

Research Article

Housing-Resources Spatial Mismatch Investigation of Affordable Housing and Policy Implementation: A Case Study from Hangzhou, China

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Abstract

Intensive spatial transformation and restructuring in China these years has brought the separation of residence-job, so as to residence-public services, which adversely affects people's access and enjoyment of job and public service resources, especially for the disadvantaged populations with limited choice of residence location and insufficient access to those resources. The residents of affordable housing are among the typical disadvantaged populations under the existing affordable housing policy in China. Residence-job separation of affordable housing residents has been paid much attention in literature, but no specific study has been conducted on the residence-public services separation and the behavioral responses of the residents. Spatial mismatch theory was originally put forward to reveal the adverse labor market outcome brought about by residence-job separation, and nowadays some scholars have tried to extend the residence-job spatial mismatch to residence-other resource spatial mismatch. This research responds to both the dilemma facing by the disadvantaged affordable housing residents and the extension trend of spatial mismatch theory. By applying the spatial mismatch theory and taking several affordable housing communities of Hangzhou as examples, the study explore the problems existing in affordable housing in commuting, employment, public service and residents' behavior response. The results found that the current affordable housing policy has led to an increase in commuting costs, a decrease in employment accessibility and welfare, a decrease in accessibility and satisfaction of public services, and disruptive behavior in the affordable housing market. These problems are mainly caused by remote layout and single supply, unreasonable allocation methods, difficulty in exchanging housing units and inadequate supervision of undesirable behaviors. To alleviate the spatial mismatch between housing and resources in Hangzhou, policy suggestions could be considered from four aspects: housing layout and supply, allocation methods, housing exchange and supervision.

Keywords

Spatial Mismatch, Affordable Housing, Resources, Welfare

1. Introduction

Since the reform and opening-up in 1978, especially since the reform of housing commercialization in 1998, the housing rights of low-income groups at the lowest level of life have

been an important concern of China's urban housing policy, and housing security into the performance appraisal system of local officials, local governments to fulfill the responsibility

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Received: 13 June 2024; **Accepted:** 3 July 2024; **Published:** 15 July 2024



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of housing security become an important constraint. Since fifteen, the construction of social housing in China has been further accelerated. By 2021 August, China had built more than 80 million units of various types of government-subsidized housing and housing for displaced people, helping more than 200 million people in need to improve their housing conditions. As one of the first cities to explore the implementation of the affordable housing policy, Hangzhou has accumulated 92 public rental housing projects and 83,300 housing units (rooms) as of April 2022, more than 500,000 families (including monetary subsidy), such as families with housing difficulties, families of migrant workers, newly-introduced college students, etc.. Although the construction and allocation of affordable housing have improved the housing conditions of disadvantaged groups, the implementation of policies has exposed issues such as vacant affordable housing units and the inadequate satisfaction of the needs of the intended beneficiaries. These practical problems have led to numerous adverse consequences, including the inability of affordable housing to fully realize its social effects [1]. Guaranteeing affordable housing as a fundamental decision concerning people's livelihoods requires local governments to allocate significant resources. Resolving the basic housing needs of low and middle income groups at the lowest economic cost becomes a 'rational choice' for local governments based on market logic and policy goals [2]. Therefore, although burdened with performance evaluation, accountability system and other institutional pressures, but under the constraints of insufficient construction funds, land supply constraints, and other conditions, local governments often respond with alienated strategic choices (inefficient supply of low-income housing), that is, to locate the suite of large-scale construction of low-income housing far from the central city, areas with insufficient employment, inadequate living services and public transport facilities. Urban entrepreneurialism explains a range of behaviors and development strategies by which local governments have shifted their focus from providing public services to pursuing economic growth, including strategic, selective to promote the practice of low-income housing, the low-income housing will be located in remote areas of the city.

At present, the urban spacial structure in China generally shows that employment opportunities are relatively concentrated in the city center due to the agglomeration effect [3]. Various public service facilities such as commercial facilities, entertainment facilities, government offices, hospitals and schools are also concentrated in the city center [4]. In this urban spatial structure layout, the security housing arranged in the urban remote areas, which will inevitably lead to various challenges in the process of affordable housing fulfilling its role: first, to bring security housing residents travel difficulties, many large-scale security housing areas lack bus line coverage, or set up a new bus stop at the beginning and end, however, bus routes and vehicles are limited, and it is difficult to meet the needs of residents' commuting and activity travel;

second, it results in the spatial separation of residence and employment, causing the employment participation and even the employment income of residents in social housing areas to decline, the longer commuting distance and the lack of jobs around the residential areas may form barriers to employment for residents; third, it leads to the spatial separation of residence and public service facilities, resulting in inconvenience to the daily lives of residents in the social housing areas, at present, although there are fewer daily life service facilities in the vicinity of many social housing units, the supply of both types and quantities is limited, and there is even a lack of high-grade public service facilities such as large shopping malls and places for leisure activities, will inevitably affect the quality of consumption of long-distance public services, and even affect the possibility of continued consumption of the public services, this makes suburbanites significantly less likely to have access to public services than people living in urban centres; fourth, when the excessive separation of residence-employment and residence-public service goes beyond the affordability range of affordable housing residents, they may resort to actions such as abandoning the rented units or seeking to exchange housing resources, on the one hand, it leads to the underutilization of affordable housing, and on the other hand, it disrupts the normal order of the operation and management of public rental housing.

Many researches have paid attention to the influence of residential migration (especially passive residential migration) on the unemployment of related subjects. This research can be traced back to the spatial mismatch hypothesis that originated in the 1960s [5]. The spatial mismatch theory describes the segregation of housing-employment space and the resulting loss of benefits such as high unemployment, long commutes and low wages in the context of suburbanization of employment in American metropolises and racial segregation in the housing market [6]. Subsequently, the theory has been widely used to study the separation of residence and employment in other situations and the resulting loss of employment welfare. Residence-job separation of affordable housing residents has been paid much attention in literature. In fact, the use of spatial dislocation in the context of the implementation of low-income housing has been studied for a long time. The spatial dislocation hypothesis was introduced in the United Kingdom shortly after it was proposed to study the impact of the public housing distribution system on the employment situation of low-income groups, the Entrapment Hypothesis was developed in which low-income groups were confined to specific inner-city public housing because of the rules of the public housing distribution system for moving across administrative boundaries, in the process of employment suburbanization, it is inevitable to face the dilemma of the separation from employment and the decrease of employment participation rate and wage income [7]. The theory of spatial mismatch has also been validated in Asian countries. In Singapore, for instance, people who are compelled to relocate to new towns often find themselves far from central employment centers, leading to spatial mismatch. This situation

results in additional economic burdens and long commuting times [8]. Whether it is the separation of public housing in the inner city and employment in the suburbs in Britain, or the separation of social housing in the suburbs and employment in the center of the city in China, the separation of housing and employment results in the loss of employment benefits, it shows that the spatial mismatch theory has a strong applicability in the situation of the implementation of social housing. In China, living in low-income housing communities in the suburbs not only results in the separation from the employment space, but also results in the separation from the public service facilities in the city center and damages the public service welfare in the low-income housing areas. Public services are closely related to the production and life of the objects of security. The absence of public services may aggravate the vulnerable position of the objects of security, and may even cause new poverty.

Given the preceding context, the study's major purpose is to follow the research approach of the mismatch between residential and employment spaces, incorporating the spatial relationship between residential areas and public services into the scope of research. It focuses on the behavioral responses of residents triggered by these relationships, aiming to uncover the problems in the spatial layout of affordable housing

and the underlying reasons. Therefore, the first section of the paper illustrates the basic situation of affordable housing in Hangzhou and explains the methods and data sources for the study. Subsequently, the paper presents key findings, including issues related to commuting, employment, public services, and resident behavioral responses concerning affordable housing, along with the causes of these issues. Finally, we offer some concluding recommendations.

2. Case Study Context: Affordable Housing Construction in Hangzhou

The housing security work in Hangzhou obviously preceded other regions, consistently taking the lead in exploring and implementing affordable housing policies. Faced with increasingly prominent housing issues, a multi-level income structure and diverse residential needs, Hangzhou, based on the principle of ensuring everyone's basic right to housing, has developed a relatively comprehensive affordable housing policy system and a diverse range of affordable housing product types to meet the diverse needs for affordable housing at different levels and hierarchies [9]. Therefore, Hangzhou was chosen as the research case.

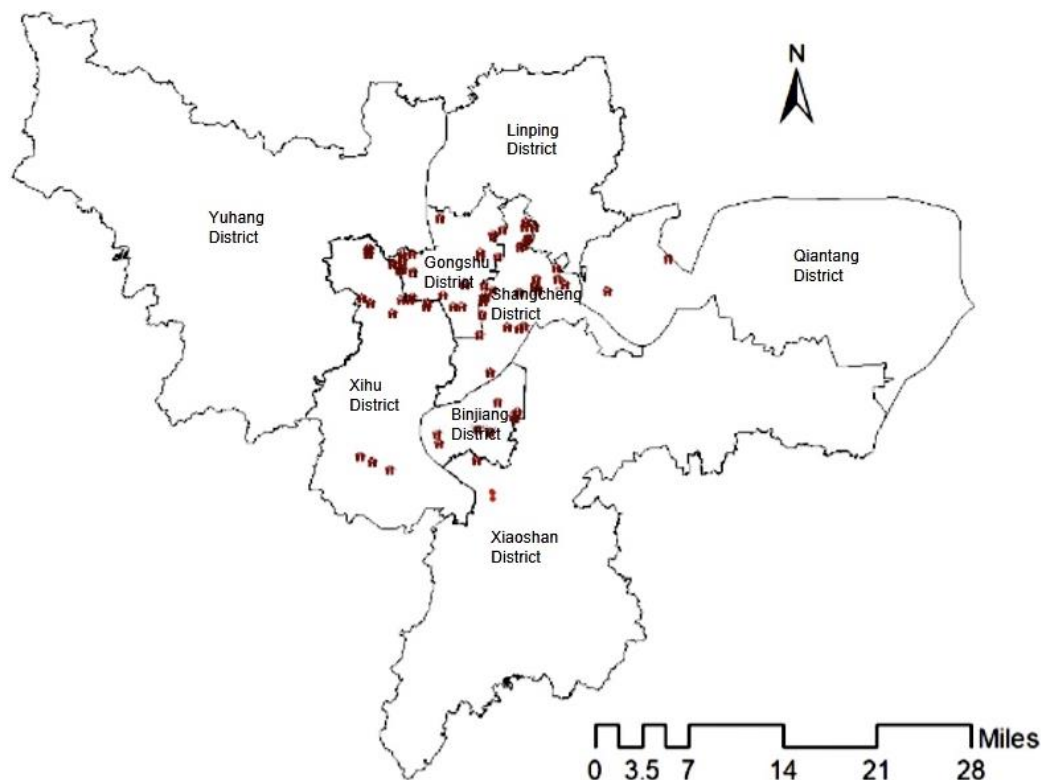


Figure 1. The distribution of affordable housing in Hangzhou.

Since the reform of the housing commercialization system in 1999, Hangzhou has begun to explore ways to solve the housing problems of low and middle income groups through

affordable housing, and has gone through the “Sale-oriented”, “Rent-and-sell” to “Rent-oriented” process of development and evolution. “Sale-oriented” mainly refers to the construc-

tion of economic housing selling at a more economical price, but for a long period of time, affordable housing has become civil servants, teachers and other staff welfare housing, the lack of security functions, this type of housing has gradually withdrawn from the social housing system; “Rent and sell” is in the affordable housing security function is insufficient, the government through the construction of low-cost housing to ensure the housing needs of the lowest income groups, “Rent-based” means that starting in 2011, Hangzhou began to vigorously build public rental housing, public rental housing to replace low-rent housing, while expanding the security object, which has broken through the household registration restrictions, and included the middle-lower income families with housing difficulties, newly employed college graduates, entrepreneurs and other groups in the scope of housing security, as the current main form of affordable housing in Hangzhou. Therefore, the affordable housing in this study mainly refers to the public rental housing in Hangzhou.

Up to now, there are 56 public rental housing districts in Hangzhou. See [Figure 1](#). The distribution map of this level public rental housing in Hangzhou is allocated to 64,200 families with housing difficulties. Most of these houses are located in Xihu District, Gongshu district, Shangcheng District and Binjiang District. In terms of unit plots, most of the large-scale public rental housing resources are concentrated in the transfer pond unit plots in the southwest corner of the city, the rural unit plots in the north of the city and the Ding Qiao unit plots in the northeast of the city, the housing supply of public rental housing is concentrated in the sixth and seventh grade land, and the housing supply of the sixth and seventh grade land accounts for 83.82% of the total housing supply, there are three main sources of government self-built, purchase, and commercial housing allocation, of which, the government self-built public rental housing is the main source, accounting for more than 70% of the total housing supply. In general, the self-built large-scale public rental housing areas are mostly distributed in the six-or seven-grade land plots which are relatively far away from the city center.

3. Materials and Methods

According to the location, the research selected a relatively mature affordable housing community in Hangzhou, Zhejiang Province for questionnaire surveys and qualitative interviews. In this study, 600 samples were sampled from the houses which had been allocated rents and a questionnaire was designed around the research questions to conduct a survey on the selected samples. The data of living conditions, commuting conditions, employment conditions, public service consumption conditions, individual and family characteristics, and related ideas, attitudes, and plans before and after moving to public rental housing were collected by questionnaire.

Totally 572 valid questionnaires were obtained by eliminating 28 questionnaires with incomplete or contradictory information. Spatial information such as the residential location, employment location, and public service facility location of the samples was obtained and visualized via the Baidu API (Place API) address resolution service. And spatial analysis was conducted using tools such as network analysis and proximity analysis on the Arcgis platform to obtain the necessary spatial data for the research. Through qualitative interviews with residents encountered in the public activity spaces of the community, as well as qualitative interviews conducted at residents' homes, we have gained an understanding of the challenges faced by residents in affordable housing in areas such as housing, transportation, employment, and public service consumption, as well as the decision-making processes and mechanisms adopted to address these challenges, including the feelings and experiences of the residents living in public rental housing, their impressions, attitudes, needs, desires, and potential behavioral decisions related to housing, commuting, employment, public service consumption and other aspects.

4. Results

4.1. Higher Commuting Costs

Affordable housing is often distributed in remote areas with lower relocation costs but far from the city center, where public transportation facilities are not yet well-developed. According to comparative statistics, the average commuting distance after housing assistance (based on the shortest path from the residence to the workplace, unemployed individuals or retirees who do not commute are not included) is 10.81 km, which is an increase of 5.08 km compared to the previous distance of 5.73 km. The average commuting time after housing assistance (based on one-way commuting time from the residence to the workplace) is 48.43 minutes, which is an increase of 21.74 minutes compared to the previous time of 26.69 minutes. The commuting cost after housing assistance (including all transportation expenses related to commuting per month) is 239.19 yuan, which is an increase of 148.24 yuan compared to the previous cost of 90.95 yuan (as shown in [Table 1](#)). Furthermore, after housing security, public transportation becomes the main mode of commuting, while before housing security, cycling was the predominant mode. The proportion of private car usage significantly increases after housing security, while the proportion of walking decreases. It can be seen that the marginalized layout of affordable housing leads to an increase in residents' commuting distance, time, and costs.

Table 1. Comparison of commuting cost characteristics before and after housing security.

	Before housing security	After housing security
Average commuting distance	5.73km	10.81km
Average commuting time	26.69min	48.43min
Monthly commuting cost	90.95yuan	239.19yuan

4.2. Lower Employment Accessibility and Benefits

Affordable housing which aims to provide housing assistance for low and middle income groups and possesses quasi-public characteristics, is often located in the peripheral areas of cities where job opportunities are not sufficiently abundant. This phenomenon has already been confirmed by a large number of studies. The study utilized data on the relative changes in employment participation and income, which can be directly obtained through questionnaire surveys. After combining the relative changes in employment and income, the study found the following changes in employment characteristics among housing assistance recipients: transitioning from employment to unemployment, changing jobs with a decrease in income, changing jobs with no change in income, maintaining the same job with a decrease in income, maintaining the same job with no change in income, changing jobs with an increase in income, and maintaining the same job with an increase in income. The proportions of these changes in the total sample size are as follows: 8.74% for transitioning from employment to unemployment, 3.67% for changing jobs with a decrease in income, 3.32% for changing jobs with no change in income, 4.02% for maintaining the same job with a decrease in income, 58.57% for maintaining the same job with no change in income, 4.55% for changing jobs with an increase in income, and 17.13% for maintaining the same job with an increase in income. The average value of employment benefits decreased by 0.33 after housing assistance.

Before housing assistance, although residents were limited by economic conditions, their choice of residence was still relatively flexible. Most people chose to live in urban villages around their workplace due to the lower cost of living. However, after participating in housing assistance, their choice of residence became more restricted because they want to enjoy the benefits of housing assistance, which ironically had the unintended consequence of limiting their housing choices. On the one hand, public rental housing is mainly distributed in the seventh and eighth grade land, which are relatively far from the central areas where job opportunities are concentrated. On the other hand, the availability of housing units in each phase is determined by the government's collection of housing resources. The allocation of housing is based on a lottery system, where applicants are assigned a housing selection number and allocated in sequence. If appli-

cants give up their chosen unit after selection, their eligibility for housing assistance will be terminated. Despite potential dissatisfaction with the location of the allocated housing, most people will not choose to give up the opportunity to rent due to the benefits provided by the government policy. When the reduction in employment accessibility and the increase in transportation costs, time costs and even psychological costs accumulate to a certain extent, it may trigger behavioral adjustments among the target population of social assistance. In situations where residential and travel behaviors are already fixed, changing jobs or even facing unemployment may become passive choices for the relevant individuals. In addition, according to surveys, some individuals actively choose to change jobs or become unemployed. The relevant policies regarding affordable housing in Hangzhou have made regulations on the income access conditions for participating in housing security and the duration of benefits for affordable housing. Some residents actively transfer to lower-income jobs or become unemployed in order to meet the access conditions, which leads to a decline in employment benefits. In addition, the relocation of low-income residents from the relatively dispersed inner-city central districts to large-scale affordable housing communities on the outskirts has exacerbated their social segregation from the mainstream society. This has led to irreversible impacts on the daily lives and even intergenerational poverty transmission of low-income families [10].

4.3. Lower Public Service Accessibility and Satisfaction

Most of the public rental houses are located in the urban fringe, the peripheral supporting facilities are still under development and construction, and the public service facilities are not perfect. A study indicated that public service facilities encounter issues such as mismatch between planning, construction, and operation and residents' needs, delays in construction or operation, and heterogeneity in operational entities or facility functions. These problems lead to low efficiency in facility supply, severely impacting residents' quality of life [11]. In the case, after the relocation, the public service facilities generally present the characteristics of smaller scale, single service category, weak service function, difficult to guarantee service time, lack of personalized service, emphasizing management rather than public welfare. It can be compared from both quantity and quality aspects.

Firstly, there is a decrease in the absolute number of public

service facilities within different life circles after relocating to public rental housing. In general, the average cumulative quantity of public service facilities within different life circles before housing security is greater than the average value after housing security. In terms of transportation facilities, the average number of public transportation stations within 0.5km before the relocation was 2 more than the average number after the relocation, and the average number of public transportation stations within 1.5km before the relocation was 11 more than the average number after the relocation. In terms of educational facilities, before the relocation, there were nurseries or kindergartens in almost all neighborhoods within 0.5km, while after the relocation, most neighborhoods either hadn't established them or were still in the planning stage. The average number of primary and middle schools within 1.5km before the relocation was 2 more than the average number after the relocation, and the average number of vocational colleges and universities within 7.5km before the relocation was 5

more than the average number after the relocation. In terms of medical and health facilities, the average number of health stations and community medical service centers within 1.5km before the relocation was 3 more than the average number after the relocation, and the average number of comprehensive hospitals within 7.5km before the relocation was 3 more than the average number after the relocation. In terms of cultural and sports facilities, the average number within 1.5km before the relocation was 6 more than the average number after the relocation. In terms of commercial service facilities, the average number of vegetable markets and living supermarkets within 1.5km before the relocation was 9 more than the average number after the relocation, and the average number of superstores within 7.5km before the relocation was 8 more than the average number after the relocation. In terms of administrative service facilities, before the relocation, there was an average of one community service center within 1.5km, but almost none after relocation (as shown in Table 2).

Table 2. Comparison of public service facilities characteristics before and after housing security.

Public service facilities	Commuting distance	Before housing security		After housing security	
		Average	Standard deviation	Average	Standard deviation
Transportation facilities	0.5km	4.76	0.128	2.80	0.100
	1.5km	17.85	0.378	9.28	0.209
	7.5km	-	-	-	-
Education facilities	0.5km	0.98	0.045	0.00	-
	1.5km	7.64	0.297	2.51	0.093
	7.5km	83.35	1.853	37.49	0.989
Medical and health facilities	0.5km	4.89	0.196	2.86	0.182
	1.5km	40.37	1.131	10.69	0.231
	7.5km	20.95	1.220	5.84	0.180
Cultural and sports facilities	0.5km	-	-	-	-
	1.5km	16.38	0.779	9.99	0.532
	7.5km	40.03	1.559	12.38	0.451
Commercial service facilities	0.5km	-	-	-	-
	1.5km	11.69	1.483	3.48	1.133
	7.5km	10.50	0.147	2.57	0.224
Administrative service facilities	0.5km	-	-	-	-
	1.5km	1.03	0.061	0.16	0.015
	7.5km	1.00	0.058	0.12	0.014

Note: It is not meaningful to consider transportation facilities within 7.5km. All samples have fitness facilities, small squares and other cultural and sports facilities, convenience stores and other business service facilities, and property management offices within 0.5km before and after housing security measures, so these indicators were not compared.

Secondly, the level and quality of public service facilities after the relocation are far inferior to those before the relocation, which cannot meet the actual needs of the residents. The object of security is mainly composed of low and middle income people with local household registration, migrant workers and new recruits. Their own level and economic conditions determine the particularity and diversity of their demand for public services, at the same time, it determines that the demand has the characteristics of low price and commonweal. In terms of the demand for transport facilities, convenient public transport is the primary demand of the objects to be guaranteed. According to surveys, although public rental housing estates all have public transport lines, however, some of the survey objects reflect that the bus route direction, frequency and running time are relatively limited after the relocation, some districts are far from the bus stops that need to take the bus line, and the lack of trips leads to frequent transfer, short running time and can not meet the needs of some long working hours. Some respondents said that if they drive themselves to and from work, they would have to commute sixty kilometers and spend more than 1,000 yuan on transportation, resulting in high transportation costs and time costs. According to the survey, there are more school-age children in the target families, and there is a great demand for kindergarten and primary school education resources. The location and construction of low-income housing have taken into account the sharing of resources for the education of kindergartens, primary and secondary schools in the vicinity and the right of children of tenants of public rental housing to attend school in the vicinity, or the construction of a separate set of kindergartens to meet the needs of the security object, but the actual situation is that the security housing around the educational resources are often in short supply and difficult to enter school, in addition, some school-age children who are already enrolled in school often find it difficult to transfer to a nearby school as they move to public rental housing, resulting in high costs of enrolment and integration. In terms of the demand for medical and health facilities, there are basically for-profit pharmacies in public rental housing estates, but they are far away from general hospitals, but the community health service station is often small, the hardware is not perfect, the service level is limited, the quality needs to be improved. In terms of the demand for cultural and sports facilities, public rental housing units are basically equipped with fitness facilities, children's play facilities and small activity squares, but this is only met at the basic circle level. To enjoy high-level cultural and sports activities, the possibility of reading books, enjoying music, visiting parks and so on is reduced by moving public rental housing away from these facilities. As for the demand for commercial service facilities, the basic circle of stores, snack shops and other commercial facilities have been covered, but the types of goods that can be provided are far from meeting the needs of the protection object, comprehen-

sive shopping malls or shopping malls are generally far away, most of the respondents said that after moving to shopping malls to significantly reduce the frequency of consumption, in addition, the survey respondents generally reported low satisfaction with the vegetable market, a commercial service facility closely related to daily life. The main reason is that the number of vegetable markets in the basic living circle is relatively small after relocation, the less variety of products available and the higher price of vegetables are two of the more critical aspects. With regard to the need for administrative facilities, all public rental housing estates have property management centres which can provide basic property services, but some respondents indicated that the accessibility of community service centres for public rental housing is low, lack of management of community services leads to a lack of identity and sense of belonging to public rental housing, such as neighborhood disputes and other sectors to regulate. In general, the accessibility of public service facilities in the living circles around public rental housing is low, and the quantity and level of services provided can not meet the needs of the target group. On the other hand, the lowering of the income threshold for access to public rental housing and the inclusion of an increasing number of middle income groups, which have higher requirements for public services for lower-income groups, the decrease of supply and the increase of demand lead to the decrease of satisfaction of public service facilities and consumption welfare.

The accessibility of public service facilities has decreased, and the frequency and time of using public service facilities have also decreased. The target beneficiaries of the scheme are mainly residents of old communities or urban villages such as Gu Dang New Village, Luo Jia Zhuang village in Xihu District, Hua Feng village in Gongshu District and Li Ming village in Jianggan District. Although there is room for improvement in the living conditions of these places, but the location is better, the public service facilities around are more perfect, and the protection object is more sensitive to the change of public service because of its own condition, if the protection object is not satisfied with the present commercial service facilities, this will reduce the willingness of the target beneficiaries to consume public service facilities. Affordable housing should not be limited to providing living space alone; it should also enhance the supply of public services, creating conditions and environments that facilitate better integration of low-income families into communities. Balancing the supply of affordable housing with the provision of public services will be crucial for optimizing the rental housing system [12].

4.4. Bad Behaviors That Destroy the Order of the Rental Market

As the primary beneficiaries of affordable housing policies, eligible individuals have the most direct perception and un-

derstanding of the employment and public service consumption environment before and after moving into public rental housing. According to the survey, a portion of the beneficiaries have negative perceptions and feelings about their work and living conditions. Specifically, the dissatisfaction rate with the spatial environment of public rental housing (including the spatial environment for employment and consumption of public services) is as high as 41.26%. When the excessive separation between residence and employment, as well as residence and public services, exceeds the tolerance of the beneficiaries, and other options are limited (such as no possibility of changing the workplace, school, or healthcare facilities), the beneficiaries consider changing their housing behaviors. The common choices for housing behavior change among the beneficiaries include two options: exchanging housing units or giving up the rental. During the process of housing exchange, some beneficiaries of housing assistance exploit the priority selection sequence to choose better locations, thereby profiting from the housing exchange market. Additionally, there is a frequent occurrence of some beneficiaries who are about to vacate their units utilizing their better location for profit in the housing exchange market. Faced with issues such as spatial mismatch and reduced welfare benefits, some beneficiaries tend to abandon their leases. Furthermore, some beneficiaries even obtain housing assistance eligibility through means of concealing information and deception, change the use of public rental housing without authorization and illegally sublease or lend it. These bad behaviors disrupt the normal operation and management of public rental housing.

5. Analysis of Causes

5.1. The Housing Layout Is Remote and the Supply Is Single

The existing problems of affordable housing in terms of commuting, employment, and public services, as well as the dissatisfaction and behaviors such as exchange or abandonment by residents, are mostly caused by the relatively single location under the self-built-based housing supply mode. Under the pressure of high land and demolition costs, the government, driven by short-term economic rationality, tends to locate affordable housing on the outskirts of cities [13]. They adopt policies that favor large-scale concentrated construction of public rental housing. The focus often lies on ensuring policy coverage for target groups and managing price mechanisms, while overlooking the spatial differentiation and accessibility of complementary public service facilities [14]. Currently, public rental housing in Hangzhou is concentrated in sixth and seventh land relatively far from the city center, with such housing accounting for 83.82% of the total units. Government self-construction is the main source of public rental housing, accounting for over 70% of the total

housing supply. The housing supply is centrally located in marginalized areas, without fully considering the correlation between residential areas, work areas, and living areas, leading to increased commuting costs for the target beneficiaries, difficulty in meeting travel needs, involvement in employment, and even decreased employment income, impaired employment welfare, and limited types and quantities of public service facilities, resulting in a lower possibility of obtaining public services than residents in the city center area. Through a single channel for housing procurement and centralized planning and layout, it has failed to achieve multi-level housing supply according to the differentiated characteristics of the target beneficiaries, and to meet the actual needs of the protected residents.

5.2. The Housing Allocation Method Is Unreasonable

A significant decline in public service consumption and welfare after relocation is due to the more micro-specific supply and demand mismatch. Specifically, suitable housing supply and security object can not match the needs of the public services after the drop in welfare consumption. At present, the method of physical allocation of public rental housing in Hangzhou is mainly based on the principle of fairness and the Order of housing selection by lottery, for example, the north or west of the city has better medical resources, but those with stronger medical needs are allocated to public rental housing in the east of the city or the south-east of the city in the Ben Giang area. For example, some of the children of the beneficiaries have enrolled in school in the north of the city, but have been assigned to the south-west of the city to turn the pond area, resulting in a daily school to cross the city, the time of more than an hour; For example, some older groups who want to live close to their children are allocated public rental housing away from their places of residence. Under these circumstances, even if the overall accessibility of public services in the life circle is good, the public services of these objects of protection consumer satisfaction will not be high. That is to say, on the one hand, the individual needs of the objects of protection are diverse and different, and they have different welfare needs hidden behind their residence, on the other hand, the fixed location of public rental housing limits its facilities are also different, which makes it more difficult to match with the most urgent welfare needs.

5.3. The Housing Exchange Is Difficult

One of the challenges faced in housing exchange is the difficulty in finding suitable housing. Housing exchange is a voluntary behavior that requires individual tenants to independently search for exchange opportunities. Although there are public rental housing information centers and other online platforms available, it still requires a significant amount of

time and effort to gather information, communicate and find suitable housing. In housing exchange arrangements, it is specified that the exchanged units must have the same layout (same number of rooms), making it even more challenging. For example, in areas like Binjiang, which is a high-tech industrial hub, young single tenants have a higher demand for one-bedroom units, while families with school-age children have a greater need for two-bedroom units in areas with abundant educational resources. With a high demand for the same layout in the same area, the chances of successful housing exchange are reduced. Furthermore, the difficulty in housing exchange has created a market where the initiating party privately offers financial compensation (ranging from thousands to tens of thousands) to the passive party. This leads to some eligible individuals whose lottery order are in the front not selecting housing based on their actual needs, but rather choosing relatively better locations to wait for housing exchange and gain additional income. Therefore, besides allocating time and effort, housing exchange also come with certain financial costs.

5.4. The Supervision of Bad Behaviors in Renting Houses Is Not in Place

A study indicated that factors such as limited manpower in government departments, heavy workload in management, lack of timely supervision, and insufficient penalties create a lax regulatory environment. This, coupled with high housing prices and rents in the housing market or the pressures faced by residents in their daily lives, are significant factors that may lead to non-compliance [15]. Engaging in improper behaviors such as obtaining eligibility for housing assistance through means of concealing information or deception, changing the purpose of public rental housing without authorization or illegally subletting, will undermine the order of the public rental housing market. The motivation behind such behaviors from residents is not only due to the failure of accurately matching their needs with affordable housing but also the inadequate government regulation and punishment for improper actions, as well as insufficient attention and supervision from the media and the general public. The residents' failure to properly understand the nature of affordable housing leads them to pursue personal interests through violations.

6. Conclusions and Recommendations

Public Service, which is directly related to residential location, is brought into the field of space dislocation theory. This paper promotes the application of spatial dislocation theory in affordable housing, and the theoretical connotation and practical application of spatial dislocation theory are further expanded. By applying and improving the theory of spatial dislocation, a questionnaire survey and interviews were conducted using public rental housing in Hangzhou as a

case study. The study compared the characteristics differences of beneficiaries before and after housing security measures in terms of commuting, employment, and public service consumption. The findings revealed problems such as increased commuting costs, reduced accessibility and benefits in employment, and decreased accessibility and satisfaction in public services. The interests of vulnerable groups in the city have been compromised. This research clarify the real impact of the implementation of the housing security policy on the production and life of the security object, and it evaluates the performance of the social housing policy more objectively. Faced with the impact of affordable housing, residents form a certain tendency in behavior selection based on the process of behavioral response guided by "perception-demand- decision-making", which also leads to some adverse phenomena that disrupt the rental market order. These problems are mainly caused by the remote layout and single supply, unreasonable distribution methods, difficulties in exchange and inadequate supervision. Our recommendations to address the existing problems of affordable housing are as follows.

First, form a multi-channel, multi-level housing supply. The general principles of public rental housing supply distribution should be: fully consider the relevance of work area and living area, "Large dispersion, small concentration," targeted, multi-point layout, as far as possible to reduce the object of housing costs, commuting costs, to meet the needs of surrounding facilities. With the deepening of the public rental housing policy measures, it is necessary to promote market purchase, encourage the entry of social forces and multi-channel financing of housing resources and multi-level supply of housing resources according to the different needs of the protected object, so as to optimize the planning layout of housing resources of public rental housing. On the basis of continuing to build and operate existing self-built and allocated projects, the affordable housing, resettlement housing and other vacant staff dormitories or vacant housing for residents are absorbed through market purchase or lease. Actively promote the reconstruction of urban villages, revitalize the idle land in urban villages and use some of them to provide affordable housing. Encouraging social forces to invest in the construction of public rental housing by means of tax and fee reductions and financial subsidies, and using social resources to raise public rental housing through various channels, to achieve multi-point, decentralized supply of relatively mature public rental housing. There is also a need to provide a multi-level supply according to the different needs of the sandwich-layer population: newly employed university graduates mainly allocate small-sized public rental housing in the areas where employment is concentrated, migrant workers and middle income families with housing difficulties mainly provide two-person public rental housing in relatively mature areas.

Second, "Fair" distribution shifts to "Fair + Near" distribution. According to the principle of "Fair distribution", the

method of physical allocation of public rental housing in Hangzhou is produced through house selection by lottery, which is supervised by public opinion, discipline inspection and fair supervision. However, this way makes the security object which is later in the order of lottery can not be selected to fit the housing supply and aggravates the problem of space dislocation; at the same time also bred "Not on demand to choose housing, but choose a better location, access to private compensation for housing" and other undesirable phenomena. In order to take care of families with special needs, European and n countries design comprehensive score ranking to determine the Order of housing selection, which helps to give priority to families with special needs The allocation of public rental housing in Beijing has been cancelled, instead, each district requires a lottery allocation within its territory based on the place of residence or work (either in the district where the public rental housing project is located or in the district where the project is located), the connection between the place of residence and the place of employment can be strengthened. These measures for the "Fair distribution" to "Fair + near distribution" provides a reference to the train of thought, but the specific operation needs to be handled carefully.

Third, promote the communication of housing resources exchange information. Through the use of internet communication tools and the intervention of the housing management department, establish a more convenient and authoritative platform, can facilitate the exchange of housing information and enhance the possibility of matching housing exchanges. While regulating the rules and procedures of exchanges, it is also important to focus on efficiency and streamline processes, providing convenience for beneficiaries to obtain more suitable housing and reducing undesirable behaviors such as abandonment or unauthorized subletting due to difficulties in exchanging housing.

Finally, "Coercion + Incentives", regulate bad behaviors. Relevant departments should strengthen supervision of media, internet, and public engagement, and impose punishments for rental fraud, unauthorized subletting, and other violations. However, it is important to note that the actions of beneficiaries are driven by their individual interests under the specific institutional framework, and their personal interests and preferences are enveloped within the norm of maximizing welfare. When the interests of beneficiaries align with policy objectives, they will choose to comply with the policies. However, when policy objectives do not align with their interests, the pursuit of maximizing benefits may induce or dominate their oppositional actions. Especially when the punishment for violating relevant regulations is less than the benefits obtained, beneficiaries may have an obvious violation of the formal rules. Singular coercive punishment measures often fail to eradicate rental fraud, subletting, and other violations, particularly when beneficiaries tend towards abandonment. By combining certain economic incentives and monetary subsidies, it is possible to encourage dissatis-

fied beneficiaries or those who no longer meet the requirements to voluntarily exit public rental housing. The use of a dual approach of "coercion + incentives" can effectively regulate behaviors such as abandonment, rental fraud, unauthorized subletting, and voluntary withdrawal from public rental housing.

Abbreviations

API Application Program Interface

Acknowledgments

My thanks go to all organizations and individuals at all levels who provided all necessary data for this study.

Author Contributions

Liping Wang: Conceptualization, Data curation, Investigation, Methodology, Writing – original draft

Zi Lin: Formal Analysis, Visualization

Funding

This work is supported by The Youth Program of Humanities and Social Sciences Research of the Ministry of Education (20YJCZH158).

Conflicts of Interest

The authors declare no conflicts of interest.

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