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Do high housing prices crowd out young professionals?—Micro-evidence from China

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ABSTRACT

Motivated by the growing trend of young professionals flowing out of high-profile cities in China, this study examines whether high housing prices have a crowding-out effect on young professionals across 235 Chinese cities. Using a conditional logit model with multiple control variables related to the economy, the social environment, and city location, the results showed an inverted U-shaped relationship between a city's house prices and young professionals' potential migration into the city. We also performed a series of robustness checks and categorised the sample by gender, academic qualification, and marital status. The results indicated the same inverted U-shaped relationship, but with different extreme points for house prices across the sub-samples. The findings offer suggestions for Chinese local governments to attract young professionals by regulating housing prices in cities where prices surpass the extreme point.

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1. Introduction

Since China's economy entered a 'new normal', its economic growth has shifted from being factor-driven to innovation-driven (Morrison, 2019), making innovation the country's core economic impetus. As the main body of innovation, professionals have become highly sought-after resources by cities. In fact, the competition for professionals is becoming increasingly fierce among Chinese cities, which is reflected by cities' various preferential policies to attract professionals. However, the dramatic increase in housing prices in superstar cities may offset the effectiveness of these strategies in attracting young professionals.

This study focussed on young professionals for the following reasons. First, most cities in China attract professionals based on the principle of 'differentiation of talent categories and treatment' wherein they classify professionals by age and other criteria

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to provide preferential treatment to certain groups. In terms of age, 45 is the threshold used by most cities in China, as local governments are unwilling to spend public funds on attracting professionals above that age unless they are highly innovative.[1] Second, despite receiving generous housing security by Chinese local governments, highly innovative professionals' incomes are sufficient to cope with high housing prices. As such, house price may not influence their choice of city to settle in. In comparison, young professionals only obtain modest preferential treatment from local governments despite their relatively low income. Consequently, they must consider high housing costs when choosing a city. Additionally, according to the China Migrants Dynamic Survey (CMDS) in 2017, nearly 95% of migrated professionals are under 45 years old. Hence, this study targeted young professionals.

The recent and peculiar phenomenon of young professionals flowing out of cities with high housing prices has attracted our attention. According to Wang and Chen (2020), the proportion of Chinese undergraduate degree holders choosing to work in Shenzhen, Beijing, Shanghai, and Guangzhou[2] decreased from 26% in 2015 to 20% in 2019. Additionally, data released by Peking University (2014, 2019) shows that the percentage of bachelor's degree graduates who stayed in Beijing to work fell drastically from 71.79% in 2013 to 16.07% in 2019. The question of whether high housing prices have a crowding-out effect on young professionals in China has thus piqued our interest. If this effect exists, it would weaken cities' advantages securing young professionals and offset the attractiveness of preferential policies for this group. Therefore, in the context of Chinese cities' scramble for the young professional resource, the relationship between housing prices and young professionals' city choice demands urgent study.

Unfortunately, research on this relationship has not drawn enough scholarly attention. As far as we know, to date, only two studies have empirically examined the impact of high housing prices on professionals' choice of cities in China, and neither of them paid attention to the specific group of young professionals. Yang and Pan (2020) argued that high housing prices only have a short-term negative effect on human capital agglomeration; in the long run, the brain drain caused by high prices will disappear. Supporting this, Lin et al. (2021) concluded that there is no crowding-out effect of high housing prices on professionals in 51 Chinese cities. However, Yang and Pan (2020) only examined professionals' inter-provincial migration, ignoring their intra-provincial movement. Given that 35.7% of Chinese migrants moved within their province in 2017,[3] it is unreasonable to exclude this large cohort of migrants, which weakens the reliability of Yang and Pan (2020) conclusion. Lin et al. (2021), on the other hand, only defined researchers as professionals, which is evidently biased; professionals also include those from management and skilled sectors. In addition, both Yang and Pan (2020) and Lin et al. (2021) used macro data in their analyses. Therefore, the main contributions of this study are as follows: (1) rather than macro data, we used micro data from the CMDS to test the relationship between Chinese cities' housing prices and young professionals' potential migration to the cities; (2) unlike the linear relationship concluded by previous studies (Lin et al., 2021; Yang & Pan, 2020), we proposed an inverted U-shaped relationship between cities' housing prices and young professionals' potential migration; and (3) we classified young professionals into sub-samples by gender, academic qualification, and marital status to clarify the heterogeneity of housing prices' effects on their potential migration.

The rest of this paper is arranged as follows. Section 2 reviews previous studies in this area. Section 3 describes the study's methodology and data. The empirical results are presented and discussed in Section 4. Section 5 summarises the study's conclusions and puts forward policy implications.

2. Literature review and hypothesis development

2.1. Factors influencing migration

The literature on the influencing factors of migration can be classified into macro and micro perspectives. Macro-level research mainly focuses on three aspects, i.e., economy, society, and distance. In terms of the economy, higher GDP (Etzo, 2011; Su et al., 2018), advanced industrial structures (Wright et al., 1997), more employment opportunities (Etzo, 2011; Li et al., 2013; Simionescu, 2019; Su et al., 2018) and better wage rates (Brown, 1997; Su et al., 2018) attract migrants, whereas high prices (Brown, 1997), which imply high living costs, hinder migration inflow. With regard to social factors, the literature affirms the positive impact of a large population (Fan, 2005; Su et al., 2018), high quality public service (Chung, 2015; Liu et al., 2015), similar culture (Lee, 1966), higher institutional quality (Lee, 1966), and a safe social environment (Radic et al., 2020) on migration. In addition, distance (Fan, 2005; Li et al., 2013) negatively affects migration, though its effect weakens gradually with time. Specifically, migrants prefer cities closer to their hometown.

From the micro perspective, researchers have studied the influence of individual characteristics, such as age (Parida & Madheswaran, 2011), marriage (ibid), education (Van der Land & Hummel, 2013), number of siblings (Zhao & Zhong, 2019), and emotional attachment (Mortreux & Barnett, 2009) on migration decisions. Specifically, people who are young, single, highly educated, rational, and with siblings are more likely to migrate. It must be emphasised that macro and micro factors do not work separately but interact with one another to shape migration decisions (Hunter et al., 2015).

2.2. Housing prices and migration

The price of housing is an important factor affecting migration. Studies have found that rising housing prices have a crowding-out effect on migrants by making housing less affordable. Berger and Blomquist (1992) analysed American census data from 1980 to conclude that migrants are more reluctant to choose cities with high housing costs. Michaelides (2011) and Plantinga et al. (2013) drew the same conclusion upon narrowing down their research samples to full-time employed American men aged 35 to 65 and college-educated American men, respectively. Similarly, Rabe and Taylor (2012) and Smith and Sage (2014) found that the sharp rise in housing prices had significantly squeezed out young people in the UK.

Helpman (1998) introduced the housing market factor to Krugman's (1991) new economic geography and proposed that a region's increasing housing prices diminish laborers' relative utility, which inhibits labour aggregation. Rabe and Taylor (2012) empirically validated Helpman's (1998) proposition among a United Kingdom sample. Tao et al. (2015) found that the reason most migrant workers return home from Shenzhen is the city's high housing cost, indicating its crowding-out effect on the labour force. However, some researchers have reached the opposite conclusion. Yang and Pan (2020) used a panel vector auto regression model to reveal a positive correlation between human capital agglomeration and housing prices. Likewise, using researchers as the proxy for professionals, Lin et al. (2021) found that increasing housing prices are more attractive to professionals across 51 Chinese cities.

Overall, research concurs that housing prices are central to migration, but it remains controversial whether they have a pull or push effect on the population. To the best of our knowledge, thus far, only Yang and Pan (2020) and Lin et al. (2021) have empirically studied the relationship between housing prices and migration in China. However, Yang and Pan (2020) only considered inter-provincial migration, while Lin et al. (2021) only sampled researchers. Notably, neither addressed the specific growing cohort of young professionals. In addition, both studies used macro data, which cannot directly reflect the migration path. In view of these gaps, this study used micro data to assess the relationship between cities' housing prices and the possibility of young professionals migrating into cities. Unlike macro data, micro data does not only record the cities entered by each migrant, but also expands the sample size, thereby improving the reliability of our conclusions.

2.3. Hypothesis

The existing literature presented so far suggests a linear relationship between housing prices and migration. However, we contend that the effect of housing prices on young professionals' migration is not straightforward but non-linear. Young professionals migrate when the expected utility of living in the destination city is higher than that of their original city (Zang et al., 2015). Such utility is usually measured by money or disposable income (Carr, 2005).

High housing prices can crowd-out young professionals. According to the 2021 Survey on Marriage and Fertility Intentions among College Students, nearly 90% of young professionals who receive a college education look forward to getting married before the age of 30 (Li et al., 2022). Owning a house has become a prerequisite for Chinese people to get married (Su et al., 2020; Wrenn et al., 2019), rendering it necessary for young professionals in China to buy housing as soon as possible after graduation. However, rising house prices spike home purchase costs. This diminishes young professionals' disposable income and consequently, their expected utility. As a result, cities' high housing prices reduce the possibility of young professionals migrating there, indicating a crowding-out effect.

Conversely, high housing prices may positively impact the migration of young professionals. First, almost all Chinese cities have housing security policies for young professionals, wherein local governments provide rental subsidies or transitional housing to attract young professionals. This alleviates the decline of young professionals' disposable income caused by higher housing prices. Second, high housing prices embody the capitalisation of public services (Oates, 1969); that is, they often mean better public services, which positively correlates with regional economic development. Thus, high house prices may symbolise good development prospects and high income expectations. In addition, as a type of investment, the rapid rise of house prices can engender higher expected returns, which also increases future disposable income. Therefore, cities with rising housing prices can appear attractive to young professionals.

As discussed above, high housing prices have both positive and negative effects on young professionals' migration. We therefore contend that the relationship between house prices in a city and the possibility of young professionals migrating to the city is not linear, but inverted U-shaped. In fact, an inverted U-shaped relationship is common in economics research (i.e., Kuznets curve and Armey-Rahn curve). In the present context, we argue that the effect of housing prices on young professionals is initially attractive, but crowds out young professionals when the housing price exceeds a certain level. In general, when a city's housing prices rise from a low level, young professionals are drawn by the increase in expected utility from housing security policies, better development prospects, and greater expected returns on housing investment, which surpasses the decrease in expected utility from higher home purchase costs. However, when housing prices continue to rise to the point where these benefits are offset by higher housing costs, the city may no longer be attractive, hence crowding out young professionals. Based on the above discussion, we proposed the following hypothesis.

HP: There is an inverted U-shaped relationship between house prices in a city and the possibility of young professionals migrating into the city.

3. Data and methodology

3.1. Data

Young professionals were the focus of this study, who we defined as population members aged from 18 to 44 who had received at least a college education. This study involved micro data describing the migration of young professionals and macro data describing city characteristics. The micro data was obtained from the CMDS conducted by the National Health Commission of the People's Republic of China in 2017,[4] while the macro data was taken from the Chinese real estate information network organised by the State Information Center of China, cities' statistical yearbooks, and the Atmospheric Composition Analysis Group affiliated with Dalhousie University. After eliminating observations with missing data, 12,830 samples were selected from 235 cities.[5]

The definitions and descriptive statistics of the variables are shown in Table 1. House price (*HP*) was our core explanatory variable, derived from the Chinese real estate information network. In accordance with the talent aggregation theory, three city characteristic types were further included as control variables in the analysis to more accurately depict the impact of housing prices on young professionals' city choices. The first was the economic characteristics, including wage rates (*W*), gross

Table 1. Variable definitions and descriptive statistics.

Category	Variable name	Description	Measurement	Mean	Standard deviation	Min	Max	Expected Sign
Independent variable	*HP*	The average annual sales price of residential housing at the city level	1,000 RMB	6.365	5.012	2.464	48.622	
City economic characteristics	*W*	Annual per capita wage income at the city level	10,000 RMB	6.560	1.330	4.223	13.499	+
	GDP	Annual per capita gross regional product at the city level	10,000 RMB	6.367	3.432	1.789	18.354	+
	Industry	The proportion of the tertiary industry's output value to gross regional product at the city level	Ratio	0.510	0.396	0.275	3.519	+
	IFA	The annual workload of the construction and purchase of fixed assets in a city in monetary terms	100 million RMB	2039.381	1964.707	88.979	17245.760	+
	CPI	Annual consumer price index at the city level	Ratio	1.015	0.005	1.001	1.033	–
City social environment	*PD*	The population per square kilometre at the end of the year	person/km^2	441.815	335.176	0.000	2294.591	+/-
	AP	The annual average PM2.5 index	ug/m^3	36.141	14.001	6.421	68.950	–
	MSC	The number of assistant and licenced doctors in the city	10,000 persons	1.149	1.111	0.086	9.442	+
	EESC	The number of primary and secondary school teachers in the city	10,000 persons	3.646	2.623	0.197	24.092	+
City location	D_1	The straight distance between the potential destination city and the home city of young professionals	km	1,116.996	635.316	0.000	3,283.927	–
	D_2	The straight distance between the potential destination city and its provincial capital	km	256.209	357.204	0.000	2,642.235	–

Source: Authors' design and calculation.

regional product (*GDP*), industrial structure upgrading (*Industry*), investment in fixed asset (*IFA*), and consumer price index (*CPI*). The second type characterised cities' social environment, including population density (*PD*), air pollution (*AP*), medical service capacity (*MSC*), and elementary education service capacity (*EESC*). City location was the third type of control variable, including distance from destination city to registered residence (D_1) and distance from destination to provincial capital (D_2).

W and *GDP* were chosen as economic control variables because a developed economy corresponds with high per capita income, making it an important factor in attracting professionals (Li et al., 2019). Although *W* and *GDP* seem to have strong substitutability, *W* represents the individual micro perspective while *GDP* represents the urban macro perspective. Next, fixed asset investment can promote economic growth (Song et al., 2013); as such, higher *IFA* reflects a city's development prospects and thus, attracts young professionals. According to Narayanan and Lai (2014), professional skills and knowledge are critical for industrial structure upgrading, placing highly educated young professionals as the right candidates for the jobs created in this area. Correspondingly, *Industry* was taken as a control variable to measure cities' industrial upgrading level, as it is presumably attractive to young professionals (Yu et al., 2015). In addition, according to Wang et al. (2021), higher living costs can delay the recovery and growth of household production after migration by crowding out production inputs from migrant families. As such, the cost of living in a city should negatively correlate with the likelihood of young professionals migrating into the city. Following Białek (2020), we used *CPI* to measure the cost of living.

In terms of cities' social environment, the crowding effect argues that when *PD* is low, an increase in *PD* has positive effects. However, an excessive increase in *PD* produces negative effects (Gad, 1973). As such, we expected *PD*'s sign to be positive or negative, depending on whether *PD* exceeds the extreme point. Likewise, air pollution can harm health, so we regarded *AP* to have an extrusion effect on young professionals (Chen et al., 2022). In contrast, a city's higher *MSC* means stronger health security for its citizens (Oehmke et al., 2007), which may attract young professionals (Lu & Guo, 2016). In theory, high education service capacity of the city can attract young professionals in two ways: continuing education for young professionals (Zhou et al., 2018) and elementary education for young professionals' children (Cieri et al., 2009). However, in China, the key for young professionals to receive continuing education is not *Shijiaoqu*,[6] which plays a decisive role in elementary education; rather, they must pass selection examinations. As such, the continuing education capacity of a city may not have a significant effect on the migration of young professionals. Therefore, we considered only *EESC* to positively impact young professionals.

Calculated via cities' longitudes and latitudes, D_1 and D_2 were chosen to control for the location of cities. Migrants often miss their hometowns (Oxfeld & Long, 2004), which encourages them to travel home often (Pearce, 2012). A short distance between one's migration destination and hometown (D_1) thus entails convenient home visits. Therefore, we expected that young professionals are less likely to migrate to a city with longer D_1. Compared to ordinary cities, provincial capitals tend to have a more developed economy and high-quality public resources; consequently, cities closer to a provincial capital receive stronger positive externalities (Xia et al., 2019).

Accordingly, we predicted cities with a shorter D_2 to be more attractive to young professionals.

3.2. Methodology

To examine the inverted U-shaped relationship between the house price of a city and the possibility of young professionals migrating into the city, we added the square term of house price into our model, which is shown in Equation (1).

$$P(choice_{i,j} = 1 | HP, Z) = F(\alpha_1 HP_j, \alpha_2 HP_j^2, \beta Z_j) \quad (1)$$

In Equation (1), $P(choice_{i,j}=1|HP, Z)$ represents the probability that individual i migrates to city j when the data on housing prices and the control variables of all alternative cities are known. $choice_{i,j}$ is a categorical variable, with values 1 and 0. $choice_{i,j}=1$ means that individual i migrates to city j, and $choice_{i,j}=0$ means that individual i does not migrate to city j. HP_j refers to the house prices of city j. HP_j^2 is the squared term of HP_j, whereas Z represents a series of control variables describing the city's characteristics, shown in Table 1. Following McFadden (1974), we employed a conditional logit model to estimate the coefficients α_1, α_2, and β in Equation (1). To decrease the effects of heteroscedasticity, all the variables except *Industry* and *CPI* were processed with a logarithm. In line with the inverted U-shaped link predicted between housing prices and migration, the expected coefficients of α_1 and α_2 were positive and negative, respectively. To test the robustness of the benchmark regression, a series of robustness checks were performed, including a Utest, specific subsample regressions, explanatory variable substitution, Poisson regression, negative binomial regression, and the two-step approach. These steps are further discussed below.

Lind and Mehlum (2010) believe that it is not rigorous to determine the existence of a U-shaped relationship only based on the significant quadratic term, because convex and monotonic relationships can also wrongly generate a U-shaped relationship and an extreme point. Following their recommendation, if the inverted U-shaped relationship between the house prices of a city and the young professionals' migration into the city is concluded by a benchmark regression, we would use a Utest to further confirm it.

The CMDS investigates the migration motivations of migrants, such as work, business, retirement, family, and so on. Compared to other motivations, work and business better reflect the trade-off between expected income and loss in young professionals' migration destination choice. Therefore, from all the micro samples, we screened 11,232 individuals whose motivations were working and doing business. Then, we used the conditional logit model to estimate Equation (1) again as a robustness check.

Nighttime light brightness (*NLB*) aptly represents the economic development level of cities (Henderson et al., 2012). Thus, we substituted *NLB* for *GDP* to estimate Equation (1) for a robustness check. *NLB* data was derived from the satellite named VIIRS.

To further analyse the relationship between a city's house prices and its probability of being chosen by young professionals, we classified all micro samples by migration destination, then used the Poisson model and negative binomial regression model to estimate Equation (2). In Equation (2), $Number_j$ refers to the number of young professionals migrating into city j. ε_j is the error term. Other variables have the same meaning as those in Equation (1).

$$Number_j = \alpha_0 + \alpha_1 HP_j + \alpha_2 HP_j^2 + \beta Z_j + \varepsilon_j \quad (2)$$

Migration can significantly alter housing prices by changing housing demand (Wang et al., 2017). Therefore, we had to consider the possible endogenous problem caused by the reverse impact of young professionals' migration on housing prices. The two-stage least square (2SLS) approach is not applicable in a conditional logit model, so we followed the 'two-step approach' created by Hilbe (2011) by regarding HP and HP^2 as endogenous variables and selecting LS (land supply area) and FD (fiscal decentralisation) as instrumental variables. Referring to Jin and Zou (2005), we defined fiscal decentralisation as the proportion of per capita municipal fiscal expenditure in per capita national fiscal expenditure. The first step of the 'two-step approach' was to estimate the model using ordinary least squares (OLS), with HP as the dependent variable and LS as the independent variable, to obtain residuals ($resHP$). Meanwhile, taking HP^2 as the dependent variable and FD as the independent variable, another OLS estimation was conducted to obtain residuals ($resHP^2$). In the second step, the residual terms acquired in the first step ($resHP$ and $resHP^2$) were added into Equation (2) to obtain Equation (3), following which the Poisson regression and negative binomial regression were respectively performed for Equation (3).

$$Number_j = \alpha_0 + \alpha_1 HP_j + \alpha_2 HP_j^2 + \alpha_3 resHP_j + \alpha_4 resHP_j{}^2 + \beta Z_j + \varepsilon_j \quad (3)$$

4. Empirical findings and discussion

4.1. Basic results and robustness checks

Table 2 reports the results of the impact of a city's house prices on the probability of young professionals migrating into the city. Column (1) ignores all control variables and Column (2) presents the results of the main conditional logit model.[7] The results of the robustness checks are in Columns (3) to (8) of Tables 2 and 3. Table 3 shows the estimated results of the Utest, where Columns (1) and (2) of Table 3 correspond to Columns (1) and (2) of Table 2. We find that the extreme points of the two columns fall in the interval and are significant at the 1% level. Concurrently, one slope in each column is negative in the interval. Therefore, the null hypothesis of the monotone or U-shape is rejected, and an inverted U-shaped relationship is confirmed.

According to Columns (1) and (2) of Table (2), the average probability elasticity of HP is positive and that of HP^2 is negative regardless of whether the control variables are included. This indicates an inverted U-shaped relationship between housing prices

Table 2. Basic regression results and robustness checks.

Variable name	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
HP	6.063***	2.529***	2.943***	3.616***	1.712***	0.762**	2.873***	1.908***
	(58.769)	(16.273)	(17.555)	(22.211)	(12.091)	(2.339)	(13.859)	(5.729)
HP^2	−0.890***	−0.419***	−0.483***	−0.601***	−0.253***	−0.129***	−0.519***	−0.356***
	(−39.669)	(−12.656)	(−13.583)	(−18.969)	(−8.397)	(−5.431)	(−9.262)	(−4.585)
resHP							−0.070***	−0.065***
							(−15.237)	(−3.909)
$resHP^2$							0.001***	0.028***
							(10.344)	(20.222)
W		1.414***	1.280***	0.493***	0.258***	0.248**	0.078	−0.086
		(16.139)	(13.496)	(5.252)	(4.622)	(1.961)	(1.306)	(−0.757)
GDP		0.183***	0.213***		0.042	0.129*	0.024	0.367***
		(4.913)	(5.343)		(1.235)	(1.680)	(0.663)	(5.019)
NLB				0.098***				
				(22.149)				
Industry		0.411***	0.384***	0.421***	0.128**	0.140	−0.009	0.333**
		(6.137)	(5.385)	(6.434)	(2.340)	(0.638)	(−0.175)	(2.053)
IFA		0.074*	0.043	0.350***	0.292***	0.232***	0.305***	0.026
		(1.913)	(1.046)	(9.837)	(7.932)	(2.685)	(8.089)	(0.361)
CPI		−0.007***	−0.005***	−0.008***	0.009***	−0.002	0.006***	−0.010***
		(−4.486)	(−3.128)	(−5.224)	(6.517)	(−0.561)	(4.389)	(−2.870)
PD		0.055***	0.050**	−0.220***	0.131***	−0.000	0.053***	0.034
		(2.718)	(2.264)	(−9.131)	(6.847)	(−0.011)	(2.644)	(0.942)
AP		−0.605***	−0.610***	−0.611***	−0.007	0.030	−0.005	0.027
		(−121.732)	(−113.075)	(−122.396)	(−0.546)	(0.967)	(−0.385)	(1.033)
MSC		0.015	0.014	0.123***	0.122***	0.145***	0.106***	−0.078*
		(1.445)	(1.266)	(10.772)	(13.193)	(3.612)	(8.531)	(−1.930)
EESC		0.309***	0.298***	0.447***	0.367***	0.365***	0.356***	0.262***
		(9.288)	(8.335)	(16.036)	(11.953)	(5.072)	(10.171)	(4.084)
D_1		−0.338***	−0.332***	−0.162***	0.020	0.027	0.023	−0.113*
		(−10.113)	(−9.196)	(−4.662)	(0.637)	(0.334)	(0.726)	(−1.717)
D_2		−0.290***	−0.281***	−0.294***	−0.253***	−0.258***	−0.251***	−0.132***
		(−55.969)	(−50.959)	(−56.614)	(−52.170)	(−20.681)	(−51.699)	(−11.335)
Constant					−4.178***	−1.799**	−4.219***	−0.695
					(−14.998)	(−2.563)	(−14.503)	(−1.209)
Inflection point for HP	3.405	3.014	3.050	3.009	3.377	2.962	2.770	2.677
Pseudo R^2	0.149	0.289	0.300	0.292				
Log-likelihood					−4,945.500	−3,048.069	−4,809.055	−2,848.224

Note: T-statistics in parentheses; ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' estimation.

Table 3. Robustness check – Utest results.

	(1)		(2)	
Extreme point	3.405		3.014	
	Lower bound	Upper bound	Lower bound	Upper bound
Interval	0.325	3.870	0.325	3.870
Slope	5.483	−0.828	2.256	−0.718
t-Value	61.787	−11.294	16.739	−6.245
$p > t$	0.000	0.000	0.000	0.000
t-Value	11.29		6.25	
p	0.000		0.000	

Test: H1: Inverse U-shape vs. H0: Monotone or U-shape.
Source: Authors' estimation.

in cities and young professionals' potential migration, confirming our hypothesis. Columns (3) to (8) of Table 2 suggest that this inverted U-shaped link remains statistically significant in specific sub-sample regressions of those whose motivations are working and doing business (Column 3), the replacement of the explanatory variable *GDP* with *NLB* (Column 4), the Poisson regression (Column 5), the negative binomial regression (Column 6), and the two-step approach (Columns 7 and 8), consistent with the benchmark regression results.[8]

Referring to our main results, the extreme point in Column (2) of Table 2 is 3.014, meaning that when the house price in a city is below RMB 20.369 thousand,[9] higher house prices attract young professionals. However, when house prices exceed RMB 20.369 thousand, the crowding-out effect on young professionals emerges and increases with house prices. As of 2017, only Shenzhen (RMB 48.622 thousand), Beijing (RMB 34.117 thousand), Xiamen (RMB 28.053 thousand), Shanghai (RMB 24.866 thousand), Sanya (RMB 23.412 thousand), Hangzhou (RMB 21.225 thousand) and Zhuhai (RMB 20.972 thousand) had house prices above RMB 20.369 thousand. This implies that rising housing prices in most Chinese cities attract young professionals, while the high housing prices in Shenzhen, Beijing, Xiamen, Shanghai, Sanya, Hangzhou, and Zhuhai have begun to crowd them out.

With regard to the control variables in Column (2), except for *MSC*, all the average probability elasticities of the control variables carry the expected signs and are significant at least at the 10% level. According to Oehmke et al. (2007), cities with high *MSC* can attract young professionals by providing citizens better health security. However, the average probability elasticity of *MSC* in Column (2) of Table 2 is not statistically significant, showing that *MSC* has no impact on young professionals. While unexpected, this result is understandable. It is biased to only use the number of assistant and licenced doctors to measure cities' *MSC*, as medical skill is also an important factor. Among all the city characteristics, high wage rates appear to be the most important inducement for young professionals to choose a migration destination, placing expected income as their most significant motivation. The second is advanced industrial structure, which shows that young professionals are also deeply concerned about numerous and suitable employment opportunities when choosing their migration destination. Cities with strong *EESC* and large economies possess the third and fourth strongest attraction for young mobile professionals, respectively. Higher *IFA* and *PD* also boost young professionals' migration, albeit weakly.

Table 4. Heterogeneity analysis.

	Gender		Academic qualification			Marriage	
Variable name	(1)	(2)	(3)	(4)	(5)	(6)	(7)
HP	2.109***	2.946***	2.297***	2.401***	2.705***	2.465***	3.096***
	(9.713)	(13.257)	(2.637)	(9.353)	(13.339)	(12.773)	(11.377)
HP^2	−0.321***	−0.517***	−0.358**	−0.394***	−0.454***	−0.439***	−0.476***
	(−6.939)	(−10.915)	(−2.003)	(−7.221)	(−10.433)	(−10.348)	(−8.688)
W	1.428***	1.415***	2.430***	2.065***	0.896***	1.735***	0.653***
	(11.424)	(11.499)	(5.046)	(14.387)	(7.858)	(16.753)	(3.937)
GDP	0.126**	0.237***	−0.068	−0.145**	0.424***	0.059	0.405***
	(2.373)	(4.539)	(−0.326)	(−2.313)	(8.899)	(1.303)	(6.133)
Industry	0.398***	0.419***	0.690*	0.580***	0.305***	0.635***	0.063
	(4.230)	(4.380)	(1.818)	(5.386)	(3.500)	(7.982)	(0.495)
IFA	0.366***	0.257***	0.219	0.413***	0.266***	0.400***	0.126**
	(7.642)	(5.555)	(1.159)	(7.421)	(6.230)	(9.851)	(2.150)
CPI	−0.008***	−0.006***	0.027***	0.001	−0.015***	−0.009***	−0.002
	(−3.440)	(−2.919)	(3.020)	(0.462)	(−7.412)	(−4.672)	(−0.673)
PD	0.058**	0.054*	0.069	0.062*	0.048*	0.045*	0.074**
	(2.017)	(1.902)	(0.589)	(1.861)	(1.843)	(1.851)	(1.992)
AP	−0.398***	−0.285***	−0.065	−0.420***	−0.299***	−0.264***	−0.464***
	(−8.317)	(−6.086)	(−0.326)	(−7.633)	(−6.907)	(−6.523)	(−7.833)
MSC	−0.025*	0.047***	0.042	0.017	−0.001	0.031**	−0.009
	(−1.651)	(3.340)	(0.827)	(1.041)	(−0.094)	(2.508)	(−0.482)
EESC	−0.060	−0.083	0.197	−0.165***	−0.027	−0.261***	0.318***
	(−1.082)	(−1.538)	(0.890)	(−2.582)	(−0.546)	(−5.609)	(4.577)
D_1	−0.590***	−0.619***	−0.317***	−0.569***	−0.649***	−0.590***	−0.639***
	(−81.444)	(−90.318)	(−10.459)	(−69.479)	(−101.182)	(−97.818)	(−72.075)
D_2	−0.283***	−0.298***	−0.250***	−0.288***	−0.296***	−0.284***	−0.300***
	(−38.083)	(−41.028)	(−8.740)	(−33.790)	(−43.785)	(−45.322)	(−32.334)
Inflection point for HP	3.282	2.848	3.206	3.051	2.977	2.810	3.253
Pseudo R^2	0.270	0.307	0.371	0.310	0.277	0.285	0.303

Note: T-statistics in parentheses; ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' estimation.

Comparing city characteristics that hinder migration, *AP* emerged as the strongest obstacle, indicating young professionals' concern about the impact of air quality on their health. D_1 was ranked second, which implies that distance from home city matters, while D_2 in third place indicates that cities far from provincial capitals are less likely to be chosen by young professionals, following the trend of provincial capital centralisation. As expected, a city's high *CPI* also inhibits young professionals' migration, although its negative impact is miniscule.

4.2. Further analysis – heterogeneity analysis

Due to diverse ideals and needs, individuals' housing preferences may vary. Therefore, this study categorised the full sample into sub-samples by gender, academic qualification, and marital status, and then used the conditional logit model to regress each one separately. Table 4 shows the estimation results of males (Column 1), females (Column 2), associate degree holders (Column 3), bachelor's degree holders (Column 4), master's or doctoral degree holders (Column 5), married (Column 6), and unmarried (Column 7). The inverted U-shaped relationship found in the benchmark regression was present across all sub-sample regressions. In terms of control variables, high wage rate yet again demonstrated the strongest attraction for young professionals in all sub-samples.

However, the *HP* inflection points of the different sub-samples varied. Comparing Columns (1) and (2), the male sub-sample had a higher inflection point than the female sub-sample, likely due to the income gap between genders. Indeed, Mamiko (2021) found that young female professionals' income is usually lower than that of their male counterparts, meaning the latter have higher purchasing power and thus a higher inflection point for *HP*. Usually, better qualified and educated persons are more likely to possess higher incomes and purchasing power, making them less likely to be squeezed out by high housing prices. Surprisingly, a comparison of the results in Columns (3) to (5) reveals that the inflection point for *HP* gradually becomes smaller with higher qualifications. This can be explained in two ways. First, in China, most young people's home purchase funds come from their parents (Li & Shin, 2013). Compared with the parents of lower educated individuals, the parents of better educated individuals have spent more on their children's education, causing less fund is available to support their children's housing purchase. Second, less-educated people participate in the workforce earlier than educated people. In the short term, the former have more savings than the newly graduated latter. Therefore, young professionals with relatively lower academic qualifications may have higher housing purchasing power, and thereby, a higher inflection point for *HP*. Comparing Columns (6) and (7), the married sub-sample has a lower inflection point for *HP* than the unmarried sub-sample. A reasonable explanation is that in China, married people are more likely to bear the obligation of raising children, which increases their financial burden and makes them more sensitive to high housing prices.

5. Conclusion

This paper has examined the relationship between housing prices in 235 Chinese cities and the probability of young professionals migrating into these cities. The empirical results show that this relationship is not simply linear; rather, it is an inverted U-shaped one. Specifically, when housing prices are low, rising housing prices are attractive to young professionals. However, when housing prices continue to rise and exceed a certain point, the relationship becomes reversed, such that high housing prices crowd out young professionals. Then, a series of robustness checks were conducted and the results consistently confirmed the inverted U-shaped relationship. Finally, we divided the micro individual sample by gender, academic qualification, and marital status for heterogeneity analyses. Again, the results demonstrated a significant inverted U-shaped relationship across all sub-samples, albeit with different inflection points for *HP*. Specifically, males, less-educated, and unmarried professionals hold higher inflection points for *HP*.

Our findings provide a basis for Chinese local governments to attract young professionals by regulating housing prices. First, in view of the inverted U-shaped relationship between cities' house prices and attractiveness to young professionals, local governments should implement policies based on their own housing prices. For example, in cities where housing prices have not exceeded the crowding-out point, house price regulation does not seem necessary. However, in cities where housing prices have exceeded the turning point, local governments should curb the rise of housing prices to prevent young professionals being squeezed out. Specifically, controlling land prices (Wen & Goodman, 2013), limiting housing credit scales (Lee & Li, 2021), and implementing home purchase restrictions.[10] Li et al. (2017) have been empirically confirmed to be effective in regulating China's housing prices. Second, perhaps because men's wages are generally higher than women's, high housing prices more easily drive out female young professionals. As such, China's local governments should strive to resolve gender discrimination in employment and narrow the gender wage gap. Third, better educated young professionals are more likely to be squeezed out by high housing prices, which further proves the necessity for local governments to rapidly regulate housing prices in cities where housing prices have exceeded the extreme point, particularly because the loss of highly skilled professionals can lead to insufficient endogenous driving forces of economic growth (Rogers, 2003). Finally, based on the finding that married young professionals are more sensitive to high housing prices, local governments can appropriately tilt preferential policies and subsidies for married couples to lighten their housing burden.

Disclosure statement

No potential conflict of interest was reported by the authors.

Notes

1. In China, highly innovative professionals include academicians from the Chinese Academy of Sciences and the Chinese Academy of Engineering, as well as Changjiang Scholars and Distinguished Young Scholars.
2. Shenzhen, Beijing, Shanghai, and Guangzhou are four Chinese superstar cities. In 2019, residential housing prices in these cities ranked first, second, fourth, and sixth highest in China, respectively, based on the authors' ranking of the data from Chinese Real Estate Information network.
3. The original data on China's migration was taken from the CMDS 2017. The percentage of migration within provinces was calculated by the authors.
4. The link to the dataset is https://www.chinaldrk.org.cn/wjw/#/home.
5. The 235 cities are recorded in List A1 of Appendix.
6. 'Shijiaoqu' means that in China, as long as children's parents or legal guardians have legal and fixed residence in a city, children can receive elementary education in that city without having to sit for any examination.
7. Since the estimation coefficients in a conditional logit model cannot be directly explained as marginal effects, in line with Cheng (2008), this paper reports average probability elasticity, which can explain marginal effects.
8. We also estimated Equation (1) for migrant professionals aged 45 and above; the results are in Table A1 of the Appendix.
9. The anti-log of 3.014 is 20.369.
10. Home purchase restrictions include restrictions on outsiders' house purchases and on second house purchases, which can effectively curb speculation in the housing market and achieve housing price regulation.

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Appendix A

List A1 City list

Ankang, Anqing, Anshan, Anshun, Anyang, Baicheng, Baise, Baishan, Baiyin, Baoding, Baoji, Baotou, Bayanzhuoer, Bazhong, Beihai, Beijing, Bengbu, Benxi, Bozhou, Cangzhou, Changchun, Changzhi, Changzhou, Chaoyang, Chengde, Chifeng, Chizhou, Chongqing, Chuzhou, Dalian, Dandong, Daqing, Datong, Dazhou, Deyang, Dezhou, Dingxi, Dongguan, Dongying, Eerduosi, Ezhou, Fangchenggang, Foshan, Fuxin, Fuyang, Fuzhou, Fuzhou1, Ganzhou, Guangan, Guangyuan, Guangzhou, Guigang, Guilin, Guyuan, Haerbin, Haikou, Handan, Hangzhou, Hanzhong, Hebi, Hechi, Hefei, Heihe, Hengshui, Heze, Hezhou, Huaian, Huaibei, Huainan, Huang, Huanggang, Huangshan, Huhehaote, Huizhou, Huludao, Hulunbeier, Huzhou, Jian, Jiangmen, Jiaozuo, Jiaxing, Jiayuguan, Jiazhuang, Jieyang, Jilin, Jinan, Jincheng, Jingdezhen, Jingmen, Jingzhou, Jinhua, Jining, Jinzhong, Jinzhou, Jiujiang, Jiuquan, Jixi, Kaifeng, Kelamayi, Kunming, Laibin, Langfang, Lanzhou, Leshan, Lianyungang, Liaocheng, Liaoyang, Liaoyuan, Lijiang, Linfen, Linyi, Lishui, Liuan, Liupanshui, Liuzhou, Longnan, Longyan, Luohe, Luoyang, Luzhou, Lvliang, Maanshan, Maoming, Meishan, Mianyang, Mudanjiang, Nanchang, Nanchong, Nanjing, Nanning, Nanping, Nantong, Nanyang, Neijiang, Ningbo, Ningde, Panjin, Panzhihua, Pingdingshan, Pingliang, Pingxiang, Puer, Putian, Puyang, Qingdao, Qingyang, Qingyuan, Qinhuangdao, Qinzhou, Qiqihaer, Quanzhou, Quzhou, Rizhao, Sanmenxia, Sanming, Sanya, Shanghai, Shangrao, Shaoxing, Shenyang, Shenzhen, Shiyan, Shuangyashan, Shuozhou, Siping, Songyuan, Suihua, Suining, Suizhou, Suqian, Suzhou, Suzhou, Taian, Taiyuan, Taizhou, Taizhou1, Tangshan, Tianjin, Tianshui, Tieling, Tongchuan, Tongliao, Tongling, Weifang, Weihai, Weinan, Wenzhou, Wuhai, Wulanchabu, Wulumuqi, Wuxi, Wuzhong, Wuzhou, Xiamen, Xian, Xianning, Xianyang, Xingtai, Xinxiang, Xinyang, Xinyu, Xinzhou, Xuancheng, Xuchang, Xuzhou, Yaan, Yanan, Yancheng, Yangjiang, Yangquan, Yangzhou, Yantai, Yibin, Yichang, Yichun, Yinchuan, Yingtan, Yulin, Yulin1, Zhangjiakou, Zhangzhou, Zhanjiang, Zhaoqing, Zhengzhou, Zhenjiang, Zhongshan, Zhongwei, Zhoushan, Zhuhai, Zhumadian, Zibo, Zigong, Ziyang, Zuishan, Zunyi

Table A1. Regression results for migrant professionals aged 45 and above.

Variable	
HP	0.919
	(1.360)
HP^2	−0.090
	(−0.539)
W	2.114***
	(6.831)
GDP	−0.153
	(−0.959)
Industry	3.183***
	(5.017)
IFA	0.085
	(0.579)
CPI	−0.010
	(−1.607)
PD	−0.057
	(−0.923)
AP	−0.588***
	(−31.978)
MSC	−0.165***
	(−2.822)
EESC	0.560***
	(4.384)
D_1	0.080
	(0.622)
D_2	−0.233***
	(−10.566)
Pseudo R^2	0.299

Note: T-statistics in parentheses; ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.
Source: Authors' estimation.