

## Article

# Spatial–Temporal Differentiation of Housing Burden of Urban Floating Population and Migration in China

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**Abstract:** Housing costs, including rent, have become a significant economic burden for millions of floating population families in urban China, affecting their living standards and influencing migration decision-making. Using data from the China Migrants Dynamic Survey (CMDS) in 2012 and 2017, this study analyzes the spatial patterns of rent, family income, and the rent-to-income ratio among different regions, cities, and groups. Results show that rent and the rent-to-income ratio have an inverse correlation with the regional economy, with lower ratios observed in eastern coastal areas compared to the central and western regions, especially the northeast. High-level cities record higher incomes, higher rents, and higher rent-to-income ratios, and groups with higher educational levels and occupational characteristics exhibit higher affordability. Rent plays a role in the flow and changes of the floating population, and the housing burden has become a key constraint for long-term residence or migration. Developed provinces and municipalities in the eastern region and high-level cities remain major destinations for migrants, but rising house prices impede permanent settlement through commercial house purchases. The government should consider migrants' demands for housing and increase the supply of subsidized housing, such as public rental housing, for the floating population.

**Keywords:** floating population; social space; housing burden; rent-to-income ratio; housing-price-to-income ratio



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## 1. Introduction

Since 1978, with the continuous promotion of urbanization and the reform of the household registration system, the large-scale population movement in China has continued for more than 40 years with the surplus rural labor force as the main force, and the size of China's floating population was about 244 million in 2017, accounting for 18% of the total population (National Bureau of Statistics, 2018), profoundly affecting the socioeconomic development of both inflow and outflow areas, and also becoming the key to achieving the goal of common prosperity and to building a people's city and a sharing city [1]. The size of China's floating population has increased rapidly since 2000, reaching a peak in 2015, and has shown a downward trend during 2015–2019, with the return migration represented by Sichuan and Anhui provinces being a common phenomenon, which is caused by the size and structure of the population, as well as factors pertaining to changes in the comprehensive benefit and costs of the outflow and inflow areas [2]. The continued slowdown in the growth rate of the permanent settlement of the floating population poses new challenges to sustainable urbanization and has attracted the attention of governments and scholars [3].

The problem of population mobility or migration is not unique to China's floating population. Actually, both in developed countries and in developing countries represented by China, the domestic/international mobility of the population faces a difficult choice

between settlement and backflow throughout the migration process. Foreign studies on the driving mechanisms of population mobility or migration can be traced back to the late 19th century, and theoretical models that elucidate the mechanism of population migration and decision-making processes have been proposed, including neoclassical economic migration theory [4,5], spatial interaction models [6,7], new migration economics [8], push–pull models [9,10], and social network theory [11]. Broadly speaking, the comprehensive comparison and evolution of input–output benefits in the inflow and outflow areas are the core decision factors of whether to migrate or whether to stay permanently/continue to migrate. The foreign residential rental market developed earlier and is more mature, and scholars' research on residential rents has included rental price effect, rental price index, rental policy effect, rental price forecast, rental income ratio, etc. [12–15]. Domestic scholars have conducted relevant studies from two perspectives: individual decision-making based on questionnaires; and regional comparison based on census data. Some scholars have studied the formation mechanism of the spatial pattern of the floating population from a macro perspective and found that wage and income levels, employment opportunities, industrial structure, capital investment, social and public services, population size, the household registration system, and the taxation system are significant, among which economic factors are the most important “pull” conditions [16,17]. Some scholars have analyzed the role of individual characteristics in population mobility decisions from the individual perspective, and they have concluded that factors such as age, education level, travel experience, and marital status among individual characteristics have a significant impact on population mobility decisions [18–20]. In conclusion, the size and spatial pattern of the mobile population can be seen as the result of a combination of economic, political, social, and individual factors. It is worth noting that China's unique household registration system and the large number of people moving within the country make the settlement process more complicated, and most studies have attributed the low growth of the permanently settled population to the restrictions of the household registration system, which has been reformed in recent years and has gradually weakened the restrictions on residents' willingness to settle [21,22]. The alternative to avoiding the account limit is to own a home in the city where they live, allowing the mobile population to enjoy the local welfare system and achieve permanent settlement [23,24]. However, existing studies have not reached a unanimous conclusion on the issue of housing affordability.

As homeownership becomes increasingly important, the expected utility of settling permanently in an inflow city determines whether migrants choose to migrate continuously or to settle [25,26]. It is widely believed that changes in housing costs affect the migration decisions and settlement intentions of mobile populations, especially when housing costs increase, which can have a “crowding-out effect” on the floating population. Several domestic and international studies have shown that housing costs are an important component of the living cost, and rising housing prices increase the cost of acquiring housing, reduce residents' housing affordability and well-being, and exclude low-income groups from the housing market, thus inhibiting the mobile population's willingness to move in and stay [27–30]. Scholars with the opposite viewpoint argue that rising housing costs, characterized by housing prices, are a signal of urban economic prosperity, implying better employment opportunities and public services, and that real estate is a stable and high-yielding investment which has an “attraction effect” on the mobile population [31,32]. Meanwhile, housing expenditure reflects the willingness to pay of the mobile population and, to some extent, has a positive effect on settlement viscosity. Other scholars combined the above two arguments and proposed that as the housing expenditure-to-income ratio increases, the floating population's residence willingness in cities shows an inverted U-shaped pattern [33], and once the housing expenditure-to-income ratio is higher than the “threshold”, it will prevent the mobile population from moving in and settling for a long time [34,35]. In other words, the housing price has a push–pull effect in both directions, and the migrant population will weigh the magnitude of both forces when choosing a city to move in.

In general, previous studies have mainly explored the impact of housing pressure on the mobile population's residence willingness from the perspective of housing prices, while rent is equivalent to a "sunk cost" for the mobile population compared to the cost of housing purchase, and paying rent does not generate any investment return, nor does it provide access to urban services such as compulsory education, which are tied to residential property rights and only reduce the disposable income of mobile households and increase their living cost. Therefore, rent should be a more important indicator of the housing burden of the mobile population than housing prices. In recent years, although some scholars have explored the relationship between the rental or lease market and residence willingness, the following shortcomings remain: (1) Most of the existing research focuses on the impact of rural migrants' home ownership and government housing security on their willingness to settle permanently. As the core subjects and contributors to the urbanization process, the floating population, due to their poor employment stability and low-income status, rent as the main housing mode. (2) Few studies have visually portrayed the spatial and temporal patterns of rental burden among the urban floating population in China. In view of the above reasons, this paper analyzed the spatial variation and evolution of rent (absolute burden) and rent-to-income ratio (relative burden) of the urban floating population in China, compared the differences in rent burden among different regions, cities and groups, and then explored the intrinsic link between rent burden and population mobility and predicted the possible impact of increased housing burden on population mobility by combining the house-price-to-income ratio index, the willingness of the migrant population to stay in the local area, and the factors influencing the willingness to stay. Finally, based on the goal of common prosperity and the concept of people's city, we propose housing security for the urban migrant population in a targeted manner.

## 2. Data Source and Research Object

### 2.1. Research Area and Data Sources

According to the current administrative division system in China, a total of 309 prefecture-level administrative units are selected as research areas. Data on the urban floating population—i.e., for the inflowing population aged 15 years and above who have lived in the inflowing area for one month or more and are not registered in the household registration of the district (county or city)—were obtained from the annual National Floating Population Health and Family Planning Dynamic Monitoring Survey conducted by the National Health and Family Planning Commission (<http://www.chinaldrk.org.cn/wjw/#/data/classify/population>, accessed on 1 April 2020), which adopted a stratified, multi-stage, size-proportional PPS approach to sampling 31 provinces (autonomous regions and municipalities) and the Xinjiang Production and Construction Corps (excluding Hong Kong, Macao, and Taiwan) across China. Urban housing price data were obtained from the annual average price of second-hand house listings provided by the China House Price Quotation Platform ([www.creprice.cn](http://www.creprice.cn), accessed on 5 February 2020), which collected data from 50 million user releases and tens of thousands of real estate websites, and reorganized the collected data, filtered duplicates, and excluded abnormalities, then obtained comprehensive and objective property data after manual verification.

### 2.2. Data Processing

The CMDS data has now been updated to 2018, but the 2018 questionnaire data has not been used because the average monthly rent expenditure of mobile households is no longer separately counted after 2017. The years 2012 and 2017 were chosen as the time points; cities above the prefecture level were used as the spatial units, and the mobile population whose "housing nature" option in the questionnaire was "rented private housing" was used as the sample for the study. The median monthly housing rent and median monthly household income of the mobile population in the city, respectively, were used for urban rent and income. The urban rent-to-income ratio (RIR) is calculated in the form of "monthly housing rent"/"monthly household income". In order to systematically

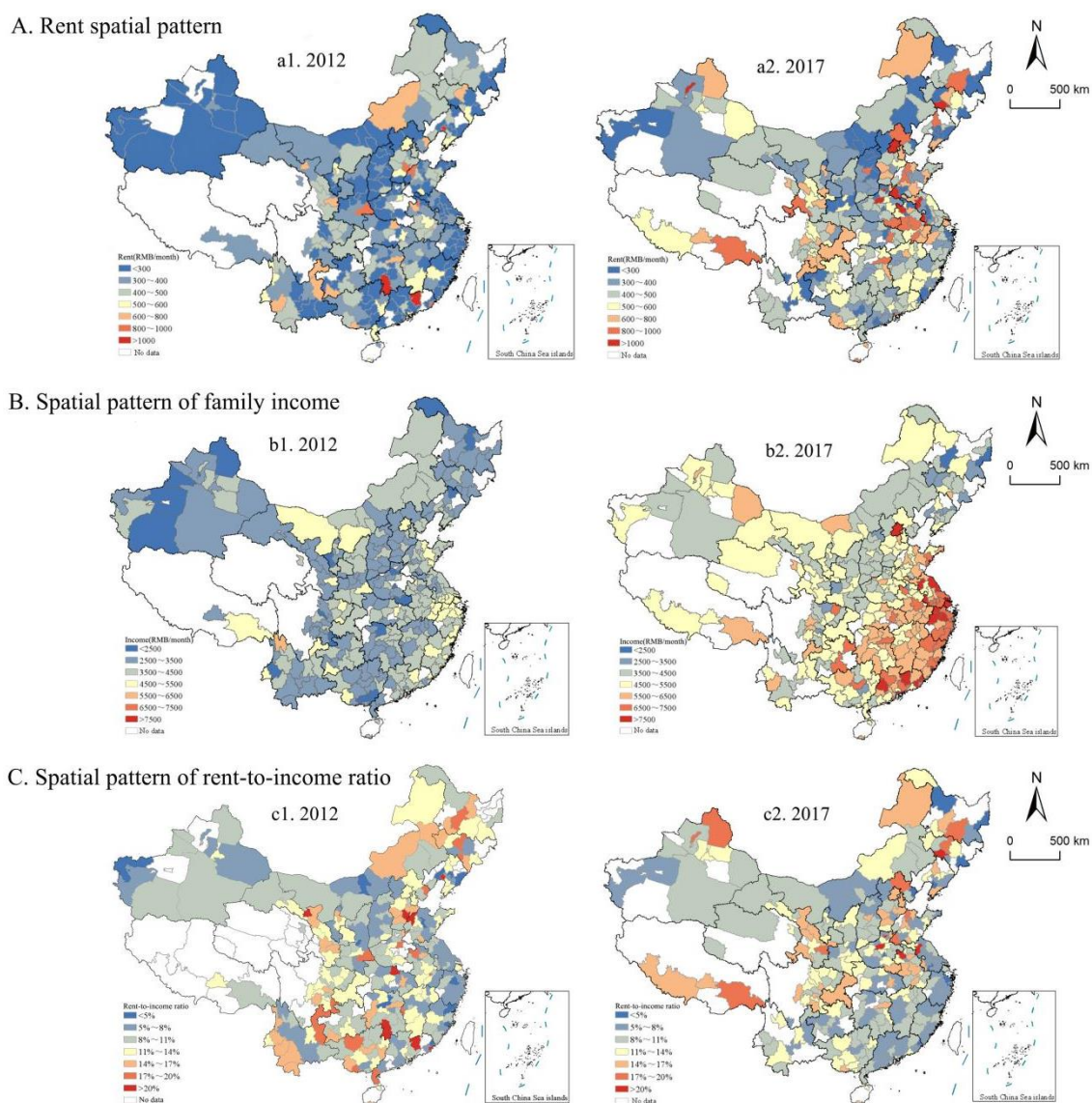
analyze and compare the spatial patterns of housing rent, household income and the RIR of the urban migrant population in China, the cities were divided into four regions: east, central, west, and northeast, and four classes: first-tier, new first-tier, second-tier, and third-tier and below, based on regional and class characteristics (The First Financial New Tier Cities Institute ranks cities above prefecture level according to five indicators: business concentration, urban hub, urban activity, diversity of life, and future plasticity, and classifies them into first-tier, new first-tier, second-tier, third-tier, fourth-tier, and fifth-tier cities (<https://www.yicai.com/topic/101425010/> (accessed on 7 August 2022)). The mobile population samples with singular and missing values were excluded, cities with less than 10 mobile population samples were removed to avoid bias caused by too small a sample size, and the final valid sample sizes of the mobile population in 2012 and 2017 were obtained as 100,134 and 95,313, respectively, with the number of sample cities both being 309.

### 3. Spatial and Temporal Differentiation Pattern of Rental Housing Burden

#### 3.1. Spatial Pattern and Evolution of the RIR

In addition to housing rent, it is also necessary to make a comprehensive judgment combined with household income to measure the degree of housing burden of the floating population. Therefore, this paper classified and visualized the rent, income, and RIR of the floating population in each city in 2012 and 2017 (Figure 1), respectively, to observe the spatial patterns and changes of each indicator, and the main conclusions are as follows.

① Rent levels showed spatial dispersion and increased divergence. In 2012, the average rent in cities was 392.83 RMB/month; by 2017, the average rent in cities rose to RMB 539.68/month, and the gap between cities widened. ② Income levels showed a significant zonal difference pattern. In 2012, the average income level of the floating population was RMB 3686.4 per month, with nearly 80% (79.73%) of the urban population earning between RMB 2500 and 4500 per month, with Shanghai, southern Jiangsu, and northern Zhejiang becoming the high-income gathering areas, while the central and northeast regions were relatively low. In 2017, the average income rose by 42.35% compared with 2012, reaching RMB 5247.53 per month; 82.01% of cities' earnings were between 3500 and 6500 yuan per month, and, except for Beijing, high-income cities clustered in Shanghai, Jiangsu, Zhejiang, Guangdong, Fujian, and other eastern coastal provinces and cities, among which first-tier cities such as Beijing, Shanghai, and Shenzhen, and new first-tier cities such as Nanjing, Hangzhou, and Xiamen had monthly incomes of up to RMB 8000 or more. Income in the central and western regions had grown significantly. In contrast, income growth in the northeast region lagged, especially in Jilin and Heilongjiang provinces, where there were still many cities, such as Jixi, Suihua, Baicheng, Baishan, Mudanjiang, and Songyuan, with monthly incomes of RMB 3500 and below. ③ The RIR was misaligned with the regional economic level. Under the joint influence of rent and income, the average RIR of the mobile population nationwide increased from 13.81% to 14.92% during 2012–2017, indicating that rent increased faster than income during the five-year period, and the rental burden of the mobile population increased. At the same time, due to the variation in rent and income between regions, it is reflected that the RIR did not match the economic development level of the region. For example, in developed coastal provinces such as Shanghai, Zhejiang, Fujian, and Guangdong, although rents had increased, incomes had risen relatively faster, and the RIR had decreased rather than risen, from 15.09%, 9.00%, 11.3% and 13.72% in 2012 to 14.61%, 8.70%, 10.66%, and 11.81% in 2017, respectively, they became areas where the rent burden was relatively lighter. On the contrary, in the northeast, where economic development was lagging behind, rents were rising fast while income was growing slowly, resulting in the RIR of Heilongjiang, Jilin, and Liaoning rising from 15.00%, 16.41%. and 14.63% in 2012 to 19.26%, 18.79%, and 16.02% in 2017, respectively.



**Figure 1.** Spatial pattern of rent and family RIR of floating population, 2012 and 2017. Note: This figure is based on the standard map of the standard map service system of the Ministry of Natural Resources of China (review number: GS (2019) 1697), and the base map is not modified.

### 3.2. Differences between Different Educational and Occupational Groups

The large number and complex composition of the floating population groups make the differences in their rental affordability not only between regions and cities, but also within groups. The national mobile population was divided into different social groups according to education level and type of occupation, respectively, to observe the inter-group differences and changing trends in rent, income, and RIR.

In terms of education levels (Table 1), in line with conventional perceptions, higher education level groups had higher income, implying stronger rent affordability. The mobile population with a diploma of primary school and below, junior high school, high school and secondary school, and junior college and above showed a gradient increase in both rent and income, with the increase in rent being 49.62%, 44.73%, 51.33%, and 61.56%, respectively, and the increase in income being 26.91%, 36.25%, 42.82%, and 42.79, respectively, from 2012 to 2017. The RIR rose in the same gradient and increased for all groups, with larger increases for the highest and lowest educated groups.

**Table 1.** Rent, income, and the RIR of groups with different educational levels, 2012 and 2017.

Education Level	Rent (RMB/Month)			Income (RMB/Month)			RIR (%)		
	2012	2017	Growth Rates	2012	2017	Growth Rates	2012	2017	Growth Rates
Primary School and below	462.16	691.49	49.62%	4572.78	5803.19	26.91%	10.11	11.92	17.90%
Middle School	550.07	796.10	44.73%	4862.48	6624.94	36.25%	11.31	12.02	6.22%
High school and secondary school	669.27	1012.83	51.33%	5117.77	7309.26	42.82%	13.08	13.86	5.96%
Junior college and above	951.95	1538.00	61.56%	6206.92	8863.06	42.79%	15.34	17.35	13.14%

Differences between different occupational groups and changes in rankings between the two years were large (Table 2). Public officials and professional technicians had the highest rent and the second highest income and RIR in 2012, but in 2017, all three data rankings rose to first place, showing the “three highs” of high rent, high income, and high RIR; the most significant change was in the group of businessmen and merchants, where the rent increased by 108.4% while the income only increased by 29.47%, leading to the RIR from 8.89% to 14.30%, making this group with the largest increase in rental pressure. The rent and income of service industry practitioners and production and construction industry practitioners were relatively stable, and the RIR of service industry practitioners fell from first to third, while the RIR of production and construction industry practitioners had been significantly lower than that of other occupational groups.

**Table 2.** Rent, income, and the RIR of groups with different occupational characteristics, 2012 and 2017.

Occupation Type	Rent (RMB/Month)			Income (RMB/Month)			RIR (%)		
	2012	2017	Growth Rates	2012	2017	Growth Rates	2012	2017	Growth Rates
Public officials and professional technicians	723.44	1360.94	88.12%	5717.51	8685.97	51.92%	12.65	15.67	23.83%
Businessmen and merchants	527.14	1098.58	108.40%	5931.75	7679.85	29.47%	8.89	14.30	60.97%
Service industry practitioners	618.40	915.86	48.10%	4695.43	6537.58	39.23%	13.17	14.01	6.37%
Production and construction industry practitioners	351.03	555.86	58.35%	4709.62	6763.20	43.60%	7.45	8.22	10.27%

### 3.3. Differences between Different Regions and Urban Grades

City size and location factors can have spatially heterogeneous effects on the rent-to-income ratio of the mobile population. In terms of differences among different economic regions (Table 3), the rent in the eastern region is significantly higher than that in other regions, followed by the central region. In 2012, the rent in the northeast region was slightly higher than that in the west, while by 2017, the rent in the western region was higher than that in the northeast region. In terms of growth rates, the rent increases in the eastern, central, western, and northeast regions during the five years were 51.13%, 56.57%, 60.86%, and 47.00%, respectively. In terms of income, there was a stepwise decline in both income and income growth, with 42.55%, 32.22%, 32.10%, and 26.34% growth in the eastern, central, western, and northeast regions respectively, and the regional income gap widened; the RIR gradually increased from the east to the west and the northeast, with 0.71%, 2.18%, 2.60%, and 2.24% growth in each region, respectively, over the five-year period. The growth rate in the central and western regions and the northeast region was significantly higher than that in the eastern region, and the gap between the RIR of the regions had widened.

**Table 3.** Rent, income, and RIR of cities in different regions, 2012 and 2017.

Regions	Rent (RMB/Month)			Income (RMB/Month)			RIR (%)		
	2012	2017	Growth Rates	2012	2017	Growth Rates	2012	2017	Growth Rates
Eastern region	648.78	980.48	51.13%	5510.75	7855.68	42.55%	11.77	12.48	6.03%
Central region	563.38	882.09	56.57%	4754.98	6287.15	32.22%	11.85	14.03	18.40%
Western region	535.01	860.61	60.86%	4486.85	5927.17	32.10%	11.92	14.52	21.81%
Northeast region	562.64	827.07	47.00%	4114.91	5198.59	26.34%	13.67	15.91	16.39%

In terms of the differences among cities in different classes (Table 4), rent was highest in first-tier cities, followed by new first-tier cities. The rent was lowest in second-tier cities in 2012 and lowest in third-tier cities and below in 2017. The rent from first-tier to third-tier cities and below increased by 79.20%, 64.44%, 63.35%, and 45.28%, respectively, in 5 years, and the rent gap between city classes was increasing. The pattern of income was similar to that of rents, which means there was a gradient difference between city grades, with increases of 57.22%, 46.26%, 43.00%, and 27.66% respectively, indicating that the higher the grade, the higher the income and the faster the growth, and also indicating that the increase in income was lower than the increase in rent in cities of all grades. In terms of RIR, there was no mismatch with the level of economic development, with first-tier cities still being the highest, followed by new first-tier cities. However, the RIR in third-tier cities and below was higher than that in second-tier cities, and the RIR increased in 2017 in all tier cities, with the largest increase (1.9%) in first-tier cities.

**Table 4.** Rent, income, and RIR of cities at different levels, 2012 and 2017.

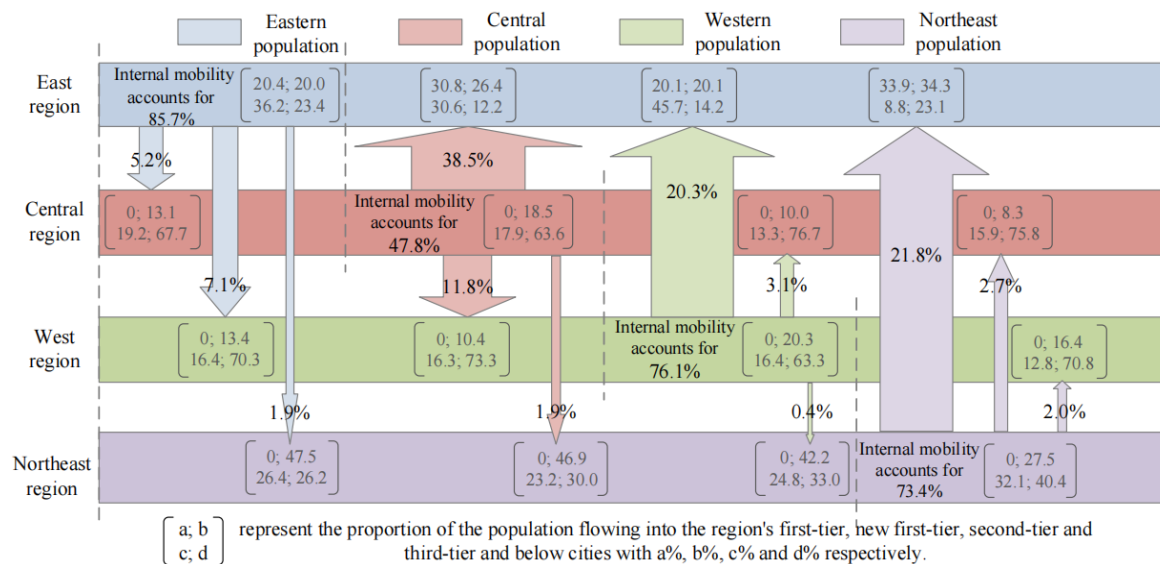
Urban Grades	Rent (RMB/Month)			Income (RMB/Month)			RIR (%)		
	2012	2017	Growth Rates	2012	2017	Growth Rates	2012	2017	Growth Rates
First-tier	862.81	1546.18	79.20%	6234.29	9801.85	57.22%	13.84	15.77	13.98%
New first-tier	594.37	977.36	64.44%	4848.48	7091.39	46.26%	12.26	13.78	12.43%
Second-tier	508.39	830.48	63.35%	4727.87	6760.97	43.00%	10.75	12.28	14.23%
Third-tier and below	512.56	744.66	45.28%	4623.31	5902.23	27.66%	11.09	12.62	13.80%

## 4. Population Mobility Tendency under the Influence of Housing Burden

### 4.1. Spatial Characteristics of Population Mobility

In terms of the direction of population flow between different regions, the overall flow was dominated by the flow from the central and western and northeastern regions to the economically developed eastern coastal regions. Taking 2017 as an example (Figure 2), we observe the following: (1) The proportion of internal flow in the eastern region was as high as 85.7%, with mutual mobility between cities of different levels within the region; another 12.3% of the population went to the central and western regions and 1.9% of the population went to the northeast region. Meanwhile, the first-tier and new first-tier cities in the east attracted a large inflow population from the central and western regions and the northeast region. (2) The proportion of internal mobility in the central region (47.8%) was the lowest among all regions, with as much as 38.5% of the population flowing to the east, and mainly concentrating in the first- and second-tier cities; the proportion flowing to the western region was also 11.8%, with more flowing to the third-tier cities; the proportion flowing to the northeast was relatively low, with the new first-tier and provincial capital cities dominating. (3) The proportion of internal flow was higher in the western region (76.1%), and most of the rest flowed to the eastern region (20.3%), mainly to second-tier cities; the proportion of flow to central China was 3.1%, the majority of which flowed to third-tier cities; the proportion of flow to the northeast region was as low as 0.4%, mainly to the new first-tier cities. (4) The proportion of internal population flowed in the northeast

was 73.4%, and the rest 21.8% of the population flowed to the eastern region, among which first-tier and new first-tier cities were more favored; another 4.7% of the population entered the central and western regions and differed from those flowing to the eastern region, who mostly chose the third-tier cities in the central and western regions.



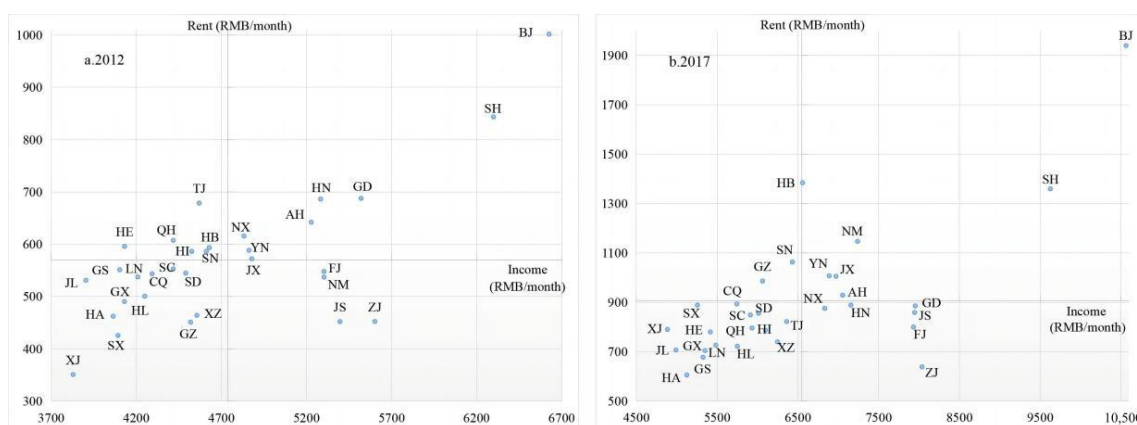
**Figure 2.** Direction of population movement by region, 2017.

The “push–pull theory” suggests that the driving force of population migration is a combination of push (repulsion) and pull (attraction) forces from both the inflow and outflow regions [36]. In addition, it is generally believed that mobile populations prefer to move to cities with better job opportunities and income growth prospects [37,38]. In addition, the level of public service supply level, quality of education and medical resources, social security improvement, and sense of local cultural identity and belonging are also important factors influencing population migration [39,40], while the increased cost of living, represented by the housing burden, constitutes the main push force of migration into the city on the mobile population. Xin Dong [41,42] found that the residence intention in a city shows an inverted U-shaped pattern of change as the “housing expenditure-to-income ratio” increases, and that high housing prices in incoming cities have formed a disincentive to migrate, but the impact of rent expenditure on the migration willingness is not considered significant. However, by analyzing the pattern of rental affordability and the characteristics of population mobility, this paper found that rental affordability may also have a constraint on the migration behaviour and residence decision of the mobile population.

The scatter plot compares rent and income of the mobile population in each province to better determine the degree of correlation between rent and income. The scatter plot of average income and rental burden of the mobile population by province and city (Figure 3) showed that Beijing and Shanghai, as well as the eastern provinces such as Zhejiang, Guangdong, Jiangsu, and Fujian, had consistently higher incomes, so it can be judged that the level of regional income was an important factor in attracting population inflow. At the same time, it can be seen that income was not the only consideration for population inflow. For example, in Inner Mongolia, Hunan, Anhui, and other places, although the income of the floating population was higher than the average level, they still needed to bear relatively high rent, which reduced the attractiveness to the population, while in Xinjiang, although the income was the lowest among the provinces, the rent cost was low at the same time; thus, it could still attract a large inflow of low-skilled laborers. Looking at Guangdong (11.13%), Jiangsu (10.8%), Fujian (10.08%), and Zhejiang (7.94%), which had the lowest RIR of the mobile population in 2017, all were provinces with the highest ratio



of mobile population size to the resident population and the highest ratio of the mobile population in foreign provinces, according to the data published in the seventh population census. In the Heilongjiang, Jilin, and Liaoning provinces, there was the largest population loss and relatively high RIR. Thus, it can be seen that the combined input–output factors, including income (earnings) and rent (costs), influenced the flow of the mobile population and its changes, and the increase in housing burden may have some negative impact on population mobility.



**Figure 3.** Rent and income of floating population by province, 2012 and 2017.

#### 4.2. Impact of Increased Housing Burden on Population Mobility

The migration behavior wherein the population flows out of the original place and finally settles in the inflow place can be divided into three successive processes: First, the floating population flows out of the original place of residence to the inflow place out of the pursuit of a better life and the expectation of a higher quality of life, of which the comprehensive assessment of the input–output effect is usually the core decision basis [5], and, as mentioned above, areas with relatively high income and low rent are more attractive to the floating population. Second, in the survival stage of entering the inflow and maintaining the separation of households, and under the combined effect of the external environment and their own conditions, the migrant population forms the decision of long-term residence or continued migration based on their overall satisfaction with living in the inflow place, and whether they have the willingness to stay for a long time and whether they can afford the living burden such as rent are the key influencing factors [43]. Third, under the premise that they have the will and financial ability to settle, they mainly achieve account migration, complete identity change, and eventually stay in the place they move to through the purchase of commercial housing. In the context of high housing prices, the housing affordability of the mobile population is increasingly becoming a key constraint for their permanent settlement or choice of outflow/backflow [44].

This paper used the question “Do you plan to stay here for some time to come” in the questionnaire as a measuring base, and if somebody selected “Yes”, it indicates that he/she had the settlement intention. (1) The settlement intention of the floating population was strongest in high-ranking cities in developed regions. From the comparison of the settlement intention of the mobile population in Table 5, we can find that the settlement intention was the strongest in the mobile population in the eastern first-tier cities, especially in Beijing, Shanghai, Guangzhou, and Shenzhen, where as many as 93% of the mobile population of northeastern origin said they were willing to stay; followed by the new first-tier cities, where the mobile population, also from the northeastern region, showed a higher settlement intention; and in the second-tier cities and the third-tier cities and below, the difference was not significant. Although residing in first-tier and new first-tier cities required higher rent and RIR, higher income, more opportunities, and better services make it easier for the mobile population to obtain higher absolute gains, and they would

subjectively prefer long-term residency or even settlement in higher-tier cities, provided that they can afford the relatively higher cost of residency in higher-tier cities.

**Table 5.** Settlement intention of floating population in different cities, 2017 (%).

Outflow Areas Inflow Cities	First-Tier Cities	New First-Tier Cities				Second-Tier Cities				Third-Tier Cities and Below			
	East	East	Central	West	North	East	Central	West	North	East	Central	West	North
Eastern region	0.90	0.87	0.80	0.79	0.82	0.85	0.76	0.78	0.74	0.83	0.77	0.75	0.75
Central region	0.88	0.83	0.80	0.84	0.86	0.80	0.83	0.78	0.80	0.77	0.84	0.76	0.78
Western region	0.86	0.76	0.78	0.85	0.84	0.77	0.79	0.81	0.65	0.75	0.79	0.80	0.68
Northeast region	0.93	0.90	0.76	0.86	0.90	0.79	0.84	0.82	0.81	0.79	0.89	0.77	0.85

(2) The housing price and income burden of high-grade cities in developed regions had the most significant impact on the settlement intention of the mobile population. From the choice of “reasons for residence difficulties” in the inflow cities expressed by the floating population in 2017 (Table 6), it can be seen that “income is too low” and “cannot afford housing” were the top two factors, accounted for 40.12% and 33.51% of the total sample, respectively, and nearly 36% of the migrant population in first-tier cities chose “cannot afford housing”, which was higher than “income is too low” and became the most common difficulty. In the northeast region, due to the relatively low housing prices, the proportion of those who chose “cannot afford housing” was much lower than that of other regions, and although the income of the mobile population in the northeast region was the lowest among all regions, the proportion of those who chose “income is too low” was much lower than that of other regions. This indicated that the judgment of the mobile population about the high or low income was influenced by the housing burden or house price, i.e., the housing-price-to-income ratio index can be used to measure the difficulty of the mobile population in settling in the inflow place.

**Table 6.** Percentage of floating population’s difficulties in different regions and cities, 2017 (%).

City Level	Location	Cannot Afford Housing	Income Is Too Low	Difficult to Find Jobs	Business Is Hard to Do	Look down upon by Locals	Children’s Schooling Problems	Not Used to Local Life	Other Reasons
First-tier cities	East	35.92	31.71	15.37	17.68	6.66	18.80	4.62	4.52
New first-tier cities	East	31.36	31.33	15.64	19.47	6.25	15.73	4.47	3.61
	Middle	33.72	39.34	16.05	32.96	6.25	16.77	4.65	3.45
	West	32.48	42.22	24.01	23.22	5.86	16.86	4.73	4.41
	Northeast	20.95	29.25	15.23	12.60	5.13	8.68	3.55	3.35
Second Tier Cities	East	35.79	36.83	17.17	20.59	5.36	16.54	4.77	4.97
	Middle	28.46	39.30	20.66	24.70	5.07	20.40	3.47	3.75
	West	41.94	49.24	33.13	37.66	7.68	23.74	5.70	7.75
	Northeast	24.98	26.98	19.53	15.63	3.93	8.63	5.35	3.15
Third-tier cities and below	East	34.55	39.92	21.05	24.23	5.21	17.74	5.00	4.88
	Middle	34.93	48.46	27.43	35.15	6.02	19.73	5.65	5.23
	West	33.85	47.35	28.75	36.44	5.88	18.66	6.59	8.14
	Northeast	20.28	37.10	24.82	17.68	4.80	10.20	5.04	4.78
Overall		33.51	40.12	22.08	26.46	5.86	17.55	5.18	5.33

(3) The higher the urban hierarchy was, the heavier the housing burden was, and there were significant differences in the affordability and response to the housing burden among the mobile population groups (Table 7). Within the same rank city, the mobile population with higher education and occupational attributes could afford a higher RIR and needed to bear a relatively smaller housing price-to-income ratio, i.e., housing burden. For example, for the mobile population with a junior college degree and above, the purchase of a 1 m<sup>2</sup> residence in 2017 in first-tier and third-tier or lower cities was equivalent to 2.99 and 0.78 months of income for their households, while for mobile households with

elementary school diplomas or lower, it took 6.41 and 1.13 months of income. In terms of occupational differences, the lowest house-price-to-income ratio was for public and professional technicians in first-tier cities, while in other classes of cities, it was for business and merchant groups, and service industry practitioners earned more than production and construction industry practitioners in first-tier and new first-tier cities, and less than them in second-tier and third-tier cities and below.

**Table 7.** Housing-price-to-income ratio and house affordability ratio of groups with different education levels and occupational characteristics, 2017.

Floating Population Groups		Education Level				Occupational Characteristics			
		Junior College and Above	High School and Secondary School	Junior High School	Primary School and Below	Public Officials and Professional Technicians	Businessmen and Merchants	Service Industry Practitioners	Production and Construction Industry Practitioners
RIR (%)	First-tier	18.95	15.63	13.13	13.78	17.35	16.32	16.40	9.69
	new first-tier	17.55	14.78	12.55	11.69	14.98	15.17	15.23	8.18
	Second-tier	16.72	13.26	11.26	10.10	14.50	13.73	13.55	7.58
	Third-tier and below	14.17	12.63	11.92	12.89	13.43	13.59	12.02	8.40
Housing-price-to-income ratio (month/m <sup>2</sup> )	First-tier	2.99	4.67	5.87	6.41	3.22	3.72	5.21	5.98
	new first-tier	1.86	2.19	2.39	2.62	1.96	1.87	2.41	2.47
	Second-tier	1.70	1.87	2.01	2.20	1.79	1.63	2.10	1.95
	Third-tier and below	0.78	0.86	0.94	1.13	0.83	0.78	0.98	0.94
Cannot afford housing (%)	First-tier	28.55	35.99	40.44	43.84	38.61	30.54	37.89	41.44
	new first-tier	23.31	29.21	32.95	38.07	34.58	22.60	27.38	36.05
	Second-tier	25.79	32.98	36.71	42.21	37.14	26.85	32.86	38.60
	Third-tier and below	21.77	30.17	34.80	40.53	36.37	21.83	32.23	35.89

(4) The issue of “cannot afford housing” can roughly predict the residence decision and mobility tendency of different socioeconomic groups in the context of high housing prices (Table 7). In terms of education level, similar to the proportional structure of the housing-price-to-income ratio, the lower the level of education, the higher the proportion of those who “cannot afford housing”. In terms of occupation type, the group of businessmen and merchants had the lowest proportion of “cannot afford housing” due to their higher income, while the group of public officials and professional technicians had the strongest will to purchase housing and settle down due to their stable work, leading to a higher proportion of “cannot afford housing”, while those working in the production and construction industry had the highest proportion of difficulty in purchasing housing. As a result, low-level and skilled migrants (e.g., elementary school diplomas and below, production and construction industry practitioners), despite their high willingness to settle down and lowest RIR, would be the first to be “squeezed out” of high-ranking cities to move to areas/cities with relatively low housing burden or become “tidal population”, i.e., return to their origin due to their weak job stability and low incomes in an environment of increasing housing burdens. Even the mobile population with higher educational and occupational characteristics (e.g., junior college diplomas and above, public officials and professional technicians) would face rising pressure to purchase housing and would have to pay higher and higher rental costs for long-term residence in the city or purchase small or remote housing, which would lead to lower life quality and happiness, and even to the dilemma of “wanting to settle down but not being able to settle down”.

## 5. Conclusions and Discussion

Based on the data from the 2012 and 2017 National Survey on Health and Family Planning Dynamics of the Mobile Population, this paper took cities above the prefecture level as the spatial unit and presented the spatial patterns of average rent, income, and RIR of the mobile population and their evolutionary characteristics, compared the differences in rental affordability among different regions and cities of different levels and different mobile population groups, and analyzed the rental burden patterns and the spatial characteristics of population mobility. The main findings are as follows.

(1) The rental burden is lower in economically developed regions. Between 2012 and 2017, rents for the migrant population generally increased nationwide, and unlike the regional economic development pattern, economically developed eastern coastal provinces

such as Jiangsu, Zhejiang, Fujian, and Guangdong had higher incomes and lower rents, and the rental burden was much lower than that in central and western and northeastern regions. The spatial dislocation between the rent burden and the level of economic development can have a heterogeneous effect on the willingness of the mobile population to migrate. (2) High-ranking cities and groups with high education and social attribute values can afford higher rents. First-tier and new first-tier cities had the heaviest rental burden, but the relative rental burden, i.e., RIR, is higher in third-tier and lower cities than in second-tier cities. In addition, groups with higher education levels and more stable occupation types had higher income levels and rent affordability. (3) Housing affordability was an important factor affecting population mobility, but the rental burden and housing price burden affected it in different ways. Influenced by comprehensive income and cost, the population flowing from low-income, high-rent inland areas to high-income, low-rent eastern coast was an inevitable choice. Despite the higher rental costs in high-ranking cities, they were still the most attractive inflow places for the mobile population due to their comprehensive advantages such as higher income and improved services. Housing prices have a more negative impact on the willingness to stay of the mobile population than rent, which may lead to a lower life quality and relocation to cities with relatively lower housing burden, such as lower-tier cities in developed eastern regions.

China's floating population, which accounts for more than a quarter of the total population, plays an indelible role in China's new urbanization and modernization, and is also a group that needs to be focused on to effectively solve the problem of balance. The housing burden is an important reality for the urban floating population, and the statistical survey of the National Population and Family Planning Commission found that in 2017, 77.11% of the floating population flowed from rural areas to cities, with relatively insufficient economic, social, and cultural capital; 57.08% of the floating population rented housing in cities; and only 2.26% of the floating population lived in public rental housing or security housing. Although the rent-to-income ratio is in a reasonable range in most cities at this stage, there are still certain shortcomings in the housing problem of the floating population and housing burden reduction. In this regard, the following suggestions are made: strengthen the quality of education and vocational education levels in the outflow areas of the population; improve the employment skills and income level of the mobile population; improve the labor security and income increase mechanism of the mobile population; continuously improve the housing affordability of the mobile population; strengthen government services for the mobile population; regulate the housing rental market; reduce the rental risk and financial burden of the mobile population as much as possible; establish and improve the housing provident fund system and housing security system for the mobile population; and increase the supply and coverage of security housing for the mobile population group. Since this paper does not analyze the rental housing burden of the mobile population through quantitative analysis methods, future quantitative analysis can also be conducted for the current state of rental housing demand and the housing or rental housing supply of the mobile population, which is conducive to a deep understanding of the inner formation mechanism of the high and low mismatch of the rent-to-income ratio. The spatial scale of this paper is large, and future research can also go deeper into the inner city in order to form more scientific and effective policy recommendations.

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