

Article

The Relationship between Housing Price, Teacher Salary Improvement, and Sustainable Regional Economic Development

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Abstract: In the post pandemic era, most of the countries are facing challenges in economic recovery, while investing in creative human capital such as teachers by increasing their salaries can be one of the policy options for governments to drive development. Housing price, however, may impact the working of these policies. Using the panel data of 31 provincial regions in China during 2006–2018, we evaluated the relationship between housing price, the improvement in teacher salary, and sustainable regional economic development. From the perspective of imbalanced regional development, we discovered the heterogeneity in the rate of return on education investment in terms of teacher salary. Higher teacher salary plays a more active role in the sustainable development of underdeveloped regions, and the crowding-out effect of housing price in Western China is the most intense. The results further provide some policy implications on efficiently promoting the coordinated development of sustainable regional economies by improving the creative human capital cultivators' salaries. This paper verifies the significance of housing price dynamics from a new perspective based on educational investment. Overall, our study provides theoretical support for improving teachers' income to promote regional economic development and further provides guidance for the government to carry out macro control to promote regional economic development with changes in housing price dynamics. Our study aims to link land systems, particularly the housing market, to sustainability and public policy.

Keywords: teacher salary; urbanization; housing price; public policy; regional development



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1. Introduction

Teachers are the representatives of creative human capital cultivators. They are the foundations of sustainable development. According to the Global Teacher Status index report published by Varkey Gems Foundation, Chinese teachers have the greatest status among countries, but teacher salary falls below the average (see Figure 1). The government in China has designed policies for improving teacher salary. In 2012, the State Council of China offered policy on ensuring that teacher salary is no less than that of local civil servants. In 2016, the subsidy policy for rural teachers was further executed to achieve the integration of urban and rural education development. In 2018, the Ministry of Education in China issued a document stressing that the investment in education should be more inclined to teachers to continuously improve the attractiveness of teaching profession.

These reform policies have already yielded initial results. In the 1980s, the average income of teachers ranked third from the bottom among 19 industries in China. In 2019, the ranking of teacher salary among the total 19 industries in China rose to seventh, according to China's National Bureau of Statistics. The current literature shows the existence of a causal relationship between salary and employee performance [1], and higher levels of education can contribute to students' performance [2]. When we consider this relationship in the process of cultivating creative human capital during urbanization, a possibly more

interesting question is whether and how increased teacher salary improve the sustainable economic development in the country or the regions, as a higher teaching quality would reasonably improve the education results.

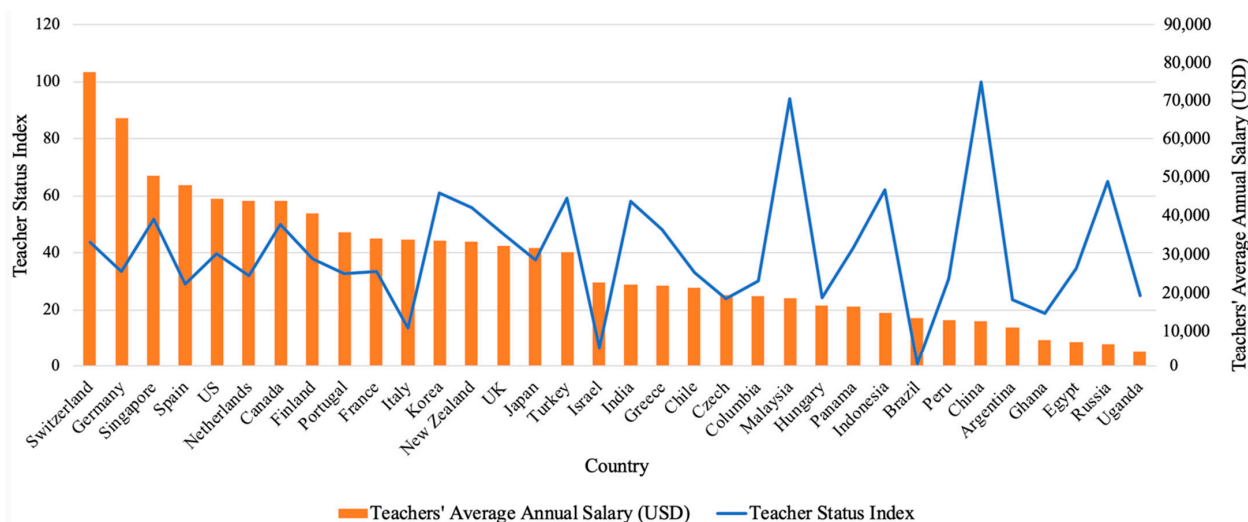


Figure 1. Global Teacher Status Index and Salary, 2018. Data come from the 2018 Global Teacher Status index report published by Varkey Gems Foundation.

As a strategic factor of production, human capital is of great significance for corporate performance and regional sustainable development [3]. However, it seems that human capital has been underutilized for a long time. According to the latest Global Human Capital Report released by the World Economic Forum, human capital has only been utilized at a rate of 62% worldwide. China ranked 34th out of 130 countries in human capital utilization, which is a sharp contrast to it having the largest population in the world. It is widely accepted that high-quality education is of great importance for human capital enhancement [4,5]. The underutilization of human capital will limit its contribution to the development of the economy. One of the basic means of developing human capital is education [6]. Thus, improving the population's quality can help raise the labor quality simultaneously, and examining the existing education system is of great significance in improving the labor market. By exploring the relationship between education and economic growth through the model of human capital, Walker [7] finds it effective to think in terms of education and adopt relevant policies to reduce barriers to sustainable growth. Therefore, it makes sense to study the role of teacher salaries in a sustainable economic development process.

Different levels of economic development among regions may lead to differences in the rate of return on investment, including investment in education [4]. Wealthy provinces and regions tend to have better educational infrastructure themselves. Consequently, the role of investment in education may be different, and this difference may be even more striking in China. As shown in Figure 2, GDP per capita in East China is higher than that in Central China, which is followed by Western China. Thus, this paper aims to further address the following research questions: Is the effect of teacher salary on sustainable economic development heterogeneous across regions? What factors influence the promotion effect of salary increase?

The role of housing price in the return on education inputs deserves to be explored. High housing price has been proven to have impacts on personal consumption [8], allocation of production factor [9], and regional economic development [10]. Houses can be considered as investment objectives other than places to live. The relatively high housing costs in cities will lead to the outflow of employees, while high-skilled workers are more mobile than workers with lower skills because of arbitrage opportunities [11]. As highly skilled workers, teachers may therefore change their location for employment, thus

affecting the sustainability of the local economy [12]. Moreover, the values of residential and commercial properties have risen rapidly in a real estate boom since the beginning of the 21st century. According to the National Bureau of Statistics of China, the average housing price increased from CNY 1948 to CNY 12,528 per square meter over the years of 2000 to 2018. The effect of housing price on labor mobility is likely to be pronounced in China. As such, it is another focus of this paper to investigate the moderating effect of housing price dynamics in the relationship between educational investment and sustainable economic development.

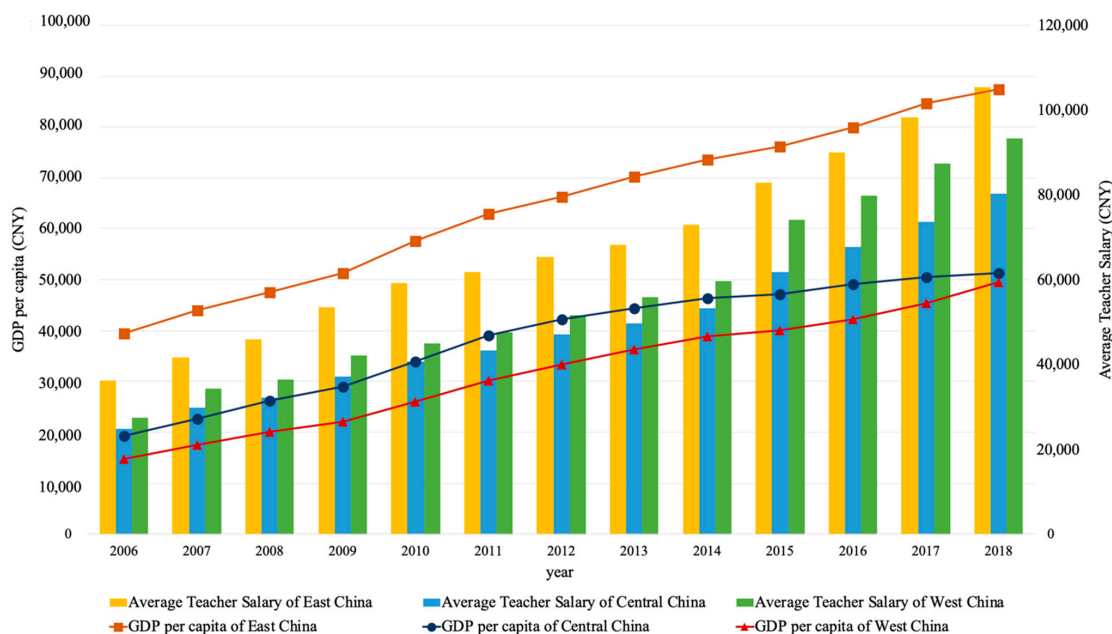


Figure 2. The annual GDP per capita and average teacher salary in East, Central, and Western China, 2006–2018. Data come from China’s National Bureau of Statistics.

A considerable amount of research has focused on the relationship between education and economic development [13–15]. Hanushek and Woessmann (2007) think that people’s cognitive skills, rather than just school achievement, are closely tied to personal income, income distribution, and economic growth [16]. Furthermore, education increases the innovative capacity of the economy and further promotes economic growth [17]. However, there is only a limited amount of research exploring this from the perspective of teacher salary and investigating its effect on the regional economic development under the housing price dynamics environment. Aiming to address the research questions mentioned above, this paper develops empirical models that explain the relationships between the salary of teachers and sustainable regional development under the housing price dynamics environment.

We contribute to the literature from the following aspects. First, we investigate whether improving teacher salary can accelerate sustainable economic development, which provides a new perspective on educational investment and further enriches the interactive mechanism between educational investment and sustainable economic development. Second, we take housing price dynamics into the research framework of education and sustainable economic development, adding new evidence of the crowding-out effect of housing prices dynamics. Third, the differences in regions are discussed in our study. We explore the impact of teacher salaries from a geographical perspective, which has practical implications for actual policy implementation. Fourth, the moderating effect of housing price dynamics is relatively modest in developed regions. Therefore, our study not only reveals the differences in the educational investment returns, but also applies the push and pull theory of housing price in region analysis and further has a guiding significance for policy formulation.

The rest of this paper is structured as follows: Section 2 introduces the related literature review and hypothesis development; Section 3 describes data sources, variable selection, and econometric model; Section 4 provides the empirical results, robustness checks, and discussions; Section 5 provides our conclusions and implications.

2. Literature Review and Hypothesis Development

2.1. Education and Regional Economic Development

As one of the proponents of the human capital growth theory, Lucas argues that economic growth is driven by the expansion of human capital storage [18]. Benassy and Brezis's research points out that an economy starting with a low level of human capital can be caught in a vicious circle [19]. Rational development and utilization of human capital can help drive economic development. There is also a general consensus on the foundation of human capital for regional development [20]. In the era of the knowledge-based economy, knowledge is the most important resource for economic growth [21], and investment in education can expand knowledge [22]. Education, as the major form of investment in human capital, can continue to dominate the total investment in economic development for a long period of time. By increasing education spending and restructuring education, the government can endogenously ensure stable economic development. Zhang and Xie's research shows that increased investment in vocational education and enhanced workforce training can help ordinary workers better adapt to China's industrial upgrading [23]. A study based on Hangzhou Science and Technology Park shows that innovation in higher education is significantly and positively correlated with the level of technological development, as reflected in the number of teachers with senior titles and the number of citations of published papers [24]. In this way, continuous optimization of the education system is therefore an effective way to improve the quality of human capital and, thus, economic growth.

As a means of developing human capital and creating knowledge, education can accelerate the process of economic development. For example, an empirical study by Lin [25] proved that higher-education courses, especially engineering or natural sciences majors, contributed the most to Taiwan's economic growth. Based on the analysis of the US economic growth factors, the contribution of education far exceeded that of physical capital since the economic crisis of the 1930s [26]. Empirical evidence from Nepal also proved that the investment in education, especially secondary and higher education, significantly contributes to sustainable economic development [27]. Therefore, the accumulation of knowledge will lead to the improvement of regional economic level [28].

Education input can be reflected in many aspects, including teacher capacity [2], teacher quantity [29], and school investment [30]. Our focus on teacher salary distinguishes our work from most of the existing literature studying education input. Importantly, it is an issue worth studying for the reason that salary can be regarded as a compensation strategy that attracts and retains effective teachers [31]. It is widely acknowledged that salary is closely related to job performance [32]. When the focus moves to the education industry, salary is also related to teacher performance. For instance, empirical evidence from Liu proved that salaries are linked to the teachers' turnover intention [33]. Trevor and Wazeter [34] found that there was a significant negative correlation between salary differences and individual perceptions of fairness, which would be reflected in teaching performance.

It is worth noting that many past studies have shown that regional differences in salaries are key factors in teacher mobility. The city income gap results in larger cities having a greater ability to attract talent [35]. In the study of US urban agglomerations, Glaeser found that urban agglomerations with stronger combined development have 30% higher incomes than other cities and gather more high-quality human capital [36]. In particular, for intellectual human capital, the structure of the regional economy is an important factor influencing their migration [37]. Schools in less economically developed areas have difficulty retaining teachers [38]. One study finds that schools with higher socio-economic status have better-educated students and better-paid, experienced teachers.

Teachers tend to move to and stay in higher socio-economic-status schools, while new teachers tend to be placed in lower socio-economic-status schools [39].

The loss of quality teachers can create an imbalance in teacher quality between districts, resulting in the underutilization of human capital. Teacher turnover is financially costly for schools as well as school districts, which must provide training for new teachers and invest resources to recruit and process new teachers, respectively [40,41]. Some studies also explored teacher mobility due to inter-regional salary differences, such that teachers' preferences for pecuniary benefits (e.g., salary) and nonpecuniary benefits (e.g., working conditions) may cause them to move to another school in a different district [38,42].

In addition, teacher mobility is also influenced by other factors, such as how the social responsibility to promote educational equality and the expectation of professional development encourage teacher mobility, while family obligations and adaptability hinder mobility [43]. School support in different districts was also identified as a key factor influencing teacher mobility, with teachers tending to move to such districts when they have a say in school curriculum development and scheduling [44]. Moreover, student characteristics are also associated with teacher mobility, with teachers tending to be more likely to travel to schools and districts with fewer minority students and higher academic achievement [45,46]. Feng and Sass find that in the Florida region, first- and second-rate teachers have higher turnover rates than average-quality teachers. As the proportion of more-experienced peer teachers increases, the likelihood of teacher turnover decreases [47]. Additionally, there is empirical evidence based on a survey of Gansu Province, China, which found a trend of rural-to-urban migration of Chinese teachers [48–50].

China is a country with sharp differences among regions and is divided into three districts: East China, Central China, and Western China. The basis for regional division is not only geographic location, but also national policy. East China includes provinces that first implemented a coastal opening policy and is the most economically advanced area in China. Central China is less developed, while Western China includes underdeveloped provinces which are under the strategy of China's western development. Because of different economic growth modes and geographical conditions among regions, reforms on sustainable development will usually achieve different effects [51]. There have been studies revealing the variation. For example, Xie and Hannum find that economic growth depresses the returns to education [52]. Psacharopoulos and Patrinos demonstrate geographic differences in education investment through a broad geographic comparison that shows that less developed countries or regions have a higher rate of return on investment in education [53]. More specifically, the returns are higher in less developed provinces than that in high-income provinces.

The regional inequality-driven teachers movement attracts attention from policy makers. In Japan and Korea, as civil servants, teachers are required to rotate regularly to ensure equal distribution of teachers in different areas [54]. In the Chinese context, China implemented a strong education support strategy and an inflexible household registration system before the reform and opening up. Such policies provided teachers with access to employment, housing, and benefits. However, it largely restricted teacher mobility, especially between urban and rural areas [55]. The high household registration threshold in developed areas [56–58] has the potential to create a barrier to the movement of teachers from rural to urban areas. The household registration system also exposes rural migrants to inequities such as housing inequality [59], which has an impact on the locational choice of human capital. With the gradual liberalization of restrictions after the reform and opening up, teacher mobility has become more liberal. The removal of hukou restrictions is expected to bring broader welfare gains [60], which helps allow all people to benefit by moving to where they are most productive [61] and reduces industry wage inequality [62]. However, there are still many restrictions on teacher mobility in terms of hukou policies, such as high relocation standards set by first-tier cities and some second-tier cities due to their own developmental considerations [63]. Additionally, labor market discrimination against

rural hukou holders still exists in cities [64], and national strategies such as ‘educational counterpart aid’ are still in place [50].

Based on the analysis above, we propose the following two hypotheses:

Hypothesis 1. *A rise in teacher salaries may contribute to the development of the regional economy.*

Hypothesis 2. *The effect of rising teacher salaries differs among regions.*

2.2. The Role of Housing Price

To the best of our knowledge, there is little research discussing the relationship between housing price and teachers’ salaries, and only a small amount of research on the relationship between housing price and salaries. Considering that teachers’ salaries are part of the income of all sectors, there is some consistency between their fluctuations and the movement of overall income. Therefore, the relationship between housing price and overall earnings may reflect the relationship between housing price and teacher salaries to some extent. Housing prices and salaries have been demonstrated to have a generally positive correlation. From a demand perspective, salaries are a proxy for income, which is considered to be positively correlated with housing prices [65,66]. From a supply perspective, higher incomes increase the supply of houses and further raise housing prices [67]. Some studies have found that the positive correlation between housing prices and income maintains an equilibrium relationship over time, i.e., house prices and income maintain a fixed or moderately adjusted ratio over time [68,69]. However, others have suggested that there may be an unbalanced link between the two [70]. Therefore, the exact relationship between salaries and housing price has not been conclusively established. Housing price income (PIR) is one of the most widely monitored indicators of housing market conditions [71]. Calculations based on data from the National Bureau of Statistics of China show that the ratio of PIR in China rose to 9.1 in 2021, exceeding the upper limit of the generally understood reasonable range. The rapid growth of housing prices and the relatively slow growth of residents’ income has become an urgency facing Chinese society [72]. Such a dilemma exists for the teaching community as well. Practice over the past years has shown that rapidly increasing housing prices have caused a relative reduction in teachers’ salaries, and such a crowding-out effect may have implications at the macrolevel.

Based on the existing literature, the explanations for the crowding-out effect of housing price dynamics on the relationship between teacher salary and sustainable economic development tend to fall under two categories: labor mobility and squeeze on disposable income.

As noted in previous work, the variation and fluctuation of housing prices cause labor mobility [73]. Some studies have demonstrated a positive correlation between the degree of human capital aggregation and house prices [74]. However, when housing prices rise more rapidly relative to human capital aggregation, there may be a crowding-out effect from housing prices. Abowd and Vilhuber [75] proved the existence of regional imbalance of employment by studying the relationship between housing prices and worker flows against the background of the US housing price bubble in the 2000s. The relationship between labor mobility and knowledge flows has been widely acknowledged [76]. Further studies expanded the effect of housing prices to productivity levels. For example, Hsieh and Moretti [77] quantified the spatial misallocation of labor caused by housing constraints and found that the constraints drove down the US production efficiency by 36 percent from 1964 to 2009. The mobile population has a much greater impact on spatial differences in housing price than the resident population [78]. In addition, attention should be paid to the spillover effect of house prices. House prices have a stronger spillover effect when real estate characteristics are similar. In Korea, this spillover effect has been shown to spread to the areas with the highest house prices [79].

On the other hand, increasing housing prices squeeze disposable income, and the housing price-to-income ratio has been an important indicator to measure the real estate bubble [80]. First, house prices have a direct impact on personal consumption. By using

micropanel data of UK, after controlling factors such as interest rate and household income, Campbell and Cocco [81] found that regional housing prices could affect the growth of consumption, which had a greater impact on the elderly. Second, housing prices can further affect disposable income by affecting the productive capacity of firms and the regional economy. The impacts of the fluctuations of housing price on economic development has extended to companies' productive capacity. Real estate investment accounts for a large proportion of enterprise assets. It was empirically proven that a USD 1 rise in a company's real estate value increases its investment by approximately USD 0.06. Particularly, small companies are much more affected than large ones [82]. Furthermore, because real estate is one of the most important forms of collateral, its fluctuations will be passed to the real economy through the channel of mortgage. One study by Chen et al. [83] studied the rise of housing prices could lead companies to spend more money on land investment, especially on commercial land, leading to gaps among different industries in financial performance. In addition, excessive investment in real estate will cause the crowding-out effect of credit funds, which further led to resource misallocation [84]. These three dimensions above, including personal consumption, company behavior, and regional economy, are not fragmented but are strongly related. The rise in housing prices leads to a decrease in households' disposable income, which constrains consumer demand. Accordingly, companies' expected earnings and motive power of innovation will decrease if people reduce the purchase of high-tech products, which has a negative impact on regional sustainable development.

According to the UN definition of sustainable development, sustainable development comprises 17 requirements, where sustainable economic development is an important component. Currently, there is no uniform and standard definition of sustainable economic development. However, most definitions tend to cover sustained and stable economic growth, coordinated regional development, and a steady increase in productivity [85]. Further research on the relationship between human capital, housing prices, and regional sustainable development showed that the concentration of human capital drives up housing prices [74] and that rising housing prices adversely affect economic development through a net crowding-out effect on consumption and investment [86]. When housing prices are too high, there is a depression in economic development [87], which hinders sustainability. Yang and Pan, using data from China, found that housing prices have a negative short-term impact on human capital and a negative long-term impact on economic development. This goes some way to explaining the fact that the current excessive rise in housing prices is actually irrational enthusiasm that has led to distortions in economic development [88]. Housing prices pushed up by the concentration of human capital may end up having a squeeze-out impact on human capital instead. Hence, the relationship between teacher mobility, housing prices, and sustainable regional development is not simple and one-way. The complex mechanisms of influence involved need to be further explored.

Based on the above analysis, it seems that the crowding-out effect of house price fluctuations may affect the achievement of sustainable economic development goals. On the one hand, fluctuating housing prices may cause teachers to move between regions in pursuit of higher salaries, thus creating an imbalance in the stock of human capital between regions, affecting the efficiency of human capital utilization, hindering the development of productivity created by human capital, and creating an imbalance in development between regions. On the other hand, the continuous rise in house prices has squeezed the disposable income of the demand side, such as teachers, thus limiting consumption demand. In addition, fluctuations in house prices also affect productivity development on the supply side, thereby interfering with the achievement of sustainable economic development. Therefore, these confirmed crowding-out effects of housing price leads to our third hypothesis:

Hypothesis 3. *The housing price moderates the relationship between teacher salaries and sustainable economic development.*

The graphical explanation of the mechanism among teacher salary, regional economic development, and housing prices is presented in Figure 3.

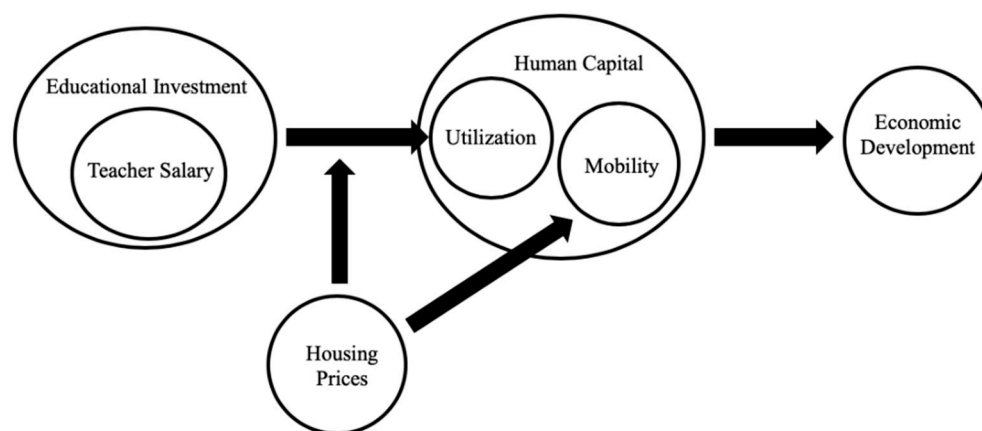


Figure 3. The mechanism of the relationship among teacher salary, housing prices, and economic development. Author-designed schematic diagram.

3. Materials and Methods

3.1. Variable Selection and Data Collection

This paper studies the relationship between teacher salaries and sustainable regional economic development, with a focus on the moderating effect of housing price. Accordingly, teacher salary is the key independent variable. The gross regional product (GDP) is the most common index to reflect economic development level. Considering the diversity of population sizes, we select per capita gross regional product as the dependent variable to measure regional economic development levels. The main subjects of this study are teachers, which means we mainly discuss individual behavior rather than organizational behavior (such as enterprises, etc.) here. In this case, we selected commercial residential housing price as a moderator to represent the level of housing price, which is more in line with the purpose of this study.

Our samples are from 2006 to 2018, covering 31 provinces (autonomous regions and municipalities) in China. The data of residential commercial housing price come from statistical yearbooks of 31 provinces (autonomous regions and municipalities) in China, which includes the price of ordinary houses, villas, and upscale apartments in China. Teacher salary data and per capita GDP data come from the National Bureau of Statistics of China. As for teacher salary, we selected the average wage of urban nonprivate sector employees in the education industry from the National Bureau of Statistics of China, which adequately reflects the average income of teachers at all educational levels (from preschool to higher education). This covers almost all the objects we want to study. The database's statistical caliber is powerfully authoritative and is widely used in various empirical studies. Due to the changes in price level from 2006 to 2018, we adjust these data according to CPI after taking 2018 as the base year. Table 1 presents the key data for the year 2018. Figure 4 shows the scatter plots of salary and GDP data from 2006 to 2018.

Table 1. Sample data.

Province	GDP Per Capita (CNY)	Average Teacher Salary (CNY)	Housing Price (CNY/m ²)	Province	GDP Per Capita (CNY)	Average Teacher Salary (CNY)	Housing Price (CNY/m ²)
Beijing	153,095	161,029	15,924	Hubei	71,109	85,045	8136
Tianjin	85,757	138,011	37,420	Hunan	52,809	79,209	5473
Hebei	43,108	77,715	7567	Guangdong	88,781	109,022	12,915
Shanxi	43,010	72,783	6649	Guangxi	40,012	74,077	5959
Inner Mongolia	63,772	85,643	5340	Hainan	52,801	88,920	14,105
Liaoning	53,872	76,151	7358	Chongqing	69,901	101,579	8190
Jilin	415,16	75,836	6801	Sichuan	51,556	83,030	6691
Heilongjiang	33,977	77,787	6678	Guizhou	42,767	84,484	5129
Shanghai	148,744	114,749	28,981	Yunnan	43,366	101,239	7384
Jiangsu	115,930	113,637	10,542	Tibet	45,476	138,809	6915
Zhejiang	101,813	123,681	15,242	Shaanxi	62,195	75,909	7922
Anhui	54,078	98,697	6937	Gansu	30,797	83,981	5387
Fujian	98,542	94,333	10,613	Qinghai	45,739	101,131	5937
Jiangxi	49,013	76,544	6540	Ningxia	51,248	83,660	4737
Shandong	66,472	94,149	7386	Xinjiang	51,950	78,255	5427
Henan	52,114	71,053	5531	Average	64,688	94,198	9542

Note: data come from the statistical yearbooks of 31 regions in China and National Bureau of Statistics of China.



Figure 4. This figure depicts the scatter plots of the data from the sample period.

The extant literature has proven that fixed investment [89], the level of existing human capital [90], and foreign trade [91] are important factors affecting regional economic development. Therefore, we take unemployment rate (*Unemployment*), degree of economic openness (*Openness*), innovation ability (*Innovation*), and the level of education (*Edu*) as control variables. The degree of economic openness (*Openness*) is measured by the proportion of total export–import volume of goods in GDP. Regional innovation ability (*Innovation*) is calculated from the annual number of patents for innovations granted to the domestic applicant. The calculation method of the level of education (*Edu*) is as follows:

$$Edu_i = \sum_{i=1}^n Proportion_i \times Year_i \quad (1)$$

where *Proportion* represents the proportion of people with different educational backgrounds in total population over 6 years old, and *Year* stands for corresponding education years. The number of people with different degrees of education are restored using the data from China's National Statistics Bureau according to the corresponding sampling ratio in a certain year.

In addition, following Dustmann and Okatenko [92], we added a series of control variables representing urban infrastructure. Enjoying better public service usually means having a higher quality of life, which may be helpful for increasing labor productivity. We measured the level of urban infrastructure from three aspects: transportation, environment, and health care conditions. Data on education are calculated by matching the data from the website of China's National Statistics Bureau with the data from China's Statistical Yearbook. Other data come from China's National Bureau of Statistics. Detailed variable definitions and abbreviations in our study are provided in Table 2. Table 3 shows the descriptive statistics of variables.

Table 2. Variable definitions.

Variable	Definition	Unit
<i>PGDP</i>	Natural logarithm of per capita gross regional product.	CNY
<i>Salary</i>	Natural logarithm of the average annual teacher salaries.	CNY
<i>HP</i>	Natural logarithm of the housing price.	CNY
<i>Unemployment</i>	Natural logarithm of the unemployment rate.	%
<i>Openness</i>	The economic openness of a province. Measured by natural logarithm of the proportion of total export–import volume of goods in GDP.	10 ^{−6}
<i>Innovation</i>	Natural logarithm of the annual number of patents for innovations granted to the domestic applicant.	-
<i>Edu</i>	Natural logarithm of the education level of a province.	-
<i>PGreen</i>	Natural logarithm of the city's per capita green area.	Square meters/person
<i>Transport</i>	Natural logarithm of the number of buses shared by 10,000 people.	-
<i>Medical</i>	Natural logarithm of the number of beds in medical institutions shared by 10,000 people.	-

Table 3. Summary statistics.

Variable	Mean	Std. Dev.	Min	Median	Max
<i>PGDP</i>	10.607	0.537	8.981	10.623	11.939
<i>Salary</i>	10.897	0.414	10.006	10.906	11.989
<i>HP</i>	8.592	0.518	7.692	8.516	10.530
<i>Unemployment</i>	1.217	0.229	0.182	1.253	1.629
<i>Openness</i>	3.266	0.972	0.916	2.997	5.499
<i>Innovation</i>	7.298	1.761	1.386	7.402	10.883
<i>Investment</i>	9.064	1.008	5.767	9.208	10.939
<i>Edu</i>	2.238	0.087	1.951	2.230	2.551
<i>PGreen</i>	2.675	0.603	1.078	2.645	4.053
<i>Transport</i>	1.105	0.511	−0.120	1.105	2.501
<i>Medical</i>	3.716	0.321	1.116	3.766	4.278

3.2. Empirical Models

3.2.1. Benchmark Model

We constructed the following panel regression model with province fixed effect to identify the relationship between teacher salary and economic growth:

$$PGDP_{it} = \alpha_0 + \alpha_1 Salary_{it-1} + \alpha_2 X + u_i + \varepsilon_{it} \quad (2)$$

where *PGDP* is the natural logarithm of per capita gross regional product and *Salary* is the natural logarithm of the average annual teacher salaries. We chose the $t - 1$ period

variable of *Salary* to eliminate the possible reverse problem. *X* is a vector of the control variables, including unemployment rate (*Unemployment*), economic openness (*Openness*), innovation ability (*Innovation*), education level (*Edu*), and public infrastructure service (*PGreen*, *Transport*, and *Medical*). Detailed information is shown in Table 2. The subscripts *i* and *t* denote province and year, respectively. u_i represents province fixed effect.

3.2.2. Moderation Model

In order to investigate the moderating effect of the housing price compared with the benchmark model (Equation (2)), we added the interaction of teacher salary (*Salary*) and housing price (*HP*) into it:

$$PGDP_{it} = \lambda_0 + \lambda_1 Salary_{it-1} + \lambda_2 HP_{it-1} + \lambda_3 Salary_{it-1} \times HP_{it-1} + \lambda_4 X + u_i + \varepsilon_{it} \quad (3)$$

Similar to Equation (2), *PGDP* here is the natural logarithm of per capita gross regional product. *Salary* is the natural logarithm of the average monthly teacher salaries. *HP* is the natural logarithm of the housing price. Considering the possible endogenous problem, we took the one-period lag housing price (*HP*) as the independent variable. *X* is a vector of the control variables, including unemployment rate (*Unemployment*), economic openness (*Openness*), innovation ability (*Innovation*), education level (*Edu*), and public infrastructure service (*PGreen*, *Transport*, and *Medical*). The subscripts *i* and *t* denote province and year, respectively. u_i represents province fixed effect.

4. Empirical Results and Discussion

4.1. Baseline Regression Analysis with the Moderating Effect of Housing Price

The impact of teacher salary on sustainable economic development is clearly presented in Table 4. Column (1) shows the result without considering control variables. Teacher salary appears to have a positive correlation with economic development. When we add all the control variables to the regression model in Column (2), the result still holds true. The positive effect of raising teacher salary is significant at the 1% level, with a coefficient value of 0.372, showing that the efforts of improving the salary system of teachers can significantly help regional sustainable development. This finding supports Hypothesis 1.

As for control variables, there is a negative relationship between unemployment rate and economic development. Greater economic openness and higher ability of technology innovation can significantly promote regional economic development. Areas with higher levels of education have stronger economic strength, which is consistent with the findings of Meulemeester and Rochat [93]. Additionally, as reflections of sound infrastructure, adequate medical resources help to increase productivity.

To further study the interaction between teacher salary and sustainable economic development, we include housing price dynamics into our analysis framework. Columns (3) and (4) report the estimated coefficients. When we put the interaction of teacher salary (*Salary*) and housing price (*HP*) into the regression equation (see Column 4), the negative interaction effect of housing price is statistically significant, with a coefficient value of -0.146 , verifying that the crowding-out effect of housing price does exist in the relationship between educational investment and economic development. Though rising wages motivate teachers to some extent, disposable income decreases when housing price rises. Thus, it can be found that the crowding-out effect of housing price weakens the positive effect of educational investment on economic development. These findings support Hypothesis 2.

Table 4. The impact of teacher salary on sustainable economic development with the moderating effect of housing price.

Dependent Variable	PGDP			
	(1)	(2)	(3)	(4)
Variable	Full Sample	Full Sample	Full Sample	Full Sample
<i>Salary</i>	0.814 *** (44.58)	0.372 *** (6.34)	0.297 *** (4.66)	1.469 *** (6.37)
<i>HP</i>			0.155 *** (2.85)	1.770 *** (5.70)
<i>Salary</i> × <i>HP</i>				−0.146 *** (−5.28)
<i>Unemployment</i>		−0.168 *** (−2.63)	−0.172 *** (−2.72)	−0.180 *** (−2.96)
<i>Openness</i>		0.078 *** (3.70)	0.075 *** (3.61)	0.041 * (1.93)
<i>Innovation</i>		0.058 *** (3.12)	0.046 ** (2.48)	0.063 *** (3.47)
<i>Edu</i>		1.116 *** (3.44)	1.117 *** (3.48)	1.188 *** (3.85)
<i>PGreen</i>		0.029 (1.09)	0.018 (0.68)	0.011 (0.44)
<i>Transport</i>		0.016 (0.33)	0.023 (0.47)	0.032 (0.70)
<i>Medical</i>		0.188 *** (4.99)	0.189 *** (5.07)	0.156 *** (4.29)
Province fixed effect	Yes	Yes	Yes	Yes
Adj. R ²	0.949	0.964	0.965	0.968
N	370	370	370	370

Note: The division of East, Central, and Western China is based on China's Statistical Yearbook. *t* statistics are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.2. Analysis with the Moderating Effect of Housing Price across Regions

In order to better investigate the differences among regions, we further divided the sample into three parts according to geographical regions. The results are in Table 5. Comparing the estimation results from Column (2) to Column (4), the positive effects of teacher salaries are all statistically significant. However, the coefficients on *Salary* are the biggest in Western China, then followed by Central and East China. The result indicates that the return on investment for teacher salary is relatively higher in underdeveloped regions. The natural logarithm of per capita gross regional product (*PGDP*) in East China increases by 1.334 units per one unit increase in *Salary*. For Central China, *PGDP* increases by 1.611% with a 1% increase in teacher salary. The return of investment increases up to 2.779% in Western China. In addition, the effect of housing price dynamics in East China is greatest among the regions.

Our results support Hypothesis 3, further verify Hypothesis 2, and also have a realistic basis. East China includes three major economic zones: the Bohai Sea economic zone, the Yangtze River Delta economic zone, and the Pearl River Delta economic zone. First, these regions have the advantages of well-developed infrastructure, enough capital, and huge economy. It is reasonable to assume that East China has formed a relatively advanced economic development system, and the salary increase plays a limited role compared with that of Central and Western China. From another point, the high consuming level makes salary increase hard to improve the expected economic growth. Second, housing price dynamics is an important factor affecting labor mobility [94]. Although high housing prices have been proven to inhibit labor concentration, the expectations for arbitrage help promote labor inflows [95]. There is tremendous economic development potential in developed regions, which provides better development opportunities. Therefore, the pulling force of human capital caused by people's high expectations can offset some of the

crowding-out effect of housing price, making the moderating effect more modest than that of underdeveloped regions.

Table 5. The impact of teacher salary on sustainable economic development with the moderating effect of housing price.

Dependent Variable	PGDP			
	(1) Full sample	(2) East China	(3) Central China	(4) Western China
Salary	1.469 *** (6.37)	1.334 *** (3.78)	1.611 *** (3.26)	2.779 *** (3.74)
HP	1.770 *** (5.70)	1.649 *** (3.30)	1.906 *** (3.21)	3.539 *** (3.74)
Salary × HP	−0.146 *** (−5.28)	−0.122 *** (−2.82)	−0.155 *** (−2.98)	−0.328 *** (−3.71)
Unemployment	−0.180 *** (−2.96)	−0.119 (−1.41)	−0.085 (−0.49)	−0.150 (−1.25)
Openness	0.041 * (1.93)	0.005 (0.12)	−0.014 (−0.30)	0.019 (0.62)
Innovation	0.063 *** (3.47)	0.072 *** (2.78)	0.057 (1.32)	0.091 ** (2.60)
Edu	1.188 *** (3.85)	0.740 *** (1.42)	1.184 (0.23)	1.530 *** (3.13)
PGreen	0.011 (0.44)	−0.068 ** (−2.19)	−0.153 (−1.29)	0.140 ** (2.53)
Transport	0.032 (0.70)	−0.074 (−0.83)	0.029 (0.24)	0.111 (1.42)
Medical	0.156 *** (4.29)	0.102 *** (2.88)	0.267 (1.20)	0.362 *** (2.48)
Province fixed effect	Yes	Yes	Yes	Yes
Adj. R ²	0.968	0.976	0.967	0.958
N	370	144	106	120

Note: *t* statistics are shown in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.3. Robustness Checks

The regression results above mainly take the effects of teacher salary and housing prices on sustainable regional economic development without bringing the time factor into discussion. Considering the possible lag effect of economic development, we further introduce the *t* − 1 period variable of PGDP as an independent variable. Similar to Equation (2), in order to reduce omitted variable bias, we also added a series of control variables about regional characteristics, including unemployment rate (*Unemployment*), economic openness (*Openness*), innovation ability (*Innovation*), education level (*Edu*), and public infrastructure service (*PGreen*, *Transport*, and *Medical*). Although a comprehensive set of control variables have been introduced, there still may be endogenous problems. Therefore, we developed the dynamic panel model (see Equations (4) and (5)) and used the S-GMM method by taking the lag term of independent variables as instrumental variables, which helps eliminate the possible reverse causality problem [96]. *u_i* represents province fixed effects.

$$PGDP_{it} = \beta_0 + \beta_1 PGDP_{it-1} + \beta_2 Salary_{it-1} + \beta_3 X + u_i + \varepsilon_{it} \tag{4}$$

$$PGDP_{it} = \beta_0 + \beta_1 PGDP_{it-1} + \beta_2 Salary_{it-1} + \beta_3 HP_{it-1} + \beta_4 Salary_{it-1} \times HP_{it-1} + \beta_5 X + u_i + \varepsilon_{it} \tag{5}$$

Empirical results are shown in Table 6. The lag effect of GDP per capita in Column (1) is significant, and teacher salary appears to have a positive correlation with economic development. According to the second-order residual autocorrelation test, we cannot

reject the null hypothesis, which means that the residuals have no second-order series autocorrelation. The model has also passed the Hansen test, that is, the instrumental variables are valid.

Table 6. Dynamic impact of teacher salaries and the moderating effect of housing price.

Dependent Variable	PGDP	
	(1) S-GMM model 1	(2) S-GMM model 2
Variable		
<i>L.PGDP</i>	1.031 *** (0.041)	1.108 *** (0.042)
<i>Salary</i>	0.074 ** (0.029)	1.177 *** (0.212)
<i>HP</i>		1.535 *** (0.295)
<i>Salary × HP</i>		−0.133 *** (0.026)
Province fixed effect	Yes	Yes
<i>p</i> -value of AR (1)	0.22	0.21
<i>p</i> -value of AR (2)	0.13	0.27
<i>p</i> -value of Hansen stat.	0.95	0.58
N	370	370

Note: Standard errors are shown in parentheses. *** and ** indicate statistical significance at the 1% and 5% levels, respectively. We control for other regional characteristics, as shown in Table 5.

When we add the interaction to the regression model as in Column (2), the main results still hold true. The lag effect of GDP per capita is significant at the 1% level with a coefficient value of 1.108. The positive coefficient value increases a bit ($\beta_2 = 1.177$) and is still significant at the 1% level. The negative interaction effect of housing price dynamics is also statistically significant with a coefficient value of -0.133 , verifying that the crowding-out effect of housing price dynamics does exist in the mechanism between educational investment and economic development. Thus, the positive effect of improving the salary system of teachers and the crowding-out effect of housing price are further proven.

Fiscal revenue is an important form of support for regional development and national governance and is the basis for the provision of public services. Sufficient fiscal revenue makes sure that the government’s function is fully played. It has been proven that fiscal incentives can usually affect governments’ behavior [97]. Thus, the steady growth of fiscal revenue is a guarantee of sustainable regional economic development. We changed the measure of sustainable economic development level into government revenue (*Revenue*). As shown in Table 7, with a series of variables controlled, the main results are further supported.

Table 7. The impact of teacher salaries and the moderating effect of housing price dynamics (dependent variable changed).

Dependent Variable	Revenue			
	(1) Full Sample	(2) East China	(3) Central China	(4) Western China
Variable				
<i>Salary</i>	2.213 *** (0.561)	2.814 *** (0.833)	4.181 *** (1.025)	8.410 *** (1.528)
<i>HP</i>	4.357 *** (0.756)	5.263 *** (1.177)	6.742 *** (1.230)	11.605 *** (1.946)
<i>Salary × HP</i>	−0.382 *** (0.067)	−0.450 *** (0.101)	−0.570 *** (0.108)	−1.030 *** (0.182)
Province fixed effect	Yes	Yes	Yes	Yes
Adj. R ²	0.962	0.959	0.913	0.977
N	370	144	106	120

Note: Standard errors are shown in parentheses. *** indicate statistical significance at the 1% levels. We control for other regional characteristics, as shown in Table 5.

4.4. Discussion

This paper provides an empirical analysis of the impact of teacher salary inputs on regional sustainability using provincial-level panel data. The main effects and the moderation of house prices were also tested using a fixed-effects model. The subregional heterogeneity analysis presents significant and correlated results. Further, we verified the robustness of the findings using a dynamic panel model.

In response to Hypothesis 1, we verified that improving the salary of creative human capital cultivators, i.e., teachers, can stimulate sustained regional development. This result also provides further evidence of the positive effect of investment in education on economic development and is consistent with previous, related studies [98–100]. It is undeniable that educational inputs will increase the level of education to some extent [101], and the increase in education for all will be more conducive to increasing labor output in various activities [102], thus contributing to sustainable economic development. Notably, this paper innovates the use of teacher salary as a key indicator of investment in education. Raising teacher salary can significantly contribute to regional economic development levels and promote sustainable economic development through possible channels such as acquiring productivity-enhancing skills, developing human capital, and creating knowledge. At the same time, based on the literature review, we argue that increasing teacher salary can further balance the human capital differences between regions. This can contribute to retaining talent and reducing teacher outflow in areas with scarce educational resources. Therefore, relevant authorities can take elevated teacher salary into account when considering economic decisions.

In response to Hypothesis 2, we also confirmed the differences of educational investment on regional economic development among different regions. By comparing the effects of educational investment in East, Central, and Western China, we found that the role of educational investment in sustainable regional economic development is more pronounced in the central and western regions compared to the eastern regions. Since the economic development in China is uneven, the level of development of the education industry also varies from region to region. When we divided our sample into three parts according to geographical regions (East, Central, and Western China), the positive correlation between teacher salary and sustainable economic development was still significant. Specifically, Western China (the least-developed region in China) is most sensitive to education investment compared with central and eastern areas. This provides a fundamental direction in our pursuit of social equity and return on investment in education. For this finding, our conclusions are similar to those of Psacharopoulos and Patrinos [53,103]. The marginal returns to investment in education vary across regions, with underdeveloped regions tending to receive higher returns to education compared to developed regions. In contrast to previous studies, we innovated to include teacher salary as an important indicator of educational investment. In addition, previous research focused less on emerging economies [104,105]. Therefore, the literature focusing on emerging economies such as China tends to focus on individual cities or small areas [106]. By dividing the sample into eastern, central, and western regions according to geographic regions, we explored the differences in returns to education investment between regions from a more macroperspective, effectively bridging the gap of related studies.

In response to Hypothesis 3, our findings confirmed that housing prices moderate the relationship between teacher salary and sustainable regional economic development. The result is that housing price dynamics have a crowding-out effect on teacher salary during the sample period, and the effect is also most evident in Western China. Therefore, the inhibiting effect of high housing prices on talent mobility deserves to be further explored. In general, developed regions are more attractive [107], and the human capital pull caused by people's high expectations of the future can offset the crowding-out effect of housing price. Therefore, China's real estate market is highly polarized and influenced by many political, cultural, and demographic factors, etc. Thus, the crowding-out effect of house prices in education investment and sustainable economic development is different. In addition,

research by Zhou and Xiong demonstrates that people with higher education are more likely to benefit from the added value of housing [108]. With the further marketization of housing in China, human capital acquired through education will benefit more, while political capital will benefit fewer in the housing market, and a better social security system established by the government will reduce inequality in the housing market [108]. Therefore, increasing regional investment in education and improving education levels are effective ways to mitigate housing inequality and further promote sustainable development of the regional economy. In contrast to previous research, we introduced housing price for the first time in exploring the relationship between teacher salary and sustainable regional economic development. This helps enrich the relationship between housing price volatility, teacher salary, and sustainable regional economic development to fill a gap in the relevant research area and provides a more equitable, long-term economic perspective on housing market decisions.

5. Conclusions and Implications

Education, as a major factor in the formation and development of human capital, plays a vital role in individual development and national economic growth. The crowding-out effect of high housing prices on investment in education is significant. Specifically, taking into account the previous literature, we believe that there are two possible ways in which the crowding-out effect of housing prices can occur. Since housing prices are significantly correlated with individuals' disposable income [65,109], when housing prices rise, teacher salaries are squeezed by housing prices, reducing disposable income at the supply level [80,81]. At the demand level, housing prices may affect the educational choices of educated people. Previous studies found that the housing market has a huge impact on citizens' education and their preferences. The presence of additional Experimental Model Senior High Schools per square kilometer in Shanghai increases housing prices by 17.1% [110]. Higher prices often mean higher-quality school districts [111]; thus, rising housing prices allow wealthier individuals to choose school districts with higher-quality education [112,113]. On a household basis, investment in education is an important component of household spending. Average individuals may give up some of their education investment and fail to enter an affluent school district when housing prices rise [114], resulting in a simultaneous shock to human capital. Housing prices in China have experienced a period of sustained high growth. How changes in housing prices affect economic growth and sustainability through investment in education is an issue of concern. At the same time, the geographical differences in returns to investment in education revealed by the study cannot be ignored.

We further propose several policy suggestions on education and real estate investment. First, aside from investing in school investment directly [30], increasing the student–teacher ratio [29], improving teachers' quality [21], and increasing teacher salary are effective ways to develop a sustainable regional economy. In this process, it is necessary to pay attention to regional differences. In Western China, where the level of economic development is relatively lower, the return on investment for teacher salary is correspondingly higher than in developed regions. Therefore, it is necessary to consider increasing education inputs in less developed areas, especially the increase in teacher welfare.

Second, the rise in housing prices leads to a decrease in households' disposable income, which constrains consumer demand. Policies such as purchase restrictions still ought to be taken to cool down the overheated real estate market. Housing costs account for a significant share of the cost of living of the labor force. Along with the process of regional integration, the spillover effect of housing prices from one city to another has been increasing [79]. High housing prices inhibit the inflow of talent and hinder industrial upgrading. Therefore, it is necessary to regulate housing prices using various methods such as fiscal regulation and administrative means.

Third, it is necessary to develop a differentiated development strategy. In the relatively economically backward regions of central and Western China, investment in education

still has a large marginal effect. Therefore, teacher compensation systems and regulation of housing prices should be planned more scientifically to make education investment more efficient for sustainable regional development. Unlike the eastern regions, China's central and western regions have seen a rapid rise in housing prices due to irrational real estate investment as a result of increased land supply, which has led to increased expected returns for real estate companies. Therefore, housing price regulation should be more locally tailored and precise.

A more recent study suggests that public services can significantly drive up housing prices [115]. Therefore, a more detailed analysis of the moderating effect of housing prices is worthwhile in the future. As analyzed above, the crowding-out effect of housing prices on investment in education may have multiple channels. On the one hand, high housing prices reduce disposable income and may offset the positive effects of rising wages. On the other hand, housing prices may influence the choices of educated individuals, such as by causing them to choose relatively low-quality education products or even to forego further education at higher levels. However, because we lack more detailed data for the time being, research on the mechanism of this crowding-out effect should be conducted in the future.

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