





ARTICLE



<https://doi.org/10.1057/s41599-022-01400-4>

OPEN

# The economics of marriage: Evidence from China

Zhitong Gao<sup>1</sup>, Jihong Pang<sup>2</sup> & Hongyong Zhou<sup>2</sup>  

Marriage market imbalances are common in modern society for social and economic reasons, including the increased cost of marriage caused by high housing prices and an imbalance in the number of men and women. We draw on the family economic theory of Gary Becker to study the general equilibrium of the marriage market in China. On the one hand, we find that the increasing price of houses, an important measure of marriage cost, has significantly reduced the marriage rate in China. Another determining factor that has reduced the marriage rate is an imbalance in the sex ratio, with more men than women, as a result of China's one-child policy. On the other hand, higher GDP and educational levels have positive effects on the marriage rate. Interestingly, the rise in housing prices after the implementation of the two-child policy in China has had a more negative impact on the marriage rate. Overall, our findings have important policy implications for government.

<sup>1</sup>School of Economics and Management, Zaozhuang University, Zaozhuang, China. <sup>2</sup>College of Business, Shaoxing University, Shaoxing, China.  
✉email: [zhouhy@usx.edu.cn](mailto:zhouhy@usx.edu.cn)

## Introduction

There are generally two types of marriage costs in the world: dowries and betrothal gifts. The difference between the two is that dowries are paid by the bride's family to the bridegroom's family, whereas betrothal gifts are given by the bridegroom's family to the bride's family. The cost of marriage varies significantly and shows different characteristics across countries and regions (Rao, 1993). For instance, with rapid economic growth in India and China, the cost of marriage in these countries has been increasing, while it is decreasing in European countries (Rao, 1993). Although the reasons for the increased cost of marriage in certain countries are complex, the following two factors need to be considered: First, an increase in the cost of marriage helps improve an individual's position in the family (Srinivasan, 2005). In societies in which men traditionally have more power than women, women are normally eager to improve their economic status in the family. Bursztyn et al. (2017) report that marriage can give people an economic boost, especially single women who do not want to be seen as ambitious before getting married. Career ambition seems to be an undesirable trait in the marriage market, even though the ability of single women to work is no different from that of married women (Maristella and Aloysius, 2003). Thus, some parents offer a higher value dowry to show that their family is wealthy, helping secure their daughter's future economic status in the family (Srinivasan and Bedi, 2007). Second, as the gender imbalance becomes more severe, marriageable young people have more difficulty finding suitable partners (Chen and Qiu, 2011). In the past, Chinese young women always asked for the 'Big Three' (Li, 2002), which became the basic material standard by which a female chose a spouse.<sup>1</sup>

In some countries, increased marriage costs have led to the emergence of a series of social problems, such as domestic violence and a rising divorce rate (Das Gupta and Shuzhuo, 1999). For example, parents in India are willing to pay larger dowries to improve the economic position of their daughters in their married life, but this increase in dowries has exacerbated domestic violence (Anderson, 2007). Worse still, some men threaten women or use force to hasten divorce so that they can receive another dowry (Vinod, 2007). Farnham et al. (2011) examine the opposite aspect of this paper by exploring the relationship between housing prices and divorce rates. They find a positive correlation between house prices and divorce rates. In other words, the higher the housing price, the higher the divorce rate (Duan, 2017). China is another populous country facing marriage problems, mainly due to the increased value of betrothal gifts. China's marriage tradition is for the groom to provide a marital house (Liu, 2018); as a result, the purchase of a house becomes an important part of the marriage cost. Many would-be Chinese mothers-in-law do not want their daughters to marry young men who do not own a house or who cannot afford to buy one. Buying a house has therefore become one of the main financial pressures on unmarried men, and on the parents of unmarried men, in China today (Xu et al, 2012). Buying a house for marriage is directly linked to the skyrocketing price of houses in China, as captured in the notion of the 'mother-in-law economy' (Yu, 2012). As housing prices continue to rise, many young people opt out of marriage because they cannot afford to buy a house. Furthermore, married couples may even choose to divorce because they cannot pay the mortgage on their home. Among other policies in recent years, the Chinese government has introduced the two-child policy and the recently implemented Marriage Law to address the imbalance between supply and demand in the marriage market.

Considering the imbalance in the marriage market, caused by social and economic factors including the increased cost of marriage due to high housing prices and the unequal numbers of men and women, our aim in this paper is to explore the impact of

various factors on the equilibrium of the marriage market. Based on the family economic theory of Gary Becker (1974), we study the general equilibrium of the marriage market in China, the increased cost of marriage, and the government's attempts to address the associated problems. We seek to investigate the effects of these policies and provide advice to policymakers on maximising social welfare. Our empirical tests are conducted using a multivariate regression, with data from China from 2002 to 2021. We find that the increasing price of houses, an important measure of marriage cost, has significantly reduced the marriage rate in China. For every 1000 yuan increase in property prices per square meter, the marriage rate falls by 0.3%. Another determining factor that has reduced the marriage rate is an imbalance in the sex ratio, with more men than women, as a result of China's one-child policy. On the other hand, higher GDP and educational levels have positive effects on the marriage rate. Interestingly, the rise in housing prices after the implementation of the two-child policy in China has had a serious negative impact on the marriage rate.

## Literature review

The cost of marriage has shown an upward trend in Asia and a downward trend in Europe (Anderson, 2003). Since the 1980s, many women have used marriage to escape poor areas and move to more prosperous ones, especially in less developed regions. This mass relocation of women through marriage has had a serious 'bride drain' effect on poor areas (Davin and Delia, 2007) and leaves men in poverty-stricken areas having to pay a high cost to marry. The phenomenon is especially prominent in some rural areas of China. In the 1980s, grooms had to pay close to a year's income to get a bride, and the cost was even higher in rural southern China. Anderson (2007) shows that in some countries, the payment for marriage can be as high as 30 years of expenses for a family. Worse still, the cost of marriage in these countries continues to rise. Marriage payments are made not only as dowries from the family of the bride but also as betrothal gifts from the bridegroom's side. With the increasing size of dowries, men must pay significant costs to wed (Menon and Seetha, 2020).

Large dowries are associated with a series of negative consequences for women, such as domestic violence, exploitation, and abandonment. In addition, in some rural areas, the presence of dowries increases the economic returns of sons and reduces the returns of daughters, which influences parents' birth decisions (Marco, 2017). Anderson (2007) provides two reasons for the increase in marriage costs: demographic change and social status. An imbalanced sex ratio is a common issue in some Asian countries where sons are preferred over daughters at birth. The preference for sons can be so ingrained that some parents will decide whether to abort based on the sex of a foetus, which further widens the difference in numbers between the sexes. Anderson (2007) points out that increases in the cost of marriage lead to the creation of property rights. This problem is particularly significant in China, where the house paid for by the husband is regarded after marriage as the common property of the husband and wife (Zheng and Yang, 2003). Although the 2011 Marriage Law clarified the ownership status of premarital property, husbands still want to share their premarital property to demonstrate loyalty to the marriage; wives are also able to obtain property protection during the marriage. Although the Chinese government has proffered solutions to the related social problems, the outcomes are not satisfactory. China has relaxed the one-child policy to allow a second child, yet it seems unlikely that the ideological preference for sons will be eradicated any time soon.

The term ‘mother-in-law economy’ is unique to China’s real estate market and clearly refers to the strict demand from would-be mothers-in-law for a marriage house—which is probably contributing to the continuous rise of housing prices in China (Wang and Liu, 2007). According to Feng (2009), the Vice President of the China Real Estate and Housing Research Association, the idea of mothers-in-law pushing up housing prices in China is not a joke but a reality. In fact, the term ‘mother-in-law economy’ is used frequently in serious meetings. The phrase ‘no home no marriage’ is an apt description of Chinese-style marriage. According to a recent survey (Hu and Li, 2019), two-thirds of the post-1990 generation entering marriageable age still hold the view that a house is necessary for marriage, even if they are unwilling to take on a large mortgage. The ideological preference for sons is a key factor in the mother-in-law economy because in conjunction with China’s one-child policy it has caused an imbalance in the sex ratio. As men’s difficulty finding a suitable marriage partner increases, some Chinese families must take on huge housing loans to meet marriage conditions. The debt leverage ratio of Chinese families is rising along with housing prices, and although the rigidity of demand is very severe in China’s real estate market, the speed with which real estate developers increase housing prices exceeds the rise in people’s purchasing power, which may present a major risk to the real estate market and even endanger the broader economy.

**Theoretical model**

**Gary Becker’s theory of family economics.** In Gary Becker’s research, the marriage market can be divided into multiple sub-markets, such as monogamy, polygamy, and polyandry. Another new finding comes from Dupuy and Galichon (2014) on the importance of compatibility in a relationship. However, the degree of compatibility is related to personality traits. When people make choices in the marriage market, they tend to show many qualities such as conscientiousness, autonomy, and extroversion. These traits are linked to other factors such as education, height, and body mass index (BMI). Hamilton (2009) points out that domestic work is important to a wife, because the wife’s personal contribution to the family, such as domestic labor, helps her gain an advantageous position in the prenuptial property contract.

In this paper, in light of the provisions of China’s Marriage Law, we only consider monogamy. We assume that men and women in the marriage market are rational in choosing whether to marry and that the choice between remaining single or getting married is entirely voluntary. To be specific, we suppose that a man *i* chooses to marry a woman *j* because the marriage is a significantly better option than staying single or marrying another woman, and that the woman is making the same rational choice to marry. *Marriage market equilibrium* is the scenario in which every man and every woman in the market has made a rational choice, meaning that nobody wants to get out of or into a marriage.

This paper draws on Becker’s family economic theory to analyse the utility and cost of marriage at the micro level. To simplify the model, it is assumed that the marriage market can be divided into several homogeneous secondary marriage markets according to regional marriage customs, religious beliefs, national characteristics, and personal appearance. For example, Tibetans are more likely to marry people of the opposite sex who are also Tibetans. Besides dowry and dowry, the utility  $U_{ij}$  (where the subscripts *i* and *j* represent the individual numbers of men and women in the marriage market) that marriage brings to a couple also comes from family service, the spouse’s education level, family background, income level, and other factors (Hamilton,

2009). Some economists even incorporate the time factor into research on the relationship between individual behaviour and utility (Becker,1974). From this, we can obtain the marriage utility function of *i* and *j*, such as Eq. (1):

$$U_{ij} = f(C_{M_i}, C_{W_j}, E_{M_i}, E_{W_j}, H_{M_i}, H_{W_j}) \tag{1}$$

where  $M_i$  and  $W_j$  represent males *i* and females *j* in the marriage market respectively,  $C_{M_i}$  represents the number of betrothal gifts and  $C_{W_j}$  represents the amount of dowry, respectively;  $E_{M_i}$  and  $E_{W_j}$  represent the education level of  $M_i$  and  $W_j$ , respectively; and  $H_{M_i}$ ,  $H_{W_j}$  represent the services invested by both parties in the marriage.

To facilitate the analysis, the utility function of the above complex structure is simplified into two factors, that is,

$$U_{ij} = f(C_{M_i}, C_{W_j}, H_{M_i}, H_{W_j}) \tag{2}$$

At this point, the input budget of both parties can be expressed as  $I_{ij}$ :

$$I_{ij} = P_c \times C_{M_i} + P_c \times C_{W_j} + P_H \times H_{M_i} + P_H \times H_{W_j} \tag{3}$$

The  $P_c$  in the formula refers to the number of betrothal gifts (or dowry) and  $P_H$  to the price of family services.

Considering the irreplaceable characteristics of betrothal gifts or dowry and family services, we can use Lyon’s utility function to describe that of marriage, as shown in formula (4).

$$uC, H = \min\{aC, bH\} \tag{4}$$

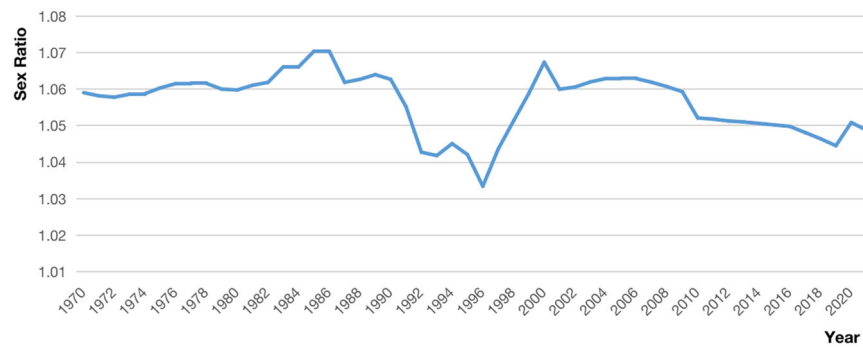
If we set the budget for  $M_i$  and  $W_j$  in marriage to  $w$ , then  $w$  contains the wealth support provided by both  $M_i$  and  $W_j$ ’s parents and the expected income of the couple after they have made their choice of partner. Thus, the number of balanced  $C_{ij}$  and  $H_{ij}$  can be obtained as follows:

$$C_{ij} = \frac{bw}{b^*P_{Cij} + a^*P_{Hij}}; H_{ij} = \frac{aw}{b^*P_{Cij} + a^*P_{Hij}} \tag{5}$$

Suppose the marriage market is balanced in the original state. However, this balance is very fragile, and many factors can break it. For example, the increasing sex ratio imbalance makes it more difficult for people to find suitable marriage partners, so the cost of marriage increases. However, it is quite simple to see from the above expression that the increasing cost of marriage ( $P_{Cij}$ ) will break the balance in the competitive market. As the cost of marriage increases, the original set of optimal options will change, which will result in at least one partner losing some of the benefits. From the perspective of the simplest utility theory, even if the marginal utility is decreasing, the number of available products will decrease due to the increase in price, which will make people more ‘unhappy’. According to the foregoing discussion, the marriage market is no longer in equilibrium. In contrast to Gary Becker’s economic theory, this means that rational marriage market participants will make other choices, that couples who had planned to get married will delay or give up marriage, and that even couples who were married will choose divorce. Thus, the most direct manifestation of the marriage market imbalance can be seen in the decline in the marriage rate and the rise in the divorce rate.

**Empirical results**

From our theoretical model, increasing the cost of marriage to buy a house is unfavourable because it will reduce happiness in the marriage. However, the cost of marriage varies with many factors and between countries. Our results are derived from an analysis of data from China, where the preferences of mothers-in-law are exacerbating the increase in housing prices. The above



**Fig. 1 Sex ratio in China 1970–2020 (number of males per female).** The line chart in the figure shows the change in the sex ratio in China over the past 50 years. The obvious gender imbalance caused by the one-child policy has gradually eased under the influence of the two-child policy.

literature review reveals two reasons for the rising cost of marriage in China: a gender imbalance and rising housing prices. The preference for sons and the one-child policy widens the numerical gap between men and women, and the uneven sex ratio further contributes to the rise in housing prices.

**China's sex ratio.** As shown in Fig. 1, from 1970 to 1985, China's sex ratio remained between 1.06 and 1.07 but increased slightly over the years. From 1996 to 2017, the Chinese average sex ratio stayed above 1.06 (the ratio is below 1.05 in 2017), meaning that 7 out of every 100 Chinese males could not find a marriage partner. The turning point of this phenomenon was after the promulgation of the one-child policy in the 1970s (it was established in 1975 but the implementation took some time). Therefore, we cannot ignore the impact of the one-child policy on the imbalance in the sex ratio. Influenced by ancient Chinese male-centred thinking, the consciousness of a 'son preference' is deeply rooted in many parts of China. Although the implementation of the one-child policy alleviated the dilemma of gender imbalance to some extent, with the relaxation of that policy and the lifting of the two-child policy (after widespread implementation in 2016), the phenomenon of gender imbalance has begun to appear again. With more men than women, competition is increasing in the marriage market and forcing the families of would-be grooms to pay more for marriage. The map in Fig. 2 shows the sex ratio of 31 provinces in China in 2021. A darker colour indicates a more unequal sex ratio, and the figures in the legend represent the number of men for every 100 women.

Figure 2 shows clearly that the preference for sons over daughters is most evident in southern provinces, such as Guangdong and Fujian. These provinces, especially in rural areas, have a stronger tradition of son preference than other provinces. Given that in the Chinese tradition only a son can inherit the family's property, a couple without a son has no heir. Although it is illegal to test the sex of a foetus before birth, some patriarchal families resort to illegal methods to do so and may even terminate the pregnancy if the foetus is female. The choice to abort is largely due to the one-child policy, which prevented many couples from having a daughter and then trying for a son.

To show the difference between the genders more intuitively, the number of males and females in a sample of the Chinese population in recent years is presented in a bar chart in Fig. 3. The chart shows clearly that men (indicated by the orange bars) are often left behind in the marriage market.

**Housing prices in China.** In China, housing prices are influenced by many factors, such as the GDP of each province, population size, and residents' preferences. However, the general upward trend in Chinese housing prices is clear. As shown in Fig. 4,

except for the financial crisis in 2008, China's housing prices have increased rapidly. In 2021, for example, China's housing price is 10,139 yuan (\$1571.94) per square meter, representing a big jump in housing prices from twenty years ago in 1999, which is 1867 yuan (\$224.32) per square meter.

Rising housing prices have made marriage more expensive in China, as a country with a 'no home, no marriage' mentality in which the purchase of a house is one of the costs of getting married. When housing prices continue to rise, a housing bubble is difficult to avoid. Many scholars have given a relatively clear definition of a housing bubble, among which the most widely used indicator is the ratio of housing prices to the average annual income. It is generally accepted internationally that housing prices are reasonable at between 3 and 6 times the average annual income. Zhang and Tao (2020) report that China's housing price-income ratio has been higher than this reasonable range for some time. As shown in Fig. 5, the ratio of housing prices to income in China was near or above 0.3 from 2003 to 2021 and was even close to 0.5 in some years. Although there are several reasons for the housing bubble in China, many experts believe the rigid demand for marriage homes is one of its most serious and unique causes. Some young men make it their life goal to buy a house, while some women consider home ownership a criterion when choosing a spouse. These social problems can be viewed as externalities, which refer to costs (negative externalities) or benefits (positive externalities) that an individual or group does not choose. As the externalities considered in this paper lead to people paying more for marriage, they are considered negative externalities. The empirical analysis presented below elaborates on the relationship between the cost of marriage and housing prices in China.

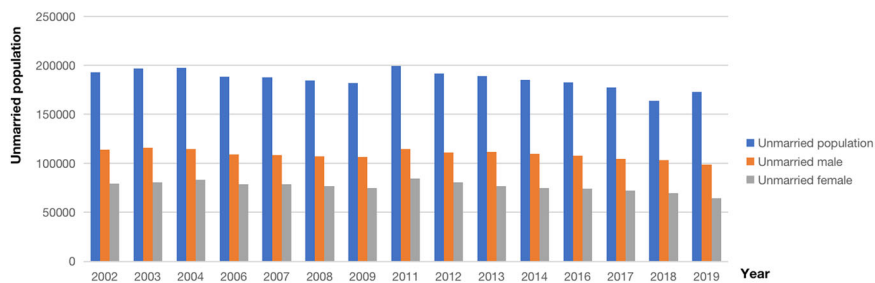
**Empirical analysis.** Given the presence of both a gender imbalance and a housing bubble in China, it is worth considering whether these factors have a significant impact on the imbalance in the marriage market. We collected statistical data from 31 provinces in China over a 20-year period (from 2002 to 2021) and used a simple econometric regression model to show how the above factors affect the balance of the marriage market. We constructed the regression model as follows:

$$\begin{aligned}
 \text{MARRIAGE\_RATE}_{i,t} = & \beta_0 + \beta_1 \text{HOUSE\_PRICE}_{i,t} \\
 & + \beta_2 \text{SEX\_RATIO}_{i,t} + \beta_3 \text{GDP}_{i,t} + \beta_4 \\
 & \text{DISPOSABLE\_INCOME}_{i,t} + \beta_5 \\
 & \text{EDUCATION\_RATIO}_{i,t} + \mu_i + \lambda_t + \varepsilon_{i,t}
 \end{aligned} \quad (6)$$

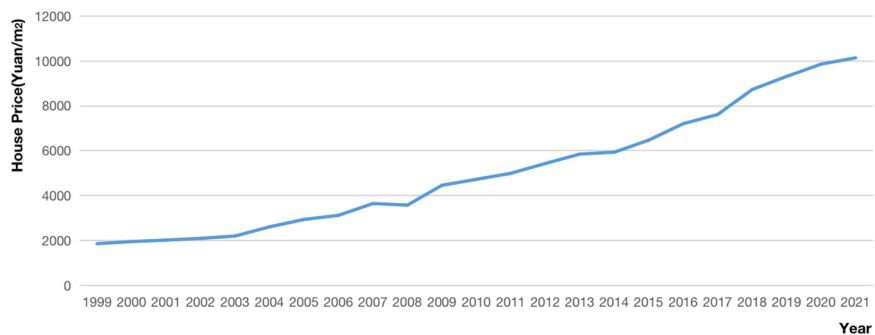
where  $i$  is the province and  $t$  is the year. To make the model clearer, Table 1 lists the definitions and units of the various factors. We include province-fixed effects ( $\mu_i$ ) to control for unobservable time-invariant provincial characteristics that may affect



**Fig. 2 Sex ratios of all Chinese provinces in 2021.** Figure shows the regional distribution of gender imbalance in the 31 provinces studied in this article in the form of a map. Darker colors in the figure indicate a more serious gender imbalance.



**Fig. 3 Unmarried population in China by gender, 2002-2019.** The bar chart in figure shows that the number of men is significantly larger than the number of women in the composition of the unmarried population.



**Fig. 4 Housing prices in China, 1999-2021.** Figure indicates the continuous upward trend of housing prices in China from 1999 to 2021.

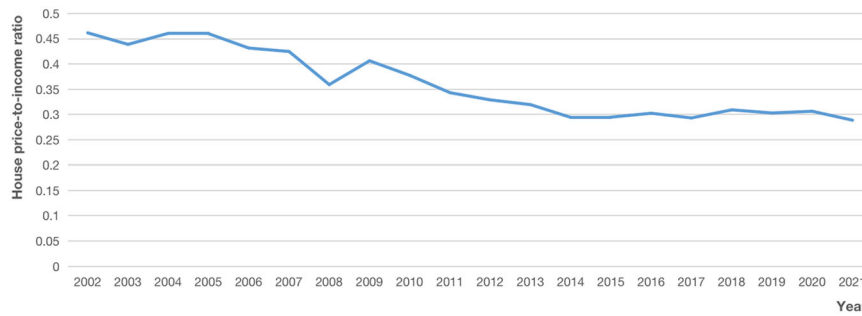
the marriage rate, and year-fixed effects ( $\lambda_t$ ) to control for contemporaneous changes in macroeconomic conditions. Standard errors are clustered at the province level.

Before analyzing the data, it is necessary to predict the impact of various factors on the marriage rate.

1. Housing prices (HOUSE\_PRICE): This variable is the primary focus of the paper. A high price of housing and rapid growth in housing prices is likely to discourage

marriage, given the rigid demand for marriage housing in Chinese families. We, therefore, hypothesise that housing prices are negatively correlated with marriage rates, such that higher housing prices are associated with fewer people being willing to marry. As mentioned above, an increase in the cost of marriage disrupts the equilibrium of the marriage market.

2. Sex ratio (SEX\_RATIO): As men are expected to buy houses in China, the sex ratio should be positively



**Fig. 5 Housing price to income ratio in China, 2003-2021.** Figure shows the share of disposable income spent on buying a house in China. In years when housing prices were booming, the share could approach 50%.

Table 1 Variable names and definitions.			
	Variable name	Variable notation	Definition
Dependent variable	Marriage rate (%)	MARRIAGE_RATE	The ratio of the number of marriages to the population in a given period
Independent variables	Housing prices (yuan/m <sup>2</sup> )	HOUSE_PRICE	Price of housing per square meter
	Sex ratio (female = 100)	SEX_RATIO	Ratio of male to female population
	Per capita GDP (yuan)	GDP	The ratio of GDP to the resident population of a region in a given period
	Disposable income per capita (yuan)	DISPOSABLE_INCOME	The sum of wage income and net income from operations, property, and transfers
	Number of parks (per thousand capita)	NUMBER_OF_PARKS	The total number of parks in a region
	Higher education ratio	EDUCATION_RATIO	The number of highly educated people in a region multiplied by a weighted number of colleges in that region

correlated with housing prices. As an increase in housing prices makes it more difficult for men to find a marriage partner, the sex ratio should be inversely proportional to the marriage rate. In other words, if the sex ratio in a province is higher, the marriage market will be further from equilibrium.

- GDP per capita (GDP): GDP (gross domestic product) is a measure of a region’s economic strength. In general, housing prices in developed regions are higher than those in developing regions, but marriage is also more affordable in economically developed regions. GDP and marriage rates should therefore move together in a positive direction.
- Disposable income per capita (DISPOSABLE\_INCOME): Income represents the economic strength of the people in an area. The more disposable income per capita, the greater the desire and power to invest in improvements to the housing environment. Therefore, housing prices and per capita income should be positively correlated.
- Higher education ratio (EDUCATION\_RATIO): People with higher education degrees have higher comprehensive quality. When faced with the challenges of marriage and the pressures of obtaining a marriage house, they may be more willing to meet the challenge (Musick et al., 2012). So, people who are highly educated may marry later in life, but they may be more willing to get married than the general population. Due to the uneven distribution of institutions of higher learning in China, we also consider the relative number of institutions of higher learning in each region based on the number of people with higher education.

The many other factors affecting marriage costs, such as the economic strength of residents, the different types of housing, and aspects of the surrounding environment, are measured in the residual items.

As mentioned, 20 years of statistics (from 2002 to 2021) are collected to refine the prediction of the marriage market equilibrium. As the data are available on the National Bureau of Statistics website, we can be assured of their credibility and accuracy. Considering the differences between mainland China and the autonomous regions of Hong Kong and Macao in the specific implementation of policies, these two regions are excluded.

Table 2 indicates that the maximum and minimum values of the marriage rates are 15.0463 and 1.6667, respectively. The marriage rate varies significantly in different regions of China during different years. The average marriage rate in China is 7.7929, a low number that will not only increase the ratio of the aging population in China (because fewer people are having children) but will also worsen the gender imbalance. Calculating the mean and standard deviation of the data values over the years, we find that the mean value of the housing price in the sample is 5596.56 yuan (USD888.34) per square meter, with a standard deviation of 198.37 (USD31.49). The housing price is high and has gone through a range of changes over the years. Therefore, it is of practical significance to discuss the relationship between housing prices and the marriage rate to balance housing prices and prevent a housing bubble.

**Regression results.** We now further analyse the factors affecting the marriage market equilibrium using the data from each province over the 20-year period (2002–2021). In the comprehensive regression model, the average housing price level, sex ratio, GDP per capita, disposable income per capita, and higher education level of each province over the years are selected as independent variables. The regression results are shown in Table 3.

According to the regression model, each variable has a significant impact on the marriage rate (all *p*-values are

**Table 2 Descriptive statistics of the variables.**

Variables	Mean	Median	Std. dev.	Min.	Max.
MARRIAGE_RATE	7.7929	7.7318	2.0122	1.6667	15.0463
HOUSE_PRICE	5596.5553	4494	198.3683	1062	37,665
SEX_RATIO	104.1501	103.85	0.1703	92.25	123.17
GDP	38,883.25	33,528.5	1147.8564	3257	173,630
DISPOSABLE_INCOME	16,879.3596	14,337	479.725	3625	78,027
EDUCATION_RATIO	11.0105	10.9962	0.2320	1.0110	20.9997

**Table 3 Regression results for marriage rate.**

Dependent variable: MARRIAGE_RATE	
Intercept	5.1135*** (0.3211)
HOUSE_PRICE	-0.0003*** (0.000027)
SEX_RATIO	-0.0181*** (0.0024)
GDP	0.000013*** (0.000013)
DISPOSABLE_INCOME	-0.0004*** (0.000035)
HIGHER_EDUCATION	0.2587*** (0.0227)
R-squared	0.6516
Observations	620

statistically significant). The goodness of fit measure shows that the independent variables selected can explain the dependent variable to a 65% extent. The coefficient of each variable also verifies the hypotheses, especially regarding the effect of housing prices on marriage market equilibrium. In the regression model, the coefficient of the average housing price is  $-0.0003$ . For every 1000 yuan increase in property prices per square meter, the marriage rate falls by 0.3%. This means that rising house prices will add to the current downturn in the marriage market. Housing, as one of the costs of marriage (whether as a betrothal gift or part of a dowry), can upset the balance of the original marriage market. From the perspective of the economic theory mentioned in the draft, the original optimal solution of utility maximization and cost minimization will be negated. The increased cost of marriage will make both parties lose part of their utility in the marriage, making them less willing to get married. Some scholars predict a housing bubble in China's property market, which could lead to a loss of confidence not only in the economy but also in marriage.

An imbalance in the sex ratio is another determining factor in the marriage market and has an even bigger effect than a rise in housing prices. The imbalance between the male and female population will increase the cost of finding a marriage partner, thus upsetting the equilibrium of the marriage market. The economic factors of GDP per capita and disposable income per capita in each province are positively correlated with the marriage rate. It can thus be concluded that higher levels of economic development are conducive to a higher marriage rate and help to maintain the balance of the marriage market in the long term. Disposable income leads to the opposite conclusion, which means that people with higher incomes are more likely to be in an uneven marriage market during the survey year, and thus are not making optimal choices in the marriage market. A higher income makes people less likely to get married. This may have something to do with people's lifestyles. The higher an individual's income level, the more likely he is to enjoy life as a bachelor. So, he may be reluctant to face the challenges of married life. Interestingly, however, rising access to higher education has played a role in addressing the inequities in the marriage market. GDP per capita and higher education are positively correlated with the marriage rate. However, it is not possible to state that regions with higher GDP levels or higher percentages of educated people are more

likely to reach equilibrium in the marriage market. According to Gary Becker's theory, whether people can achieve the optimal solution in marriage is also related to the contribution of both husband and wife to the family, along with other factors.

**Chinese government policy changes**

In China, the enforcement of the one-child family planning policy over nearly four decades has not prevented its population from growing rapidly, and in 2013 it accounted for 19% of the world's total population, according to the data from China's National Bureau of Statistics. As the gender imbalance and increase in marriage costs affect the economy's equilibrium and lead to social problems, such as a housing bubble and a marriage market imbalance, the government must take measures to deal with these externalities. It is, therefore, necessary for the Chinese government to introduce new policies to reduce or prevent housing bubbles—which it has been working to do by implementing the two-child policy in October 2015 and the new Marriage Law in 2014.

**Two-child policy.** China is the only country in the world with a family planning policy. The policy encourages couples to 'marry and have children at a later age and have fewer and healthier children', with the aim of reducing the number of births and control overall population levels. For the past three decades, the policy has achieved its objectives of keeping China's population levels under control. The policy also accounts for traditional Chinese beliefs by allowing couples in rural areas and belonging to minority ethnicities to have a second child if their first is a daughter. This reflects the more deeply rooted preference for sons in rural areas and among minority ethnicities. However, the one-child policy has also created a series of problems, such as a gender imbalance, labour shortages, and an aging population. As the policy was introduced in the 1970s, most people born since then have no siblings. Now aged in their late forties, these products of the one-child policy must take care of as many as four elderly parents as well as their own children. The introduction of the all-inclusive two-child policy will reduce the pressure on such couples.

Considering that the implementation of the two-child policy may have a great impact on the gender imbalance and other factors mentioned above, this paper divides the data into two groups. The first set of statistics portrays the influence of various variables on the marriage market from 2002 to 2015 before the formal implementation of the two-child policy. The second set of statistics portrays the influence of those same variables from 2016 to 2020, after the implementation of the two-child policy. The two groups of variables were respectively regressed to observe the changes in the coefficients.

As shown in Table 4, on the premise that the regression results of both sets of data showed statistical significance, their coefficients changed greatly. These influences are first reflected in housing prices. From the regression results, we see that while housing prices had a negative impact on the marriage rate, the

**Table 4 Regression results before and after the two-child policy.**

Dependent variable: MARRIAGE_RATE		
Year	2002–2015	2016–2020
Intercept	5.8146***	14.2749***
	0.3614	1.5505
HOUSE_PRICE	−0.000058***	−0.0001***
	0.000076	0.000032
SEX_RATIO	−0.0012***	−0.0035***
	0.0031	0.0027
GDP	0.000068***	0.000033***
	0.000019	0.00001
DISPOSABLE_INCOME	−0.0003***	−0.0002***
	0.000058	0.00003
HIGHER_EDUCATION	0.4080***	−0.2430***
	0.0299	0.0807
R-squared	0.62	0.78
Observations	620	620

increase in housing prices after the implementation of the two-child policy further reduced the marriage rate. The reasons for this change are clear: the pressure of living, working, and parenting is doubled with the birth of the second child. When young couples get married, they may not only have to pay off a mortgage, but may also have to raise two children. As a result, in the face of such pressure, more and more young people are deterred from marriage, leading to a further decline in the marriage rate.

The sex ratio may be greatly affected by the implementation of the two-child policy. In some areas where sons are preferred, the implementation of the two-child policy has made first-born daughters more inclusive. An increase in girls would ease the accumulation of more boys than girls over the past few decades. The regression results indicate that after the implementation of the two-child policy, the gender imbalance has a bigger impact on the marriage rate. As for the factor of GDP per capita, the data comparison between the two groups decreases from 0.000068 to 0.000033. This means that macroeconomic factors have less influence on the marriage rate after the new policy. There was no significant difference between the two groups in the control regression of disposable income per capita factors, both of which showed that the more disposable income individuals have, the less inclined they are to get married. However, this tendency has been alleviated since the implementation of the two-child policy. Interestingly, the effect of education on marriage rates has gone in the opposite direction: before 2016, the greater the proportion of people with higher education, the higher the marriage rate. However, attitudes may have changed since 2016, with people becoming more reluctant to marry as education levels generally rose, possibly because highly educated people are deterred by the challenge of raising two children. Family pressure on young couples was independent of higher education when they were being asked to foster rather than raise another child full-time.

**Other policies.** The two-child policy is not the only attempt China has made to address the imbalance in the marriage market. The Marriage Law was revised in 2014, further clarifying the legal protection of property in marriage. The house, as the most important property to be divided during marriage disputes, has been given special attention in the newly revised Law. The new Marriage Law pays more attention to property rights than the old law it replaced, which regarded the marital house bought by the groom before marriage as the joint property of the couple after marriage. Thus, if the couple divorced, the marital house would

be divided equally. Although the woman had paid nothing for the house, she would receive a half-share of the property along with other compensation. The new Marriage Law addresses this issue by declaring that if one spouse has bought a marital home in full before the marriage, the property belongs to that spouse. Given that few families can afford to pay for a house with a lump sum, a more common practice is to obtain a mortgage from a bank. In this case, in the event of a divorce, the number of mortgage payments contributed by each partner is used to determine the proportion of ownership. This change makes it clear that the government realises the seriousness of the property rights problem and is attempting to address it.

After the end of the two-child policy in May 2022, China began to fully implement the three-child policy to optimise the population structure and solve the aging problem. This policy has been implemented in different areas at different times, but local governments have taken a positive attitude toward it. Various incentives have been introduced in some cities to encourage people to have a third child. At the same time, China is constantly improving the maternity leave system and the popularisation of maternity insurance. These policies are all aimed at alleviating social problems exposed by the census.

However, the implementation of these policies has not yet had obvious effects. It took nearly two decades for the outcomes of the one-child policy to start to be revealed, and the same is likely to be true of the policy of allowing a second child or a third child in all situations. Meanwhile, it is difficult to reduce housing prices or even realise the relative equilibrium of the housing market through policy adjustment. China has a long way to go to shift away from its traditional prejudices. Although general equilibrium in the marriage market cannot be achieved within just a few years through policy changes, the Chinese government still needs to implement new policies.

### Policy implications and conclusions

Our regression results indicate that marriage rate is closely related to many factors in China. According to the results of the seventh population census released by the Chinese National Bureau of Statistics, the average annual population growth rate from 2010 to 2021 is 0.53%. Compared with the average annual population growth rate from 2000 to 2010, this represents a drop of 0.04%. The decline is a cautionary sign for the Chinese government regarding its population policy. China has been a country with a large population, and it has enjoyed the so-called “demographic dividends” for a long time, including a large proportion of the labor force, an important driver of its rapid economic growth. With the decline of population growth rate as a result of the declining marriage rate, China starts to face many challenging issues, such as rising labor costs and population aging. Rising housing prices over the past two decades have become a deterrent to marriage, as reported in this study. We suggest the Chinese government implement important policies and regulations to curb house price increases, including imposing home purchase limits, increasing down payments, and raising mortgage rates.

The declining marriage rates are also related to the sex ratio of the population. In China, boys are still far outnumbered by girls. Therefore, the Chinese government has adopted the policy of fully opening up the two-child policy and encouraged the three-child policy. While these policies can harmonize the ratio of male to female in China, it can also play an important role in promoting the marriage ratio. We also find the influence of economic factors such as GDP and educational levels on marriage rates in China. The higher the GDP per capita, the higher the marriage rate. Maintaining a higher GDP growth rate is thus particularly important to improve the marriage rates. Considering the positive



effect of educational levels on the marriage rates, we suggest the Chinese government continuously improve the educational levels among its population, including providing more financial aid to university students and encouraging more people to pursue a college degree.

The policy of allowing all families to have two children gives many families more opportunities and flexibility to plan their lives. Around 2015, the Chinese government started to give families the choice to have a second child. After three decades of the one-child policy, Chinese families saw a glimmer of hope, and there was a small upsurge in second children being born after 2016. However, it can be predicted that those born because of the policy change will face stiffer competition than their older siblings due to the stretching of limited resources and the presence of more peers. Whether entering college or entering the workforce, these 'lucky people' will need to put more effort into competing with their peers. Therefore, the Chinese government should prepare for potential social problems arising from the change in the fertility policy, such as support for the elderly, the aging of the population, and a decline in the employment rate. Fortunately, these problems are common in social and economic life and there are many successful solutions available. Meanwhile, it is essential to grant clear property rights to property owners. Although many Chinese people realise that the new Marriage Law protects their property from unnecessary losses, some people, especially the parents of women, believe that it will increase the divorce rate. In 2013, the national divorce rate was 2.57 per 1000 persons, but in some cities with higher housing prices, such as Beijing, the rate was as high as 3.06. The changes to the Marriage Law protect husbands' property and ease their financial worries if they want a divorce. As the cost of divorce decreases, the likelihood of infidelity increases. Therefore, the government should pay attention to properly protecting women's rights when amending the Marriage Law.

In summary, an increase in marriage costs and an imbalance in the sex ratio have upset the balance of the marriage market. Although the government has taken some action in response, the problem cannot be alleviated quickly. Given the deeply rooted causes of these social problems, it is difficult for policies to make a significant impact in the short term. This paper uses a simple econometrics regression model. To obtain more accurate conclusions, a more sophisticated model is needed. In addition, to make the model more convincing, more variables need to be considered, such as unemployment (which affects average incomes). The data used in this paper are statistical data from the last ten years, but using a dataset with a longer time span would improve the accuracy of the model. Therefore, the range of years studied could also be increased in an improved model.

### Data availability

All data in this article are from the official website of the National Bureau of Statistics of China. The datasets generated during and analyzed during the current study are available from the corresponding author upon reasonable request.

Received: 23 June 2022; Accepted: 6 October 2022;

Published online: 31 October 2022

### Note

1 In China, the three standard items requested for marriage were a watch, a bicycle, and a sewing machine in the 1970s; a refrigerator, a color television, and a washing machine in the 1980s; and an air conditioner, a personal computer, and a video recorder in the 1990s. Since the 1990s, economic development and improved living

standards have gradually changed the 'Big Three' into 'Mobile and Fixed', with 'fixed' referring to a house.

### References

- Anderson S (2003) Why dowry payments declined with modernization in Europe but are rising in India. *J Political Econ* 111(2):269–310
- Anderson S (2007) The economics of dowry and brideprice. *J Econ Perspect* 21(4):151–174. <https://doi.org/10.1257/jep.21.4.151>
- Becker GS (1974) A theory of social interactions. *J Political Econ* 82(6):1063–1093
- Bursztyn L, Fujiwara T, Pallais A (2017) 'Acting wife': marriage market incentives and labor market investments. *Am Econ Rev* 107(11):3288–3319
- Chen Y, Qiu Z (2011) How high housing prices affect household savings rate and property inequality. *Econ Res* 46(10):25–38
- Corinne HR, Rathod S, Falle T, Pande RP, Krishnan S (2009) Challenging assumptions about women's empowerment: social and economic resources and domestic violence among young married women in urban South India. *Int J Epidemiol* 38:577–585
- Davin D (2007) Marriage Migration in China and East Asia. *J Contemp China* 16(50):83–95
- Duan Z (2017) The relationship between real estate price and inflation and output: theoretical analysis and empirical test based on Chinese data. *Quant Econ Tech Econ Res* 12:127–139
- Dupuy A, Galichon A (2014) Personality traits and the marriage market. *J Political Econ* 122(6):1271–1319
- Das Gupta M, Shuzhuo L (1999) Gender bias in China, South Korea and India 1920–1990: effects of war, famine and fertility decline. *Dev Change* 30(3):619–652
- Farnham M, Schmidt L, Sevak P (2011) House prices and marital stability. *Am Econ Rev* 101(3):615–619
- Feng M (2009) Looking Back over the past 30 years: An interview with Gu Yunchang, Vice President of China Real Estate Research Association. *China Real Estate Information*, (10):11–16
- Hamilton G (2009) Property rights and transaction costs in marriage: evidence from prenuptial contracts. *J Econ Hist* 59(1):68–103
- Hu J, Li W (2019) Post-90s: is it necessary to have a house for marriage? A study based on a follow-up survey of Chinese college students. *China Youth Stud* 6:69
- Li S (2002) The best difference between Pareto's optimal and general equilibrium. *Econ Sci* 2002:2
- Liu H (2018) Marital behaviour and childbearing behaviour of rural families in view of Economics—also on Gary S. Becker's family theory. *J Huanghe Sci Technol College* 2018:1
- Marco A (2017) Daughters dowries deliveries: The effect of marital payments on fertility choices in India. *J Dev Econ* 125:89–104. <https://doi.org/10.1016/j.jdeveco.2016.11.004>
- Maristella B, Aloysius S (2003) Why dowries? *Am Econ Rev* 2003:9
- Menon S (2020) The effect of marital endowments on domestic violence in India. *J Dev Econ* 143:102389. <https://doi.org/10.1016/j.jdeveco.2019.102389>
- Musick K, Brand J, Davis D (2012) Variation in the relationship between education and marriage: marriage market mismatch? *J Marriage Fam* 74(1):53–69
- Rao V (1993) The Rising Price of Husbands: A Hedonic Analysis of Dowry Increases in Rural India. *J Political Econ* 101(4):666–677
- Srinivasan S (2005) Daughters or dowries? The changing nature of dowry practices in South India. *World Dev* 33(4):593–615. <https://doi.org/10.1016/j.worlddev.2004.12.003>
- Srinivasan S, Bedi AS (2007) Domestic violence and dowry: evidence from a South Indian village. *World Dev* 35(5):857–880. <https://doi.org/10.1016/j.worlddev.2006.08.005>
- Vinod HD (2007) Law of demand in dowry size, status of Indian women and recent wrong-headed policies. *Indian J Econ Bus* 6(2):267–275
- Wang Y, Liu X (2007) The development of rural women's self-help Groups in India and its Enlightenment to China. *Socialist Research* (05):125–128
- Xu J, Xu Q, He F (2012) Demographic factors behind housing price rise: international experience and Chinese evidence. *World Econ* 35(1):24–42
- Yu Y (2012) The phenomenon of mother-in-law economy. *Real Estate Fashion* 2012:13. <http://www.cnki.com.cn/Article/CJFDTotal-ZSTW201213039.htm>
- Zhang C, Tao M (2020) Sex ratio imbalance, marriage payment and intergenerational support. *Econ Sci* (02):87–100
- Zheng D, Yang S (2003) The fixed tendency and power strategy of the relationship between husband and wife. *Sociol Res* 2003:4

### Acknowledgements

We acknowledge the China National Bureau of Statistics database for uploading its meaningful datasets.

### Competing interests

The authors declare no competing interests.

**Ethical approval**

This article does not contain any studies with human participants performed by any of the authors.

**Informed consent**

This article does not contain any studies with human participants performed by any of the authors.

**Additional information**

**Correspondence** and requests for materials should be addressed to Hongyong Zhou.

**Reprints and permission information** is available at <http://www.nature.com/reprints>

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2022