



Housing prices and the subjective well-being of migrant workers: evidence from China

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Abstract

Owning a house is important for most young people in urban China, especially for migrants. For migrants who want to settle in their working city, high housing prices may have a negative effect on their subjective well-being. Using nationally representative migrant survey data, this study examines the relationship between housing prices and migrants' subjective well-being in China. The results indicate that housing prices play a significantly negative role in migrants' subjective well-being, especially for low-educated, female, and rural-to-urban migrants. These results are robust to instrumental variable analysis. In addition to the direct mental effect, there is evidence of two possible ways in which housing prices may affect migrants' subjective well-being. First, high housing prices increase the possibility of migrants living alone in the city, and a geographical family split decreases their subjective well-being. Second, to earn more to purchase a house in the working city in the future, they are more likely to work longer hours and decrease their leisure time, which may cause a decrease in their happiness.

Keywords Housing prices · Migrants' subjective well-being · Family split · Decrease in leisure time

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1 Introduction

As a social and positional good, a house is considered not only a dwelling place but also a necessity when young Chinese adults get married. In China, purchasing a house rather than renting reflects people's social status and provides a sense of security (Foye et al., 2018). For young men, owning a house before getting married is a Chinese tradition, but only a few young migrants in urban China can afford a house in the city because of the high housing prices. Since the *hukou* (household registration) system reform in the 1980s, the number of migrants has steadily increased from 6.6 million to approximately 236 million.¹ Although migrants play an important role in urban economic development, migrants earn lower wages, are entitled to less social welfare, and face occupational segregation or discrimination compared to their local counterparts (Meng & Zhang, 2001). It is less affordable for migrants to buy a house in urban areas during their working years because of their relatively low salaries. According to data from the National Health Commission of the Republic of China, approximately 90% of city migrants do not own a house, although most of them would like to; therefore, high housing prices may affect young migrants' subjective well-being due to the gap between their desire and reality. While researchers have explored whether homeownership affects people's residential satisfaction or overall happiness, few studies have focused on how housing costs and housing prices affect migrants' subjective well-being, especially for those who do not own a house in the city where they live and work (Huang et al., 2015; Zheng et al., 2020).

In the past decade, the average residential housing price has increased rapidly from 4725 to 9980 yuan per square meter in China.² In first-tier cities, such as Beijing, Shanghai, Guangzhou, and Shenzhen, housing prices have even peaked that is out of reach for most young adults, especially for young migrants. Thus, instead of buying their own house, renting one has become a common residential pattern for most migrants. However, renting is just a provisional choice in the early years when migrants work in the city, and their ultimate goal is to own a house. According to our data, migrants can rent a house very cheaply, even in first-tier Chinese cities (e.g., renting shared flats or living in very cheap accommodations built for migrants), and the average rent is only a quarter of their monthly wages. Compared to relatively low rentals, housing prices are much higher, and migrants should save more to pay for down payments and earn more to afford housing loans. Namely, high housing prices and the desire to buy a house are real burdens for migrants, which is why we focus on housing prices rather than rental prices. Housing prices have been proven to be important in several outcomes and people's behaviors in China, such as fertility behavior, marriage, and entrepreneurship (Li & Wu, 2014; Liu et al., 2020; Wrenn et al., 2019). However, there is a lack of empirical analysis of whether housing prices affect migrants' subjective well-being and its potential mechanisms.

To explore the effect of housing prices on migrants' subjective well-being, we match micro individual level data from the China Migrants Dynamic Survey with macro statistical data on housing prices at the city level from the China Regional Statistical Yearbook. Using an ordered-probit model, we find that housing prices have a negative effect on migrants' subjective well-being, and this effect is more significant for low-educated, female, and rural-to-

¹ Data source: National Bureau of Statistics of the People's Republic of China.

² Data source: National Bureau of Statistics of the People's Republic of China.

urban migrants. In addition to the direct mental effect, two possible channels through which housing prices may affect migrants' subjective well-being are also explored. On the one hand, if migrants do not own a house and the housing price is high, it is difficult for them to bring their families to the city. The increase in city housing prices raises the possibility of a geographical family split for migrants, with their families left behind in rural areas or another city, resulting in feelings of loneliness and unhappiness. We call this the "family split" effect. In addition, due to the high housing prices and living costs, migrants living in cities with high housing prices have to work longer hours and work harder to purchase houses in the future. A reduction in leisure time decreases migrants' subjective well-being. We call this the "work more" effect.

Our study differs from the literature in several ways. First, previous studies have focused mainly on the role of homeownership (Huang et al., 2015; Liu et al., 2020; Zheng et al., 2020), and we extend this by exploring the relationship between city housing prices and migrants' subjective well-being in China. Compared to homeownership, housing prices matter more for migrants, as most of them do not own a house in the city where they live and work. Second, we explore the effect of housing prices on different groups of migrants, defined by sex, education level, and *hukou* status. Third, we examine two potential mechanisms through which housing prices affect migrants' subjective well-being: the "family split" effect and the "work more" effect.

The remainder of this paper is organized as follows. Section 2 reviews the literature. Section 3 discusses the background of housing in China. Section 4 develops the hypotheses. Section 5 presents the data sources, descriptive analysis, and empirical methods. The main results, heterogeneous results, robustness check results, and instrumental variable results are reported in Sect. 6. Section 7 presents the mechanism results. Section 8 concludes the paper.

2 Literature review

In recent decades, a consensus has been reached that housing prices are negatively associated with individuals' objective behaviors and outcomes, such as consumption, marriage entry, birth rate, and expenditure on children (Fu et al., 2016; Liu et al., 2020; Lovenheim & Reynolds, 2013; Newman & Holupka, 2014; Wrenn et al., 2019). Some studies directly combine housing prices with marriage patterns or fertility behavior in China. High housing prices significantly lower the marriage entry rate for both females and males and significantly decrease the fertility rate (Liu et al., 2020; Wrenn et al., 2019). Second, housing prices affect homeowners' participation in the labor market. If housing values increase by 100 thousand yuan, the probability of female homeowners participating in the labor market will decrease by 1.37% (Fu et al., 2016). Third, housing prices play an important role in children's development (Leventhal & Newman, 2010). The housing cost burden reduces family expenditures on children, especially for poorer families (Lovenheim & Reynolds, 2013; Newman & Holupka, 2014). However, the above studies did not examine the link between housing prices and people's subjective well-being, especially in the Chinese context, and it remains to be explored whether rising housing prices reduce people's subjective well-being.

The subjective well-being of migrants has been examined by a number of studies, and increasing attention has been given to the role of family characteristics, personal income, social integration, social norms, social mobility, neighborhood built environment, climate change, and transport poverty (Ambrey & Fleming, 2013; Appau et al., 2019; Churchill & Smyth, 2019; Churchill et al., 2020; Jach et al., 2018; Lawton & Fujiwara, 2016; Liu et al., 2017a, b; Morrison, 2011; Stutzer & Lalive, 2004). The recent Chinese well-being literature has examined the effect of economic conditions, social networks, transportation, and environmental quality on migrants' subjective well-being (Bian et al., 2018; Feng et al., 2018; Liu et al., 2019). For instance, Liu et al. (2017b) explored the impact of social and physical environment on migrants' subjective well-being based on a questionnaire survey in Guangzhou and found that the sense of relative deprivation is a critical element of migrants' subjective well-being. Moreover, neighborhood social ties can improve migrants' subjective well-being directly and significantly, and the effect is weaker for migrants than for local residents (Liu et al., 2017a). However, to the best of our knowledge, no study has directly regarded city housing prices as an antecedent of people's subjective well-being.

Two lines of research on subjective well-being are closest to our study. The first investigates the effect of homeownership and indicates that, as a reflection of social status, homeownership is considered an important factor in people's subjective well-being (Foye et al., 2018; Hu, 2013; Rossi & Weber, 1996; Wu et al., 2019b; Zumbro, 2014). For example, in Germany, owning a house significantly increases people's life satisfaction, especially for low-income households, while the rise of the homeownership rate among relevant others will decrease homeowners' relative wealth and subjective well-being based on a social norm framework (Foye et al., 2018; Zumbro, 2014). Some studies have focused on China and have reached the same conclusion that homeownership is positively correlated with residents' subjective well-being (Hu, 2013; Hui et al., 2014; Wu et al., 2019b; Zheng et al., 2020). The second subset of the literature focuses on the role of housing conditions or housing-related factors in shaping people's happiness (Azimi & Esmailzadeh, 2017; Zhang et al., 2018). Based on a large sample survey in China, Zhang et al., (2018) find that house-related characteristics, such as house size and the number of bedrooms and bathrooms, are positively correlated with people's housing satisfaction.

To summarize, although there is a growing interest in the relationship between homeownership, house-related characteristics, and individuals' subjective well-being (Chen et al., 2020; Wu et al., 2019b; Zhang et al., 2018), there is no existing research examining the effect of housing prices on people's subjective well-being, especially among migrants in China. Based on a large sample survey, we expand on the literature by exploring the role that city housing prices play in migrants' subjective well-being in China. Second, we further explore the heterogeneous effect of city housing prices by migrants' sex, *hukou* status, and years of schooling. Third, we investigate whether family split and decreasing leisure time mediate the relationship between city housing prices and migrants' subjective well-being; namely, high housing prices may have a negative effect on migrants' subjective well-being by increasing the possibility of a nonfamilial residence for them or decreasing their leisure time.

3 Background

3.1 The housing culture in China

Chinese people possess both passion and perseverance for buying a house rather than renting unlike residents of Western countries. Based on a survey from Hong Kong Commercial Banking in 2017, the homeownership rate reached 70% in China, which is much higher than that in the United States, the United Kingdom, and other surveyed countries, and the willingness to buy a house in the next five years is higher in China than in other countries (Fig. 1). China has a longstanding culture in which people attach great importance to owning a house. Most Chinese people prefer living in a house they own, and owning a house is one of the most important goals for young adults. In addition, young couples tend to buy a house before they get married, as house ownership is usually regarded as a necessity for entering marriage. Therefore, most young people experience great pressure, as the housing prices in the city are too high and continue to increase. For migrants, the pressure of buying a house is much greater. Although some migrant families may have a self-built or commercial residential house in their hometown, these houses often belong to their parents and are mostly located in less-developed areas (third- or fourth-tier cities or rural areas). Moreover, as migrants are usually at a marriageable age, they are eager to obtain their own houses in the city where they live and work. Most migrants may earn less than their local counterparts, so they must earn more or sacrifice welfare in other aspects of life to purchase a house if they want to settle in the city. In this specific culture and social environment, high housing prices may have a much more severe effect on migrants' subjective well-being.

3.2 The high housing prices in China

As a breakthrough in the reform of the housing distribution system, monetized housing distribution was implemented in 1998 in China, which fundamentally promoted the housing commercialization process. Since then, people have had to rely on themselves to afford a commercial house rather than living in a state-owned house, and housing prices have been on the rise. Figure 2 illustrates that the average housing price increased from only 2000 yuan

Fig. 1 The percentage of millennial homeowners in the main countries. (Data Source: HSBC Survey on the Home Ownership Rate of Young People in 2017)

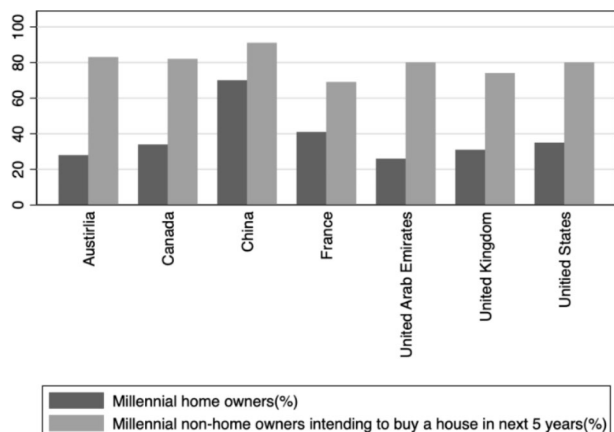
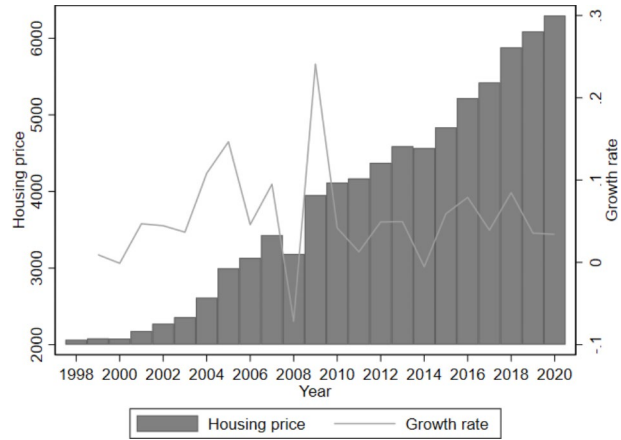


Fig. 2 Housing prices in China, 1998–2020. (Data Source: The National Bureau of Statistics of China)



per square meter in 1998 to almost 10,000 yuan per square meter in 2020 (the numbers are adjusted for inflation using the year 1998 as 100), while people’s salaries increased much more slowly.

As many researchers use the housing price-to-income ratio as a proxy for housing price, we also conduct a robustness check by exploring the relationship between the housing price-to-income ratio and migrants’ subjective well-being. The correlation coefficient between housing price and the housing price-to-income ratio of all cities in China in 2012 was 0.968, which means that housing price is highly positively related to the housing price-to-income ratio; if people live in cities with high housing prices, it is more difficult for them to afford a house.³ The housing prices shown in Fig. 2 are only the national average prices, and housing

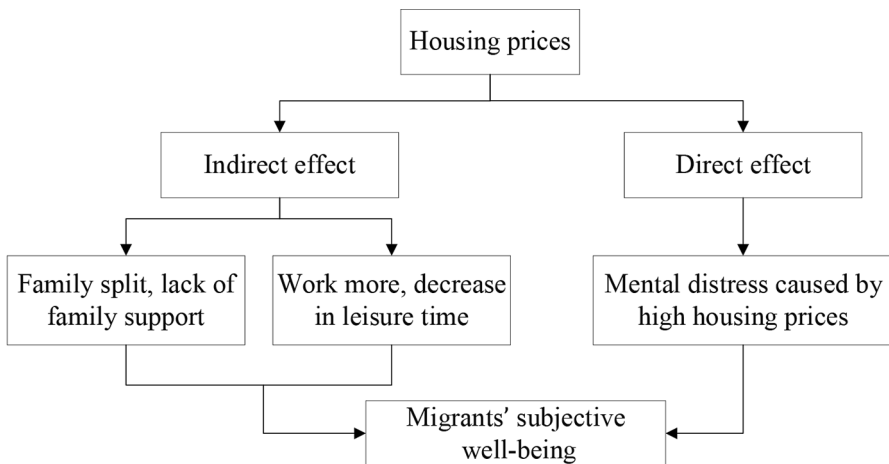


Fig. 3 Conceptual framework

³ The data was obtained from the 2012 China Migrants Dynamic Survey.

prices in first-tier cities such as Beijing, Shanghai, Shenzhen, and Guangzhou have reached a level that is unaffordable for many people. While the development of the real estate industry has promoted economic development, it has also created intense pressure on people to buy houses. High housing prices have become one of the most important problems for individuals, especially for migrants and those with low incomes.

4 Theoretical hypotheses

Housing prices may affect migrants' subjective well-being, both directly and indirectly. On the one hand, high housing prices create mental pressure for migrants. Housing prices may also be correlated with a migrant's subjective well-being through family separation and a decrease in leisure time. The conceptual framework of this study is illustrated in Fig. 3.

It should be noted that homeowners' subjective well-being is significantly higher than that of renters (Zheng et al., 2020). In particular, for migrants who are usually less educated and earn less than their local counterparts, it is necessary to distinguish homeowners from renters. Considering that the home ownership rate of migrants is extremely low in China (approximately 10% in 2012), we focus mainly on how housing prices are related to renter migrants' subjective well-being. In addition, because we investigate the housing price effect instead of the housing wealth effect, we keep only renters in the full sample. As discussed in the background section, migrants in China face a dilemma. City housing prices are usually much higher than migrants can afford due to their relatively low salaries, and most of them cannot afford a house even if they have worked in the city for many years. Moreover, in many Chinese cities, home ownership serves as part of the betrothal gifts when young people get married. Thus, young migrants may feel depressed in the face of high housing prices, and they have to work harder and save more to buy a house in the future. The mental distress of being unable to own a house in urban areas and the heavy pressure to purchase a house in the future may cause unhappiness. We aim to fill this gap by highlighting the central role of housing prices in migrants' subjective well-being and thus develop our first hypothesis:

H1: Housing prices have a negative effect on migrants' subjective well-being.

After documenting these results, we further analyze the heterogeneous effect of housing prices on different migrant groups, divided by sex, *hukou* status, and years of schooling. Female, low-educated, and rural-to-urban migrants are relatively disadvantaged in economic conditions and social opportunities compared to their counterparts. Consequently, owning a house is a more difficult target for these migrants because of the high housing prices.

As homeownership gives women a sense of security, they usually attach more importance to owning a house compared to men (Hu, 2013; Huang et al., 2015). In addition, women often have a disadvantage in the labor market; they often earn less than their male counterparts due to discrimination or other objective factors. Hence, high housing prices will reduce the possibility of migrants buying a house in the city, and compared to men, they may reduce women's happiness to a larger extent.

Low-educated migrants may feel unhappier when faced with the same high housing prices, while better-educated migrants may feel more hopeful and optimistic about their future, so they may be less affected by housing prices (Ai et al., 2004). Moreover, these better-educated migrants can transform their *hukou* status through several channels in China,

such as changing their *hukou* registered place to the work unit to obtain urban *hukou*, while if low-educated migrants want to change their *hukou* status and enjoy urban social welfare, most of them have to buy a new house in the city because it is more difficult for them to find a job that can provide a *hukou* registered place.

Compared with urban-to-urban migrants, rural-to-urban migrants desire to own a house in cities more. In China, the *hukou* system, as a population registration system, is used to allocate basic living or social welfare to urban residents. Therefore, if rural-to-urban migrants want to integrate into cities economically, owning a house is an important and fast method to gain social welfare in cities. For example, the 2012 China Migrants Dynamic Survey data show that approximately 33% of urban-to-urban migrants are covered by urban employee medical insurance in working cities, while only 15% of rural-to-urban migrants possess this type of insurance. Thus, the influence of housing prices on rural-to-urban and urban-to-urban migrants may be different. This leads to the second hypothesis:

H2: The effects of housing prices on migrants' subjective well-being identified in Hypothesis 1 vary according to migrants' sex, *hukou* status, and education.

Regarding the mechanisms, apart from the direct mental effect of not owning a house, we examine whether there are underlying mechanisms explaining how high housing prices affect migrants' subjective well-being. For migrants, both being geographically separated from their family or increasing their working hours may have a harmful effect on their subjective well-being. Thus, there may be two potential channels through which high housing prices affect migrants' subjective well-being: the "family split" effect and the "work more" effect. On the one hand, most migrants live alone because they do not own a house, and family separation may have a direct negative effect on their mental health. On the other hand, because of the high housing prices and high living costs, most migrants often work very hard, sacrifice their leisure time or consume less for purchasing a house in the future (Attanasio et al., 2009; Dong et al., 2017). However, in cities with high housing prices, daily consumer spending is usually relatively higher; hence, rather than consuming less, it is more likely that migrants may increase working hours and decrease leisure time to earn more for purchasing a house in the future.

The "family split" effect. According to the National Bureau of Statistics data, household geographical split is a common phenomenon for migrants in recent years in China, and the percentage of migrants who move into cities with the whole is relatively low. For instance, approximately 32.79 million rural-to-urban workers moved into cities with their families in 2011, and this number rose to 33.75 million in 2012. However, the proportion of migrants who moved with their families among all migrant workers remained low in 2012, approximately 20.66%. The 2012 National Monitoring and Investigation Report on Migrant Workers also shows that approximately 70% of migrant workers do not rent a house independently or buy one. Thus, most migrant workers face the problem of being geographically separated from their families, partly as a consequence of the expensive housing prices. Since the average monthly wage of migrant workers was 2561 yuan in 2012, considering the goal of saving more for house purchasing, migrants may feel more economically pressured if they bring their family to the cities and live together. In addition, a house has a value-added social function, such as social security and welfare. For example, owning a house usually means that second-generation migrants can enjoy urban *hukou* status, medical insurance and education opportunities in most cities in China. If migrants do not acquire a

house in the city, there is a high probability that they will send their children back to their hometowns for education.

More commonly, migrants work in cities alone, send remittances to their families, and return home for family reunions, such as the Spring Festival. Family migration and co-residence patterns account for part of migrants' social integration and settlement intentions, and nonfamilial co-residence patterns decrease migrants' happiness (Wu et al., 2020a). Due to the household split, migrants are more likely to feel lonely and lack a sense of belonging in the city. For example, Chen et al., (2015) compared married migrants living together with those whose spouses were absent and found that living separately affects couples' health negatively. Thus, we obtain the following "family split" hypothesis:

H3a: Migrants are geographically separated from their family members because of high housing prices, which decreases their subjective well-being.

The "work more" effect. Apart from the negative effect of family split, economic factors such as consumption, earnings and leisure time are also crucial to why housing prices have a negative effect on migrants' subjective well-being. Although most migrants cannot afford a house in their early working years, they are very enthusiastic about buying a house in the future. To achieve this, there are only two options for migrants: consume less or earn more, and the second option seems much easier. First, to save money, migrants living in cities with high housing prices may sacrifice their non-necessity consumption, such as personal entertainment spending. However, high housing prices also mean high living costs, and migrants may pay more to satisfy their daily needs compared to their counterparts living in cities with low housing prices. In addition, considering that migrants' consumption levels are already relatively low in China, there is insufficient space for them to further sacrifice or decrease consumption when they work and live in the city. Therefore, migrants living in cities with high housing prices usually increase their expenditures rather than consume less to meet daily needs, making it difficult for them to consume less to save money for a house.

The second choice for migrants is to earn more money. It is more possible for migrants to work longer and harder to save more for a house. In China, the high housing prices and the willingness to settle in the city force migrants in cities with high housing prices to sacrifice their leisure time or even health. They may choose to work up to 12 h per day and even forgo free weekends or holidays to earn more for purchasing a house in the future.⁴ Long working hours and less leisure time have been shown to have harmful effects on people's self-rated health or happiness (Wu et al., 2019a; Golden & Wiens-Tuers, 2006). Here, we arrive at the final "work more" hypothesis.

H3b: As a response to high housing prices, migrants who want to buy a house may work longer and harder, which may reduce their subjective well-being.

5 Data and method

5.1 Data and variables

This study mainly utilizes the 2012 China Migrants Dynamic Survey (CMDS, 2012), which is a nationally representative survey of migrants in China administered by the National

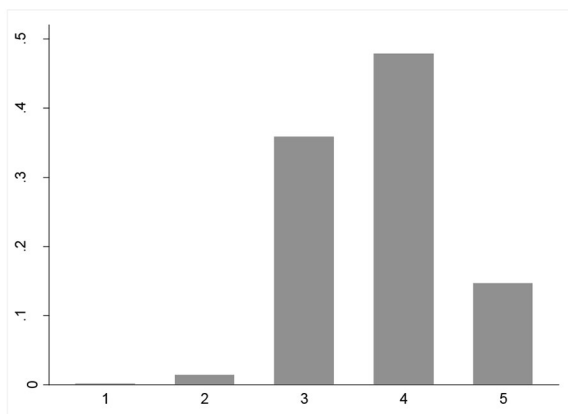
⁴ Démurger et al., (2009) show that the rural migrants in China work on average 69 h per week, while urban residents only work approximately 44 h per week.

Health Commission of the People's Republic of China. This survey covers 31 provinces and contains information about migrants' demographic characteristics, family member information, employment status, feelings about life, and so forth. A stratified, multistage and probability (proportional to the size) sampling method was used in this survey. The respondents are migrants aged 15 to 59 years who have lived in the local region for more than one month without local *hukou*. This survey provides information on the subjective well-being of migrants, which is the dependent variable in our study. In addition, we focus on whether housing prices demonstrate a significant correlation with migrants' subjective well-being, so the housing price of each city is obtained from the China Statistical Yearbook for Regional Economy. We matched the housing price data with the CMDS and finally obtained a total valid sample of 105,602 migrants, covering 271 cities (more than 90% of the prefecture-level cities in China) after excluding the missing values. In contrast to the literature, we focus on housing prices instead of homeownership; thus, the sample we use is migrants who do not own a house in the city. Thus, we only consider renters, who account for more than 90% of all migrants in the CMDS data.

The variable of interest in this study is self-rated happiness, which is usually used as a proxy variable for respondents' subjective well-being (Wu et al., 2020b; Zheng et al., 2020). In the CMDS survey, migrants were asked, "Do you feel happy at present?" The answers were measured on a five-point Likert scale ranging from *very happy* (1) to *very unhappy* (5). For convenience of analysis, we reverse the happiness variable from a negative indicator to a positive indicator so that a higher value means that migrants are happier. The mean and standard deviation of migrants' subjective well-being are 3.71 and 0.71, respectively. Figure 4 illustrates that approximately 60% of the migrants feel happy, while less than 2% of migrants feel unhappy.

Our key independent variable is the average housing price at the city level. To calculate the housing price of each city, we collected two indicators from the China Regional Statistical Yearbook: residential housing sales area (10,000 square meters) and residential housing sales amount (100 million yuan). Since the migrants' subjective well-being data are from the 2012 CMDS, we use the housing prices calculated in 2012 in the main regression analysis. We construct two housing price indicators in the following ways: first, the city residential housing sales amount is divided by the city housing sales areas to obtain the average sales

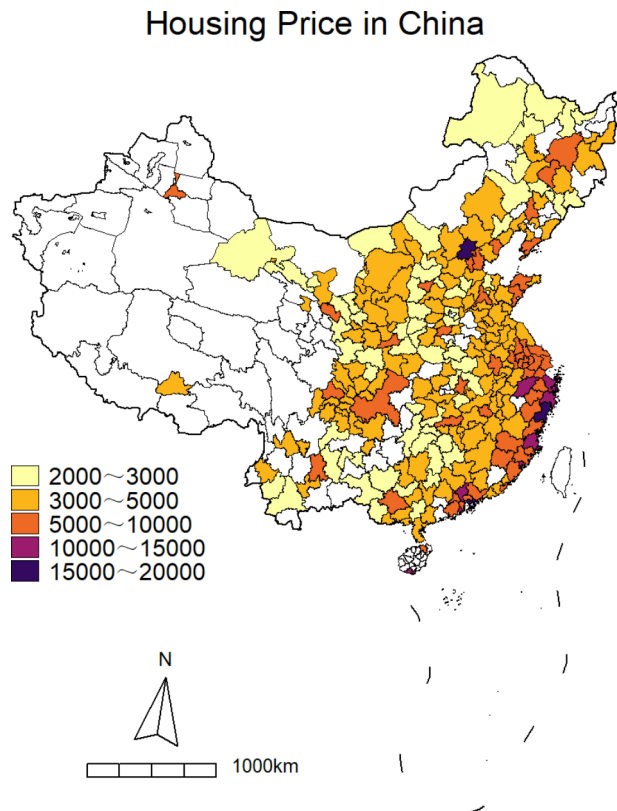
Fig. 4 Distribution of subjective well-being. (Notes: 1=very unhappy, 2=unhappy, 3=neutral, 4=happy, 5=very happy)



price of city residential houses; second, because the housing price-to-income ratio is usually used to measure the housing cost burden and housing affordability (Abeyasinghe & Gu, 2011; Li & Wu, 2014), we regard the housing price-to-income ratio as a housing price indicator in the main analysis.⁵ Figure 5 shows that the housing price of each city ranged from 2000 to 20,000 yuan per square meter in 2012, and the housing prices in the central and western regions were lower than those in the eastern and coastal regions. The six cities with the highest housing prices are Shenzhen, Beijing, Wenzhou, Hangzhou, Xiamen, and Guangzhou.

To obtain more robust results, we investigate the influence of the city housing prices in previous years in the robustness check. For the floating population who have lived in the city for a long time, their subjective well-being is not only affected by the housing prices in the current year but is also possibly associated with prices in previous years. Therefore, we examine the effect of city housing prices in 2010 and 2011 on migrants' subjective well-being.

Fig. 5 Housing prices in each city



⁵ Residential housing sales amount is the total value of all residential houses of the city sold in that year, and residential housing sales area is the total square meters of all residential houses sold of the same city in that year.

The survey included a list of individual characteristics, such as age, sex, marital status, *hukou* status, working hours per day, schooling years, and migration duration. *Hukou* status is one of the factors influencing inequality between migrants and local residents, such as wages and social insurance participation (Fang & Sakellariou, 2016; Liu, 2005). Women are more likely to value a sense of security and place more emphasis on owning a house. High-skilled and low-skilled migrants have different wage levels, and high-skilled migrants seem to have a higher level of social and economic integration into the city (Zhu & Chen, 2010). Working hours are usually regarded as a critical factor of individuals' subjective well-being; therefore, we included this as a control variable in the analysis (Liu et al., 2017b). Family characteristics are also controlled in the regressions, such as family income, family size,

Table 1 The descriptive statistics of key measures

Variable	Definition	Mean or percentage	Standard deviation
Panel 1: Subjective well-being			
Self-rated happiness	Do you feel happy at present: 1 = very unhappy; 2 = unhappy; 3 = neutral; 4 = happy; 5 = very happy	3.709	0.714
Panel 2: Housing prices			
Housing prices	The logarithm of the residential housing sales prices	8.840	0.674
Housing price-to-income ratio	Housing price divided by the average yearly wage in the city	0.163	0.116
Panel 3: Individual characteristics			
Age	15–60	32.990	9.205
Age square	The square of age	1172.972	640.107
Sex	Binary variable: 1 = male; 0 = female	0.531	0.499
Marriage status	Binary variable: 1 = married; 0 = otherwise	0.742	0.438
Ethnicity	Binary variable: 1 = Han; 0 = otherwise	0.939	0.240
<i>Hukou</i> status	Binary variable: 1 = rural <i>hukou</i> ; 0 = otherwise	0.867	0.340
Working hours per day	1–16	9.474	1.917
Schooling years	Schooling years of respondents	9.591	2.767
Migration years	The period in which a respondent reported to have moved to the current city	5.048	4.312
Panel 4: Family characteristics			
Family income	The logarithm of family monthly income	8.239	0.795
Family size	The number of family members	2.937	1.235
The number of children aged below 14 (children)	The number of children aged below 14	0.680	0.757
Housing rent	The logarithm of housing rent per month	4.935	2.381
Panel 5: City characteristics			
Total population	The logarithm of total population of each city	6.250	0.836
Gross domestic product (GDP) per capita	The logarithm of GDP per capita at the city level	11.192	0.748
Tertiary industry output as a share of GDP (Tertiary share)	Tertiary industry output as a share of GDP (percentage)	46.600	12.690
The number of industrial enterprises (Enterprise)	The logarithm of the number of industrial enterprises	7.368	1.428

housing rent per month, and the number of children below age 14. Family size represents family preferences, and the number of young children in the family influences the dependency ratio and economic burden of migrants. Aligned with the literature, we control for family size and the number of children aged below 14 years in the analysis (Artazcoz et al., 2004).

Finally, some city characteristics are also controlled, including total population, gross domestic product (GDP) per capita, tertiary industry output as a share of GDP, and the number of industrial enterprises. Descriptive statistics of the key measures used in this study are presented in Table 1. The housing prices of all cities in the survey range from 2000 to 19,000 yuan per square meter, and the mean of the logarithm of the housing price is 8.840. The working hours of migrants are relatively long—approximately 9.5 h a day. The average years of schooling of migrants is approximately 9.6 years. Generally, the migrants in the survey are relatively young. All respondents were aged 15 to 60 years, and the mean age was 33 years.

5.2 Method

An ordered-probit model is used to quantify the effect of housing prices on migrants' subjective well-being. The specifications are provided by the following equation:

$$y_{ij} = \beta_0 + \beta_1 p_j + \beta_2 X_{ij} + \gamma city_j + \beta_3 weather_j + \beta_4 socialclimate_j + \epsilon_{ij} \quad (1)$$

where y_{ij} denotes migrant i 's subjective well-being or self-rated happiness and p_j is the key independent variable of interest, indicating the housing prices or housing price-to-income ratio of city j . Following relevant studies, X_{ij} represents individual and family characteristics, including age, age squared, sex, marital status, ethnicity, *hukou* status, working hours per day, schooling years, migration years, family income, family size, the number of children less than 14 years of age and monthly rent (Artazcoz et al., 2004; Fang & Sakellariou, 2016; Liu, 2005; Liu et al., 2017b; Zhu & Chen, 2010). Among these, the captured effect of housing prices in the main regressions may reflect the influence of rental prices. To rule out such an interference, we include the housing rent per month as a control variable in Eq. (1). $city_j$ indicates city characteristics, including total population, GDP per capita, tertiary industry output as a share of GDP, and the number of industrial enterprises.

Climate and weather conditions are also controlled for in the models. Social integration and social climate may partly determine how satisfied migrants are when they live in communities or cities and influence their overall satisfaction (Yang et al., 2020). Therefore, two indicators are chosen to measure the social climate of city j from the survey: (1) "Do you think locals are willing to accept you as one of them?" and (2) "Do you think locals always look down on migrants?" The answers ranged from "strongly disagree" to "strongly agree". In addition, weather conditions are associated with migrants' subjective well-being; for example, high temperatures in the summer significantly decrease people's happiness (Florida et al., 2013). To avoid the possible interference of natural climate conditions, $weather_j$ is also controlled in the regressions, including average yearly temperatures, average yearly wind speed, and average yearly precipitation. Standard errors are clustered at the city level.

In this study, two models are used for the analysis. The first listed in Eq. (1) includes individual, family and city characteristics, weather controls and social climate conditions, and

the second adds province fixed effects to the models to rule out the influence of provincial characteristics that may bias the results of city housing prices. The second model is listed as follows:

$$y_{ijm} = \beta_0 + \beta_1 p_{jm} + \beta_2 X_{ijm} + \gamma city_{jm} + \beta_3 weather_{jm} + \beta_4 socialclimate_{jm} + \delta_m + \epsilon_{ijm} \quad (2)$$

In Eq. (2), δ_m is the provincial fixed effect. In this model, we exclude the influence of observed and unobserved provincial characteristics that may be related to both housing prices and migrants' subjective well-being. In addition to the housing prices in the current year, we also use the housing prices in previous years as a proxy variable to examine the role of housing prices in determining the happiness of migrants.

6 Results

6.1 Baseline results

We test the hypothesis that city housing prices are negatively associated with migrants' subjective well-being in this section. Table 2 presents the results of the empirical models in Eqs. (1) and (2). Two housing price indicators are considered in the models: city housing prices and housing price-to-income ratio. In Column (1), we explore the relationship between city housing prices and migrants' subjective well-being, controlling for basic individual, family and city characteristics, social climate and weather conditions. Column (2) further controls for marital status, working hours, family income, the number of children under age 14, and family size. Column (3) augments the model by including the provincial fixed effects. In Columns (4)–(6), the housing price-to-income ratio is used to reflect housing affordability for migrants. Column (6) includes the provincial fixed effects.

The results in Table 2 support our first hypothesis that housing prices are negatively related to migrants' subjective well-being. Columns (1), (2) and (3) illustrate that as the city housing prices rise, the happiness of migrants decreases. Even after controlling for provincial fixed effects, the coefficients of housing prices are significant. Columns (4)–(6) present the influence of the housing price-to-income ratio. When the housing price-to-income ratio is higher, migrants are more likely to feel unhappy in the city because it is more difficult for them to buy a house and the living cost is higher. These findings are partly consistent with previous studies indicating that high housing prices discourage young adults from entering marriage and hinder their entrepreneurial activities (Li & Wu, 2014; Wrenn et al., 2019).

6.2 Heterogeneous effects on subjective well-being

Here, we test our second hypothesis and further explore whether the effect of housing prices varies across migrants' education level, *hukou* status, and sex.

Table 2 Regressions results of housing prices on migrants' subjective well-being

	(1)	(2)	(3)	(4)	(5)	(6)
Housing prices	-0.074*** (0.009)	-0.096*** (0.010)	-0.029** (0.012)			
Housing price-to-income ratio				-0.129*** (0.022)	-0.159*** (0.023)	-0.079*** (0.025)
<i>Individual and family characteristics</i>						
Age	0.015*** (0.002)	0.009*** (0.003)	0.005 (0.003)	0.008*** (0.001)	0.005** (0.002)	0.002 (0.002)
Age square	-0.000*** (0.000)	-0.000*** (0.000)	-0.000 (0.000)	-0.000*** (0.000)	-0.000** (0.000)	-0.000 (0.000)
Sex	-0.062*** (0.007)	-0.041*** (0.007)	-0.041*** (0.007)	-0.039*** (0.004)	-0.024*** (0.004)	-0.025*** (0.004)
Ethnicity	-0.039*** (0.014)	-0.032** (0.016)	-0.023 (0.016)	-0.002 (0.009)	0.007 (0.010)	0.006 (0.010)
<i>Hukou</i>	0.021** (0.011)	0.021* (0.011)	0.031*** (0.011)	0.016** (0.007)	0.016** (0.007)	0.023*** (0.007)
Schooling years	-0.002 (0.001)	-0.005*** (0.002)	-0.004** (0.002)	0.000 (0.001)	-0.002 (0.001)	-0.001 (0.001)
Migration years	0.019*** (0.001)	0.016*** (0.001)	0.017*** (0.001)	0.011*** (0.001)	0.009*** (0.001)	0.010*** (0.001)
Housing rent	0.010*** (0.001)	0.003** (0.002)	0.003* (0.002)	0.007*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
Family income		0.129*** (0.007)	0.132*** (0.007)		0.076*** (0.004)	0.079*** (0.004)
Marriage		0.015 (0.011)	0.007 (0.011)		0.013* (0.007)	0.005 (0.007)
Working hour		-0.025*** (0.002)	-0.024*** (0.002)		-0.014*** (0.001)	-0.013*** (0.001)
Children		-0.021*** (0.007)	-0.013* (0.007)		-0.012*** (0.004)	-0.009** (0.004)
Family size		0.040*** (0.005)	0.051*** (0.005)		0.024*** (0.003)	0.030*** (0.003)
<i>City characteristics</i>						
Total population	-0.022** (0.010)	-0.015 (0.010)	-0.072*** (0.017)	0.002 (0.007)	0.009 (0.007)	-0.045*** (0.010)
GDP per capita	0.015 (0.010)	0.013 (0.010)	0.012 (0.014)	0.014** (0.006)	0.011* (0.006)	0.007 (0.008)
Tertiary share	-0.003*** (0.000)	-0.003*** (0.000)	-0.002*** (0.001)	-0.003*** (0.000)	-0.004*** (0.000)	-0.002*** (0.000)
Enterprise	0.034*** (0.007)	0.036*** (0.008)	0.070*** (0.014)	0.011** (0.005)	0.010** (0.005)	0.046*** (0.009)
Weather controls	YES	YES	YES	YES	YES	YES
Social climate	YES	YES	YES	YES	YES	YES

Table 2 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)
Provincial fixed effect	NO	NO	YES	NO	NO	YES
<i>N</i>	105,602	105,602	105,602	99,306	99,306	99,306
adj. <i>R</i> ²				0.116	0.123	0.135

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. The housing price-to-income ratio is measured by the city housing prices divided by the average wages at the city level (obtained from the China Regional Statistical Yearbook), and thus there are some sample size differences between Columns (1)-(3) and Columns (4)-(6). Weather controls include average yearly temperature, average yearly wind speed, and average yearly precipitation

6.2.1 Education level

Table 3 Heterogeneous regressions by education level

	(1)	(2)	(3)	(4)
	Low-educated	High-educated	Low-educated	High-educated
Housing prices	-0.058** (0.029)	0.013 (0.034)		
Housing price-to-income ratio			-0.269** (0.113)	0.007 (0.107)
Individual characteristics	YES	YES	YES	YES
Family characteristics	YES	YES	YES	YES
City characteristics	YES	YES	YES	YES
Weather controls	YES	YES	YES	YES
Social climate	YES	YES	YES	YES
Provincial fixed effect	YES	YES	YES	YES
<i>N</i>	73,683	31,919	68,931	30,375

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. Individual, family and city characteristics, weather variables, and social climate are the same with those controlled in Table 2

To verify Hypothesis 2, we divide our sample into two groups: the high-educated group and the low-educated group. Highly educated migrants are defined as those who have obtained a high school education or above. Otherwise, migrants are categorized as the low-educated group.

Table 3 presents the results of the heterogeneous effect of city housing prices on migrants with different education levels. Columns (1) and (2) show that city housing prices are negatively related to low-educated migrants' subjective well-being, while city housing prices show a positive correlation with high-educated migrants' subjective well-being, it is not statistically significant. Columns (3) and (4) support the same conclusion that the housing price-to-income ratio has a negative effect on low-educated migrants' subjective well-being when we use the housing price-to-income ratio as a proxy variable for city housing prices. These results are similar to those of previous well-being studies.

6.2.2 *Hukou* status

We divide the sample into two groups based on migrants' *hukou* status: rural-to-urban and urban-to-urban migrants. We expect that a high housing price will significantly weaken the subjective well-being of rural-to-urban migrants.

Table 4 shows the results of the effect of city housing prices on rural-to-urban migrants and urban-to-urban migrants. After controlling for individual, family, and city characteristics, columns (2) and (4) indicate that both city housing prices and housing price-to-income ratio have a significantly negative effect on rural-to-urban migrants' subjective well-being. Although urban-to-urban migrants are negatively affected by housing prices, the effect is not statistically significant. These findings are consistent with our expectation that rural-to-urban migrants are more likely to be affected by city housing prices.

Table 4 Heterogeneous regressions by *hukou* status

	(1)	(2)	(3)	(4)
	Urban hukou	Rural hukou	Urban hukou	Rural hukou
Housing prices	-0.022 (0.042)	-0.050** (0.026)		
Housing price-to-income ratio			-0.153 (0.131)	-0.183** (0.086)
Individual characteristics	YES	YES	YES	YES
Family characteristics	YES	YES	YES	YES
City characteristics	YES	YES	YES	YES
Weather controls	YES	YES	YES	YES
Social climate	YES	YES	YES	YES
Provincial fixed effect	YES	YES	YES	YES
<i>N</i>	14,249	91,353	13,383	85,923

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. Individual, family and city characteristics, weather variables, and social climate are the same with those controlled in Table 2

6.2.3 Sex

To test the hypothesis that city housing prices have a larger negative effect on female migrants, the sample in this study is grouped into female and male migrants. Although the heads of households are usually male, females usually attach more importance to buying a house for the sense of security it provides. The expectation is that city housing prices will have a negative correlation with female migrants' subjective well-being.

Table 5 Heterogeneous regressions by sex

	(1)	(2)	(3)	(4)
	Male migrants	Female migrants	Male migrants	Female migrants
Housing prices	-0.009 (0.031)	-0.060** (0.030)		
Housing price-to-income ratio			-0.119 (0.114)	-0.253** (0.108)
Individual characteristics	YES	YES	YES	YES
Family characteristics	YES	YES	YES	YES
City characteristics	YES	YES	YES	YES
Weather controls	YES	YES	YES	YES
Social climate	YES	YES	YES	YES
Provincial fixed effect	YES	YES	YES	YES
<i>N</i>	62,289	43,313	58,424	40,882

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. Individual, family and city characteristics, weather variables, and social climate are the same with those controlled in Table 2

Table 6 Results for robustness check

	(1)	(2)	(3)
	Using the whole sample	Lagged housing prices	
Housing prices	-0.056** (0.022)		
Housing prices in 2010		-0.090** (0.039)	
Housing prices in 2011			-0.155** (0.066)
Individual characteristics	YES	YES	YES
Family characteristics	YES	YES	YES
City characteristics	YES	YES	YES
Weather controls	YES	YES	YES
Social climate	YES	YES	YES
Provincial fixed effect	YES	YES	YES
<i>N</i>	112,985	105,602	105,602

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. Individual, family and city characteristics, weather variables, and social climate are the same with those controlled in Table 2

The results of the effects on female and male migrants are presented in Table 5. Columns (1) to (4) indicate that as city housing prices and housing price-to-income ratios increase, the subjective well-being of female migrants significantly decreases. However, the coefficient of housing prices for males is not significant. These findings are consistent with previous literature showing that females focus more on city housing prices.

6.3 Robustness check

Here, we mainly discuss the time-lagged effect when exploring the relationship between city housing prices and migrants' subjective well-being. The sample used in the baseline models is renter migrants, namely, those who do not own a house in the city. We use the whole sample and add a dummy variable reflecting the homeownership status of the migrants in Column (1) of Table 6. This conclusion is consistent with that of our previous analysis. In addition, migrants may also respond to city housing prices in previous years; thus, considering the possible time-lagged effect caused by housing prices, we calculate the residential housing prices in 2010 and 2011 to estimate the effect of housing prices again. Columns (2) and (3) of Table 6 show that city housing prices in 2010 and 2011 are also negatively associated with migrants' subjective well-being.

6.4 Instrumental variable results

A threat to the identification of the causal effect of housing prices is omitted variable bias. Although we control for individual, family and city characteristics as much as possible, there may still be some unobserved factors affecting housing prices and migrants' subjective well-being. Therefore, we use an instrumental variable approach to further eliminate or mitigate possible estimation bias owing to the omitted problem in this section. Another threat is the possible two-way causality between housing prices and migrants' subjective well-being. There may be a reverse causality problem in which housing prices could play a critical role in shaping migrants' subjective well-being, and the happiness that migrants feel when they live in cities could partly determine regional housing demand and housing prices. Intuitively, migrants may be more willing to pay a higher price for a house in the city where they feel happier. Therefore, considering that the omitted variable and reverse causality may bias the estimated results, we choose two types of instrumental variables to mitigate the potential endogeneity problem: the average slope of each city and the land supply at the city level.

Geographical conditions are exogenous and naturally formed, and they are used as instrumental variables when the effect of housing prices is identified (Saiz, 2010; Wrenn et al., 2019). Regarding geography as a key element in urban development, Saiz (2010) points out that the slope of a region is highly correlated with city housing prices. Wrenn et al., (2019) also use the average slope of each city to solve the endogenous problem of housing prices. From the perspective of housing supply, if the slope of each city is lower, it means that the available land area is larger and housing prices are lower. Consequently, we use the average slope of each city as an instrumental variable.

In addition, the land supply of each city decided by the local government is one of the main factors influencing housing prices. As construction land area is regulated by the central government, it is not directly related to migrants' subjective well-being, which satisfies the

exogenous condition of the instrumental variable. We construct two variables based on the land supply from the China Regional Statistical Yearbook: the growth of the construction land area of each city from 2009 to 2012 and the growth rate of each city during the same period. Both indicators are used in instrumental variable specifications.

Table 7 presents the results for the instrumental variable analysis.⁶ In Columns (1) and (3), the average slope and growth of the construction land area are used as the instrumental variables. In Columns (2) and (4), the average slope and growth rate of the construction land area between 2009 and 2012 are used in the instrumental specification. The results in Columns (1) and (2) show that housing prices are negatively and significantly correlated with migrants' subjective well-being, which is consistent with the results in Table 2. Columns (3) and (4) indicate that if the city housing price increases, migrants are significantly unhappier, and the coefficients are -0.513 and -0.510 , respectively. These results show that our estimated results in the main regressions are robust and credible.

7 Mechanism analysis

The findings in the previous section reveal that an increase in housing prices is not conducive to an increase in migrants' subjective well-being. The first mechanism may be a direct emotional effect. As one of the important goals of young adults is owning a house in the city, the high housing prices may make migrants feel pressured and uncomfortable. The feeling that they cannot afford a house in the city where they work for a very long time may make them unhappy. In addition to the direct negative emotional effect, we attempt to further analyze whether there are possible channels through which city housing prices play a role in migrants' happiness and subjective well-being. As discussed in the hypothesis section, there are two potential channels: the "family split" effect and the "work more" effect.

Table 7 Results with instrumental variables

	(1)	(2)	(3)	(4)
	IV-ordered-probit with cmp		IV-probit	
Housing prices	-0.064** (0.029)	-0.064** (0.029)	-0.513** (0.229)	-0.510** (0.227)
Individual characteristics	YES	YES	YES	YES
Family characteristics	YES	YES	YES	YES
City characteristics	YES	YES	YES	YES
Weather controls	YES	YES	YES	YES
Social climate	YES	YES	YES	YES
Provincial fixed effect	YES	YES	YES	YES
<i>N</i>	105,602	105,602	105,602	105,602

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. Individual, family and city characteristics, weather variables, and social climate are the same with those controlled in Table 2

⁶ The first-stage *F*-statistic of the instrumental equation in Column (4) of Table 7 is 2340.463, which is above the rule-of-thumb criterion of 10, and it satisfies the standard criteria of instrumental variable (Stock & Yogo, 2005). The *p* value of overidentifying restrictions Hansen's J test is 0.162, so the null hypothesis that the overidentifying exclusion restrictions are valid cannot be rejected.

7.1 The “family split” effect

To test the “family split” hypothesis, we consider migration and residential patterns of migrants and explore whether housing price is an important factor of family split. We select three indicators from the survey to reflect migrants’ residential patterns: whether they live with children less than 18 years of age, whether they live with their parents, and whether they live with their spouses. If the city housing prices rise, they will increase the living costs and burdens for migrants, which may increase the possibility of migrants living in cities alone. Our expectation is that the city housing prices are negatively correlated with the possibility of migrants living with young children, parents, or spouses.

Table 8 presents the results of this study. Columns (1), (3) and (5) show that as the city housing prices increase, migrants are less likely to live in the same city with their children, parents, or spouses. A one percentage point increase in city housing prices corresponds to a 0.021% decrease in the possibility of migrants living with their children and a 0.006% drop in the possibility of migrants living with their parents. Similarly, it is correlated with a 0.013% decrease in the possibility of migrants living with their spouses. Overall, these findings show that high housing prices lead to a higher possibility of family split for migrants and thus reduce migrants’ subjective well-being, which confirms the “family split” effect.

To further explore the mediation effect of the geographical family split, we add the above residential pattern indicators into Eq. (2) and estimate the effect of housing prices again.

Table 8 Results for mechanism analysis: the “family split” effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Living with children	Happiness	Living with parents	Happiness	Living with spouse	Happiness
Housing prices	-0.021*** (0.005)	-0.008*** (0.002)	-0.006** (0.003)	-0.008*** (0.002)	-0.013*** (0.005)	-0.008*** (0.002)
Living with children		0.040*** (0.002)				
Living with parents				0.010*** (0.004)		
Living with spouse						0.035*** (0.003)
Individual characteristics	YES	YES	YES	YES	YES	YES
Family characteristics	YES	YES	YES	YES	YES	YES
City characteristics	YES	YES	YES	YES	YES	YES
Weather controls	YES	YES	YES	YES	YES	YES
Social climate	YES	YES	YES	YES	YES	YES
Provincial fixed effect	YES	YES	YES	YES	YES	YES
N	105,602	105,602	105,602	105,602	105,602	105,602
adj. R ²	0.394	-	0.298	-	0.553	-
Ratio of mediation effect		3.931%		11.750%		4.820%

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. Individual, family and city characteristics, weather variables, and social climate are controlled. Columns (1), (3) and (5) are estimated by Linear Probability Models (LPM), and Columns (2), (4) and (6) are estimated by ordered-probit models. To calculate the ratio of mediation effect, Columns (2), (4) and (6) report the marginal effect evaluated at the extreme value of very high happiness (score 5)

Columns (2), (4) and (6) in Table 8 show that after controlling for whether migrants live with their children, parents, or spouses, the coefficients of the marginal effect of housing prices decrease and are statistically significant, consistent with our expectation. Table 8 also shows that living with children, parents, or spouses accounts for 3.931–11.750% of the negative effect of housing prices.⁷

7.2 The “work more” effect

To test the “work more” hypothesis, we select three indicators from the survey: total monthly expenditures, television hours per week, and working hours per week. Watching television can reflect migrants’ leisure hours. As the above indicators are continuous variables, we use OLS models to estimate the effect of housing prices. Columns (1), (3), and (5) in Table 9 illustrate the results. First, a one percentage point increase in city housing prices is corre-

Table 9 Results for mechanism analysis: the “work more” effect

	(1)	(2)	(3)	(4)	(5)	(6)
	Total expenditure	Happiness	Watching television hours	Happiness	Working hours	Happiness
Housing prices	434.040*** (57.201)	-0.008* (0.005)	-0.463** (0.190)	-0.008*** (0.002)	0.333** (0.162)	-0.007*** (0.002)
Total expenditure		0.013*** (0.002)				
Watching television hours				0.006*** (0.001)		
Working hours						-0.007* (0.004)
Individual characteristics	YES	YES	YES	YES	YES	YES
Family characteristics	YES	YES	YES	YES	YES	YES
City characteristics	YES	YES	YES	YES	YES	YES
Weather controls	YES	YES	YES	YES	YES	YES
Social climate	YES	YES	YES	YES	YES	YES
Provincial fixed effect	YES	YES	YES	YES	YES	YES
<i>N</i>	105,602	105,602	105,602	105,602	105,602	105,602
adj. <i>R</i> ²	0.272	-	0.028	-	0.073	-
<i>Ratio of mediation effect</i>		9.542%		9.116%		18.651%

Notes: Standard errors in parentheses are clustered at the city level. ***/**/* indicates significance at the 1%/5%/10% levels. Individual, family and city characteristics, weather variables, and social climate are controlled. Columns (1), (3), and (5) are estimated by OLS models and Columns (2), (4), and (6) are estimated by ordered-probit models. To calculate the ratio of mediation effect, Columns (2), (4), and (6) report the marginal effect evaluated at the extreme value of very high happiness (score 5)

⁷ The marginal effect of city housing price in Column (3) of Table 2 is 0.0088, and we calculate the ratio of mediation effect according to this marginal effect coefficient.

lated with a rise of 4.34 yuan in the total monthly expenditure of migrants. The results show that high housing prices increase the living costs of migrants, which indicates that there is not much room for migrants to consume less to purchase a house in the future. Second, a ten percentage point increase in housing prices corresponds to a drop of 0.05 h in migrants' leisure time in watching television and a rise of 0.03 h in working for migrants, which indicates that migrants may work longer or even harder when facing high housing prices. Therefore, the results confirm our hypothesis that, on the one hand, as the living costs of migrants in cities with high housing prices are also relatively higher, it is relatively difficult for migrants to save money by decreasing daily consumption because of the high living standards in these cities (due to data limitations, we cannot analyze the correlation between city housing prices and migrants' necessity and non-necessary consumption). In contrast, high housing prices cause migrants to work more to achieve their goal of purchasing a house. They have to increase working hours, decrease leisure time, work harder, or sacrifice entertainment time (Columns 3 and 5, Table 9), which confirms the "work more" effect.

Similarly, we add the above variables into the regression models and examine the effect of housing prices after controlling for the possible mediation variables. In Columns (2), (4), and (6) of Table 9, we add total expenditure, watching television hours and working hours, respectively, into the models. The results show that the cost and time use indicators act as mediation variables because the association between housing prices and migrants' subjective well-being reduces after controlling for these variables. We find that rising living costs, decreasing leisure time and increasing working hours account for at most 18.651% of the effect of city housing prices on migrants' subjective well-being.

8 Conclusion and implications

Existing studies have focused on the effects of housing prices on fertility behavior, marriage entry, and entrepreneurship, as well as the relationship between homeownership and subjective well-being. However, the relationship between housing prices and the subjective well-being of migrants has not been studied (Li & Wu, 2014; Liu et al., 2020; Wrenn et al., 2019). A large number of migrants have flowed into cities in recent decades in China, and most of them want to settle there, while only a few can afford to buy a house there. Therefore, considering the relatively low average wage of migrants, we focus on the negative effect of housing prices on migrants' happiness to bridge the gap in the literature regarding housing prices and migrants' subjective well-being. In addition to the main effect, we further analyze the potential mechanisms behind the effect of housing prices on migrants' subjective well-being.

Based on nationally representative CMDS data in China, we use an ordered-probit model to estimate the effect of housing prices on migrants' subjective well-being and find that the higher the housing price is, the lower the subjective well-being of migrants. In the heterogeneous analysis, we group the sample by sex, *hukou* status, and education level. The results indicate that highly educated migrants are not significantly affected by housing prices, while city housing prices show a negative correlation with low-educated migrants' subjective well-being. Housing prices have a greater effect on female migrants, and rural-to-urban migrants are also significantly and negatively affected. Furthermore, there may be a time-lagged effect of city housing prices on migrants' SWB. We identify the effect of

housing prices in 2010 and 2011 on migrants' subjective well-being and obtain consistent results. To further mitigate the endogenous biases, we follow the literature, use the average slope of each city and land supply at the city level as instrumental variables, and obtain robust results.

There are two possible explanations for these mechanisms. First, the "family split" effect: due to the longstanding tradition of living with extended families, migrants will experience loneliness and feel a lack of belonging to the city if they face a geographical family split. The increase in city housing prices raises the possibility of migrants living separately from their families, which reduces migrants' subjective well-being. Second, regarding the "work more" effect, the living costs of migrants are relatively higher in cities with high housing prices, and thus, it is more likely that they will work longer hours and decrease leisure hours to achieve the goal of purchasing a house in the future. Both working overtime and decreasing leisure time significantly reduce migrants' subjective well-being. The "family split" effect and the "work more" effect account for up to 11.750% and 18.651% of the negative effect of city housing prices, respectively.

The policy implication of this study is that housing prices exert a substitution effect on migrants' subjective well-being. Providing low-cost housing for migrant workers is a critical measure to raise migrants' welfare, especially for those with lower education. In addition, public policy aimed at increasing migrants' subjective well-being should be improved by providing complete basic public welfare, not just for the migrants but also for their families, such as offering the same opportunity for access to education, medical services, and other social welfare to migrants' families as to the local people.

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Declarations

Conflict of interest The authors declare no conflict of interest.

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