

# The Effect of Shanghai Housing Price on The Fertility Rate in The Yangzte River Delta Region Over the Past Ten Years

Xingchen Wan

Malvern College Qingdao, 77 Tiejishan Road, Chengyang District, Qingdao, Shandong, 266106, China

Corresponding Author: Xingchen Wan, Email: 2018307157@qq.com

## Abstract

In the past decade, the aging of the population in China has been accelerating as a result of a low fertility rate and longer life expectancy. House price has always been closely related to our life, and it is one of the most discussed topics among adults. I focused on the Yangtze River Delta Region and used Shanghai as a prototype to explore the relationship between fertility rate and housing prices, and made cross-area comparisons among Shanghai, Zhejiang, and Jiangsu. I first wielded intervention analysis to explore the intervention effect of housing prices on the fertility rate in Shanghai. Then, I built a fixed-effect model to study area heterogeneity in terms of the relationship between fertility rate and housing price. Finally, I explored the influence of Shanghai's housing price on the fertility rate in Zhejiang and Jiangsu. The results indicate that Shanghai's housing price has an inhibitory effect on Shanghai's fertility rate. Higher housing price means greater pressure,

which comes from economic, social and other aspects. The unemployment rate also has an inhibitory effect on the fertility rate, while per capita GDP and education have a positive impact on fertility. For area heterogeneity, the impact of housing prices on fertility rates in different regions is as follows: Zhejiang > Jiangsu > Shanghai. This can be attributed to different ways of development and ideas, such as education, real estate investment, work and other human factors. Besides, the impact of Shanghai housing prices on Zhejiang and Jiangsu fertility rates is positive and significant, and greater than that on Shanghai local fertility rate, which may be to the differences or changes in population migration, fertility concepts and personal life planning. Our results have managerial implications in house price-related policy-making and population management.

*Citation: Xingchen Wan. (2022) The Effect of Shanghai Housing Price on The Fertility Rate in The Yangzte River Delta Region Over the Past Ten Years. The Journal of Young Researchers 4(4): e20220524*

*Copyright: © 2022 Xingchen Wan. This is an open-access article distributed under the terms of the Creative Commons Attribution License (<https://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.*

*Received on April 25, 2022; Accepted on May 15, 2022; Published on May 24, 2022*

## Keywords

Fertility rate; Birth rate; Housing price; Yangtze River Delta; Intervention analysis; Fixed effect model; Time series.

## Introduction

In the context of China's severe aging and the liberalization of the second-child policy, this academic illustrates whether housing prices in a single area, Shanghai, have an impact on fertility in the Yangtze River Delta. I used the birth rate as a proxy for fertility rate for their similar meanings and the easy accessibility of authoritarian birth rate data. Zhejiang and Jiangsu Provinces are the representatives of the Yangtze River Delta region except for Shanghai and are combined with multiple human factors. For example, education, employment, fertility concepts, life planning, regional development, etc., through the vertical and horizontal comparison of Shanghai, Zhejiang, and Jiangsu, to explore the cross-regional impact between them.

In the past ten years, China's population aging speed has continued to increase. China has become the fastest aging country in the world. According to the data from the National Bureau of statistics in 2018, the population aged 60 and above in China is 240.9 million, accounting for 17.3% of the total population, of which 158.31 million people are 65 and above, accounting for 11.4% of the total population. The number of elderly people is more than 200 million, ranking the first in the world. The main reason for this result is China's low fertility rate and increased life expectancy. Therefore, in recent years, fertility has gradually become a topic of concern. Housing prices are always closely related to our lives and are one of the most discussed topics among adults. Using Shanghai as a prototype, one of the cities with the highest housing prices in China, I tried to explore the relationship

between the fertility rate and housing prices over the past ten years and made comparisons across Shanghai, Zhejiang, and Jiangsu.

I used time-series data from the National Bureau of Statistics of China and set the time range from 2000 to 2020. These include the influencing factors I have discussed, such as housing prices, education penetration rate, the number of unemployed or fixed asset investment. The above are factors that can influence the fertility rate. Then I combined these data with the method of Intervention Analysis to form the model, which is the application of modeling procedures for incorporating the effects of exogenous forces or in time series analysis. I also wielded a fixed-effect model for cross-area comparisons.

First, there is an inhibitory influence on Shanghai's fertility rate on the housing price. This literature analyzes this point from the aspects of GDP, education and unemployment population size. Secondly, the horizontal comparison of the impact of local housing prices on the local fertility rate in the three regions shows in order of the impact is Zhejiang > Jiangsu > Shanghai. This conclusion gets from the respective analysis of these three regions. For Zhejiang, it mainly depends on the housing or real estate investment according to the average housing prices changing in Zhejiang. For Jiangsu, the discussion starts with the emphasis on children's education here. Shanghai depends on the social environment of survival of the fittest. Thirdly, Shanghai's housing price has a positive and significant impact on Jiangsu and Zhejiang's fertility. This result is got from the discussion of the rise or fall of house prices in Shanghai will lead to the change of the intention and decision of the population living in Zhejiang and Jiangsu to move to Shanghai. Therefore, it will lead to the changes of where to settle down or have a family, then decide on giving birth.

The contribution and managerial implication of this research mainly lie in the area related to fertility rate policies across areas at the macro-level. We can see that to maintain a healthy fertility rate, the government not only needs to care about certain social and geographical factors within a city or province but should also consider influencing factors in neighbourhood areas. Moreover, given the significant impact of housing prices on the fertility rate, to keep a good fertility rate, the government should not only focus on fertility rate-related policies but consider adjusting housing price-related policies as well, so that to improve residents' overall happiness.

## Literature Review

### Factors Influencing Fertility Rate

Based on previous research, factors influencing fertility rate can be categorized into three levels, namely, micro-level factors aiming at the individual or couple, meso-level factors relating to social relationships and social networks, and macro-level factors which target cultural and institutional settings (Balbo, Billari, & Mills, 2013).

Firstly, there are a lot of micro-level factors that have been discussed. For instance, the role of intentions in the fertility decision-making process, partner and partnership, gendered division of labor, economic and employment uncertainty, etc. The research at the micro-level focuses on the individual and/or marital decision-making process that underlies the choice to have children. The situation affects decisions about timing and the number of children. The choice is often a reasonable response to uncertainty and/or compliance with the prescribed 'sequencing' of Life Course Events. Numerous researches have studied the link between life process situations and

trajectories (Mainly partnership, education, employment, and economic conditions) and fertility behaviour (Westoff & Ryder, 1977).

Besides, some researchers pay attention to meso-level factors. Such as social interaction, place of residence, social capital, confounding factors, and reverse causality at the meso-level. In recent years, there has been an increasing interest in development and application. A theory that takes into account the fact that individuals are positioned as social actors Those who make decisions and act as Relatives and colleagues. Some studies focus on the role of interpersonal relationships. Other people who shape an individual's fertility decision It has to do with the choice of reproduction of the place of residence. Finally, research regards social networks as a source of social capital in the following forms: Emotional and material help. However, there is still no awareness of the importance of social networks in explaining the observed birth patterns. Combined with persuasive empirical research, the key reason is there is a lack of adequate data and it is difficult to model and properly identify a society. Identify interaction effects and separate them from choice and contextual factors (Bongaarts & Watkins, 1996).

Moreover, at the macro-level, there are also a lot of reasons that have been explored. For example, economic trends, unemployment trends, policy measures, welfare regimes, and so on. The extensive literature focuses on cultural and institutional settings. Individuals and couples are embedded to influence fertility decisions. Here we can check the 'economy versus culture' dichotomy (Billari, 2004). Because in several studies, economic trends, social policy, institutional constraints and welfare regimes affect the rate and both of fertility, while other contributions focus on reproductive values, attitudes, and the impact of culture and behaviour.

Also, next to these two broad approaches, there are other macro-level studies. Explore the role of contraceptive technology in fertility mechanics (Neels, 2010).

### **House Price in China**

Some studies show that in China, during 1998-2002, there was a growth of the housing market remained modest (Fang et al., 2016). In the decade since 2003, the real estate industry has also seen a remarkable growth trend. To revitalize the market, the government canceled sub-private residential facilities for urban residents, leading to an increase in demand for housing (Li & Song, 2016). The short-term boom in the housing market in 2007 led to an increase in capital inflows in the real estate industry due to stagnation in manufacturing (Wu, 2015). During 2009-2010, housing prices grew rapidly, and housing prices increased by an average of 30% in China's most important cities.

The empirical models generally adopt a dynamic approach to evolving home prices into pre-selected fundamentals and short-term sets and long-term decision-makers. The approach commonly found is a set of home price levels. Short-term and long-term determinants of the error correction model (ECM), or Vector Error Correction Model (VECM) using economic theory. The ECM, which determines the long-term balance, accounts for changes in home prices. Terms of change conditions and error correction of explanatory variables delayed levels interpreted as reflecting long-term imbalances. The reaction of home prices. In VECM, all variables are treated like this: endogenous and multiple co-integral relationships can be found. This type of model can be used to determine the over/undervaluation of home prices. There are deviations to the values implied by the long-term equation, but use for prediction purposes using long-term

equations benchmark and construct predictions assuming reversal. That's what this long-term benchmark implies (Bragoudakis, Z., 2016).

### **The Influence of House Price on Fertility in China**

China's fertility rate has continued to decline since adopting the one-child policy in the late 1970s. Between 1980 and 2010 The country's gross fertility rate (TFR) has fallen from 2.24 to 1.18, well below the world average and replacement rate. It is necessary to maintain the current population. Low fertility rates are now considered the leading cause of the decline in the working-age population and population aging, one of the most difficult socio-economic problems. Despite the gradual relaxation of contraception Policies in recent years 1) The expected increase in fertility rates has not yet been observed (Chen, 2016; Mu, 2017; Song, 2016; Zhong, 2016). China offers a unique context for subject research. Because of accelerated urbanization and residential commercialization, housing prices in China continue to rise. General house prices rose from 2714 yuan per square meter in 2004 to 5617 yuan per square meter in 2016, more prominent in the mid-sized cities. The volume of housing transactions has also increased sharply. "Housing reform and the establishment of the real estate market have been influencing every aspect of the socioeconomic behaviours of families and individuals. Particularly, China's deep-rooted cultural tradition to 'build a nest to woo the phoenix' has created a high homeownership rate. In addition, the temporal pattern and scale of change in house price vary in different regions in China, primarily because the housing system reforms were implemented in batches and stages across the country" (Liu, Xing, & Zhang, 2020).

There are three ways that housing prices can affect the fertility rate. The first one is the

substitution effect due to price fluctuations. The home and the children are very complementary because raising children requires space. Therefore, the rise in home prices makes parenting costs increase, and the substitution effect will reduce the family's child demand (Dettling & Kearney, 2014; Lindo, 2010). Increasing home prices can also reduce the willingness to give birth if parents have to buy a home when their children are adults, a common phenomenon in Chinese society. The pressure is particularly strong for parents of male children, as the ability to buy a house is essential for a son's competitiveness in the marriage market (Li & Wu, 2014; Wei & Zhang, 2011; Wrenn et al., 2019).

Secondly, rising home prices can reduce the family's purchasing power. Assuming that the quantity of children is a normal good, this income effect will weaken the demand for children (Yi & Yi, 2008). Thus, rising house prices not only force households to replace children with other consumption but also overwhelm the demand for children by reducing their purchasing power.

Thirdly, for homeownership families, rising home prices increase family wealth. Even if an increase in wealth is not realized, it can help ease credit constraints when home prices become higher-value collateral in imperfect capital markets. As a result, households are more likely to consume household assets and increase demand for their children (Dettling & Kearney, 2014; Li & Wu, 2014). But, again, given that children have to buy a house when they reach adulthood, the increase in the value of the house may not offset the negative impact on fertility rates (Li, Li, & Gao, 2012; Yi & Yi, 2008).

## Data

### Fertility Rate

The fertility rate in my paper refers to the ratio of the number of births in a certain area during a certain period (usually a year) to the average number of people in the same period (or mid-term number), expressed in thousandths. The birth rate in my paper refers to the annual birth rate. The yearly data from the National Bureau of Statistics of China show that from 2001 to 2019, the birth rate of China had a continuously decreasing trend from 13.38% in 2001 dropped to 10.48% in 2019 (Figure 1).

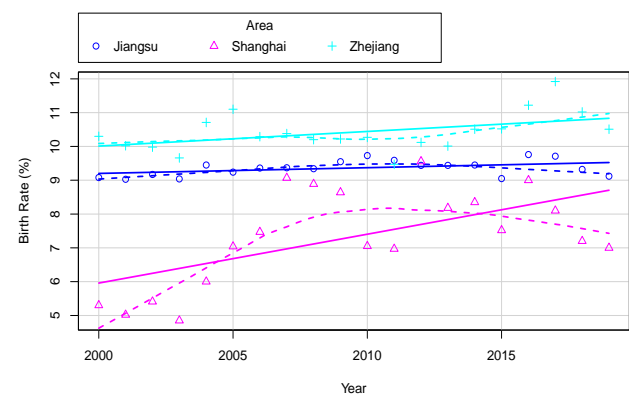


Figure 1. Birth rates of Jiangsu, Shanghai, and Zhejiang over the past 20 years.

### Changes in Housing Prices

Shanghai housing price in 2020, more than doubled ten years ago, mainly due to 2 periods of a surge. First, it rose from 22,000 yuan/square meter to 30,000 yuan/square meter from 2012 to 2013. Second, from 2015 to 2016, it rose from 30,000 yuan to 52,000 yuan/square meter. And from 2017 to 2018, the housing price experienced large fluctuations and the general trend was down, in 2020 it was in a small swing. This data provides the information and evidence of the housing pieces changing for the model analysis. Comparatively, the variation in housing

prices in Zhejiang and Jiangsu provinces is small (Figure 2).

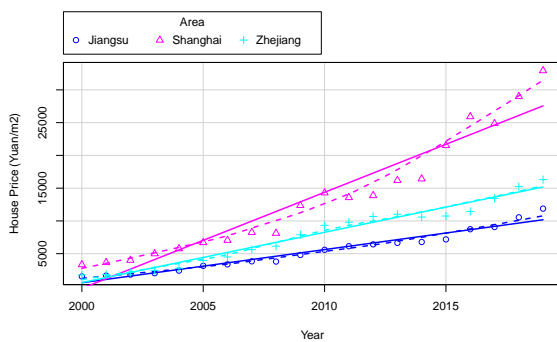


Figure 2. Housing prices of Jiangsu, Shanghai, and Zhejiang over the past 20 years.

### Social and Geographical Influential Factors

Using data downloaded from the National Bureau of Statistics of China, we include the following social and geographical factors as explanatory variables of the birth rate as well.

#### Shanghai Annual GDP

Gross domestic product (GDP) refers to the final outcome of the production activities of all resident units in a country (or region) in a certain period calculated at market prices. For a region, it is called the regional gross product or regional GDP.

#### Education

I collected data from 2000 to 2020 on the number of people receiving higher education in Shanghai, taking into account the number of ordinary colleges and universities, the number of students enrolled, the number of students in school, the number of undergraduate enrollments in ordinary colleges and universities, etc.

#### Unemployment population size

The number of urban people who have registered but are still unemployed refers to those who have a non-agricultural household registration is

within a certain working age (16 years old to retirement age), have the ability to work, are unemployed and require employment, and have registered for unemployment in the local labour security department.

#### Crude Oil Price

I also include the international crude oil price as one of the influential factors, as it impacts transportation and employment, thus further exerting an impact on many aspects of everyone's daily life, and affecting almost everyone's decision on fertility.

#### Fertility-Related Policies

There are several fertility policies promulgated by the government, which can directly or indirectly influence the decisions of people who choose to give birth to babies. Two major policies have played a depressing effect on Shanghai's fertility rate.

The information from Shanghai Municipal Human Resources and Social Security Bureau shows that in 2003, "Regulations of Shanghai Municipality on Population and Family Planning", "Encourage citizens to marry late and have late childbearing; encourage a couple to have one child; those who meet the requirements of the law and these regulations can request another child to be arranged." The policy is proposed based on the exploding population back in 2003, but has had a long-term, unexpected depressing effect on Shanghai's low fertility rate.

The second amendment was made following the "Decision on Amending the Shanghai Population and Family Planning Regulations" at the 27th meeting of the Standing Committee of the 14th Shanghai Municipal People's Congress on February 23, 2016. The concept of late marriage and late childbirth was canceled, and

the birth of a second child was encouraged. The original 30-day maternity leave was awarded for late childbirth, which boiled down to the normal extension of 30 days of maternity leave. The original late marriage rewards 7 days of marriage leave, and now 10 days of marriage leave are unified. The original 3 days of late childbirth nursing leave has now been changed to 10 days of paternity leave.

## Methods

### Data Preprocessing Methods

#### *Autocorrelation Check*

We employed the autocorrelation check to discover seasonality and trends in our time series data. Autocorrelation measures the relationship between the current value of a variable and any past value that you may have access to. The most striking aspect of autocorrelation analysis is how it helps us to find hidden patterns in data and choose the right prediction method. Specifically, we can use it to help identify seasonality and trends in time series data. In addition, the combination of the analytical autocorrelation function (ACF) and partial autocorrelation function (PACF) is necessary to select an appropriate lag order model for time series prediction.

#### *Seasonality Adjustment*

If we detected seasonality in the time series data, we need to do seasonality adjustment to make sure that our data is stationary, so that to meet the criterion of building a stationary time series model. Seasonal adjustment provides clear reports for non-seasonal trends and cyclical data covered by seasonal differences. Through this adjustment, economists and statisticians can better understand the basic trend of a given heat table. The activity of each season is temporary, and the length is generally known. Through

adjustment, statisticians can more easily observe non-seasonal and fundamental trends and cycles and obtain correct and useful reports on the labour market and purchasing habits.

### Intervention Analysis Model

Intervention analysis is the application of modelling procedures to include the influence of external forces or interventions in time series analysis. These interventions, such as policy changes, strikes, floods, and price changes, can cause abnormal changes in the time series, leading to unexpected and abnormal observations, called outliers. Specifically, four types of outliers resulting from interventions, additive outliers (AO), innovational outliers (IO), temporary changes (TC), and level shifts (LS), have attracted great interest in the literature. The model structure is as follows

$$x_t - u = z_t + \frac{\Theta(B)}{\Phi(B)} w_t, \quad (1)$$

where  $\Theta(B)$  is the moving average polynomial and  $\Phi(B)$  is the autoregressive polynomial, and  $z_t$  is the intervention term.

Estimating the Intervention Effect consists of several steps. Two parts of the whole model need to be estimated-the basic ARIMA model of the series and the intervention effect. Several methods have been proposed. One method includes the following steps: The data before the intervention point is the one that can be used to determine the ARIMA model for the series. Use that ARIMA model to forecast values for the period after the intervention. Calculate the differences between actual values after the intervention and the forecasted values. Examine the differences in step 3 to determine a model for the intervention effect. What we do after step 4 depends on the available software. If a suitable

program is available, we can use all the data to estimate the overall model that integrates the ARIMA sequence and intervention model. Otherwise, we may only use the difference in step 4 above to estimate the scale and nature of the intervention.

### Fixed Effect model

To compare the house price on the fertility rate across different regions in the Yangtze River Delta, I wielded a fixed-effect model. In statistics, a fixed-effects model is a statistical model in which the model parameters are fixed or non-random quantities. This is in contrast to random-effects models and mixed models in which all or some of the model parameters are random variables. In many applications including econometrics and biostatistics, a fixed-effects model refers to a regression model in which the group means are fixed (non-random) as opposed to a random-effects model in which the group means are a random sample from a population. Generally, data can be grouped according to several observed factors. The group means could be modelled as fixed or random effects for each grouping. In a fixed-effect model, each group means is a group-specific fixed quantity.

In panel data where longitudinal observations exist for the same subject, fixed effects represent the subject-specific means. In panel data analysis the term fixed effects estimator (also known as the within estimator) is used to refer to an estimator for the coefficients in the regression model including those fixed effects (one time-invariant intercept for each subject).

## Results and Discussion

### The Impact of House Price on Fertility Rate in Shanghai

After the Autocorrelation check and seasonal adjustments, I first use the house price as an

intervention term and build an Intervention Analysis model on the fertility rate. After estimating the parameters of the house price, I found that the relative strength of intervention is 1.75, both significant at the level of 0.05 and positive. Besides, I ran a regression model to see how other social and geographical factors, including housing price, GDP per capita, high school student number, unemployment population size and petroleum investment, the influence fertility rate in Shanghai, with the results shown in Table 1.

Table 1. Regression analysis of influential factors on fertility rate in Shanghai

Variables	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	4.10	2.87	1.43	0.18
House_price	0.00	0.00	-0.93	0.37
GDP_per_capita (RMB)	0.00	0.00	0.74	0.47
High_school_student_num (10K)	0.78	0.29	2.67	0.02**
Unemployment_num (10K)	-0.28	0.16	-1.76	0.10*
Petroleum_investment (100M RMB)	-0.01	0.05	-0.17	0.87

Note. Significance level: '\*' 0.1; '\*\*' 0.05; '\*\*\*' 0.01.

Through the analysis results, I find that Shanghai's housing price has a negative influence on its fertility rate. There is a continuously increasing trend in housing prices from 2000 to 2020. Housing prices continue to rise. Most people, especially young people of marriageable age or remaining age, cannot afford the expensive housing prices in Shanghai. People usually choose to rent or buy a house with a loan or move away from the city centre to the rural area or urban-rural fringe. Giving birth to a child is a burden for people nowadays. Most of them will not choose to have a child when they cannot afford the housing price, which brings additional financial pressure to them.

The results of the model analysis show that the size of the unemployed population also harms the fertility rate, which means that the fertility rate will decrease as the size of the unemployed



population expands. When a person cannot find a job without any income, he will have no money to support himself, his family, and not to mention a child. Uncertainty or even lack of income will greatly inhibit people's willingness to bear children, thus leading to a decline in fertility.

There are two factors that have positive impacts on Shanghai's fertility rate. One is GDP per capita. It is a standard for measuring the living standards of the people of a country. Combining it with the fertility rate analysis can conclude that when people's living standards improve, the fertility rate will also increase. The standard of living includes many aspects such as food, clothing, housing, and health. When people's living standards improve, housing, travel, health care, etc. will no longer be troublesome issues for people. People will have the ability to bear and raise children, bear the costs and energy they will spend after the child is born, such as going to school, insurance and so on.

The second factor is the number of high school students. I use it to represent the popularization of education in Shanghai. Unexpectedly, it has the most obvious positive impact on fertility. In other words, the higher the popularity of education, the higher the fertility rate. People's low willingness to have children is largely due to the economic and social pressures of having children, especially children's education, because the most important thing for a child's future is the education for the first half of their life, and he is unable to give the best education for children seems to be social pressure for parents. Better education may mean more expensive school district housing, more expensive tuition, and more investment in children's education. All kinds of pressure from education inhibited people's willingness to have children. However, if education is popularized, or the penetration rate becomes higher, this

means that after a child is born, there is a high probability that a good education will be received, which will provide an extra guarantee for the child's future, which will undoubtedly reduce the pressure on parents. People's willingness to choose to have children will increase as a result, and the fertility rate will rise.

### Comparisons Among Different Areas in Yangtze River Delta

The Yangtze River Delta includes the provinces of Zhejiang, Jiangsu, Anhui and Shanghai. I chose to make a horizontal comparison between Zhejiang, Jiangsu and Shanghai because these three regions are the most famous areas in the Yangtze River Delta region. I ran a fixed-effect model to compare the commonalities and differences in the impact of house prices on the fertility rate, and the results are shown in Table 2.

Table 2. Fixed effect model for comparing Jiangsu, Zhejiang, and Shanghai

Variables	Estimate	Std. Error	Pr(> t )
GDP.10MRMB	0.00	0.00	0.05**
Industry.10MRMB	0.00	0.00	0.29
Agriculture.10MRMB	0.00	0.00	0.52
Finance.10MRMB	0.00	0.00	0.01***
HousePrice.RMB	0.00	0.00	0.09*
High School Student Num	-0.02	0.01	0.10*
Crude Oil Price.USD	0.02	0.01	0.02**
Area Jiangsu	10.79	1.56	0.00***
Area Shanghai	5.70	0.40	0.00***
Area Zhejiang	10.46	0.93	0.00***

Note. Significance level: '\*' 0.1; '\*\*' 0.05; '\*\*\*' 0.01.

House prices in all three areas continued to rise substantially during this period. From 2000 to 2020, the housing price in Zhejiang ranked second among the three regions. In 2020, the housing price was around 15,000 yuan per square meter, and its birth rate was the highest, there has been a slight increase in the birth rate in Zhejiang, the birth rate was around 11% in 2020. Jiangsu province has the lowest housing price of the three regions, averaging 20,000 yuan per square meter in 2020. Its birth rate ranks second and has stabilized at 9.5% in the past two decades.

Shanghai's housing price is the highest, with an average of 30,000 to 35,000 yuan per square meter in 2020, and its birth rate is the lowest, only about 7.5% in 2020. However, it increased significantly from 2000 to 2010 and then declined only slightly in the following ten years. In a horizontal comparison, the impact of housing prices in three regions on the local fertility rate is Zhejiang>Jiangsu>Shanghai.

Housing prices in Zhejiang have the greatest impact on its birth rate. Zhejiang Province is located in the south wing of the Yangtze River Delta on the southeast coast of China and faces the East China Sea to the east. It is one of the birthplaces of ancient Chinese civilization. The excellent geographical environment has allowed Zhejiang to become rich in fisheries in ancient times. Therefore, it has a strong economic foundation. Zhejiang is now one of the most active provinces in China. Under the premise of giving full play to the leading role of the state-owned economy, it is based on the private economy. Development has driven the economy to take off, forming a distinctive "Zhejiang economy". By 2013, the per capita disposable income of residents ranked first in China for 21 consecutive years. Zhejiang's private economy has developed rapidly and accounted for the bulk of the local economy, which has created the character of Zhejiang's "hiding wealth in the people". This is why the Chinese have the traditional impression that "Zhejiang people are very rich". However, the facts are similar. According to statistics from the Zhejiang Provincial Health and Family Planning Commission, since the 1990s, the cumulative number of voluntarily giving up births in the province has exceeded the cumulative number of unplanned births during the same period. The total number of more than 200,000 people. In addition, even though the house prices of Wenzhou and Shaoxing (two major cities in

Zhejiang Province) are still rising in 2010, compared with the increase of 67% or even doubled last year, the rise of house prices has slowed down significantly (Pang, 2011). It may attract fewer people to come to Zhejiang and have housing investments. The locals are rich and comfortable, the service industry is developed, and the city is civilized and clean. If people already have a child, they do not need to have so many children. Therefore, for Zhejiang, the impact of housing prices on the birth rate has become even greater. If housing prices rise, this will to a certain extent attract migrants to invest or live here, and the settlement of migrants is bound to increase the local birth rate. Therefore, Zhejiang's birth rate is more affected by housing prices.

Jiangsu has a large population and is also a famous education province in China. There are many prestigious schools and the pressure of college entrance examinations. Parents in Jiangsu attach great importance to the education of their children. They generally believe that as long as their children are willing to study, they must pay for it, even if their academic performance is not good, they will not let their children go out to find a job after graduating from junior high school, and most of them choose to go to a vocational high school, learn some skills and so on. A lot of energy and money has been invested in cultivating one child, and most families cannot afford one more child. If housing prices also change at this time, for example, if housing prices rise, people may not be able to pay even the basic housing prices or there may be financial pressure. They may give up the plan of having babies when they think about the cost of raising children in the future, especially education. By analyzing the average marriage age and childbearing age of young people in Zhenjiang (a city in Jiangsu Province) from 2003 to 2012, the paper concludes that the average

marriage age and childbearing age of young people will be significantly delayed with the rise of a house price index (Meng, 2013). From this point of view, in Jiangsu, housing prices also have a significant impact on the birth rate.

However, Shanghai has almost the highest average housing price in China. Even so, Shanghai, a highly developed area with more development opportunities, is still the first choice for many domestic and foreign residents to choose to settle. There is great competition in Shanghai, both in terms of work and resources. Therefore, no matter how expensive the house price is, most people are still willing to live frugally and even borrow money to buy a house in Shanghai, just to find a place for themselves in this huge city. In addition, there is also a certain survival of the fittest in the fierce competition. Most of the people who stay in Shanghai can survive in Shanghai and start a family then have children, and some people even choose to let the child be born in Shanghai for the best education. Therefore, the housing price in Shanghai will not have too much influence on its birth rate.

#### **Cross Area Analysis**

We also take a look at the cross area influence of housing prices and found that the impact of Shanghai's housing prices on the birth rate of Jiangsu and Zhejiang is positive and significant, and it is greater than the impact on the birth rate of Shanghai's population. In other words, the rising housing prices in Shanghai will bring about an upward trend in the birth rates of Zhejiang and Jiangsu. On the contrary, when housing prices in Shanghai fall, the birth rates in these two provinces will also fall.

When housing prices in Shanghai rise, a large number of people will leave Shanghai because they cannot afford the rent. They will also choose to stay in areas near Shanghai in addition to

major cities such as Beijing and Shenzhen. The Yangtze River Delta region is A very suitable choice. It is defined in the concept of the industrial economy as the industrial economic belt of southern Jiangsu and northeastern Zhejiang with Shanghai as the leader. This is my country's current economic sector with the fastest economic development, the largest economic aggregate, and the most potential for development. For people who leave Shanghai because of high housing prices, the housing prices here are slightly lower, and the cost of living is relatively small, but the fast economic development of Shanghai has a great role in promoting personal development, and these areas are still close to Shanghai, and Shanghai's economic advantages can still radiate to the provinces and cities of the Yangtze River Delta. The more people withdraw from Shanghai and settle in Zhejiang and Jiangsu, the birth rate of these two places will naturally rise.

This conclusion may also be due to the impact of Shanghai's housing prices on the plans of people who might want to move to Shanghai from Zhejiang and Jiangsu. In the past ten years, the number of immigrants in Shanghai has far exceeded that of the locals living here. They come from all over China, but more than 80% are from Jiangsu and Zhejiang provinces. Many people from Zhejiang and Jiangsu, especially young people of working age or marriageable age, have many intentions to settle in Shanghai. At this time, the rising housing prices in Shanghai also brought economic pressure to their lives. Some of them would choose to stay in the local area and establish a family there, get married, and have children. The birth rate in Zhejiang and Jiangsu increased as a result.

In contrast, Shanghai's housing prices will have a smaller impact on Shanghai's birth rate. Shanghai has a policy on residence registration,

which clearly requires that you have to hold the “Shanghai Residence Permit” for 7 years. Therefore, for “Shanghaiers” or those who would like to settle in Shanghai, they need to stay here for a long time. Once settled, most people will not give up the advantage of settling in Shanghai. Secondly, the housing prices in each area of Shanghai are generally higher than the average housing prices in other cities. Therefore, housing prices are a problem that must be faced when staying in Shanghai. This is not enough to prevent those who stay in Shanghai from continuing their life process. This includes giving birth to children. In addition, most of the population staying in Shanghai are middle-class and above people with advanced education. They do not have a traditional concept of fertility. Most women choose to have late childbearing or continue their professional careers and give up childbirth. It can be seen that Shanghai housing prices will not have a great impact on the local fertility rate.

### Conclusion

In the past ten years, China’s population aging speed has been increasing. China has become the fastest aging country in the world. The main reason for this result is China’s low fertility rate and increased life expectancy. Therefore, the fertility rate has gradually become a topic of concern in recent years. Housing prices are always closely related to our lives and are one of the most discussed topics among adults. I focused my attention on Shanghai, one of the cities with the highest housing prices in China, and tried to explore the relationship and impact it can affect between the fertility rate in the Yangtze River Delta and Shanghai’s housing prices.

Through the research and analysis of this topic, it shows that Shanghai’s housing prices have an inhibitory effect on Shanghai’s fertility rate

(birth rate). To a certain extent, higher housing prices mean more pressure, which comes from various aspects, such as economic and social aspects. Similarly, another possible influential factor, the unemployment rate, also has an inhibitory effect on the fertility rate. The reason is the same as that of high housing prices. On the other hand, GDP per capita and the popularization of education have a positive effect on fertility. In a horizontal comparison, the impact of house prices in various regions on their fertility is Zhejiang > Jiangsu > Shanghai. This conclusion can be attributed to the different development methods and ideological concepts of various regions, such as education, real estate investment, work and other human factors. The impact of Shanghai’s housing prices on the fertility rate in Zhejiang and Jiangsu is positive and significant, and it is also greater than the impact on the local fertility rate in Shanghai. This kind of cross-regional influence can be attributed to the migration of the population, the concept of fertility, and the difference or change of personal life planning. For managerial implication, our research suggests that to maintain a healthy fertility rate, the government needs to care about certain social and geographical factors within a city or province, and also take influencing factors in neighbourhood areas into consideration, among which housing price is a key factor.

**Conflict of Interests:** the author has claimed that no conflict of interests exists.

### References

1. Balbo, N., Billari, F. C., & Mills, M. (2013). Fertility in Advanced Societies: A Review of Research / La fécondité dans les sociétés avancées: un examen des recherches. *European Journal of Population / Revue Européenne de Démographie*, 29(1), 1–38. <http://www.jstor.org/stable/42636100>

2. Billari, F. (2004). Becoming an Adult in Europe: A Macro/(Micro)-Demographic Perspective. *Demographic Research*, 3, 15-44.
3. Bongaarts, J., & Watkins, S. (1996). *Social interactions and contemporary fertility transitions. Population and Development Review*, 22(4), 639-682
4. Bragoudakis, Z. G., Emiris, M., & Constantinescu, M. (2016). *Selected Review of the Empirical Literature on House Price Modelling and Forecasting: What Does the Literature Say?*
5. Chen, Y. (2016). New population policy and its economic and social impact. *Academia Bimestrie*, 1, 62-66 (in Chinese).
6. Dettling, L. J., & Kearney, M. S. (2014). House prices and birth rates: The impact of the real estate market on the decision to have a baby. *Journal of Public Economics*, 110, 82-100.  
<https://doi.org/10.1016/j.jpubeco.2013.09.009>
7. Fang, H., Gu, Q., Xiong, W., & Zhou, L.-A. (2015). Demystifying the Chinese Housing Boom. *National Bureau of Economic Research Working Paper Series, No. 21112*.  
<https://doi.org/10.3386/w21112>
8. Li, L., & Wu, X. (2014). Housing prices and entrepreneurship in China. *Journal of Comparative Economics*, 42, 436-449.  
<https://doi.org/10.1016/j.jce.2013.09.001>
9. Li, P., & Song, S. (2016). What Pushes Up China's Urban Housing Price So High? *The Chinese Economy*, 49(2), 128-141.  
<https://doi.org/10.1080/10971475.2016.1143306>
10. Li, Y., Li, X., & Gao, B. (2012). Study on the impact of rising housing prices on residents' fertility behaviour. *Social Science Journal of Hunan Normal University*, 6, 99-103 (in Chinese).
11. Liu, J., Xing, C., & Zhang, Q. (2020). House price, fertility rates and reproductive intentions. *China Economic Review*, 62, 101496.  
<https://doi.org/10.1016/j.chieco.2020.101496>
12. Meng, X. (2013). An Empirical Analysis of the Impact of House Price Rising in the Transition Period on the Delay in the Age of Marriage and Childbirth for Youth—Using Zhenjiang as an Example. *Science & Technology Vision*, 28, 129 (in Chinese).
13. Mu, G. (2017). Effects and prospects of the implementation of the comprehensive two-child policy. *China Policy Review*, 1, 24-26 (in Chinese).
14. Neels, K. (2010). *Temporal variation in unemployment rates and their association with tempo and quantum of fertility: Some evidence for Belgium, France and the Netherlands*. Paper presented at the Annual Meeting of the Population Association of America, Dallas, 17 April.
15. Pang, Y. (2011). Zhejiang: Private capital supports strong housing prices. *China Real Estate News*, 14 (in Chinese).
16. Song, J. (2016). The environment and the purpose of the two-child policy in China. *Population & Economics*, 4, 121-126 (in Chinese).
17. Su, C.-W., Khan, K., Hao, L.-N., Tao, R., & Peculea, A. D. (2020). Do house prices squeeze marriages in China? *Economic Research-Ekonomska Istraživanja*, 33(1), 1419-1440.  
<https://doi.org/10.1080/1331677X.2020.1746190>
18. Wei, S.-J., & Zhang, X. (2011). The Competitive Saving Motive: Evidence from Rising Sex Ratios and Savings Rates in China. *Journal of Political Economy*, 119(3), 511-564. <https://doi.org/10.1086/660887>

19. Westoff, C., & Ryder, N. (1977). *The predictive validity of reproductive intentions. Demography*, 4, 431–453.
20. Wrenn, D. H., Yi, J., & Zhang, B. (2019). House prices and marriage entry in China. *Regional Science and Urban Economics*, 74, 118–130.  
<https://doi.org/10.1016/j.regsciurbeco.2018.12.001>
21. Wu, F. (2015). Commodification and housing market cycles in Chinese cities. *International Journal of Housing Policy*, 15(1), 6–26.
22. Yi, J., & Yi, X. (2008). Increasing housing prices and secular fertility decline in Hong Kong. *China Economic Quarterly*, 3, 9 (in Chinese).
23. Zhong, X. (2016). Study on the evaluation and improvement path of China's universal second-child policy: Based on the survey of reproduction willingness of urban couples both of whom are not the only child. *Chinese Public Administration*, 7, 127–131 (in Chinese).