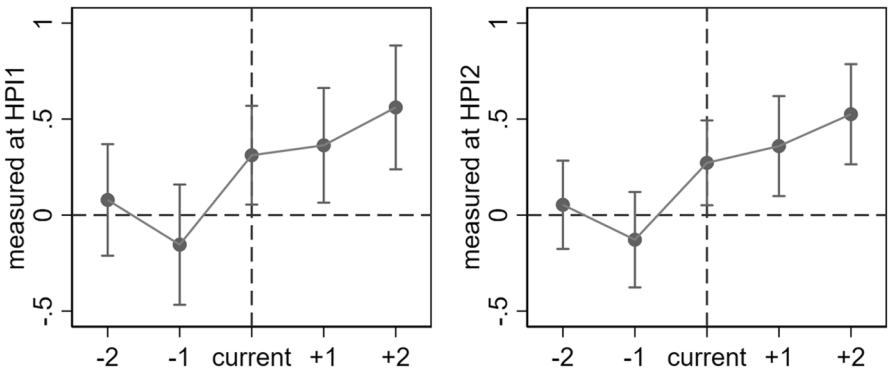

Fig. 3 Parallel Trend Test. *Notes*: This figure plots the parallel trend test for our DDD strategy. The x-axis represents the time relative to the year in which the city where the company's headquarters are located issued the real estate regulation policy. The y-axis represents the coefficient of the three-way interaction of companies' real estate holding value before policy implementation (*REvalueb*), the cross-sectional treatment dummy (*policy*), and the time dummies (*before1*, *before2*, etc.). We set all observations more than 3 years before policy implementation as the default group. The figure plots the two-tailed 90% confidence interval around each estimate of the coefficient of the three-way interaction. To compute companies' real estate market value, the left panel uses commercial business house prices from 35 large and medium-sized cities and the right panel uses commercial comprehensive house prices for over 200 cities

real estate is considered the most valuable asset in China. The second criterion comprises the top 10 cities in terms of GDP, indicating the most prosperous economies in China. As noted by Wright and Yanotti (2019), companies often exhibit a "home bias" when investing in real estate, meaning that those situated in these major cities are more inclined to invest in local real estate assets, whether for market expansion or real estate asset arbitrage.

Secondly, to account for the potential influence of house price changes in areas where companies have subsidiaries, we construct a weighted house price index (HPI_{weight}) using location information from these subsidiaries. This index helps capture the impact of real estate investments in areas other than the companies' headquarters. The calculation for the weighted house price index is provided in formula (10).

$$HPI_{weight} = \frac{PPE_{mother}}{PPE_{Merg}} \times HPI_{mother} + \left(1 - \frac{PPE_{mother}}{PPE_{Merg}}\right) \sum \frac{1}{N} HPI_{subsidies} \quad (10)$$

Here, PPE_{mother} represents the fixed asset scale of parent companies, while PPE_{merg} represents the fixed asset scale of company groups, including parent and subsidiary companies. HPI_{mother} represents the house price index at the location of the company's headquarters, and $HPI_{subsidiaries}$ represents the house price index at the locations of subsidiaries. N represents the number of subsidiaries included in the analysis, limited to subsidiaries in mainland China.

The results of the regression analysis are presented in Table 7, providing robust support for our baseline regression findings. In columns (1) and (2), the coefficients of *REvalue1* and *REvalue2* are -0.388 and -0.294, respectively, both statistically significant at the 1% level. In columns (3) and (4), the coefficients of *REvalue1* and *REvalue2* are -0.275 and -0.207, respectively, both significant at the 5% level. In column (5), when we incorporate the weighted house price index (*HPI_weight*), the coefficient of *REvalue_weight* is -0.337, significant at the 1% level. In summary, even after considering the influence of remote real estate investments by companies, the negative impact of real estate value on product market competitiveness remains evident.

Other Robustness Tests

To ensure the robustness of our baseline results, we further conduct three robustness tests to examine the impact of alterations in the sample period, changes in the dependent variable, and the use of alternative measures for the key independent variable. The results of these tests are presented in Table 8.

In our first robustness test, we eliminated observations from 2007 and earlier, acknowledging the substantial changes in China's corporate accounting standards during that time. The coefficients for *REvalue1* and *REvalue2* in columns (1) and (2) persist in being significant at the 1% level, with values of -0.454 and -0.339, respectively. This supports the robustness of our baseline results even when focusing on a more constrained sample period.

In the second robustness test, we replace the dependent variable with the growth rate of product market share (*M_growth*). The coefficients of *REvalue1*

Table 7 Alleviate Concerns on Real Estate Investment in Other Areas

	(1)	(2)	(3)	(4)	(5)
	35 large and medium-sized cities		Top 10 GDP cities		Using weighted HPI
	Comp	*Comp*	*Comp*	*Comp*	*Comp*
$REvalue1_{t-1}$	-0.388***		-0.275**		
	(-3.593)		(-2.110)		
$HPI1_{t-1}$	0.812		1.492*		
	(1.362)		(1.689)		
$REvalue2_{t-1}$		-0.294***		-0.207**	
		(-3.537)		(-2.034)	
$HPI2_{t-1}$		0.915		1.288	
		(1.458)		(1.350)	
$REvalueweight_{t-1}$					-0.337***
					(-4.577)
$HPIweight_{t-1}$					0.694
					(1.068)
$Comp_{t-1}$	5.629***	5.680***	4.874**	4.912**	6.614***
	(3.376)	(3.410)	(2.148)	(2.161)	(4.492)
$Size_{t-1}$	-2.789**	-2.996**	-4.896***	-5.092***	-3.618***
	(-2.355)	(-2.551)	(-3.524)	(-3.696)	(-3.891)
Lev_{t-1}	0.734	0.683	2.169	1.832	3.846
	(0.190)	(0.176)	(0.396)	(0.335)	(1.212)
CF_{t-1}	-0.696	-0.877	-6.864	-7.082	2.647
	(-0.111)	(-0.140)	(-0.818)	(-0.847)	(0.521)
$TATO_{t-1}$	-19.184***	-19.205***	-22.616***	-22.571***	-20.804***
	(-10.532)	(-10.557)	(-10.178)	(-10.190)	(-12.481)
$TobinQ_{t-1}$	4.408***	4.388***	4.157***	4.131***	3.744***
	(7.230)	(7.222)	(5.556)	(5.547)	(8.226)
_cons	66.578***	70.933***	111.722***	116.376***	84.593***
	(2.609)	(2.810)	(3.773)	(3.982)	(4.240)
firm	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes
N	8927	8927	5135	5135	12,355
Adj. R^2	0.057	0.057	0.074	0.074	0.060

This table addresses concerns regarding companies investing in real estate outside their headquarters' locations. In columns (1) and (2), the sample comprises companies located in 35 large and medium-sized cities. In columns (3) and (4), the sample consists of companies located in the top 10 cities in terms of GDP in China. In column (5), we use a weighted house price index to re-compute the market value of real estate holdings and control the index itself to capture the house price changes in remote investment areas. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

Table 8 Other Robustness Tests

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Drop 2007 and before		*Use alternative depended variable*		*Use alternativein depended variable*		
	Comp	*Comp*	*M_growth*	*M_growth*	*Comp*	*Comp*	*Comp*
$REvalue1_{t-1}$	-0.454***		-0.007***				
	(-4.029)		(-3.643)				
$HPI1_{t-1}$	0.404		0.005				
	(0.676)		(0.560)				
$REvalue2_{t-1}$		-0.339***		-0.005***			
		(-3.980)		(-3.829)			
$HPI2_{t-1}$		0.465		-0.005			
		(0.843)		(-0.537)			
$REvalue3_{t-1}$					-0.337***		
					(-5.005)		
$HPI3_{t-1}$					1.057*		
					(1.861)		
$REvalue4_{t-1}$						-0.456***	
						(-4.975)	
$HPI4_{t-1}$						0.280	
						(0.423)	
$REvalue5_{t-1}$							-0.359***
							(-4.985)
$HPI5_{t-1}$							0.322
							(0.476)
$Comp_{t-1}$	4.513***	4.582***	0.093***	0.094***	6.062***	6.020***	6.065***
	(2.774)	(2.825)	(3.290)	(3.350)	(4.283)	(4.237)	(4.288)
$Size_{t-1}$	-5.382***	-5.589***	-0.083***	-0.085***	-4.020***	-3.756***	-3.899***
	(-4.670)	(-4.916)	(-5.458)	(-5.682)	(-4.610)	(-4.277)	(-4.447)
Lev_{t-1}	7.627**	7.585**	0.118**	0.117**	3.397	3.407	3.324
	(2.249)	(2.235)	(2.177)	(2.163)	(1.156)	(1.157)	(1.129)
CF_{t-1}	-3.219	-3.339	-0.230**	-0.232**	1.905	1.860	1.795
	(-0.593)	(-0.615)	(-2.396)	(-2.418)	(0.388)	(0.379)	(0.365)
$TATO_{t-1}$	-23.185***	-23.238***	-0.267***	-0.268***	-21.299***	-21.275***	-21.311***
	(-12.115)	(-12.115)	(-10.428)	(-10.451)	(-13.151)	(-13.144)	(-13.146)
$TobinQ_{t-1}$	3.541***	3.539***	0.065***	0.065***	3.639***	3.655***	3.652***
	(7.090)	(7.115)	(6.016)	(6.041)	(8.063)	(8.084)	(8.100)
_cons	127.600***	131.815***	1.793***	1.834***	93.387***	88.683***	91.671***
	(5.045)	(5.309)	(5.530)	(5.775)	(4.999)	(4.708)	(4.878)
firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes

and *REvalue2* in columns (3) and (4) are both significant at the 1% level, with values of -0.007 and -0.005, respectively. This suggests that the negative impact of

Table 8 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Drop 2007 and before		*Use alternative depended variable*		*Use alternativein depended variable*		
	Comp	*Comp*	*M_growth*	*M_growth*	*Comp*	*Comp*	*Comp*
N	11,006	11,006	13,497	13,502	13,501	13,496	13,501
adj. R^2	0.064	0.063	0.038	0.038	0.061	0.061	0.061

This table presents the robustness test results. In columns (1) and (2), we drop observations from 2007 and earlier and obtain 9,245 observations. In columns (3) and (4), we use the growth rate of a company's market share (*M_growth*) to replace the dependent variable in our baseline regression to measure a company's product market competitiveness. In columns (5)–(7), we recalculate the market value of companies' real estate holdings using *HPI3*, *HPI4*, and *HPI5*, respectively. The definitions of the new variables are given in Table 14 in the appendix. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

a firm's real estate holding value on its product market competitiveness remains consistent when using an alternative measure for the dependent variable.

In the third robustness test, we use alternative measures for the key independent variable by calculating companies' real estate market value (*REvalue3, REvalue4, and REvalue5*) based on HPI3, HPI4, and HPI5, as defined earlier. The coefficients of *REvalue3, REvalue4, and REvalue5* in columns (5)—(7) are all significant at the 1% level, with values of -0.337, -0.456, and -0.359, respectively. This demonstrates that our baseline results remain robust irrespective of the specific measure used for the key independent variable (*REvalue*).

Mechanism Analysis

The Presence of the Collateral Effect

In the United States, real estate holdings by firms are widely known to have a collateral effect (Alimov, 2016; Chaney et al., 2012; Cvijanović, 2014; Gan, 2007; Lin, 2016; Mian & Sufi, 2011). However, it's uncertain whether Chinese firms' real estate holdings exhibit a similar collateral effect. Wu et al. (2015) argue against a collateral effect in Chinese real estate, as they suggest Chinese banks can recover their loans without real estate collateral, often being politically connected. On the other hand, Chen et al. (2015a) assert that Chinese real estate does have a collateral effect. To address this discrepancy, we aim to test whether Chinese firms' real estate holdings indeed have a collateral effect. We use the proportion of collateral loans in total assets as the dependent variable, sourced from the CSMAR database. The results are presented in Table 9.

In column (1) of Table 9, the coefficient of *REValue1* is 0.001, significant at the 1% level. This suggests that a one standard deviation increase in firms' real estate holding value results in a 0.66 percentage point increase in the firms' collateral loans as a proportion of total assets. This represents 9.9% of the sample's standard deviation. Given

Table 9 Collateral Effect of Real Estate

	(1) *collateral*	(2) *collateral*
$REvalue1_{t-1}$	0.001***	
	(3.280)	
$HPI1_{t-1}$	-0.001	
	(-0.354)	
$REvalue2_{t-1}$		0.001***
		(2.844)
$HPI2_{t-1}$		0.000
		(0.379)
$Comp_{t-1}$	-0.004**	-0.004**
	(-2.045)	(-2.134)
$Size_{t-1}$	-0.010***	-0.009***
	(-4.130)	(-3.945)
Lev_{t-1}	0.096***	0.097***
	(12.324)	(12.343)
CF_{t-1}	-0.015*	-0.014
	(-1.656)	(-1.579)
$TATO_{t-1}$	-0.012***	-0.012***
	(-4.143)	(-4.095)
$TobinQ_{t-1}$	-0.005***	-0.005***
	(-3.842)	(-3.855)
_cons	0.226***	0.214***
	(4.440)	(4.244)
firm	Yes	Yes
year	Yes	Yes
N	12,149	12,154
adj. R^2	0.152	0.151

This table presents the results of fixed-effects panel regressions to test the relationship between companies' real estate holding value and their collateral loan amounts. The dependent variable is the ratio of a company's collateral loans to its total assets. The key independent variable is the market value of companies' real estate holdings. The control variables and fixed effects are the same as in our baseline regression. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

that the mean of total assets in our sample is around 12 billion yuan, this suggests firms' collateral loans from banks increase by approximately 12 million yuan (12,000×0.001). The results in column (2) align with those in column (1), providing consistent evidence. These findings support the notion that Chinese firms' real estate holdings do indeed have a collateral effect, where higher real estate holding values are associated with increased borrowing from banks.

Table 10 Reinvestment of Financial Resources in Real Estate

	(1) *INV_RE*	(2) *INV_RE*	(3) *INV_RE*	(4) *INV_RE*	(5) *HV1*	(6) *HV1*	(7) *HV2*	(8) *HV2*
$REvalue1_{t-1}$	0.003*	0.001			0.296***	0.292***		
	(1.909)	(0.553)			(8.177)	(7.162)		
$collateral_{t-1}\_REvalue1_{t-1}$		0.067**				0.408		
		(2.266)				(1.063)		
$HPI1_{t-1}$	0.002	0.000			-0.622***	-0.663***		
	(0.240)	(0.005)			(-8.101)	(-7.892)		
$REvalue2_{t-1}$			0.002**	0.001			0.177***	0.175***
			(1.982)	(0.642)			(8.370)	(7.261)
$collateral_{t-1}\_REvalue2_{t-1}$				0.071***				0.301
				(2.636)				(1.342)
$HPI2_{t-1}$			0.013*	0.016**			-0.397***	-0.412***
			(1.687)	(2.041)			(-7.861)	(-7.502)
$collateral_{t-1}$		-0.114		-0.181		-0.994		-0.852
		(-0.767)		(-1.217)		(-0.926)		(-1.131)
$Comp_{t-1}$	0.018*	0.017*	0.018*	0.016*	-0.022	-0.040	-0.048	-0.055
	(1.951)	(1.912)	(1.958)	(1.912)	(-0.342)	(-0.516)	(-1.023)	(-1.026)
$Size_{t-1}$	-0.070***	-0.060***	-0.072***	-0.062***	0.419***	0.450***	0.421***	0.443***
	(-6.718)	(-5.728)	(-6.816)	(-5.917)	(5.187)	(5.258)	(6.106)	(6.260)
Lev_{t-1}	-0.019	-0.017	-0.018	-0.017	-0.271	-0.238	-0.101	-0.078
	(-0.536)	(-0.485)	(-0.531)	(-0.483)	(-1.612)	(-1.091)	(-0.848)	(-0.501)
CF_{t-1}	-0.026	-0.001	-0.025	0.002	-0.191	-0.247	-0.016	-0.001
	(-0.502)	(-0.011)	(-0.483)	(0.046)	(-0.806)	(-0.821)	(-0.104)	(-0.005)
$TATO_{t-1}$	-0.055***	-0.048***	-0.054***	-0.049***	0.012	0.043	0.007	0.022

Table 10 (continued)

	(1) *INV_RE*	(2) *INV_RE*	(3) *INV_RE*	(4) *INV_RE*	(5) *HV1*	(6) *HV1*	(7) *HV2*	(8) *HV2*
	(-3.579)	(-3.443)	(-3.545)	(-3.466)	(0.154)	(0.537)	(0.123)	(0.383)
$TobinQ_{t-1}$	-0.012**	-0.008*	-0.012***	-0.009*	0.054**	0.066**	0.045**	0.045**
	(-2.578)	(-1.752)	(-2.647)	(-1.931)	(2.158)	(2.274)	(2.376)	(2.142)
_cons	1.557***	1.320***	1.570***	1.354***	-7.244***	-7.901***	-7.500***	-7.965***
	(6.968)	(5.989)	(7.000)	(6.110)	(-4.162)	(-4.307)	(-5.104)	(-5.303)
firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,497	12,191	13,502	12,196	13,492	12,186	13,502	12,196
R^2	0.069	0.073	0.071	0.080	0.473	0.470	0.531	0.534

This table presents the results of fixed-effects panel regressions to test the relationship between companies' real estate holding value and their real estate purchases. In columns (1)–(4), the dependent variable is the ratio of a company's investment real estate book value to its total assets. In columns (5)–(8), the dependent variable is the real amount of a company's real estate holdings in fixed assets, computed using house prices during the baseline period (2002). The key independent variable is the market value of companies' real estate holdings. The control variables and fixed effects are the same as in our baseline regression. In columns (2), (4), (6), and (8), we introduce the interaction of real estate value and collateral loan (*REvalue_collateral*) in our regressions to examine whether collateral loans are invested in real estate projects. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

Reinvestment in Real Estate

The reason why an increase in a firm's real estate holding value relaxes its financial constraints but does not necessarily improve its product market competitiveness may be attributed to the crowding-out effect resulting from companies reinvesting their capital in real estate projects. To measure real estate reinvestment, we employ two variables: the proportion of real estate investments in total assets adjusted by the industry-year median and the real number of real estate investments based on house prices during the baseline period in 2002. Detailed definitions of these variables can be found in Table 14 in the appendix.

Table 10 presents the results of our analysis. In columns (1) and (3), we directly examine the relationship between real estate holding value and the proportion of a company's investments in real estate. The coefficients of *REvalue* are 0.003 and 0.002, significant at the 10% and 5% levels, respectively. These results indicate that higher real estate holding values are associated with greater investments in real estate in the following year.

In columns (2) and (4), we investigate whether the collateral effect influences real estate reinvestment by introducing the interaction term of *REvalue* and collateral in our regressions. The coefficients of the interaction term are 0.067 and 0.071, significant at the 5% and 1% levels, respectively. This suggests that collateral loans can strengthen the positive relationship between real estate holdings in fixed assets and real estate investments. Consequently, financial resources obtained through collateral loans are more likely to be invested in real estate projects.

In columns (5)-(8), we use HV as the dependent variable and obtain similar conclusions. These results further support our conjectures. Specifically, in China, while an increase in firms' real estate holding value can alleviate their financial constraints through the collateral effect, the substantial capital invested in real estate projects may crowd out investments in the product market. In other words, the crowding-out effect of real estate appears to outweigh the collateral effect.

Influence of Real Estate Holding Value on Marketing and R&D

In contrast to Alimov (2016), our findings do not support the notion that an increase in a company's real estate collateral value leads to improvements in its product market strength through increased marketing and R&D investment. To investigate this relationship, we directly regress marketing investment (*Sale*) and R&D investment (*RD*) on real estate holding value (*REvalue*). Additionally, we introduce the interaction term of collateral loans and real estate value (*REvalue_collateral*) to explore the potential influence of the collateral effect channel.

Table 11 presents our results. In columns (1) and (3), we observe that the coefficients of *REvalue* for marketing investment are 0.007 and 0.005, respectively, but they are not statistically significant. This suggests that an increase in companies' real estate value does not translate into increased investments in product marketing. Similarly, in columns (5) and (7), the coefficients of *REvalue* for R&D investment are 0.007 and 0.006, respectively, but they are also not statistically significant. These results indicate that an increase in companies' real estate value does not lead to increased investments in R&D activities.

Table 11 Influence of Real Estate Holding Value on Marketing and R&D

	(1) *Sale*	(2) *Sale*	(3) *Sale*	(4) *Sale*	(5) *RD*	(6) *RD*	(7) *RD*	(8) *RD*
$REvalue1_{t-1}$	0.007	0.017			0.007	0.008		
	(0.430)	(1.120)			(0.972)	(1.167)		
$REvalue1_{t-1}$_ $collateral_{t-1}$		-0.005				-0.077*		
		(-0.032)				(-1.684)		
$HPI1_{t-1}$	0.091	0.086			-0.008	-0.015		
	(1.048)	(1.012)			(-0.200)	(-0.398)		
$REvalue2_{t-1}$			0.005	0.011			0.006	0.007
			(0.417)	(0.930)			(1.171)	(1.281)
$REvalue2_{t-1}$_ $collateral_{t-1}$				0.035				-0.068*
				(0.295)				(-1.716)
$HPI2_{t-1}$			0.068	0.065			0.002	0.002
			(0.881)	(0.851)			(0.075)	(0.069)
$collateral_{t-1}$		-0.788		-0.930		0.250		0.286
		(-0.693)		(-0.820)		(0.413)		(0.467)
$Comp_{t-1}$	0.273***	0.285***	0.269***	0.274***	0.103*	0.140**	0.104*	0.140**
	(2.765)	(2.798)	(2.731)	(2.714)	(1.939)	(2.401)	(1.948)	(2.392)
$Size_{t-1}$	-0.323**	-0.501***	-0.322**	-0.492***	-0.046	-0.076	-0.048	-0.075
	(-2.336)	(-3.885)	(-2.351)	(-3.817)	(-0.672)	(-1.054)	(-0.712)	(-1.055)
Lev_{t-1}	0.276	0.604	0.276	0.602	-0.254	-0.458**	-0.258	-0.466**
	(0.685)	(1.508)	(0.685)	(1.504)	(-1.197)	(-1.975)	(-1.220)	(-2.017)
CF_{t-1}	2.279***	1.900***	2.293***	1.925***	0.465**	0.659***	0.466**	0.659***
	(3.750)	(3.411)	(3.781)	(3.454)	(1.980)	(3.225)	(1.974)	(3.219)
$TATO_{t-1}$	1.876***	1.699***	1.878***	1.703***	0.168	0.080	0.170	0.083
	(7.760)	(7.310)	(7.766)	(7.310)	(1.230)	(0.591)	(1.238)	(0.609)
$TobinQ_{t-1}$	0.099	0.099	0.097	0.098	0.068***	0.077***	0.069***	0.078***
	(1.482)	(1.416)	(1.460)	(1.394)	(3.056)	(2.940)	(3.075)	(2.963)
_cons	8.955***	12.633***	8.956***	12.472***	1.794	2.714*	1.829	2.673*
	(2.999)	(4.627)	(3.038)	(4.591)	(1.210)	(1.737)	(1.249)	(1.732)
firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,497	12,191	13,502	12,196	6,191	5,607	6,191	5,607
R^2	0.066	0.067	0.066	0.067	0.133	0.141	0.133	0.141

This table presents the results of fixed-effects panel regressions to test the relationship between companies' real estate holding value and their marketing and R&D expenditure. In columns (1)–(4), the dependent variable is the ratio of companies' selling expenses to their total assets. In columns (5)–(8), the dependent variable is the ratio of companies' R&D expenditure to their total assets. The key independent variable is the market value of companies' real estate holdings. The control variables and fixed effects are the same as in our baseline regression. In columns (2), (4), (6), and (8), we introduce the interaction of real estate value and collateral loans (*REvalue _collateral*) in our regressions to examine whether collateral loans are invested in marketing and R&D projects. The figures in round brackets are t-statistics. All standard errors are clustered at firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

When we introduce the interaction term *REvalue_collateral* in columns (2), (4), (6), and (8), we find that the coefficients of *REvalue_collateral* are not statistically significant in all cases. This implies that collateral loans are not directed towards product marketing or R&D investment, providing evidence that these resources are not utilized in these productive activities.

In summary, our results differ from those reported by Alimov (2016), who observed a positive effect of real estate value on marketing and R&D investment. In the Chinese context, although an increase in real estate value can alleviate financial constraints, the resources made available through the collateral effect are not invested in product market competition. This discrepancy may help explain why our baseline results contradict the existing literature.

Crowding-Out Effect of Real Estate on Non-real Estate Fixed Assets and Employees

The previous analysis has revealed that an increase in firms' real estate holding value does not lead to increased investments in marketing and research and development (R&D). However, to gain insight into the source behind the negative impact of real estate holding value on product market competitiveness, it is essential to identify which productive resources are being crowded out. Capital and labor, being pivotal factors in production, merit close examination to assess whether real estate investments displace these resources. In the context of Chinese firms, we investigate the impact of companies' real estate holding value on per capita wages (Perwage), employee growth rate (Growstaff), and the proportion of non-real estate fixed asset investments in total assets (Unrefix), all of which represent fundamental production factors.

Table 12 presents the results of our analysis. In columns (1) and (3), we directly regress *Unrefix* on *REvalue*. The coefficients of *REvalue* are both -0.001, significant at the 1% level, indicating that real estate investment crowds out investment in productive fixed assets. A one standard deviation increase in real estate holding value leads to a crowding out of about 0.7 percentage points in non-real estate fixed asset investments. This is equivalent to 17.5% of the sample's standard deviation for the variable *Unrefix*. When we introduce *REvalue_collateral* in columns (2) and (4), the coefficients of *REvalue_collateral* are both 0.002, significant at the 10% level. These results suggest that while some companies use collateral to purchase productive equipment, such investments are not sufficient to offset the negative crowding-out effect. Ultimately, the crowding-out effect prevails over the collateral effect.

In columns (5) and (7), we directly regress *Perwage* on *REvalue*. The coefficients of *REvalue* are -0.006 and -0.005, significant at the 5% level, indicating that real estate investment crowds out labor investment. An increase of one standard deviation in real estate holding value results in a decrease of approximately 0.04 points in per capita wages. This decrease is equivalent to 5.5% of the sample standard deviation for the variable *Perwage*. When we introduce REvalue_collateral in columns (6) and (8), the coefficients of *REvalue_collateral* are -0.003 and -0.006, respectively, but they are not statistically significant. This suggests that collateral loans are not utilized to incentivize employees, which differs from the findings of Ersahin et al. (2018).

In columns (9) and (10), we directly regress Growstaff on *REvalue*. The coefficients of *REvalue* are -0.007 and -0.005, both significant at the 1% level, indicating

Table 12 Crowding-Out Effect of Real Estate on Capital and Labor

	(1) *Unrefix*	(2) *Unrefix*	(3) *Unrefix*	(4) *Unrefix*	(5) *Perwage*	(6) *Perwage*	(7) *Perwage*	(8) *Perwage*	(9) *Growstaff*	(10) *Growstaff*
$REvalue1_{t-1}$	-0.001***	-0.001***			-0.006**	-0.006**			-0.007***	
	(-6.144)	(-6.416)			(-2.383)	(-2.171)			(-4.598)	
$REvalue1_{t-1}\_collateral_{t-1}$		0.002*				-0.003				
		(1.788)				(-0.139)				
$HPI1_{t-1}$	0.001*	0.001			-0.001	-0.001			0.005	
	(1.829)	(0.959)			(-0.076)	(-0.041)			(0.596)	
$REvalue2_{t-1}$			-0.001***	-0.001***			-0.005**	-0.005**		-0.005***
			(-5.705)	(-5.871)			(-2.413)	(-2.186)		(-4.466)
$REvalue2_{t-1}\_collateral_{t-1}$				0.002*				-0.006		
				(1.650)				(-0.297)		
$HPI2_{t-1}$			0.001	0.001			-0.020	-0.019		0.006
			(1.121)	(0.833)			(-1.605)	(-1.445)		(0.944)
$collateral_{t-1}$		-0.020*		-0.020*		-0.342*		-0.326*		
		(-1.809)		(-1.828)		(-1.914)		(-1.853)		
$Comp_{t-1}$	-0.001	-0.002	-0.001	-0.001	0.044***	0.049***	0.047***	0.052***	0.039**	0.039**
	(-0.889)	(-1.028)	(-0.789)	(-0.905)	(2.762)	(2.776)	(2.893)	(2.922)	(2.267)	(2.317)
$Size_{t-1}$	0.008***	0.008***	0.008***	0.007***	0.123***	0.121***	0.123***	0.120***	-0.033***	-0.036***
	(8.328)	(7.798)	(8.108)	(7.539)	(6.159)	(5.604)	(6.176)	(5.616)	(-3.055)	(-3.367)
Lev_{t-1}	0.006*	0.009**	0.007*	0.009**	-0.124*	-0.088	-0.125*	-0.088	-0.093**	-0.094**
	(1.870)	(2.325)	(1.905)	(2.388)	(-1.803)	(-1.105)	(-1.813)	(-1.108)	(-2.175)	(-2.192)
CF_{t-1}	-0.042***	-0.042***	-0.042***	-0.042***	0.111	0.111	0.110	0.110	-0.001	-0.003
	(-6.781)	(-6.397)	(-6.777)	(-6.378)	(1.486)	(1.363)	(1.469)	(1.357)	(-0.007)	(-0.034)
$TATO_{t-1}$	-0.008***	-0.009***	-0.008***	-0.009***	0.063**	0.051*	0.062**	0.051	-0.000	-0.001

Table 12 (continued)

	(1) *Unrefix*	(2) *Unrefix*	(3) *Unrefix*	(4) *Unrefix*	(5) *Perwage*	(6) *Perwage*	(7) *Perwage*	(8) *Perwage*	(9) *Growstaff*	(10) *Growstaff*
	(-5.334)	(-5.471)	(-5.385)	(-5.525)	(2.199)	(1.667)	(2.167)	(1.643)	(-0.005)	(-0.043)
$TobinQ_{t-1}$	0.001*	0.000	0.001*	0.000	0.037***	0.042***	0.038***	0.043***	0.039***	0.039***
	(1.886)	(0.193)	(1.794)	(0.095)	(4.878)	(4.794)	(4.960)	(4.885)	(5.499)	(5.498)
_cons	-0.165***	-0.162***	-0.156***	-0.153***	7.862***	7.914***	7.882***	7.937***	0.787***	0.853***
	(-8.031)	(-7.440)	(-7.830)	(-7.208)	(18.374)	(17.160)	(18.515)	(17.295)	(3.367)	(3.690)
firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	13,497	12,191	13,502	12,196	13,477	12,171	13,482	12,176	13,458	13,463
R^2	0.026	0.028	0.025	0.027	0.558	0.550	0.558	0.551	0.022	0.021

This table presents the results of fixed-effects panel regressions to test the relationship between companies' real estate holding value and their productive fixed assets and labor. In columns (1)–(4), the dependent variable is the ratio of companies' non-real estate fixed assets to their total assets. In columns (5)–(8), the dependent variable is the logarithm of companies' per capita wages. In columns (9) and (10), the dependent variable is the growth rate of companies' number of employees. The key independent variable is the market value of companies' real estate holdings. The control variables and fixed effects are the same as in our baseline regression. In columns (2), (4), (6), and (8), we introduce the interaction of real estate value and collateral loans (*REvalue_collateral*) in our regressions to examine whether collateral loans are invested in productive fixed assets and labor. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

that real estate investment crowds out the labor force in companies. A one standard deviation increase in real estate holding value leads to a decrease of approximately 0.044 points in per capita wages. This corresponds to 9.75% of the sample standard deviation for the variable *Growstaff*.

These results lend support to our hypotheses, demonstrating that companies' real estate investments crowd out their fundamental production factors, thus exerting a negative impact on their product market competitiveness. In the context of China, the prevalence of the crowding-out effect may help elucidate why our findings diverge from the existing literature on developed countries.

Further Analyses

Heterogeneity Analysis

As discussed in the introduction and hypothesis development sections, the crowding out effect dominating the collateral effect in emerging markets can be attributed to several factors. These include not only the high returns of real estate holdings, but also capital shortages, an immature business environment, and government intervention. To examine the diverse impacts of real estate on product market competitiveness from these varied perspectives, we employ the interaction term method, as outlined in the studies by Li et al. (2019), Chen et al. (2022), and Gokkaya et al. (2023).

From a microeconomic standpoint, we have opted to investigate the influence of industry competition and financial constraints on our analyses. To accomplish this, we employ the Herfindahl index and Kaplan-Zingales Index to classify firms into two categories:[8] those operating in relatively competitive and relatively monopolistic industries, as well as those facing high and low financial constraints. Subsequently, we incorporate interaction terms into our regression models to explore their impact.

The findings in Panel A of Table 13 demonstrate that within relatively monopolistic industries, the detrimental impact of real estate on product market competitiveness is more pronounced. Specifically, in columns (1) and (2), we observe more substantial marginal effects of -0.447 and -0.323, respectively. This implies that monopolistic firms are more inclined to divert their resources toward real estate projects, thereby intensifying the crowding-out effect. Conversely, in relatively competitive industries, this effect is not statistically significant. This suggests that monopolistic companies in China tend to prioritize real estate investments over productive ones, leading to a more pronounced crowding-out effect in such industries.

Furthermore, highly financially constrained companies experience a more substantial negative impact of real estate, as evident from marginal effects of -0.36 and -0.263 in columns (3) and (4). In contrast, less financially constrained firms exhibit a smaller effect of -0.21 and -0.142. These results confirm that heightened competition

[8] The detailed calculation process for the KZ index can be found in Table 16 in the Appendix.

Table 13 Further Analysis

Panel A Heterogeneity Analysis from a Micro Prospective				
	(1)	(2)	(3)	(4)
	Comp	*Comp*	*Comp*	*Comp*
$REvalue1_{t-1}$_*HHI*	-0.447***			
	(-2.738)			
$REvalue2_{t-1}$_*HHI*		-0.323**		
		(-2.363)		
$REvalue1_{t-1}$_*HKZ*			-0.150*	
			(-1.881)	
$REvalue2_{t-1}$_*HKZ*				-0.121*
				(-1.902)
$REvalue1_{t-1}$	-0.071		-0.210*	
	(-0.420)		(-1.812)	
$REvalue2_{t-1}$		-0.069		-0.142
		(-0.487)		(-1.645)
HHI_{t-1}	3.383***	3.129***		
	(3.468)	(3.262)		
HKZ_{t-1}			-1.502	-1.562
			(-1.421)	(-1.490)
Controls	Yes	Yes	Yes	Yes
firm	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes
N	13,496	13,501	9,985	9,985
R^2	0.062	0.062	0.067	0.067
Panel B Heterogeneity Analysis from a Macro Prospective				
	(1)	(2)	(3)	(4)
	Comp	*Comp*	*Comp*	*Comp*
$REvalue1_{t-1}$_*Hlandfiscal*	-0.205*			
	(-1.729)			
$REvalue2_{t-1}$_*Hlandfiscal*		-0.188*		
		(-1.936)		
$REvalue1_{t-1}$_*Hgdpgoal*			-0.232**	
			(-2.525)	
$REvalue2_{t-1}$_*Hgdpgoal*				-0.158**
				(-1.965)
$REvalue1_{t-1}$	-0.512***		-0.454***	
	(-3.565)		(-4.203)	
$REvalue2_{t-1}$		-0.399***		-0.382***
		(-3.527)		(-4.501)
$Hlandfiscal_{t-1}$	1.344	1.291		
	(1.384)	(1.373)		
$Hgdpgoal_{t-1}$			1.103	0.855
			(1.092)	(0.852)
firm	Yes	Yes	Yes	Yes

Table 13 (continued)

year	Yes	Yes	Yes	Yes
N	10,855	10,860	10,247	10,252
R^2	0.067	0.067	0.063	0.063
Panel C Impact of Real Estate Holding Value on Firms' BHAR				
	(1)		(2)	
	BHAR		*BHAR*	
$REvalue1_{t-1}$	-0.012***			
	(-4.251)			
$HPI1_{t-1}$	0.022*			
	(1.959)			
$REvalue2_{t-1}$			-0.008***	
			(-3.620)	
$HPI2_{t-1}$			0.028**	
			(2.560)	
Controls	Yes		Yes	
firm	Yes		Yes	
year	Yes		Yes	
N	13,497		13,502	
R^2	0.370		0.369	

This table presents the regression results of further analysis which includes 4 panels. Panel A demonstrates the results of heterogeneity analysis from a micro perspective, wherein we test whether peer competition and financial constraints affect the relationship between a company's real estate holding value and its product market competitiveness. We introduce the interaction term between the Herfindahl index and real estate value (*REvalue_HHI*) and the interaction term between KZ index and real estate value (*REvalue_HKZ*) in our baseline regressions. For detailed definitions of the variables *HHI* and *HKZ*, please refer to Table 14 in the appendix. Panel B demonstrates the results of heterogeneity analysis from a macro perspective, wherein we test whether city governments' dependence on land finance and GDP growth pressure affect the relationship between a company's real estate holding value and its product market competitiveness. We introduce the interaction term between land finance dependence and real estate value (*REvalue_Hlandfiscal*) and the interaction term between GDP growth goal and real estate value (*REvalue_Hgdpgoal*) in our baseline regressions. Please refer to Table 14 in the appendix for detailed definitions of the variables *Hlandfiscal* and *Hgdpgoal*. Panel C presents the panel fixed-effects regression results of our lasting effect analysis. We lag the independent variables such as the key explanatory variable and the control variables by 2, 3, 4, and 5 years. Panel D presents the regression results for the relationship between companies' real estate holding value and long-term value. The dependent variable is the BHAR of company stocks, which is used to measure a company's long-term market value. In Table 13, to save space, we merge all coefficients of control variables into one row and use the label "Yes" to mark them. The figures in round brackets are t-statistics. All standard errors are clustered at the firm level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively

for financial resources amplifies the crowding-out effect, particularly for firms facing significant financial constraints.

From a macro perspective, we investigate the heterogeneity in the crowding-out effect of real estate in China based on two factors: local governments' reliance on land finance and the pressure to achieve GDP growth targets. We gauge dependence on land finance by examining the ratio of land transfer fees to local fiscal revenue within the budget. Additionally, we assess GDP growth pressure by comparing the current year's GDP growth target with the previous year's growth rate.

The findings in Panel B of Table 13 reveal that in cities with a high reliance on land finance, the negative impact of real estate is more pronounced. Specifically, the marginal effects, captured by the coefficients of the interaction term, *REvalue_Hlandfiscal*, are -0.205 and -0.188 in columns (1) and (2), respectively, both statistically significant at the 10% levels. This suggests that local governments' preference for increasing house prices heightens the crowding-out effect, resulting in a more substantial adverse influence of real estate on firms' product market competitiveness.

Similarly, in cities facing high GDP growth pressure, the crowding-out effect of real estate is more pronounced. The marginal effects, captured by the coefficients of the interaction term, *REvalue_Hlandfiscal*, are -0.232 and -0.158 in columns (3) and (4), respectively, both statistically significant at the 5% level. This affirms that the pressure to achieve high GDP growth exacerbates the crowding-out effect, further eroding firms' product market competitiveness.

This heterogeneity analysis substantiates our argument that local governments' reliance on land finance and the pressure to attain high GDP growth rates contribute to their preference for rising house prices. Consequently, this reinforces the crowding-out effect of real estate, providing substantial evidence that government intervention plays a pivotal role in driving the observed crowding-out effect.

Influence of Real Estate Holding Value on Companies' Long-Term Market Value

To investigate whether investors in the stock market adopt a passive investment strategy and assess its impact on firms' long-term value, we conduct an analysis focusing on the relationship between a company's real estate holding value and its long-term stock returns. To quantify a firm's long-term value, we employ the buy-and-hold abnormal returns (BHAR) of stocks, commencing from the outset of 2003.

The calculation of BHAR involves the use of formula (11). In this equation, R_{it} signifies the monthly stock return, while MR_{it} denotes the monthly market return. The abnormal return is computed as $1+R_{it}$—MR_{it}, which quantifies the extent to which an individual stock surpasses or lags behind the market return. Subsequently, we aggregate these abnormal returns starting from January 2003 through December of each year, resulting in the buy-and-hold abnormal returns ($BHAR_{it}$).

$$BHAR_{i,t} = \prod_{200301}^{t}(1 + R_{i,t} - MR_t) \tag{11}$$

The findings presented in Panel C of Table 13 reveal that the coefficients of *REvalue* are -0.012 and -0.008, signifying statistical significance at the 1% level. These results imply a negative association between a company's real estate holding value and its long-term value, in alignment with our initial hypotheses. It suggests that, when taking a long-term perspective, investors exhibit a preference for companies that employ strategies emphasizing long-term value creation rather than those with a primary focus on short-term real estate investments.

Despite the potentially lucrative returns of real estate investments, investors seem to prioritize considerations beyond immediate financial gains, focusing on the sustainability and competitiveness of a company's primary business activities. This inclination might be because the returns from real estate investments don't directly influence the profit figures reported in a company's financial statements. Additionally, the noted reduction in a firm's product market competitiveness due to substantial real estate holdings could indicate potential future profit downturns. This trend underscores the idea that investors value long-term value creation as a pivotal element in their investment decisions.

Conclusion

Our study delves into the intricate dynamics of a firm's real estate holdings and their impact on its core business from the dual perspectives of the collateral effect and the crowding-out effect. The collateral effect posits that real estate holdings alleviate a firm's financial constraints and bolster its competitive edge in the product market. Conversely, the crowding-out effect, analyzed through the lenses of both financial institutions and corporations, suggests that rapid growth in housing prices diverts resources away from a firm's primary operations, resulting in inadequate investments in productive endeavors.

Our research takes both these effects into account and discerns that the crowding-out effect exerts a dominant influence, leading to a detrimental impact of real estate holdings on a firm's product market competitiveness. While Chinese firms' real estate holdings do indeed yield a collateral effect by enhancing their financial standing, the resultant financial resources are not channeled into vital areas such as marketing, research and development, or other productive pursuits. Instead, they tend to be reinvested in real estate ventures, ultimately displacing resources from core business functions.

Several contributing factors underlie the prevalence of the crowding-out effect. Firstly, as an emerging market, China grapples with constraints on capital resources and intense competition for these resources, which amplifies the crowding-out effect. Secondly, China's market economy is still evolving, with certain sectors characterized by monopolistic tendencies, incentivizing companies to prioritize real estate investments over other productive endeavors. Lastly, local governments in China exhibit a propensity for fostering rising property prices, which reinforces irrational market expectations and exacerbates the crowding-out effect. This complex interplay between market competition and government intervention significantly shapes the crowding-out effect.

Our findings provide a comprehensive understanding of the intricate interplay between real estate holdings and a firm's core operations, particularly within the context of emerging markets. This empirical evidence underscores the importance of government regulations in real estate markets to promote balanced development. However, our study does not delve into specific regulatory measures that could effectively mitigate the adverse crowding-out effect on a firm's primary operations and the broader economy of emerging markets. This area warrants further exploration and research in the future.

Appendix

Table 14 Definitions of Other Variables Used

Variable	Definition
REvalue3	Market value of a company's real estate holdings scaled by the net value of fixed assets in 2002; market value is measured with commercial comprehensive house prices for 35 large and medium-sized cities
REvalue4	Market value of a company's real estate holdings scaled by the net value of fixed assets in 2002; market value is measured with province-level commercial business house prices
REvalue5	Market value of a company's real estate holdings scaled by the net value of fixed assets in 2002; market value is measured with province-level commercial comprehensive house prices
HPI_3	Commercial comprehensive house prices for 35 large and medium-sized cities in year *t* / commercial comprehensive house prices for 35 large and medium-sized cities in 2002
HPI_4	Province-level commercial business house prices in year *t* / province-level commercial business house prices in 2002
HPI_5	Province-level commercial comprehensive house prices in year *t* / province-level commercial comprehensive house prices in 2002
collateral	Collateral loans from banks / total assets
M_growth	(Market share – market share last year)/ market share last year
LnP	Logarithm of city-level house prices
LnH	City-level housing sales area
Undevelopable	Undevelopable area with steep slopes greater than 15° / undeveloped area with nighttime light incentive less than 20
Sunny	Average ratio of sunny days in January at the city level from 2012 to 2020
Grow_people	Growth rate of urban population
Elasticity	City-level housing supply elasticity estimated by the method developed by Saiz (2010)
Interest	National-level loan interest rate over 5 years at the end of every year
HV	the real amount of a company's real estate holdings i, computed using house prices during the baseline period (2002)
INV_RE	(Proportion of a company's real estate investments in total assets—industry median of the proportion of real estate investments in total assets) × 10
Sale	Selling expenses × 100 / total assets
RD	R&D expenditure × 100 / total assets
Perwage	Natural logarithm of (cash paid to and for employees / number of employees)
Growth_staff	(Number of employees this year—number of employees last year) / number of employees last year
Unrefix	[(Net value of fixed assets—net value of real estate in fixed assets)$_t$—(net value of fixed assets—net value of real estate in fixed assets)$_{t-1}$] / total assets
HHI	Dummy variable: if the Herfindahl index exceeds its year-level median, *HHI* equals 1, and 0 otherwise
HKZ	Dummy variable: if the KZ index exceeds its year-level median, *HKZ* equals 1, and 0 otherwise
Landfiscal	Land premiums / budgeted financial revenue
Hlandfiscal	Dummy variable; if the *Landfiscal* exceeds its year-level median, *Hlandfiscal* equals 1, and 0 otherwise
gdp_goals	GDP growth goals in cities
Hgdpgoal	Dummy variable: if the *GDP* growth goal this year exceeds the GDP growth rate last year, *Hgdpgoal* equals 1, and 0 otherwise
BHAR	BHAR from the start of 2003

Table 15 Impact of real estate holdings on employees in different housing investing channels

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Firms without real estate development business				Firms with real estate development business			
	Perwage	*Perwage*	*Growstaff*	*Growstaff*	*Perwage*	*Perwage*	*Growstaff*	*Growstaff*
$REvalue1_{t-1}$	-0.008***		-0.006***		0.013***		-0.002	
	(-2.941)		(-4.326)		(2.677)		(-0.604)	
$HPI1_{t-1}$	0.000		0.006		-0.020		-0.009	
	(0.002)		(0.735)		(-0.960)		(-0.383)	
$REvalue2_{t-1}$		-0.006***		-0.005***		0.008**		-0.000
		(-2.945)		(-4.218)		(2.122)		(-0.071)
$HPI2_{t-1}$		-0.019		0.004		-0.022		0.009
		(-1.351)		(0.592)		(-0.889)		(0.473)
$Comp_{t-1}$	0.051***	0.054***	0.038**	0.039**	0.005	0.004	0.062	0.063
	(2.884)	(3.039)	(2.037)	(2.086)	(0.139)	(0.116)	(1.575)	(1.589)
$Size_{t-1}$	0.116***	0.115***	-0.030***	-0.033***	0.150**	0.158***	-0.135**	-0.141***
	(5.537)	(5.528)	(-2.607)	(-2.862)	(2.554)	(2.655)	(-2.482)	(-2.639)
Lev_{t-1}	-0.068	-0.069	-0.096**	-0.096**	-0.576***	-0.562***	-0.193	-0.193
	(-0.937)	(-0.942)	(-2.032)	(-2.038)	(-3.166)	(-3.127)	(-1.171)	(-1.135)
CF_{t-1}	0.200**	0.198**	-0.052	-0.054	-0.378**	-0.380**	0.395	0.394
	(2.518)	(2.484)	(-0.615)	(-0.639)	(-2.091)	(-2.118)	(1.639)	(1.634)
$TATO_{t-1}$	0.063**	0.063**	0.009	0.008	-0.010	-0.010	-0.168*	-0.167*
	(2.073)	(2.060)	(0.392)	(0.356)	(-0.162)	(-0.158)	(-1.772)	(-1.785)
$TobinQ_{t-1}$	0.037***	0.037***	0.040***	0.040***	0.014	0.016	0.022	0.021
	(4.557)	(4.601)	(5.292)	(5.290)	(1.025)	(1.092)	(0.904)	(0.853)
_cons	7.981***	8.015***	0.724***	0.782***	8.086***	7.928***	3.164***	3.253***
	(17.779)	(17.981)	(2.866)	(3.143)	(6.494)	(6.298)	(2.616)	(2.740)
Firm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	12,043	12,048	12,025	12,030	1434	1434	1433	1433
Adj. R^2	0.563	0.563	0.021	0.020	0.353	0.351	0.022	0.022

This table aims to uncover impact of the way that companies choose to invest in real estate on companies' hiring behavior. In columns (1)-(4), the sample consists of companies without real estate development business, while in columns (5)-(8), the sample comprises companies with a real estate development business. Results in columns (1)-(4) indicate that for companies that opt to purchase real estate or engage third-party firms through bidding processes for their real estate projects, both wages and labor quantity are crowded out, which align with those presented in Table 12. Additionally, results in columns (5)-(8) suggest that a minority of companies choosing to become developers may experience changes in their employee composition, potentially leading to increased wages

Table 16 The Calculating Process of KZ Index

Steps	Processes
(1)	For each year of the entire sample, we categorize the sample based on operating net cash flow/total assets at the beginning of the year ($\frac{CF_{it}}{ASSET_{it-1}}$), cash dividends/total assets at the beginning of the year $\frac{DIV_{it}}{ASSET_{it-1}}$), cash holdings/total assets at the beginning of the year ($\frac{CASH_{it}}{ASSET_{it-1}}$), asset liability ratio (LEV_{it}), and Tobin's Q (Q_{it}). If $\frac{CF_{it}}{ASSET_{it-1}}$ is below the median, we assign KZ_1 as 1; otherwise, 0. Similarly, If $\frac{DIV_{it}}{ASSET_{it-1}}$ is lower than the median, then KZ_2 is taken as 1, otherwise 0. If $\frac{CASH_{it}}{ASSET_{it-1}}$ is lower than the median, then KZ_3 is taken as 1, otherwise 0. If LEV_{it} is higher than the median, KZ_4 is taken as 1; otherwise, 0. If Q_{it} is higher than the median, KZ_5 is taken as 1, otherwise 0
(2)	Let $KZ^* = KZ1 + KZ2 + KZ3 + KZ4 + KZ5$
(3)	We employ Ordered Logistic Regression to run the following model and estimate the coefficients of each independent variables $KZ^*_{it} = \alpha_1 \frac{CF_{it}}{ASSET_{it-1}} + \alpha_2 \frac{DIV_{it}}{ASSET_{it-1}} + \alpha_3 \frac{CASH_{it}}{ASSET_{it-1}} + \alpha_4 LEV_{it} + \alpha_5 Q_{it} + \varepsilon_{it}$
(4)	Using estimated coefficients to calculate the expectations of KZ*, which represents the KZ index we are interested in

Fundings and Acknowledgements Aimin Zeng expresses gratitude for the financial support received from the Humanities and Social Science Fund of the Ministry of Education, under Grant Nos. 18YJA630004 and 15YJA630093. Zhihua Wei extends thanks to the National Natural Science Foundation of China for their support through Grant Nos. 71972163 and 71790601, and to the Special Project of Chinese Modernization at Xiamen University under Grant No. 20720231051. All errors are our own.

Declarations and Statements Open Access funding enabled and organized by CAUL and its Member Institutions We declare that all authors involved in this paper have no financial or personal interests that could potentially impact our objectivity. These interests may encompass employment, consultancy, stock ownership, honoraria, and other relevant factors. The dataset are available upon request.

References

Aghion, P., Van Reenen, J., & Zingales, L. (2013). Innovation and institutional ownership. *American Economic Review, 103*, 277–304. https://doi.org/10.1257/aer.103.1.277

Alimov, A. (2016). Product market effects of real estate collateral. *Journal of Corporate Finance, 36*, 75–92. https://doi.org/10.1016/j.jcorpfin.2015.10.008

Ambrose, B. W., Diop, M., & Yoshida, J. (2017). Product market competition and corporate real estate investment under demand uncertainty. *Real Estate Economics, 45*, 521–590. https://doi.org/10.1111/1540-6229.12150

Apgar, M. (1995). Managing real estate to build value. *Harvard Business Review, 73*, 162.

Bahaj, S., Foulis, A., & Pinter, G. (2020). Home values and firm behavior. *American Economic Review, 110*, 2225–2270. https://doi.org/10.1257/aer.20180649

Bolton, P., & Scharfstein, D. S. (1990). A theory of predation based on agency problems in financial contracting. *American Economic Review,* 80, 93–106. https://www.jstor.org/stable/2006736

Borusyak, K., Hull, P., & Jaravel, X. (2022). Quasi-experimental shift-share research designs. *Review of Economic Studies, 89*, 181–213. https://doi.org/10.1093/restud/rdab030

Breznitz, D., & Murphree, M. (2011). *Run of the red queen: Government, innovation, globalization, and economic growth in China*. Yale University Press.

Campello, M. (2003). Capital structure and product markets interactions: Evidence from business cycles. *Journal of Financial Economics, 68*, 353–378. https://doi.org/10.1016/s0304-405x(03)00070-9

Campello, M. (2006). Debt financing: Does it boost or hurt firm performance in product markets? *Journal of Financial Economics, 82*, 135–172. https://doi.org/10.1016/j.jfineco.2005.04.001

Chakraborty, I., Goldstein, I., & MacKinlay, A. (2018). Housing price booms and crowding-out effects in bank lending. *The Review of Financial Studies, 31*, 2806–2853. https://doi.org/10.1093/rfs/hhy033

Chaney, T., Sraer, D., & Thesmar, D. (2012). The collateral channel: how real estate shocks affect corporate investment. *American Economic Review, 102*, 2381–2409. https://doi.org/10.1257/aer.102.6.2381

Chang, J., Bai, X., & Li, J. J. (2015). The influence of institutional forces on international joint ventures' foreign parents' opportunism and relationship extendedness. *Journal of International Marketing, 23*, 73–93. https://doi.org/10.1509/jim.14.0088

Chen, P., Wang, C., & Liu, Y. (2015a). Real estate prices and firm borrowings: Micro evidence from China. *China Economic Review, 36*, 296–308. https://doi.org/10.1016/j.chieco.2015.10.002

Chen, Y.-F., Lin, F.-L., & Yang, S.-Y. (2015b). Does institutional short-termism matter with managerial myopia? *Journal of Business Research, 68*, 845–850. https://doi.org/10.1016/j.jbusres.2014.11.039

Chen, K. C. W., Chen, T. Y., Han, W. F., & Yuan, H. Q. (2022). Auditors under fire: The association between audit errors and the career setbacks of individual auditors. *Journal of Accounting Research, 60*, 853–900.

Cvijanović, D. (2014). Real estate prices and firm capital structure. *Review of Financial Studies, 27*, 2690–2735. https://doi.org/10.1093/rfs/hhu035

Dallas, M. P. (2014). Manufacturing paradoxes: Foreign ownership, governance, and value chains in China's light industries. *World Development, 57*, 47–62.

Diop, M. (2018). Real estate investments, product market competition and stock returns. *Real Estate Economics, 46*, 291–333. https://doi.org/10.1111/1540-6229.12201

Ersahin, N., Irani, R. M., & Ellul, A. (2018). Collateral shocks and corporate employment*. *Review of Finance, 24*(1), 163–187. https://doi.org/10.1093/rof/rfy036

Gan, J. (2007). The real effects of asset market bubbles: Loan- and firm-level evidence of a lending channel. *Review of Financial Studies, 20*, 1941–1973. https://doi.org/10.1093/rfs/hhm045

Gokkaya, S., Liu, X., & Stulz, R. M. (2023). Do firms with specialized M&A staff make better acquisitions? *Journal of Financial Economics, 147*, 75–105.

Goldsmith-Pinkham, P., Sorkin, I., & Swift, H. (2020). Bartik instruments: What, when, why, and how. *American Economic Review, 110*, 2586–2624. https://doi.org/10.1257/aer.20181047

Jia, J. X., Gu, J., & Ma, G. R. (2021). Real estate boom and firm productivity: Evidence from China. *Oxford Bulletin of Economics and Statistics, 83*, 1218–1242. https://doi.org/10.1111/obes.12434

Jiang, F. X., Jiang, Z., & Kim, K. A. (2020). Capital markets, financial institutions, and corporate finance in China. *Journal of Corporate Finance, 63*, 21. https://doi.org/10.1016/j.jcorpfin.2017.12.001

Kaplan, S., & Minton, B. (2012). How has CEO turnover changed? *International Review of Finance, 12*, 57–87. https://doi.org/10.1111/j.1468-2443.2011.01135.x

Kumar, A., & Vergara-Alert, C. (2020). The effect of financial flexibility on payout policy. *Journal of Financial and Quantitative Analysis, 55*, 263–289. https://doi.org/10.1017/s002210901800114x

Li, H., & Zhou, L.-A. (2005). Political turnover and economic performance: The incentive role of personnel control in China. *Journal of Public Economics, 89*, 1743–1762. https://doi.org/10.1016/j.jpubeco.2004.06.009

Li, J., Lu, Y., Song, H., & Xie, H. H. (2019). Long-term impact of trade liberalization on human capital formation. *Journal of Comparative Economics, 47*, 946–961.

Lichtenberg, E., & Ding, C. (2009). Local officials as land developers: Urban spatial expansion in China. *Journal of Urban Economics, 66*, 57–64. https://doi.org/10.1016/j.jue.2009.03.002

Lin, L. (2016). Collateral and the choice between bank debt and public debt. *Management Science, 62*(1), 111–127. https://doi.org/10.1287/mnsc.2014.2094

Lu, B., Tan, X. F., & Zhang, J. H. (2019). The crowding out effect of booming real estate markets on corporate TFP: Evidence from China. *Accounting and Finance, 58*, 1319–1345. https://doi.org/10.1111/acfi.12451

Mao, Y. (2021). Managing innovation: The role of collateral. *Journal of Accounting and Economics, 72*(1), 101419. https://doi.org/10.1016/j.jacceco.2021.101419

Mao, G., & Shen, Y. (2019). Bubbles or fundamentals? Modeling provincial house prices in China allowing for cross-sectional dependence. *China Economic Review, 53*, 53–64. https://doi.org/10.1016/j.chieco.2018.08.001

Martin, A., Moral-Benito, E., & Schmitz, T. (2021). The financial transmission of housing booms: Evidence from Spain. *American Economic Review, 111*, 1013–1053. https://doi.org/10.1257/aer.20191410

Meng, L., Xiao, X., & Zhou, Y. (2021). Housing boom and household migration decision: New evidence from China. *Journal of Real Estate Finance and Economics*. https://doi.org/10.1007/s11146-021-09856-y

Mian, A., & Sufi, A. (2011). House prices, home equity-based borrowing, and the US household leverage crisis. *American Economic Review, 101*, 2132–2156. https://doi.org/10.1257/aer.101.5.2132

Rong, Z., Wang, W., & Gong, Q. (2016). Housing price appreciation, investment opportunity, and firm innovation: Evidence from China. *Journal of Housing Economics, 33*, 34–58. https://doi.org/10.1016/j.jhe.2016.04.002

Saiz, A. (2010). The geographic determinants of housing supply. *The Quarterly Journal of Economics, 125*, 1253–1296. https://doi.org/10.1162/qjec.2010.125.3.1253

Stein, J. (2003). Agency, information and corporate investment. In G. Constantinides, M. Harris, & R. Stulz (Eds.), *Handbook of the economics of finance (North Holland, Amsterdam).* Elsevier.

Steinfeld, E. (2010). *Playing our game: Why China's rise doesn't threaten the west*. Oxford University Press.

Sun, X., & Gunia, B. C. (2018). Economic resources and corporate social responsibility. *Journal of Corporate Finance, 51*, 332–351. https://doi.org/10.1016/j.jcorpfin.2018.06.009

Wang, Z., & Zhang, Q. (2014). Fundamental factors in the housing markets of China. *Journal of Housing Economics, 25*, 53–61. https://doi.org/10.1016/j.jhe.2014.04.001

Wang, S., Chan, S. H., & Xu, B. (2012). The estimation and determinants of the price elasticity of housing supply: Evidence from China. *Journal of Real Estate Research, 34*, 311–344. https://www.jstor.org/stable/24888412

Wang, R., Hou, J., & He, X. (2017). Real estate price and heterogeneous investment behavior in China. *Economic Modelling, 60*, 271–280. https://doi.org/10.1016/j.econmod.2016.09.020

Wright, D., & Yanotti, M. B. (2019). Home advantage: The preference for local residential real estate investment. *Pacific-Basin Finance Journal, 57*, 101167. https://doi.org/10.1016/j.pacfin.2019.06.014

Wu, J., Gyourko, J., & Deng, Y. H. (2015). Real estate collateral value and investment: The case of China. *Journal of Urban Economics, 86*, 43–53. https://doi.org/10.1016/j.jue.2014.12.006