Analysis of the Impact of Population Structure Change on Housing Pricei China

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ABSTRACT

It is very important to discuss the impact of China's demographic structure change on the real estate market in the process of gradually disappearing "demographic dividend" and increasing aging. In this paper, unitary linear regression model was adopted to explore the impact of dependency ratio changes on housing price based on panel data of Provinces in China from 2002 to 2019. Further heterogeneity analysis method was adopted to perform grouping regression from different dependency ratios, regions and time perspectives. The results of this study are as follows: (1) the total dependency ratio has a negative relationship with housing price. (2) There is a positive relationship between elderly population dependency ratio and housing price, and a negative relationship between children dependency ratio and housing price. (3) There is a negative relationship between the total dependency ratio and housing price in eastern and western China, a positive relationship between the total dependency ratio and housing price in northeast China, and no significant relationship between the total dependency ratio and housing price in central China. (4) Before the census year 2010, dependency ratio showed a negative relationship with housing price, while after the census year 2010, dependency ratio showed a positive relationship with housing price.

Keywords: *Population Structure, The Dependency Ratio, Average Selling Price Of Commercial Housing, Linear Regression, Heterogeneity Analysis.*

1. INTRODUCTION

High housing prices have seriously affected social stability and economic development. Between 2000 and 2019, the total average selling price of commercial housing in China rose from 2,112 yuan per square meter to 9,310 yuan per square meter. Analyzing the factors behind China's housing prices is crucial to understanding the current situation of China's real estate market and whether the government can adopt effective regulation policies. At the same time, in recent years, demographic changes have also attracted much attention. Population structure refers to the result of dividing the population according to different criteria. Dependency ratio is also a reflection of demographic structure. Dependency ratio, also known as dependency coefficient, refers to the ratio of non-working age population to the number of working age population in the population. The larger the dependency ratio is, the more the number of dependents per worker is, which means the more serious the burden of dependents is. Therefore, this paper will make use of Chinese provincial panel data from 2002 to 2019 to conduct an empirical analysis on the relationship between dependency ratio and housing price by adopting unitary linear regression and heterogeneity analysis method, and provide Chinese case lists and Strategies for the research on population structure and housing price.

2. LITERATURE REVIEW

Real estate market has become one of the important force to promote China's economic and social development, but in recent years due to China's commercial housing price increases too rapidly, leading to supply and demand imbalance, for China's economic development caused some negative effects, and, more importantly, because of high house prices do not match with national income, affect social harmony and people's well-being [1].

In the research related to this paper, part of the literature discusses the influence effect of housing price. Peng Xushu and Zhang Xiao start from the theoretical mechanism of influencing factors of regional innovation capability and price factors influencing regional innovation capability, and analyze the influence of price

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factors such as labour force, land and real estate, energy resources and financial assets on regional innovation capability [2]. Yu Yinxia and Zhao Zhongxiu [3] empirically studied the relationship between housing price and import and export trade based on panel data of 30 provinces in China from 2007 to 2018, and found that there was a significant "inverted U-shaped" relationship between housing price and import and export trade on the whole, and there were regional differences. The mechanism test shows that, in the left side of "inverted U", real estate investment expands the promotion effect of housing price on export trade in eastern China, and consumption expands the promotion effect of housing price on import trade in central China. On the right side of "inverted U", real estate investment further aggravates the dampening effect of housing price on export trade in eastern China, and consumption also aggravates the dampening effect of housing price on import trade in central China. Li et al through the nonlinear framework, such as the east again looked at the differences in regional financial dependence on land and economic development strength, house prices affect heterogeneity mechanism of local government debt risk, the study found that home prices are effect of reducing the risk of local government debt as land financial dependence on deepening gradually weakened and produce negative effects, and power of economic development is to strengthen the housing prices ease the role of local government debt risk [4]. Sun Weizeng et al empirically investigated the impact of short-term housing price fluctuations on individual education choices by using the micro data of the 2010 National population census and the micro data of the 2005 and 2015 National population sampling surveys, and solved the endogenous problem by identifying the structural breakpoints of housing price changes [5].

Another part of the literature focuses on the influencing factors of housing price. Wang Chongrun and Zhao Chang used the data of 30 provinces and cities from 2004 to 2019 to adopt the mediating effect model, and found that although population aging inhibited the rise of housing price on the whole, inheritance motivation promoted the rise of housing price, while risk-free asset preference inhibited the rise of housing price. There is obvious regional heterogeneity in the influencing channels of population aging on housing price. The mediating effect of population aging through inheritance motivation in eastern and western regions is significantly greater than that without risk preference, while the mediating effect is opposite in central regions [6]. Jipeng Liu makes an empirical analysis of China's provincial panel data from 2000 to 2019 and finds that: at the national level, aging population has become a factor affecting the fluctuation of China's commercial housing price. At the regional level, the impact of population aging on commercial housing prices shows significant regional differences. Specifically, population aging in developed regions has a significant negative impact on the price of commercial housing, while population aging in less-developed regions has no significant correlation with the price of commercial housing, while population aging in developing regions has a significant positive impact on the price of commercial housing [7].

Some literatures also discuss the influencing factors and effects of housing price. Is celebrating and ren-ling Liu Chengqing and Ren Ling through the establishment of 2002-2018 national 270 PVAR prefecture level panel data model, based on housing price to income ratio grouping classification index return, the study found that the urbanization and urban and rural income gap enlargement have pushed prices rise, house prices increase could suppress the urbanization and widening income gap between urban and rural areas, the city is in the high housing price to income ratio influence is far greater than the influence of the city is low housing price to income ratio [8].

Based on the above literature, the text may have the following four contributions. First, in terms of research methods, this paper will conduct three types of heterogeneity analysis, namely dependency ratio heterogeneity analysis, regional heterogeneity analysis and time heterogeneity analysis. Second, in terms of the theme, few articles focus on the evaluation and analysis of China's housing price by dependency ratio. This paper takes dependency ratio as a representative of the population structure to explore its impact on China's housing price and its countermeasures. Third, this paper adopts the data from The National Bureau of Statistics of China from 2002 to 2019. The data are comprehensive, relatively new and close to reality, which is conducive to reflecting the overall problems in China in the past two decades and helping to draw more accurate and timely economic conclusions. Fourth, in the world under the big background premise of growing aging population, the population structure and its impact on housing prices research is particularly important, so this article conclusion and policy suggestion is of important theoretical significance and practical value.

3. RESEARCH DESIGN

3.1. Explained Variables

The explained variable in this paper is housing price. Based on existing studies, this paper adopts average selling price of commercial housing (pri) as a proxy variable, and performs logarithmic processing (lpri) on this variable in the empirical stage of this paper.

3.2. Explanatory Variables

This paper uses total dependency ratio (peo) as the core explanatory variable to measure China's population

structure. At the same time, elderly dependency ratio (old) and adolescent dependency ratio (chi) were selected as explanatory variables to conduct heterogeneity analysis.

3.3. Data Sources

In the empirical part of this paper, 31 provinces, municipalities or autonomous regions in China were selected as the objects of empirical analysis, and the observation period was from 2002 to 2019. However, in China, the census is conducted once every 10 years, that is, at the end of the year when "0", a census is carried out every five years; at the end of the year on the "5", and is a sample survey based on a census held every 10 years. During the sample period in this paper, all dependency ratio data except census year (2010) were sampled data, and the data of census year (2010) differed greatly from the sample data before and after the census year (2010) and were not comparable. Therefore, dependency ratio data of 2010 were excluded in this paper. The sample data used in this paper came from the National Bureau of Statistics (NBS), and descriptive statistical analysis of variables was conducted. The results are shown in Table 1.

3.4. Model Setting

The research model of this paper is unitary linear regression, which is as follows:

$$lpri = \beta_0 + \beta_1 peo + \varepsilon \quad (1)$$

Where, *lpri* is the explained variable, namely the average sales price of commercial housing after logarithm, *peo* is the total dependency ratio of the core explanatory variable, and ε is the random error term.

Table 1. Descriptive statistics

Variable	unit	Obs	Mean	Std.Dev.	Min	Max
pri	Yuan/m^2	527	5320	4523	1062	35905
peo	%	527	37.64	6.802	19.30	57.60
old	%	527	13.05	3.099	6.700	23.80
chi	%	527	24.59	7.188	9.600	44.60

4. EMPIRICAL ANALYSIS

4.1. Correlation Analysis

Figure 1 depicts the relationship between the average selling price of commercial housing and the dependency ratio, where pri is the average selling price of commercial housing (yuan/m^2) and peo is the dependency ratio (%). As can be seen preliminarily from the trend in the chart, the average selling price of commercial housing decreases with the increase of dependency ratio. The relationship between average selling price of commercial housing and dependency ratio needs to be further confirmed by regression analysis in this paper.

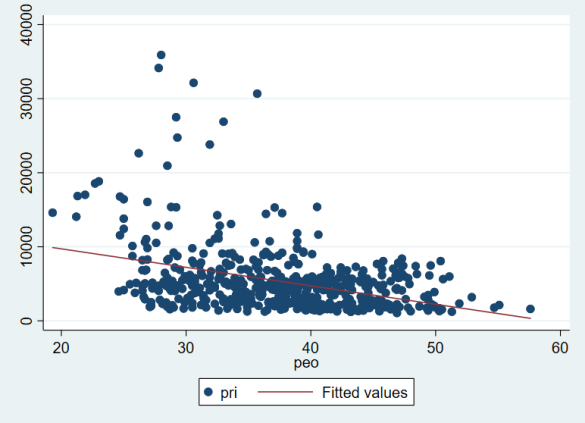

Figure1 Correlation between average selling price of commercial housing (yuan/m^2) and dependency ratio (%)

4.2. Baseline Regression

Model (1) in Table 2 reports the main regression results of dependency ratio affecting the average selling price of commercial housing. Specifically, the estimated coefficient of the core explanatory variable of the model is -0.0389, which is significantly negative at the significance level of 1%. The regression results show that the dependency ratio in China has a negative impact on the average selling price of commercial housing. This is because the rising dependency ratio indicates that the proportion of China's non-working age population is increasing, and the ability to create social wealth is declining rapidly, which leads to a decline in real estate demand and thus lower housing price.

Table 2. Regression results of baseline regression and dependency ratio heterogeneity analysis

	(1) lpri	(2) lpri	(3) lpri
peo	0.0389***		
	(6.8080)		
old		0.1398***	
		(14.8218)	
chi			0.0861***
			(16.7680)
_cons	9.8016***	6.5131***	10.4549***
	(43.8410)	(45.6058)	(74.6158)
N	527	527	527
R2	0.3236	0.3187	0.3947

Note: ***, ** and * indicate that the statistical value is significant at the significance level of 1%, 5% and 10%, and the z value is in parentheses. The same below.

4.3. Dependency Ratio Heterogeneity Analysis

Model (2) and Model (3) in Table 2 respectively report the regression results of the dependency ratio of the elderly population and the dependency ratio of the juvenile population on the average selling price of commercial housing. The estimated coefficients of explanatory variables are 0.1398 and -0.0861 respectively, both of which are significantly positive at the significance level of 1%. The regression results show that the dependency ratio of the elderly is conducive to the increase of the average selling price of commercial housing, but the dependency ratio of the children is not conducive to the average selling price of commercial housing. This is mainly because the rising ratio of children to children will increase the burden of family support, which will lead to less capital investment in housing consumption, thus reducing housing demand and leading to the decline of housing prices. Elderly families in China are often willing to use their savings to buy homes for their children, in part boosting demand for real estate and driving up prices.

4.4. Regional Heterogeneity Analysis

According to the 2011 classification method of the National Bureau of Statistics, all provinces in China are divided into four regions: eastern, central, western and northeastern regions, in order to reveal the regional characteristics of the influence of dependency ratio on the average selling price of commercial housing (The eastern region consists of 10 provinces, including Beijing, Hebei, Tianjin, Shandong, Shanghai, Jiangsu, Zhejiang, Guangdong, Hainan and Fujian. The central region consists of 7 provinces, including Inner Mongolia Autonomous Region, Shanxi, Henan, Anhui, Jiangxi, Hubei and Hunan provinces. The western region consists of 11 provinces, including Xinjiang Uygur Autonomous Region, Tibet Autonomous Region, Gansu Province, Qinghai Province, Sichuan Province, Yunnan Province, Guangxi Zhuang Autonomous Region, Ningxia Hui Autonomous Region, Guizhou Province, Chongqing Municipality and Shaanxi Province. The Northeast region consists of 3 provinces, including Heilongjiang, Jilin and Liaoning.). Table 3 model (1), (2), (3), (4), respectively, reported the dependency ratio affect China's eastern, central and western, the return of the northeast China commodity house average sales price as a result, the explanatory variables of estimated coefficients were respectively 0.0408, 0.0165, 0.0209 and 0.0594, the estimated coefficients with the eastern region and western region of the variables through a 1% significance level, northeast China through a 5% significance level, but the central region failed to pass the significance level of the central.

Table 3. Analysis of regional heterogeneity

	(1) lpri	(2) lpri	(3) lpri	(4) lpri
peo	0.0408***	0.0165	0.0209***	0.0594**
	(4.3168)	(1.4355)	(3.2610)	(2.1228)
_cons	10.1942***	8.7749***	8.9602***	6.4944***
	(30.3075)	(18.6289)	(33.8526)	(7.9490)
N	170	102	204	51
R2	0.6486	0.1080	0.1859	0.7455

4.5. Time Heterogeneity Analysis

This paper will take the 2010 census year as the time node and divide the sample period into two periods to conduct time heterogeneity analysis. Model (1) in Table 4 reports the regression results of dependency ratio influencing the average selling price of commercial housing before the census year 2010. The estimated coefficient of explanatory variable is -0.0524, and the regression result is significantly negative at the significance level of 1%. Table 4 Model (2) reports the regression results of dependency ratio influencing the average selling price of commercial housing after the census year 2010. The estimated coefficient of explanatory variable is 0.0475, and the regression results are significantly positive at the significance level of 1%. The regression results in Table 4 show that dependency ratio has a negative impact on the average selling price of China's commercial housing before the census year 2010, while dependency ratio has a positive

impact on the average selling price of China's commercial housing after the census year 2010.

Table 4. Analysis of time heterogeneity

	(1)	(2)
	lpri	lpri
peo	0.0524 * * *	0.0475 * * *
	(10.4390)	(14.2901)
_cons	9.8600 * * *	7.0417 * * *
	(48.3605)	(49.7018)
N	248	279
R2	0.3338	0.5627

5. CONCLUSIONS

According to the above empirical results, this paper considers that the total dependency ratio has a negative relationship with the average selling price of commercial housing in China. From the perspective of different dependency ratios, the dependency ratio of the elderly population is positively correlated with the average selling price of China's commercial housing, while the dependency ratio of children is negatively correlated with the average selling price of China's commercial housing. According to the four regions of China, the average selling price of commercial housing in the eastern and western regions decreases with the increase of the total dependency ratio, the average selling price of commercial housing in the northeast increases with the increase of the total dependency ratio, and the dependency ratio has no significant effect on the average selling price of commercial housing in the central region. From the perspective of different time intervals, the dependency ratio before the census in 2010 has a negative relationship with the average selling price of China's commercial housing, while the dependency ratio after the census in 2010 has a positive relationship with the average selling price of China's commercial housing.

6. POLICY RECOMMENDATIONS

The implications of the above conclusions lie in the following three points. First, in view of the negative impact of the total dependency ratio on housing price, the government should take corresponding policies to avoid the adverse impact of the possible depression of the real estate market on the economy. Second, explore the establishment of coping with the aging of housing prices rise policy system, actively cultivate the elderly consumer industry, guide the elderly to establish a new concept of consumption; In view of the negative impact of rising child dependency ratio on housing prices, we should be alert to the risks brought by a rapid decline in housing prices to economic development. Third, the systemic impact of rising dependency ratios on housing prices in different regions should be treated differently in light of local conditions. Fourth, the current two-child policy will further increase China's child dependency ratio, and actively respond to the rising child dependency ratio on the downward driving effect of housing prices.

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