

Article

Urban Land Regulation and Heterogeneity of Housing Conditions of Inter-Provincial Migrants in China

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Abstract: The relation between urban land regulation and migrants' access to decent housing is a fascinating topic in developing countries. Land-use conflicts emerge when entrepreneurial pursuits (for example, the exchange value of land) affect the fortunes of low-wage migrant workers using the destination city to settle down (through the use value of land). Land-use disputes and housing opportunity inequality (between the "land scarcity with migrant explosion" areas and the "land-abundant but migration-inactive" areas) is apparent across different kinds of cities. This article reviews the relationship between China's urban land supply and regulation system and the migrant housing-condition problem. Our spatial analysis attests to the areal variance of migrant housing conditions (overcrowding and shortages of basic amenities such as toilet and kitchen facilities) across 301 Chinese cities. The analysis results explain the relationship between the inferior housing conditions in the coastal metropolises and the strict management of land uses in China's first-tier cities. Using micro household data from the national 1% population sampling survey (National Bureau of Statistics of China, 2015), this research provides a vivid case study at a large national scale to compare migrant housing amenity across different cities. This empirical study can advance understanding of the land-use disputes (exchange value vs. use value of urban land), which are an important structural root of housing inequality among different kinds of host cities (not merely among migrant workers themselves or across neighborhood scales). This macro-level variance of land demand, supply, and the regulation system proves the key challenge to achieving social harmony. Beyond a top-down land and housing system in China today, some more bottom-up and participatory migrant housing supply means (such as informal housing schemes such as "urban villages") could be another way to address the above housing challenge. In this sense, we have mapped the migrants' housing conditions in the Chinese top-down and marketization context, which can be contrasted with the informal and participatory housing supply in some other country contexts.

Keywords: land supply system; migrants; housing condition; migratory pattern; mainland China

1. Introduction

Since market-oriented reform and opening up, China's rapid urbanization process has been accompanied by massive rural–urban migration [1]. Housing problems for migrant workers have gradually become a major challenge facing cities in China, which has attracted more and more attention. In 2016, China's migrants reached 247 million, accounting for 18 percent of its total population [1]. However, more detailed data on current housing conditions have not been released. Previous studies have shown that overcrowding, dilapidation, and facility inadequacy have been the main housing

problems faced by Chinese internal migrants in host cities [2–4]. Housing conditions are one of the most important indices for measuring social integration and citizenization (*shimin hua*) levels (have migrants been integrated into mainstream urban society, and do they have the same social welfare as urban residents?) [5,6]. Housing condition improvement has also become one of the prominent policy targets during China's New-Type Urbanization period [1]. Unlike GDP-centered growth in the 1990s in China, New-Type Urbanization focuses on the goals of social harmony, ecological sustainability, and rural–urban integration. Compared with China's old urbanization path, the New-Type Urbanization is more human-centered, and its core task is to promote the citizenization levels of migrant workers in an orderly manner.

Both developed and developing countries are facing the significant development problem of migrants' housing conditions [7]. The United Kingdom, the United States, and some other developed countries have implemented national and local policies to increase the affordable housing supply through multi-level governments' (central and local governments at different administrative ranks) direct or indirect investment in public housing construction [8]. In many developing countries with imperfect welfare systems, slum re-construction has become a bottom-up approach for low-wage migrants, who solve their housing problems incrementally. In most Latin American cities, informal settlements shelter 30 to 50 percent or more of the population and therefore represent a very vibrant migrant housing market that cannot be ignored [9]. In post-reform China, since the implementation of market-oriented reform and opening-up policy in 1978, the development and utilization of urban land for residential purposes have been under more strict governmental regulations, covering rural land expropriation, rural–urban land conversion, urban residential planning, and licensed residential construction processes undertaken by *danwei*¹ units or real estate companies [10]. The institutional arrangement of primary and secondary urban land markets in a dual-track land-use system in transitional China has played a prominent role in making housing supplies accessible to migrant workers. At the same time, unskilled and low-wage migrants can hardly access public housing in the destination cities, owing to the persisting *hukou*² system [3]. This makes the housing problem of migrants in China fundamentally different from that of migrants in Brazil, Mexico, and India. It is representative and instructive to explore the housing conditions of migrants in a transitional economy such as China's, to reveal the underlying institutional and market roles.

Most existing studies focus on the impact of migrants' family structures and individual characteristics on housing conditions. Prior research focuses on the differences in housing quality based on the characteristics of the migrants themselves, such as age, gender, education level, and length of residence in the destination city [11,12]. However, research on the spatial heterogeneity of migrants' housing conditions is relatively scarce. This article uses housing condition indices, namely, crowding and basic amenity coverage (such as the percentage of private toilet and kitchen facility coverage), that were self-reported by households in the 2015 1% population census, to measure the spatial variance pattern of migrants' housing conditions across China's 301 cities at the prefectural level and above (including provincial, sub-provincial, and prefecture-level cities). To be more specific, this article first visualizes the geographic information to reveal the spatial variance pattern of the housing conditions of Chinese migrants, reflecting their consumption capacities, preferences, and choices in different kinds of cities. Furthermore, regression analysis was carried out to reveal the influencing factors for the spatial heterogeneity of the migrant housing conditions across 301 prefecture-level cities in mainland China. This empirical study provides a reference for different cities to solve their migrant housing problems and improve the integration of migrants in the destination cities.

¹ Danwei was the dominant institution and urban workplace in the public-oriented and distributive economy during the pre-reform era. Danwei acted as the state agencies in cities, responsible for the subsistence, political life, and social welfare (e.g. housing, medical care, kindergarten and entertainments) of its employees.

² Hukou system is a residency status system that has separated the rural population from urban population, and entitled more welfare benefits to the latter.

The rest of this article is organized as follows. In the second section, we briefly present the theoretical basis for our empirical study, and we then review and compare the different land and housing systems in Latin American countries and China for dealing with the housing problems of migrants. In the third section, we introduce the data and spatial analysis methods used in this article. In the fourth section, we present the areal variance of the migrant housing conditions of 301 prefecture-level cities in mainland China through geographic information visualization and spatial analysis tools. Then, we report the results from the spatial regression analysis to further explore the factors that influence the spatial pattern of the housing condition of Chinese inter-provincial migrants. In the conclusion, we summarize our main findings and their policy implications.

2. Land, the Housing Supply System, and Its Impacts on Migration and Integration Processes

2.1. *Why the Land System Is Important in Understanding Migrant Housing Inequalities: A Theoretical Aspect*

Despite the active involvement of governments and developers, quite a few developing countries can provide adequate housing to migrants in rapidly urbanizing areas. Existing literature focuses on the formal and informal housing supplies, the latter as a participatory third way beyond governmental and market means. Almost half of the urban population in developing countries may be sheltered in informal housing [13]. However, this fundamental role of informal housing is controversial in different land tenurial systems. In Chinese cities, informal housing (such as an “urban village”) is underreported by governments, as it violates the Land Management Law, and its formalization process is also state-dominated to better fit into urban development planning [14,15]. However, in Brazil, for instance, mega-slums have shaped a spectacular cluster of urban poverty, with active bottom-up participation in the host city’s housing provision, policymaking, and service delivery regardless of migrants’ residency status or consumption ability [16]. Other cases of informal urbanism and an incremental housing process are reported for countries in Africa and South Asia [17,18]. This areal variance in terms of migrants’ housing process is fascinating, across municipal, regional, and national scales. The notions of “city”, “land”, and “housing” are starkly different in the different tenurial systems.

First of all, since the 1980s, housing stratification and inequality have continued to be an important theme in different countries, as the Western World began to neoliberalize their housing policies and the transitional economies (including mainland China) initiated public housing privatization and real estate development. The research on the socio-spatial inequalities of housing covers a wide range of topics, such as neoliberal housing policies and the effects on disadvantaged groups including migrant workers, the inequalities of access to housing among different social groups, and residential segregation faced by immigrants [19,20]. Many empirical studies have focused on housing problems with migrants in the Chinese mega-cities (such as Beijing, Shanghai, Guangzhou, and Shenzhen) since transition from a centrally planned to a market-led economy [21,22]. However, we still know little about how migrant housing conditions vary across the vast regions of China. The areal variance of the migrant housing situation is of great significance for better understanding the unequal access to urban housing for the one-quarter of a billion migrants in transitional China. In the next section, we review the Brazilian and Chinese land and housing systems, to elaborate more clearly why land-use control and strong state intervention in market operations can affect migrant housing choices in the Chinese contexts.

Second, from a theoretical perspective, the areal variance of migrant housing conditions has strong connections to sociological theory and Marxist political-economic explanations for labor–capital–land relations. Property-related conflicts stand at the core of Weber’s theory of social stratification [23]. It is hence important to reveal where people (including migrants) in a market situation can enjoy easier access to property and better housing conditions. It is in the mega-cities, as growth hubs, where land-use conflicts commonly erupt between the local city-branding movements (for image-making and real estate booming) and high demand for low-rental areas among migrant tenants. This more intense land-use conflict can be manifested as the inferior housing conditions among migrant workers. We,

therefore, hypothesize that the main reception areas for migrants are faced with more intense land-use disputes than are other cities.

Third, this land-use dispute is interpreted in Marxian theories as land-use conflicts between the land use value versus the land exchange value. Within the Chinese rural–urban dual land system, the contested issue is how to expand the stock of affordable housing, and improve housing quality and infrastructure, especially in the overcrowded reception areas. The geographical phenomena (such as the areal variance of migrant housing conditions) are spatial manifestations of land-related Marxist ideas. The migrants' housing location choices are contested by various forms of interests and conflicts, and they shed some light on the relations between land-use regulations and social justice [24]. In this sense, our empirical study on the areal variance of migrant housing would be illuminating for the Marxist criticism of the incompatible multiple attributes of “land”—for capital accumulation on one hand (i.e., land exchange value) and human life on the other hand (i.e., land use value). The significant role of “land” in the processes of capital accumulation and social reproduction is observable in our study. More importantly, the role played by “land” would be disparate across the different cities, which may affect the housing access and conditions for migrant workers when they move to different kinds of cities.

2.2. International Experience of Migrant Housing Problems from a Land Institution Perspective

Housing is a central aspect of the right to an adequate standard of living, as reflected as far back as the 1948 Universal Declaration of Human Rights [25]. The Conference on Human Settlements (UNCHS) held by the United Nations also demonstrated the importance of promoting more adequate, healthy, livable, equitable, and sustainable human housing [26,27]. The housing problem of migrants is related to the effective operation of the labor market, which will exert a positive impact on labor mobility and permanent residence in the host cities [28]. However, both developed and developing countries have been faced with the problem of migrant housing, which includes how to improve housing conditions. This problem has long been a challenge for policymakers around the world.

The housing condition issue for migrant workers is embedded in diverse land and housing institutions across different countries. For instance, in the advanced industrialized countries, housing markets are regarded as free and open, involving a complex network of owners, tenants, real estate developers, property companies, agencies, governments, and other organizations involving communities and NGOs [29]. In the 1980s, new economic organizations, such as large foundations and some financial institutions, were introduced to (re)build communities in the United States. Residents, volunteers, and social groups were linked together to undertake a series of continuous developments to upgrade the poor housing environments of migrant laborers [30]. In the United Kingdom, large-scale, low-cost public housing was built starting in the second half of the 19th century to solve the housing problem of migrants [31].

The situation in the developing countries is different from that in developed capitalist countries, where the relatively mature welfare systems have been established over a long industrialization history. In this context, it is necessary to re-examine the regional variance of tenure and land systems and its impacts on the migration and integration process [32–34]. In many developing countries, such as Brazil, Mexico, India, and Ghana, access to affordable housing is not necessarily achieved through market mechanisms or government-sponsored public housing schemes. In some developing countries, the incremental investment in housing by migrants themselves has reached close to 70 percent [35]. Latin America is one of the most urbanized regions in the world; in most Latin American cities, 30 percent to 50 percent of the population cluster in informal urban settlements, creating a huge “underground” market that cannot be ignored [36]. Because it is difficult for a large number of poor families migrating to cities to obtain legal land or housing in cities, they use illegal means to seize public or private land in or adjacent to cities and build humble housing step by step, incrementally improving their living conditions. The migrant communities, spontaneously located in vacant public or private areas, have become the main means for solving the housing problem of low-income migrant

families in Latin America, leading to the formation of hundreds of informal settlements in cities [37,38]. In these regions, public services and infrastructure are often lacking [39]. In Turner's migration model, it is assumed that once migrants settle down in the host cities, they will gradually claim their residency rights and improve their housing conditions bit by bit [40]. In particular, comfortable, private, and healthy housing conditions are needed, as the economic resources accumulated by migrant families become more abundant and the size of the family expands. From generation to generation, migrants gradually improve their living conditions, matching accommodation with changing family circumstances, employment, and income status [41]. As local communities developed, the poor residents organized themselves to pressure the government to provide infrastructure and more services to improve living conditions [42,43].

In Brazilian cities, for example, a gradual and government-led approach has been introduced to address the housing problems of migrants. There is a degree of flexibility in the forms and methods of payment for local land ownership. In this framework, the concept of housing is an evolving process rather than a fixed or complete commodity [44]. In the "Favela Bairro Program" in Rio de Janeiro, based on the original self-built housing of low-income migrant families, residents of some slums were granted legal land property rights by the government. Poor people who were unable to obtain land at the original site were resettled in another location and directed to new built-up areas on the outskirts of the city. At the same time, the living conditions in slums are to be gradually improved. For instance, the local governments have invested to improve water, electricity, communication, transportation, and public health facilities and services, and to provide some basic medical and educational resources. The residents are also encouraged to renovate their own self-built homes and are provided with some building materials and funds either for free or at low interest rates [45]. In the beginning, these families had often lived in homes with only one kitchen and bathroom, or perhaps none. They then remodel common areas (such as living and dining rooms). In this process, the number of spaces and rooms enlarges according to the needs of the family [44]. In densely populated urban areas, families often expand upwards by building a second story on flat concrete roofs. Low-density areas are usually horizontally extended to enhance the comfort of living [46]. The studies on Brazil show that at least 700 municipalities have developed rehabilitation programs for slums or informal settlements, of which about 500 involve the normalization of land possession in various forms [47,48]. In Colombia, the government has also addressed migrants' housing problems by granting land-use rights in shanty towns, where about 60 percent of the urban population lives [49]. In other words, migrant families in many cities of Latin America can purchase or invade land to occupy and gradually acquire legal tenure and improve housing structures [46].

2.3. China's Land System and Housing Conditions for Migrants

As mentioned earlier, land availability, real estate development policies, and regulations are key factors in explaining an area's real estate market structure. These factors are inextricably linked to migrants' access to affordable housing in the real estate market or the local public housing schemes [50–53]. In some developing countries, upward social mobility, the land-use legislation procedure, and the availability of land around cities can ensure that most people can move to legal housing within a few years of arriving in the city. The above process involves the transition from informal or illegal land occupancy to legal tenure, and from informal towards formal housing [54]. China has specific features of its tenurial system and migrant regulations that have a significant impact on the issues of migrant housing conditions.

Since the 1980s, urbanization has been advancing rapidly in China, under a regulation framework defined by its *hukou* system (i.e., local vs. nonlocal household registration) [55,56]. At the same time, the government can monopolize the primary land market and control the expropriation, conversion, and transfer of land for urban residential purposes [57]. Because of the governmental regulation and planning of land resources, the housing delivery model in China is top-down and strictly follows national laws, local codes, and regulations [58]. This is very different from the experience in Latin

America (especially Brazil) as discussed earlier, where a large percentage of urban dwellers live in illegal housing (and, largely, are allowed to remain in it).

With the rapid growth and agglomeration of the urban population, the demand for housing has continued to increase, which has posed a challenge to the urban land supply in Chinese cities [59]. The restrictive planning regulations, high standards, and slow and cumbersome development procedures can make it difficult to increase the housing supply and adapt to increased demand as people migrate [58]. In some regions with rapid demographic and GDP growth and real estate booms, if housing is in short supply or there is a lack of supply elasticity, real estate development costs will be high. This will lead to a higher home purchase and rental price [52,60,61]. Moreover, if land prices continue to rise, the speculative nature of the urban land market also will increase. Land prices have been fueled in part by property developers hoarding land and passing on costs to urban residents. The threshold for migrant families to enter the urban property market has been pushed higher as a result of these mismanagement and under-supply problems in the property market [62,63]. Housing prices in the main destination areas remain very high, making it difficult for the migrant population and new employment groups to afford them [64]. This reveals that, on the supply side, the national policy design, institutional arrangements, and government actions are all involved in shaping the local real estate market. Some argue that the land and housing system and public finance system should be reformed to improve the sustainability and inclusiveness of the migrant housing supply [65].

In addition, due to the impacts of the *hukou* (i.e., household registration) system, China's internal migrants have a relatively poorer opportunity and capacity to obtain economic support from their parents, relatives, employers, governments, or financial sectors in the urban housing market. This disadvantage is reflected in housing allocation and purchase quotas, housing financing, housing subsidies, public housing applications, and other aspects where preference is given to the local *hukou* holders [66–68]. Chan (2018) argues that migrants have fewer opportunities to improve their housing conditions than residents and public-sector workers [69]. In addition to the *hukou* factor, economic conditions, migration costs, and uncertainty about the future also affect migrants' inferior positions in the real estate market [70].

Due to housing unaffordability, the characteristics of migrant workers as “migratory birds” and lower-wage earners have been more prominent [71,72]. Economically rational migrants often have a stronger incentive to save money and thus exhibit more frugal housing consumption. The migrant families often live in overcrowded, low-cost housing, with little infrastructure or inferior facilities, to save money and enhance their ability to resist risks or uncertainties [73–75]. Due to the land system and policies, migrants mostly obtain housing through the formal real estate market. Therefore, the housing conditions of migrants are determined by national policies, market mechanisms, local development initiatives, migration regulation codes, and the mobility (“migratory bird”) features of the migrants themselves in the host cities. The migrant housing conditions are greatly affected by the land and housing supply mechanisms.

From the perspective of migration patterns, population migration in China can be divided into inter- and intra-provincial migration. Inter-provincial migration has become an important research topic in recent years, due to the rise of inland-to-coast, long-distance migration in China since the 1980s. Previous studies on the inter-provincial migration of the population in China have involved the characteristics of the inter-provincial migrant population [76], the spatial pattern (direction and density) of migration, the main agglomeration destination areas and socio-economic integration issues [77–80], and the factors influencing migration decisions and patterns [81,82]. Compared with shorter-distance migration within provinces, inter-provincial migration is farther in distance, larger in scale, and faster in growth rate [81]. Its distribution has demonstrated more obvious regional differences and is more apparently affected by the regional migration network [77]. More importantly, inter-provincial migration can better reflect the impact that the destination city background has on migrant housing consumption, since the areal variance is more prominent across longer-distance migrations.

According to Tobler’s (1970) first law of geography, inter-provincial migrants have less social capital and face more institutional barriers and a higher cost of living in the cities to which they migrate [83]. This may reduce their willingness to move permanently and to assume housing consumption costs, leading to their relatively poor housing conditions in the destination cities [84]. However, in China, there are few studies on the spatial variance of the housing conditions of inter-provincial migrants. Recent studies have begun to explore the complicated relationship between migration patterns and migrant living conditions. These scholars believe that as the income of inter-provincial migrants increases, they may pay more attention to their living standards and quality of life. Their migration decisions may be more significantly affected by the spatial variance in urban amenities and housing conditions [85]. Therefore, it is important to study the spatial heterogeneity of the housing conditions of inter-provincial migrants.

3. Data Sources and Research Methods

Based on the above research, this article presents an empirical model to quantitatively analyze the spatial difference in the housing conditions of inter-provincial migrants and its influencing factors. We used the micro household data of 1% of the 2015 population census provided by the National Bureau of Statistics of the People’s Republic of China. The national census provides a broad and reliable data set for accurate social and demographic analysis [2]. This article examines the spatial distribution of the inter-provincial migrants’ housing conditions, with overcrowding (household housing space consumption) and a shortage of basic amenities (such as toilet and kitchen facilities) as the most prevalent housing condition indicators. This spatial analysis of migrant housing conditions was conducted across 301 cities at the prefecture level and above in China, and it revealed the factors influencing spatial differences. Three migrant housing indices—household-level housing space consumption, the percentage of private toilet coverage, and the percentage of private kitchen coverage, as self-reported by the inter-provincial migrants in the 2015 1% population census—were used to conduct a comparative study on the housing conditions of different areas. This study is expected to provide a reference for different destination cities to solve the respective housing problems of migrants and improve their integration and happiness.

The following sections will introduce (a) the data sources and their advantages, (b) the method used to analyze the spatial heterogeneity and the agglomeration area for the three housing condition indicators, and (c) the regression models used to explore the influencing factors. The research design is shown in Figure 1.

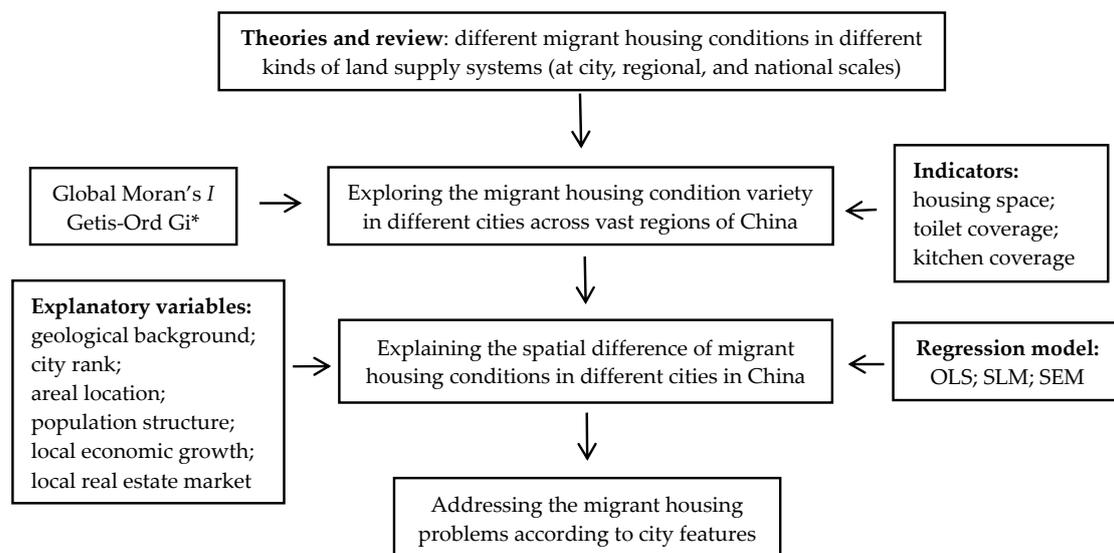


Figure 1. Flow chart of research design.

This research was conducted from a typical geographical perspective (on a particular municipal scale) to examine the regional variance of migrant housing issues. As elaborated in the theoretical parts, this is an important topic in land, housing, and migration—migrants have different housing opportunities in disparate cities across vast regions such as China. There exists a multi-scalar issue in geographical research. Scale, multi-scales, and scaling up and down are all important in regional studies. We have aggregated the migrant housing data at the city level for two reasons. First of all, the city/municipality is a basic management unit of the economy and population in China. Different cities have different policies to govern land resources and regulate migration. Our research can reveal the city-level variance of migrant housing amenity, which is very important for housing policymaking in the different regions and different kinds of cities. Secondly, the migrant housing data were previously aggregated at the larger provincial scale. We can access the household data (provided by the National Bureau of Statistics of China) and aggregate them at the municipal scale. Such finer-scale aggregation is important for regional variance studies. In the future, we plan to conduct more studies on migrant housing conditions at even finer scales, including typical migrant neighborhoods (such as “urban villages”) in different kinds of cities in China.

3.1. Data

This study was based on micro household data from the 2015 1% census conducted by the National Bureau of Statistics of the People’s Republic of China (NBS, PRC). The large sample size and standard statistical process for the national census data enable the data to reflect the true and reliable situation in China in 2015. The standard time for this investigation was set at 0:00 on November 1, 2015. In this national survey, group sampling, two-stage sampling, probability proportional sampling, and cluster sampling methods were adopted. The entire population (excluding residents of Hong Kong, Macao, and Taiwan and foreigners) in approximately 60,000 surveyed communities was considered as the survey object. The data set contains a total of 1,371,252 valid microdata samples. This survey was registered on a household basis, which allowed us to examine differences in housing conditions at the household level. In our research, the data set for inter-provincial migration contained 78,933 valid microdata samples.

We selected three representative indicators in the census data (namely, household-level housing space consumption, the percentage of private toilet coverage, and the percentage of private kitchen coverage) to measure the spatial heterogeneity of the housing conditions of inter-provincial migrants on the scale of prefecture-level cities in China. This study then further analyzed the factors influencing the spatial heterogeneity. The data for the independent variables were mainly from the 2016 China City Statistics Yearbook. The rent data of each prefecture-level city came from the Xitai data. This database covers the whole country and is updated each year (Available at <http://www.cityre.cn>). Figure 2 shows the main provinces and central cities in mainland China.



Figure 2. Map of China in 2019, with labels added for provinces (see text). Scale: 1:16 million. Source: Ministry of Natural Resources of the People’s Republic of China. Available online: <http://bzdt.ch.mnr.gov.cn/>.

It should be noted that, apart from Hong Kong, Macao, and Taiwan, China can be divided into seven regions. In Figure 2, different colors differentiate the seven regions: (1) Northeast China in the pink color including the provinces of Heilongjiang (H6), Jilin (J3), and Liaoning (L); (2) Northwest China in the Earth-yellow color including Ningxia (N), Xinjiang (X), Qinghai (Q), Shaanxi (S5), and Gansu (G4); (3) North China in the light-green color including Beijing (B), Tianjin (T1), Hebei (H2), Shanxi (S3), and Inner Mongolia (I); (4) Central China in the orange color including Henan (H3), Hunan (H4), and Hubei (H5); (5) East China in the yellow color including Shanghai (S1), Shandong (S2), Jiangsu (J1), Jiangxi (J2), Anhui (A), Zhejiang (Z), and Fujian (F); (6) South China in the purple color including Guangdong (G2), Guangxi (G1), and Hainan (H1); (7) Southwest China in the sky-blue color including Sichuan (S4), Yunnan (Y), Guizhou (G3), Tibet (T2), and Chongqing (C).

3.2. Methods

3.2.1. Spatial Autocorrelation

Global Moran’s I

Spatial autocorrelation refers to the potential interdependence of the observed data for some variables in the same distribution region. If the research attests to the relations of positive spatial autocorrelation, this reveals regional agglomeration and similarity. This study employed the Moran’s *I* index to measure whether the spatial distribution of the housing condition indicators had agglomeration in the whole study area. The range of the Moran’s *I* index is $[-1, 1]$. On the premise of a given significance level, Moran’s $I > 0$ indicates a trend of agglomeration, and the greater the value is, the greater the spatial correlation is. Moran’s $I < 0$ means that the space is discretized, and the smaller the value, the greater the spatial difference. Moran’s $I = 0$ indicates that the space is random and there is no spatial autocorrelation.

Getis-Ord G_i^*

In this article, the Getis-Ord G_i^* index was used as the hotspot analysis tool to detect hot and coldspots of the housing condition distribution with statistical significance. This tool works by looking at each element in the adjacent element environment. To be a statistically significant hotspot, elements should have high values and be surrounded by other elements that also have high values. The same is true for coldspots.

3.2.2. Spatial Regression Modeling

This article used spatial regression modeling (the Spatial Lag Model and Spatial Error Model) to study the factors that influenced the spatial heterogeneity of housing conditions. This is because the traditional regression methods (such as the ordinary least-squares method) ignore the spillover effects and spatial interactions among adjacent units. We selected three regression methods to analyze the factors influencing the spatial differences in housing conditions at the prefecture level in China. One model we used was an ordinary least-squares method (OLS). The second was a Spatial Lag Model (SLM), which was used to investigate whether the variables had the diffusion phenomenon (spillover effect) in the region. When the error terms of the model are spatially correlated, a Spatial Error Model (SEM) is an appropriate analysis tool. In this study, the GeoDa software was used for spatial statistical analysis. The OLS model, SLM model, and SEM model were, respectively, used to empirically study the spatial effect of the housing conditions of inter-provincial migrants in China. The results show that among the three regression models, the SEM model better explains the spatial pattern of the migrant housing conditions.

4. Results

4.1. Spatial Pattern and Agglomeration Type of Housing Conditions of Inter-Provincial Migrants

We first observed the spatial patterns of the aggregation and dispersion of migrant housing conditions (overcrowding and a shortage of basic amenities such as toilet and kitchen facilities) in different cities. In the context of China's New-Type Urbanization today, it is of great significance to analyze this spatial heterogeneity of migrants' urban lives, especially during their longer-distance migration across provincial boundaries. The following analysis includes two research objectives: (a) to measure and visualize the regional heterogeneity of the housing conditions of inter-provincial migrants in China, and (b) to explain, statistically, the mechanism of the spatial variance for the above-mentioned key indicators of housing conditions.

The global spatial autocorrelation of the housing conditions of inter-provincial migrants across the Chinese cities in 2015 (see Table 1) shows that the Moran's I values of the three housing condition indicators (i.e., housing space, toilet coverage, and kitchen coverage) are all positive and significant. The spatial pattern of the housing conditions of inter-provincial migrants demonstrates the obvious agglomeration characteristics. The ArcGIS 10.2 software was used to draw the spatial distribution maps and hotspot maps of the housing conditions in 2015.

Table 1. Global spatial autocorrelation.

	Moran's I	$Z(I)$	p
Housing space	0.347	9.925	0.001
Toilet coverage	0.414	11.697	0.001
Kitchen coverage	0.369	10.935	0.001

Data Source: 1% population sampling survey conducted in 2015 by the National Bureau of Statistics of China.

4.1.1. Migrants' Housing Space Consumption

The spatial distribution of the household-level housing space of inter-provincial migrants has the characteristics of "high in Central China, while low in the southeast coastal region and Northwest

China” (Figure 3a). In general, inter-provincial migrants in some cities in Northeast and Northwest China (e.g., Jiamusi City in Heilongjiang Province and Zhangye City in Gansu Province), which are dominated by the traditional manufacturing industry, together with the vibrant coastal economy on the southeast coast, are more likely to suffer from housing overcrowding. However, in vast Central China (such as in Henan, Hubei, and Hunan), with a large population outflow, the housing space of inter-provincial migrants is characterized by a more spacious living environment.

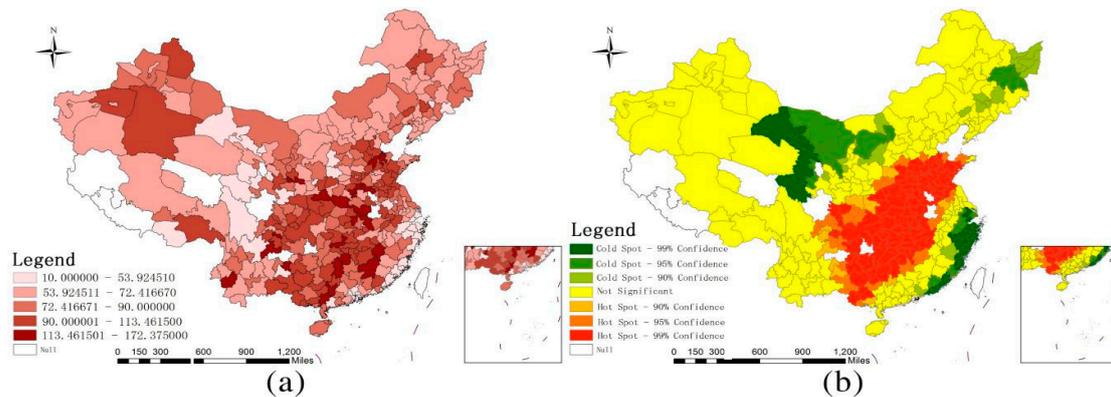


Figure 3. The spatiality of the household housing space of inter-provincial migrants in urban China: (a) household housing space (unit: m^2); (b) hotspot analysis of household housing space. (Data source: 1% population sampling survey conducted in 2015 by the National Bureau of Statistics of China.).

The hotspots for the housing space of Chinese inter-provincial migrants are mainly distributed in the vast areas of Central China, between the famous “Hu Line” (proposed by Hu Huanyong in 1935) and the southeast coast (Figure 3b). Specifically, hotspot areas are distributed in Henan, Southern Hebei and Shanxi, Western Anhui, Hubei, Hunan, Chongqing, Shandong, Eastern Shaanxi, Northern Jiangxi Provinces, and other regions.

Central China, represented by Hubei and Hunan, is covered with vast high values of migrant housing space consumption. Except for some cities with higher administrative levels (for example, Wuhan, the capital of Hubei Province), the relatively lower housing costs in Central China can explain the housing affordability and consumption behaviors among the inter-provincial migrants. The housing space of the inter-provincial migrants is relatively large in Central China, and this also reflects the law of the geographic differentiation of urban housing crowding at different administrative levels.

The northern parts of Central China are high-value areas of migrant housing space consumption, too, involving Henan, Southern Hebei, Southern Shanxi, and Eastern Shaanxi Provinces. The national-level “Rise of Central China” strategy has driven rapid real estate development in these regions. In particular, Zhengzhou has become an important regional hub, with real estate booms around the Greater Zhengzhou City Region. Besides, the flat terrain has lowered housing construction costs. It is easier for migrants to enjoy more spacious housing conditions here.

In addition, there is a divided pattern of “high in inland, while low in coast” in the Shandong Peninsula. The migrant housing space of Yantai, Weihai, and Qingdao is lower than that of other cities in Shandong Province. This may be because the Shandong Peninsula Economic Open Zone is located in the coastal area, with a more advanced export-oriented economy and a booming housing market, where the cost of renting or buying housing is higher than that in the interior of Shandong.

The coldspots of the housing space of inter-provincial migrants are mainly located in some cities of Northeast and Northwest China and the narrow strip of the coast. It is impressive that the western complex topography and lower land availability can lead to the significant low-value agglomeration of migrant housing space (i.e., Ali in Tibet, Guoluo in Qinghai, Zhangye in Gansu, and Alxa League in Inner Mongolia). The southeast coast is another low-value cluster of migrants’ housing space consumption, situated in Zhejiang Province (Ningbo, Shaoxing, Taizhou, and Wenzhou),

Fujian Province (Fuzhou, Quanzhou, and Zhangzhou), and Guangdong Province (Chaozhou and Shantou). Here, housing affordability for inter-provincial migrants is relatively poor, and they can hardly occupy a larger living space. The governments' tightened controls over land development exacerbate the existing housing congestion problems in these areas.

4.1.2. Migrants' Basic Amenity Coverage

The measurement of the shortage of basic amenities (such as toilet and kitchen facilities) for the inter-provincial migrants combined a pair of numerical calculations of the percentages of the private toilet and kitchen coverages, respectively. Principally, the spatial distribution of migrants' basic amenity coverage levels formed a pattern of "high in Northeast Coast and Central China, but low in Southeast Coast and Northwest and Southwest China" (see Figure 4a,c). Central China has better basic housing facilities for inter-provincial migrants, forming a high-value distribution zone of basic amenity coverage extending from the southeast of Heilongjiang to Guangdong Provinces. To be more specific, the highest hotspot index of the percentage of private toilet coverage appears in Yongzhou City of Hunan Province, and the lowest, in Lhasa of the Tibet Autonomous Region (Figure 4b). The area with the highest hotspot index of the percentage of private kitchen coverage is Siping City in Jilin Province, and the lowest area is Guoluo City in Qinghai Province (Figure 4d).

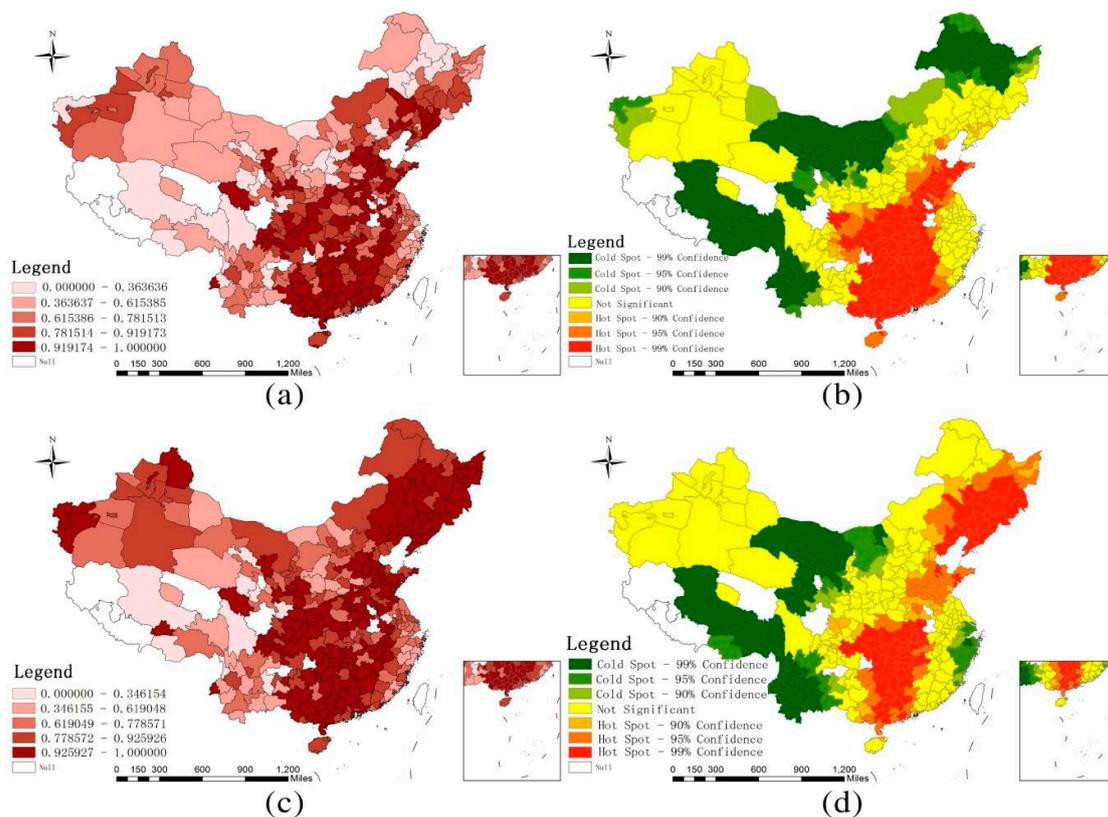


Figure 4. The spatiality of the basic amenity coverage of inter-provincial migrants in urban China: (a) percentage of private toilet coverage; (b) hotspot analysis of the percentage of private toilet coverage; (c) percentage of private kitchen coverage; (d) hotspot analysis of the percentage of private kitchen coverage. (Data source: 1% population sampling survey conducted in 2015 by the National Bureau of Statistics of China.).

As can be seen from Figure 4, the specific distribution characteristics of the housing facilities for Chinese migrants can be summarized as follows. First, in Northeast China, there is an inconsistent pattern between the toilet and kitchen coverage indicators. For instance, the northern part of Northeast China (mostly in Heilongjiang Province in Figure 4a,b) is a coldspot region for the indicator of the

percentage of private toilet coverage. The central and southern parts of Liaoning Province (along the Yellow-Bo Sea and therefore more exposed to the coastal export-oriented economy) show a higher performance in private toilet accessibility, but do not shape the high-value cluster of it. By contrast, when it comes to the indicator of private kitchen coverage, the central and southern parts of Northeast China (i.e., Heilongjiang, Jilin, Liaoning, and the east ends of Inner Mongolia Province such as Chifeng and Tongliao Cities in Figure 4c,d) formed a high-value cluster.

Second, it is very impressive that there is a high convergence between the two indicator hotspots (private toilet and kitchen coverage ratios) in vast Central China, involving Hubei and Hunan as shown in Figure 4. In Central China, migrants' relatively spacious housing (Figure 3) and affordable housing costs can provide the possibility for housing facility improvements. However, in Jiangnan Area in Hubei Province (i.e., Tianmen, Qianjiang, and Xiantao Cities), the relatively inferior housing facilities among migrants can be partially attributed to the real estate fever present here, together with a limited land supply during the area's Old Town Redevelopment Projects.

Third, Shandong Province (especially the coastal part with a higher degree of economic opening) is another convergence area of high values for the two indicators of toilet and kitchen coverage (see Figure 4).

Fourth, the low-value agglomeration of the two indicators (toilet and kitchen coverage) is also almost convergent in almost the same area, including Gansu, Qinghai, Tibet, and western Sichuan. These coldspot areas are either inland regions with less advanced economies or situated in inferior physical environments (for instance, the western Sichuan region located in the Qinghai-Tibet Plateau and the Hengduan Mountains).

4.2. Influencing Factors Explaining the Spatial Variance of Migrant Housing Conditions

4.2.1. Variable Selection

The housing conditions of inter-provincial migrants are influenced by a range of factors. The spatial heterogeneity of housing conditions is not merely the result of people's psychological and behavioral attitudes and choices regarding housing space and amenity consumption. The above housing condition variance is also affected by market resource allocation mechanisms and macro-level policymaking. This article explores the influence of the geographical, social, and economic characteristics of different prefecture-level cities in China on the housing condition variance of inter-provincial migrants. The research hypothesis of this article was derived from the "spatial context effect". That is, performing as the structural context of household housing consumption behavior, a series of geographic and areal backgrounds can act on the housing condition variance at the individual or household level.

Building on previous studies, this article comprehensively considers the interaction between migrant housing conditions and local contexts (i.e., economic development, market expectations, urban attraction, investment scale, payment capacity, land supply, and other factors). At the same time, the basic laws of economic operation, governance of the land and housing supply, and availability of data are also included.

The three indicators (i.e., housing space consumption, the percentage of private toilet coverage, and the percentage of private kitchen coverage) for the housing conditions of the Chinese inter-provincial migrants were selected as dependent variables (Y) in the regression models.

The following were selected as independent variables (X): (a) the geological environment, represented by the SLOPE (the slope is calculated as the ratio of the ground climbing height to the horizontal movement distance, and the higher the value, the steeper the slope); (b) the city rank (the administrative rank, with centrally administrated provincial-level cities as the reference); (c) the regional location (the region of China, with East China as the reference); (d) the local population structure (the proportion of migrants in the total permanent population); (e) the economic level of the city (as measured by GDP, employee wages, and fixed asset investments); (f) the local real estate market (represented by the residential land expansion, residential investment, and rental levels). The spatial

regression model was constructed to analyze the factors influencing the spatial difference of migrant housing conditions. The specific variables and meanings are shown in Table 2.

Table 2. List of Variables.

	Variable Group	Variable Name	Variable Description	
Explained variable	Housing conditions	Housing space	Household housing space (square meters)	
		Toilet coverage	Percentage of private toilet coverage	
		Kitchen coverage	Percentage of private kitchen coverage	
Explanatory variables	Geological background	SLOPE	Slope	
	City rank	RANK	Provincial-level as the reference	
	Areal location	AREA	East China as the reference	
	Population structure	POP	The proportion of the migrant population	
	Local economic growth	GDP	Gross Domestic Product (thousand CNY)	
			WAGE	The average wage of employees (thousand CNY)
			FAI	Fixed asset investment (billion CNY)
	Local real estate market	LAND	The annual expansion rate for residential land	
			INVEST	Residential investment per capita (thousand CNY)
			RENT	Rental level (CNY)

Three models were selected for regression analysis, namely, the ordinary least-squares model (OLS), Spatial Lag Model (SLM), and Spatial Error Model (SEM). The variable relationship can be modeled as follows.

- (1) The variable relationship of housing space as the dependent variable can be modeled as follows:

$$\ln P_i = \beta_1 \text{SLOPE}_i + \beta_2 \text{RANK}_i + \beta_3 \text{AREA}_i + \beta_4 \text{POP}_i + \beta_5 \text{GDP}_i + \beta_6 \text{WAGE}_i + \beta_7 \text{FAI}_i + \beta_8 \text{LAND}_i + \beta_9 \text{INVEST}_i + \beta_{10} \text{RENT}_i + \lambda$$

$$i = 1, 2, \dots, n$$

- (2) The variable relationship of housing facilities (toilet and kitchen coverage) as the dependent variable can be modeled as follows:

$$P_i = \beta_1 \text{SLOPE}_i + \beta_2 \text{RANK}_i + \beta_3 \text{AREA}_i + \beta_4 \text{POP}_i + \beta_5 \text{GDP}_i + \beta_6 \text{WAGE}_i + \beta_7 \text{FAI}_i + \beta_8 \text{LAND}_i + \beta_9 \text{INVEST}_i + \beta_{10} \text{RENT}_i + \lambda$$

$$i = 1, 2, \dots, n$$

where $\ln P$ and P are the dependent variables representing the housing condition indicators, i is the regional unit, λ is the constant term, and β_1 – β_{10} are the regression coefficients of each independent variable.

4.2.2. Regression Analysis Results

This work analyzed the factors driving the spatial difference of the three indicators of housing conditions by using ordinary least squares (OLS), the Spatial Lag Model (SLM), and the Spatial Error Model (SEM). When performing regression in GeoDa, the AIC (Akaike information criterion) is usually used as a measure of the degree of model fit, where a smaller AIC indicates a higher degree of model fit. In this study, we found that the SEM model was more suitable for explaining the regression results of the different housing condition indicators (the housing space, private toilet coverage, and private kitchen coverage).

According to the regression results in Table 3, the geological background variable of slope has a negative impact on all the indicators of housing conditions. The influence of slope is statistically significant for all three housing condition indicators. Generally speaking, in the case of a large slope and complicated geological environment, the investment for building housing is higher, the construction is difficult, and maintenance is not easy. This may explain the relatively poor housing conditions in areas with more “sloping” terrain.

Table 3. Regression Results.

Variable	Housing Space			The Percentage of Private Toilet Coverage			The Percentage of Private Kitchen Coverage		
	OLS	SLM	SEM	OLS	SLM	SEM	OLS	SLM	SEM
CONSTANT	1.749	-2.270	1.926	0.009	-0.045	0.017	0.011	-0.019	0.014
SLOPE	-4.655 **	-3.621 *	-4.675 **	-0.068 ***	-0.054 **	-0.074 ***	-0.044 **	-0.036 **	-0.044 **
RANK (Provincial as reference)									
Sub-provincial	63.169 ***	59.093 ***	62.315 ***	0.566 ***	0.506 ***	0.540 ***	0.624 ***	0.597 ***	0.611 ***
Prefectural	83.246 ***	78.663 ***	82.495 ***	0.720 ***	0.655 ***	0.715 ***	0.783 ***	0.752 ***	0.775 ***
AREA (East China as reference)									
South China	8.578 **	7.994 **	8.715 **	0.206 **	0.181 **	0.202 **	0.145 **	0.136 **	0.143 **
Central China	19.232 ***	18.370 ***	19.748 ***	0.111 **	0.107 **	0.124 **	0.104 **	0.103 **	0.111 **
North China	0.442	0.226	0.720	-0.039	-0.034	-0.036	0.045	0.040	0.045
Northwest China	5.941	6.177	6.606	0.043	0.055	0.058	0.075 *	0.077 *	0.078 *
Southwest China	22.525 ***	22.595 ***	23.042 ***	0.150 **	0.159 **	0.155 **	0.121 **	0.125 **	0.122 **
Northeast China	-6.494	-5.041	-5.773	-0.048	-0.035	-0.045	0.153 ***	0.148 ***	0.157 ***
POP	-59.146 ***	-52.372 ***	-57.021 ***	-0.558 ***	-0.474 ***	-0.485 ***	-0.404 ***	-0.371 ***	-0.383 ***
GDP	-0.032	-0.030	-0.038	0.0007 *	0.0008 *	0.0008 *	0.0003	0.0004	0.0003
WAGE	-0.026	-0.030	-0.027	-0.0002	-0.0002	-0.0002	-0.0001	-0.0001	-0.0001
FAI	0.062 ***	0.058 ***	0.060 ***	0.0004 ***	0.0004 ***	0.0005 ***	0.0005 ***	0.0005 ***	0.0005 ***
LAND	0.823	0.774	0.723	-0.0005	-0.003	-0.003	0.0009	0.0006	0.001
INVEST	-0.111	-0.109	-0.112	-0.0005	-0.0005	-0.0009	-0.003 *	-0.003 *	-0.003 *
RENT	-75.947	-70.158	-111.381	-6.039 ***	-5.560 **	-5.752 **	-4.780 **	-4.716 **	-5.067 **
R ²	0.712	0.715	0.714	0.735	0.742	0.742	0.813	0.814	0.815
Sigma ²	385.553	362.552	364.353	0.034	0.032	0.032	0.024	0.022	0.022
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Log likelihood	-1499.21	-1497.69	-1498.55	-101.362	-105.418	-104.683	164.534	165.749	166.059
AIC	3032.41	3031.38	3031.11	-168.723	-174.837	-175.365	-295.069	-295.498	-298.119

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Ordinary least-squares method is known as OLS, Spatial Lag Model as SLM, Spatial Error Model as SEM, and the Akaike information criterion as AIC. Data source: 1% population sampling survey conducted in 2015 by the National Bureau of Statistics of China.

The city rank is a comprehensive representation of urban resource concentration and all kinds of socio-economic activities. Generally speaking, the higher the city rank is, the more attractive the city will be to migrant workers. This exerts a complicated impact on urban economic growth and market demand, and ultimately on the local property market. In the current administrative governance levels, Chinese cities can be categorized as provincial, sub-provincial, and prefecture-level cities. A provincial city is an organized city directly under the jurisdiction of the central government. There are four provincial cities in China. A sub-provincial city refers to a city with a sub-provincial administrative structure. Its predecessor was a separate planned city. Prefecture-level cities occupy most of the total number of prefecture-level administrative units and are the main body of the Chinese urban system. The main difference between provincial, sub-provincial, and prefecture-level cities lies in the social and economic management authority. As shown in Table 3, we find that the level of urban administration (taking provincial cities as the reference) is one of the most important factors influencing the inter-provincial migrants' housing conditions. The higher-ranked cities, as the regional hub, have high real-estate values, very strong housing demands, and stricter household registration barriers. Housing in these cities is more likely to be unaffordable to migrant workers. As a result, in cities with higher administrative levels, longer-distance migrants are hardly able to afford spacious and comfortable housing.

Equally impressive, the regional location (with East China as the reference) shows the areal variance of the housing condition indicators. The inter-provincial migrants in Central China (except a regional hub such as Wuhan) enjoy larger and better-equipped homes than their peers in East

China, probably due to a higher housing affordability level and therefore easier access to superior housing conditions in most areas of Central China. There is no obvious difference between the housing conditions of inter-provincial migrants in Northwest and East China, except for slightly better private kitchen coverage in Northwest China than in East China. At the same time, inter-provincial migrants from Southwest China have consumed more spacious housing than their counterparts from East China, possibly because of the relatively low rental and sales prices in Southwest China. The housing conditions of inter-provincial migrants in South China are also significantly better than those in East China, especially in terms of facilities.

POP (the proportion of migrants in the total permanent population) is an important factor affecting housing demands. With the acceleration of urbanization, the increase in new migrants will generate strong demand for housing. The greater the potential housing demand is, the more intense the competition in the urban housing market is. At the same time, people often hold a very positive attitude about the urban real estate market. These factors are driving up housing costs among migrants, too. The ratio of migrants in the city's total population showed a significant negative impact on the migrants' housing conditions. If the proportion of the migrant population in the host city is high, inter-provincial migrants are more likely to live in housing with poor conditions, in terms of both housing space and facilities.

The impact of GDP is significant on the toilet coverage indicator, while exerting a negative but insignificant impact on housing space. It is shown that the faster economic growth and the consequent high rental and sales prices have exacerbated the housing congestion for inter-provincial migrants. It is optimistic to suggest that GDP growth is helpful for improving migrants' basic amenities. For instance, some old buildings are replaced by new residential buildings, and the facilities are renovated and improved accordingly.

WAGE has reportedly little effect on the housing conditions of the inter-provincial migrants. The complexities of their cost-benefit tradeoff in housing consumption can explain uncertainties between wage levels and housing condition indicators.

FAI has a positive impact on all three indicators of housing conditions. This can be explained by the fact that the higher the number of fixed asset investments in a city, the more the housing comfort improvements that are experienced by migrant workers.

Urban residential land expansion has no significant effect on the three housing condition indicators. In Chinese cities, urban residential land expansion caters for the home-purchase demands. However, the migrants mostly resort to rental housing rather than self-owned housing in the host cities. Residential investment per capita has a negative impact on housing conditions, which is particularly significant for kitchen coverage. This implies an unexpected negative effect of local real estate developments on migrants. In a housing market experiencing a real estate boom, inter-provincial migrants may choose more frugal housing consumption strategies, such as living in basements or villages in the city or sharing apartments with others. It is also interesting that RENT is one of the most important factors affecting the living amenities of inter-provincial migrants. RENT exerts a negative impact on migrant living conditions, showing that migrants are sensitive to living costs in the destination cities.

5. Conclusions

Housing inequality is an important research topic, especially in rapidly urbanizing areas. The disadvantaged status of migrants is reported in many countries. However, we know little about how the migrant housing conditions vary from one city to another across a large and economically transitioning country such as China. This study examined the areal variance of migrant housing conditions across China's 301 cities since the country's transition from a centrally planned to a market-led economy. As China is a transitional economy, the Chinese government can monopolize the primary land market, and control the land expropriation, conversion, and transfer for urban residential purposes. This top-down land regulation mode is very different from the land and housing experience of many Latin American countries (e.g., Brazil), which is more incremental and bottom-up.

As explained in Weberian and Marxian theories, property-related conflicts and land-use disputes are rooted in the profound labor–capital–land relationship in the particular asset accumulation and social reproduction system. According to the Marxist criticisms of the incompatible multiple attributes of “land” (land exchange value vs. land use value), the mega-cities, as growth hubs, would experience more intense land-use conflicts, between the local city-branding movement and high demand for low-rental areas among migrant tenants. This more intense land-use conflict can manifest as inferior housing conditions among migrant workers. Our spatial analysis attested to this rule of land-use dispute—southeast coastal economic zones were identified as the “land scarcity with migrant explosion” zones, wherein migrants are faced with more intense land-use disputes than in other cities and therefore have more inferior housing conditions.

Our research also reveals the more habitable areas in vast Central China, which are the areas that have been rapidly urbanizing and industrializing in recent years. We found that the inter-provincial migrants in Central China (except a regional hub such as Wuhan) can enjoy larger and better-equipped homes than their peers in East China. The less intense land-use conflict in Central China can explain the easier access to the superior housing conditions there. Public housing schemes are open to migrant families in some cities in Central China, especially to well-educated talents from other provinces. This change in local governments’ land policy (land financing no longer using land as a financing tool to attract investments) is an important signal, with a great transformation of China’s urbanization path from a GDP-centered to a more human-centered approach (i.e., China’s New-Type Urbanization). However, it is apparent that land-use disputes are still considerable in the coastal areas of China, and migrants in metropolises in coastal China are still faced with housing crowding problems.

In its theoretical aspects, our empirical study also revealed the difference in the role played by “land” across different cities, even within the same country. “Land” plays a central role in the “growth machine”, to attract investments, accumulate revenues, and also provide more decent housing for migrant talents. This implies the need to conduct a comparable political–economic analysis on the close relations between the role of “land” and migration trends in different kinds of cities experiencing different stages of sectoral restructuring. The old thesis on “land politics” and the “growth machine” (that land can be used as an important financing tool to speed up local capital accumulation and circulation processes) would be enriched if the diversity of China’s urbanization path were considered.

This study improves our understanding of the housing condition inequalities across the different urban units in China [86,87]. This points to policy implications for better entitling the disadvantaged, longer-distance migrants in different types of cities [88]. Our empirical analysis shows that more “targeted” housing policies are essential. Policymakers should focus on the more coordinated development of housing markets in different regions. For instance, in the “land scarcity with migrant explosion” zones such as some coastal metropolises, talent-targeting housing policy could be a way to address the housing scarcity issue among well-educated groups in big cities in China. This would be helpful for promoting “orderly migration” and curing the overpopulation problems in the coastal areas, and at the same time, it might guide unskilled migrants to move to smaller cities around the mega-cities and in vast Central China. Beyond a top-down land and housing system in China today, some more bottom-up and participatory migrant housing supply means (such as informal housing schemes such as urban villages) could be another way to address the above housing challenge. Some more preferential housing policies in Central and West China are also important for attracting more skilled migrants and addressing the enduring “brain-drain” problems in the recent “talent war” in China today, with regions and cities competing for skilled migrants. Additionally, the lack of housing facilities in the Tibet, Inner Mongolia, and Yunnan-Guizhou regions should also be addressed. Specific measures could include an increased land supply, faster infrastructure construction, and so on. Particular city-level policies have not been fully explored due to data limitations. Since this study was based on the data of a single year, 2015, in future studies, we will consider expanding the period of study to explore this topic in greater depth (e.g., comparative studies for different years to illuminate change). This research was also conducted at the municipal scale. More work can be performed at finer scales,

including typical migrant neighborhoods in different kinds of cities in China. Despite these limitations, this study is enlightening for addressing migrant housing problems in the context of China's land policy framework.

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