EasyChair Preprint

№ 15955

Approaching an Interactive Resolution on New Citizens' Job–Housing Balance and Vacant Housing Reduction in Guangzhou

Ziyao Dong, Yangbing Zhang, Yuejiang Su, Yingqiao Fang, Yilin Huang and Siyang Zheng

March 31, 2025

Approaching an Interactive Resolution on New Residents Job-Housing Balance and Vacant Housing Reduction in Guangzhou

Ziyao Dong[1*] , Yangbing Zhang[2†] , Yuejiang Su[3&], Yingqiao Fang[4&], Yilin Huang[5&] and Siyang Zheng[6&]

[1-6] South China University of Technology, Guangzhou, China.

dongziyao2616@163.com, zhangybct@scut.edu.cn

Abstract

This study examines the job-housing relationship and the housing vacancy rate in Guangzhou, aiming to propose an interactive resolution on new residents' job-housing balance and Guangzhou's vacant housing reduction for sustainable urban developments. Initially, it calculates the self-sufficiency of employment and residential populations across 11 administrative districts and 170 streets/towns in Guangzhou, along with peak commuting times for weekdays, to evaluate the job-housing relationship of new residents. Subsequently, the study assesses the housing vacancy rate in Guangzhou and analyzes the current state of vacant properties. Finally, by integrating the job-housing dynamics of new residents with the housing vacancy situation, the study proposes strategies aimed at addressing the challenges of vacant housing and job-housing imbalance through the rational allocation of unoccupied properties.

1 Introduction

In recent years, the rapid urbanization and economic development of numerous major cities have led to a significant influx of new residents, resulting in a substantial increase in housing demand (Zeng et al., 2021). For the majority of new residents, there is a strong preference to seek livelihoods in areas with abundant job opportunities (So et al., 2001). However, it is often the case that regions with a high availability of job opportunities also have elevated housing prices (Rabe & Taylor, 2012). As a result of the pressures of daily living, most new citizens are compelled to choose residential areas that are located far from their workplaces (Blumenberg & King, 2024). This situation typically results in longer commuting times, which not only diminishes the overall quality of life for these

[*] Writing the main body of the thesis

[†] Determine the thesis topic and provide writing ideas and directions

[&] Data collection and processing

individuals but also places considerable traffic pressure on urban transportation systems (Huang et al., 2022). This issue is particularly pronounced in Guangzhou (Zheng et al., 2021). As a first-tier city with promising prospects for future development, Guangzhou has attracted many new residents from various provinces in search of employment (Wang et al., 2024). Confronted with high housing costs, these new residents frequently choose to reside in suburban areas far from their workplaces, thereby exacerbating the imbalance between job locations and housing availability (Song et al., 2019). This imbalance not only contributes to congestion during peak commuting hours but also poses significant challenges to the sustainable development of the city, creating substantial obstacles for urban planners and policymakers (Song et al., 2019).

The concept of job-housing balance is critical in urban planning, as it directly impacts the socio-economic dynamics of a city (Huang et al., 2021). This concept has its roots in Western urban design, dating back to the 19th century with Howard's "Garden City" model, which advocated that "residents' employment areas should be within walking distance" to mitigate issues such as urban overcrowding and traffic congestion (Howard, 1902). Subsequently, both domestic and international research has converged on a relatively unified definition: within a well-defined urban area, the number of housing units should be approximately aligned with the number of job opportunities (Cervero, 1989; Giuliano, 1992). This alignment allows residents to work nearby, minimizing travel distances and time costs (Zhao et al., 2011). A favorable job-housing ratio can effectively reduce traffic congestion, decrease environmental pollution, and enhance overall urban efficiency (Xiao et al., 2023). In summary, achieving a job-housing balance is not only a matter of urban planning but also a crucial factor in fostering sustainable urban development and improving the quality of life for residents in rapidly urbanizing cities like Guangzhou (Xiao et al., 2023).

Currently, the majority of scholarly research considering the new residents concentrates on proposing housing supply strategies, such as increasing the availability of affordable housing (Wang et al., 2024), while the issue of job-housing balance receives comparatively little attention. Furthermore, most new residents are employed in the city center, where land resources are limited and there is a shortage of space for new housing construction. This situation, combined with high rental prices in the area, exacerbates the imbalance between job locations and housing availability. Nevertheless, there remain some vacant housing units in the city center. Effectively utilizing these vacant properties could not only address the issue of housing vacancy but also enhance the job-housing relationship and mitigate the imbalance between jobs and housing, proposing a possibly win-win resolution for the two major problems in urban development.

Therefore, to address the aforementioned imbalance between job and housing, this study focuses on Guangzhou as the research area. Initially, it assesses the self-sufficiency of employment and residential populations across 11 administrative districts and 170 streets/towns in Guangzhou, along with the commuting times during peak hours on weekdays, to evaluate the job-housing relationship of new residents in the city. Subsequently, the study measures the housing vacancy rate in Guangzhou and analyzes the current status of vacant properties. Finally, by integrating the job-housing relationship of new residents with the housing vacancy situation in Guangzhou, this research proposes targeted strategies aimed at addressing both the challenges of vacant housing and the imbalance between employment and housing through the rational allocation of these vacant properties.

2 Method

2.1 Date Description

This study focuses on Guangzhou area, which comprises 11 administrative districts and 170 streets and towns. By the end of 2019, Guangzhou's administrative area spanned 7,434 square

kilometers, with a permanent resident population of 15.3 million (data sourced from the 2020 Guangzhou Statistical Yearbook). As the capital of Guangdong Province, Guangzhou has consistently demonstrated high-quality economic development, positioning itself as a crucial driver of growth for the province. Furthermore, its advantageous development conditions have generated a substantial number of employment opportunities.

Mobile signaling data, recognized as a significant form of big data, has attracted increasing attention from researchers due to rapid advancements in mobile communication technology in recent years. Additionally, mobile signaling data can be utilized to reflect users' travel trajectories, which can subsequently be employed to identify users' residential and workplace locations. This will aid in measuring the job-housing balance indicators. The mobile signaling data employed in this study was provided by China Telecom and encompasses the period from 00:00 on April 16, 2019, to 24:00 on May 1, 2019, specifically focusing on the new residents in Guangzhou.

Remote sensing data refers to information about the Earth's surface and its features that is collected from a distance, typically using sensors mounted on satellites or aircraft. This method enables the acquisition of data without direct contact with the ground and is widely applied across various fields, including environmental monitoring, land use planning, climate research, disaster management, and urban development. Furthermore, remote sensing data can be effectively utilized to measure housing vacancy rates in different regions. Consequently, this study will employ cloud-free composite data from April 2019, provided by the National Oceanic and Atmospheric Administration (NOAA), to assess housing vacancy rates across various administrative districts and streets/towns in Guangzhou. As a next-generation nighttime light dataset, NPP-VIIRS provides vcm data that effectively mitigates the influence of stray light, ensuring excellent spatial continuity, high resolution (500m×500m), and strong timeliness, with updates occurring on a monthly basis.

2.2 Date Processing

(1) Mobile Signal Data

The study commences with an analysis of mobile signaling data, which encompasses user codes, the city and district of number attribution, the longitude and latitude of recorded base stations, as well as the start and end times of signaling records and their respective durations. A total of 172,699,047 signaling records were analyzed, involving 7,253,819 users and 27,241 base stations. The original dataset was filtered to exclude signaling records with durations of less than 30 minutes, resulting in a refined dataset characterized by longer signaling durations and a reduced number of records.

The distribution of base stations in the central urban area generally adheres to a regular grid pattern of 500m×500m, while in suburban areas, the spacing between base stations ranges from 1 to 2 km. By examining the travel trajectories reflected in the mobile signaling data and integrating the cumulative duration of user stops at various locations with established travel patterns, we successfully identified the residential and workplace locations of 883,995 users.

After acquiring the mobile signaling records and base station information of users, criteria for identifying workplaces and residences were established. This study considers users' travel patterns, the extended duration of signaling records, and the limited number of records available. The methods based on the shortest distance and access frequency exhibited relatively low success rates in accurately identifying workplaces and residences. Consequently, the method utilizing cumulative stay time at visited base stations was selected for identification, implemented through programming in Python.

To enhance the efficiency of the identification process, the workplace was identified first. If the actual workplace could not be determined, the identification of the residence was not pursued further. Working hours were defined as 08:00 to 18:00, and the base station where the user accumulated the longest stay time during this period on a given workday was considered the potential workplace for

that day. Following the identification of potential workplaces for each day, the actual workplace was defined as the location that appeared most frequently, with a minimum occurrence of three days.

Similarly, the residence identification period was established from 20:00 in the evening to 06:00 the following day. After identifying potential residences based on cumulative stay duration for each day, the actual residence was defined as the location that appeared most frequently, with a minimum occurrence of five days. Additionally, this study does not account for scenarios in which individuals work from home. Therefore, cases where the workplace and residence are the same location were excluded from the analysis.

Further statistical analysis was performed to evaluate various indicators of job-housing balance, including the number of residents, the number of workers, and the self-sufficiency ratio (local employment/resident population) for each street or town. Using the Baidu Maps route planning API, we calculated the commuting times for the aforementioned users during peak hours on weekdays, considering both private car and public transportation modes.

(2) Remote Sensing Data

The monthly DNB data provided by the platform categorizes global regions into six segments and offers two products: vcm and vcmsl, with the former effectively eliminating the influence of stray light. In this study, we utilize the vcm product for Tile 3, which is subsequently imported into Arc Map and clipped to the geographical boundaries of Guangzhou.

The primary steps for calculating the housing vacancy rate in this research are outlined as follows: First, outliers and negative values are systematically excluded from the remote sensing data. Next, the urban area is delineated based on the relationship between brightness thresholds and the corresponding changes in perimeter. Following this, the top 20% of brightness values from the statistical curve of grid brightness values are designated as the housing occupancy threshold. The housing vacancy rates for the remaining grids are then calculated using linear interpolation. Finally, the average housing vacancy rate for the grids within each street, town, and administrative district is computed.

3 Results

Based on the analysis of mobile signaling data, Tables 1 to 4 present findings on new residents across administrative districts and sub-districts/towns in Guangzhou. Table 1 summarizes the number of new residents in each administrative district, including their residential population, employment population, locally employed population, and average self-sufficiency ratio. Table 2 identifies the two sub-districts/towns in each administrative district with the highest and lowest self-sufficiency ratios, along with the corresponding residential population, employment population, and locally employed population of new residents. Table 3 provides the average commuting time of new residents during weekday peak hours for each administrative district, detailing the average driving time, average public transport time, and overall average commuting time. Table 4 highlights the two sub-districts/towns in each administrative district with the longest and shortest average commuting times during weekday peak hours, along with their respective driving and public transport durations.

Furthermore, an analysis based on remote sensing data examines housing vacancy rates across administrative districts and sub-districts/towns in Guangzhou, with the results presented in Table 5. Table 5 reports the average housing vacancy rate for each administrative district and identifies the two sub-districts/towns within each district with the highest and lowest vacancy rates. This comprehensive analysis provides valuable insights into the dynamics of job-housing balance and commuting patterns, contributing to a better understanding of urban mobility and residential stability.

Administrative District	Employment (Persons)	Resident Population (Persons)	Local Employment (Persons)	Average Self-Sufficiency (%)
Tianhe	162,598	118,908	5,771	4.85
Baiyun	126,120	159,554	29,326	18.38
Liwan	38,256	51,323	1,807	3.52
Haizhu	89,333	99,096	5,028	5.07
Yuexiu	87,661	46,617	700	1.50
Panyu	123,657	146,590	33,534	22.88
Huangpu	72,456	66,922	13,486	20.15
Huadu	61,848	65,083	24,223	37.22
Zengcheng	55,222	64,808	27,430	42.33
Nansha	46,048	44,536	22,388	50.27
Conghua	20,796	20,558	8,866	43.13

Table 1: Employment, Resident and Local Employment Population, and Average Self-Sufficiency by District

Administrative District	Street/Town	Employment (Persons)	Resident Population (Persons)	Local Employment (Persons)	Self-Sufficiency (%)
Tianhe	Xintang Street	6,075	4,427	726	0.16
	Shadong Street	759	1,258	15	1.19
Baiyun	Zhongluotan Town	10,120	10,186	5,486	53.86
	Tangjing Street	3,626	5,923	137	2.31
Liwan	Hailong Street	2,119	3,520	495	14.06
	Shamian Street	411	247	0	0.00
Haizhu	Pazhou Street	16,066	4,994	1,127	22.57
	Sushesha Street	1,807	2,666	9	0.34
Yuexiu	Kuanquan Street	2,258	2,572	74	2.88
	Dadong Street	3,086	1,711	2	0.12
Panyu	Hualong Town	5,348	3,915	1,955	49.94
	Shiqiao Street	9,426	12,417	1,084	8.73
Huangpu	Jiulong Town	5,536	5,460	2,727	49.95
	Huangpu Street	3,859	5,352	179	3.35
Huadu	Shiling Town	8,932	8,567	5,086	59.37
	Timian Town	410	397	39	9.82
Zengcheng	Shitan Town	4,865	5,376	3,090	57.48
	Yongning Street	10,362	14,714	5,037	34.23
Nansha t	Longxue Street	3,764	750	593	79.07
	Zhujiang Street	1,849	1,696	504	29.72
Conghua	Lvtian Town	284	247	232	93.93
	Jiekou Street	1,880	2,976	394	13.24

Table 2: Employment, Resident and Local Employment Population, and Self-Sufficiency by Selected Streets/Towns

Administrative District	Average Driving Time (min)	Average Public Transport Time (min)	Average Commute Time (min)
Tianhe	22.85	59.46	41.15
Baiyun	23.00	67.36	45.18
Liwan	23.00	58.25	40.63

Haizhu	22.09	61.28	41.69
Yuexiu	24.64	51.58	38.11
Panyu	23.14	67.73	45.43
Huangpu	23.15	69.79	46.47
Huadu	20.98	74.32	47.65
Zengcheng	22.99	84.21	53.60
Nansha	21.14	77.28	49.21
Conghua	23.93	89.98	56.96

Table 3: Average Driving and Public Transport Time, and Average Commute Time (in minutes) during Peak Hours by District

Administrative District	Street/Town	Driving Time (min)	Public Transport Time (min)	Average Commute Time (min)
Tianhe	Qianjin Street	23.8	113.4	68.6
	Xinghua Street	21.3	51.6	36.45
Baiyun	Taihe Town	25.9	81.8	53.85
	Tongde Street	20.1	57.3	38.7
Liwan	Duobao Street	25.2	70.5	47.85
	Zhanqian Street	22.7	47.8	35.25
Haizhu	Shayuan Street	21.8	109.2	65.5
	Haizhuang Street	20.6	50.2	35.4
Yuexiu	Liurong Street	38.6	72.5	55.55
	Renmin Street	22.4	48.1	35.25
Panyu	Shilou Town	26.5	74.9	50.7
	Hualong Town	16	63	39.5
Huangpu	Huangpu Street	25.5	114.7	70.1
	Dasha Street	19.7	56.2	37.95
Huadu	Timian Town	28.9	94.3	61.6
	Huacheng Street	18.1	61.5	39.8
Zengcheng	Zhengguo Town	34.7	148.7	91.7
	Licheng Street	18.6	62.7	40.65
Nansha	Longxue Street	18.6	98.3	58.45
	Lanhua Town	19.7	64.5	42.1
Conghua	Liangkou Town	47.6	156.9	102.25
	Taiping Town	18.4	65.4	41.9

Table 4: Average Driving and Public Transport Time, and Average Commute Time (in minutes) during Peak Hours by Selected Streets/Towns

Administrative District and Average Vacancy Rate (%)	Street	Vacancy Rate (%)
Tianhe (15.46)	Shahe Street	33.90
	Xian Village Street	1.65
Baiyun (16.26)	Jingxi Street	30.54
	Tangjing Street	1.54
Liwan (20.08)	Qiaozhong Street	35.10
	Zhanqian Street	1.97
Haizhu (17.45)	Nanzhou Street	31.50
	Shayuan Street	7.24
Yuexiu (16.70)	Guangta Street	32.55
	Liuhua Street	3.10

Panyu (23.42)	Xinzhao Town	32.80
	Shibi Street	14.22
Huangpu (17.78)	Changzhou Street	30.44
	Huangpu Street	3.40
Huadu (12.64)	Xiuquan Street	29.88
	Huadong Town	5.34
Zengchengt (22.04)	Zengjiang Street	33.22
	Yongning Street	18.03
Nanshat (15.16)	Wanquingsha Town	33.04
	Longxue Street	8.70
Conghua (18.88)	Taiping Town	34.07
	Jiekou Street	13.53

Table 5: Average Housing Vacancy Rates (%) by District and Selected Streets/Towns

4 Discussion

According to Table 1, in our sample, Nansha District has the highest average self-sufficiency in employment and resident population among the administrative districts in Guangzhou, while Yuexiu District has the lowest. This disparity is primarily influenced by a combination of factors, including economic development levels, industrial structure, and living costs. Nansha District, designated as a new economic zone in Guangzhou, has undergone rapid development in recent years, attracting a substantial influx of enterprises and investments. The flourishing manufacturing and high-tech industries in this district have generated numerous job opportunities. Furthermore, the relatively low living costs in Nansha have drawn a significant number of migrant workers, contributing to a robust local employment population. In contrast, Yuexiu District, as the central urban area of Guangzhou, is economically advanced but faces constraints due to limited land resources. Its industrial structure is predominantly oriented towards the service and commercial sectors, which results in relatively fewer job opportunities. Consequently, residents in Yuexiu are more likely to seek employment in other districts, leading to a lower local employment population in Yuexiu District. This analysis highlights the complex interplay of economic and structural factors that influence local employment dynamics in Guangzhou's administrative districts.

In our sample, Table 2 indicates that Lyutian Town in Conghua District has the highest self-sufficiency in employment and resident population among the towns in Guangzhou, while Shamian Street in Liwan District has the lowest. Lütian Town's economy is primarily supported by agriculture and rural development. In 2021, it was recognized as a provincial-level demonstration town for leisure agriculture and rural tourism for the year 2020. The rural cultural and tourism sectors have generated numerous employment opportunities for local residents. Additionally, the low cost of living and favorable living conditions in rural areas attract individuals to seek both employment and residence in Lütian Town, resulting in an impressive self-sufficiency rate of 93.93%. Conversely, Shamian Street is well-known for its rich historical and cultural heritage, which draws a significant number of visitors. The local economy is largely centered on the service sector, including restaurants, hotels, and tourism, which primarily provides employment opportunities for migrant workers rather than local residents. Moreover, the relatively limited job opportunities available in Shamian Street lead many individuals to pursue employment elsewhere. Consequently, these factors have resulted in a local employment population of zero in Shamian Street.

According to Tables 3 and 4, in our sample, Conghua District exhibits the longest average commuting time during peak hours on weekdays in Guangzhou, while Yuexiu District records the shortest. Among the towns, Liangkou Town in Conghua District has the highest average commuting

time during these peak hours, in contrast to Zhanqian Street in Liwan District, which has the lowest. Conghua District is situated on the outskirts of Guangzhou, far from the city center, and is characterized by relatively underdeveloped transportation infrastructure and limited public transport options. Consequently, residents in this district tend to spend more time commuting. In contrast, both Yuexiu and Liwan Districts are located in the central area of Guangzhou, benefiting from favorable geographical positions and well-established transportation infrastructure. The public transport systems in these districts, which include multiple subway and bus lines, enable quick access to various destinations, thereby effectively reducing commuting times. This analysis highlights the significant impact of geographical location and transportation infrastructure on commuting patterns within Guangzhou, underscoring the need for targeted improvements in areas with longer commuting times.

In our sample, Table 5 indicates that Panyu District has the highest average housing vacancy rate in Guangzhou, while Huadu District has the lowest. Among the streets, Qiaozhong Street in Liwan District exhibits the highest vacancy rate, whereas Tangjing Street in Baiyun District has the lowest. Panyu District, located in the southern part of Guangzhou, is relatively distant from the city center and displays uneven internal development. Certain areas have experienced rapid growth, attracting a significant number of residents, while others have lagged behind, resulting in an overall increase in the vacancy rate. Furthermore, in recent years, Panyu District has witnessed the construction of numerous residential projects, particularly large-scale developments, which have substantially increased the supply of new properties and, consequently, the number of vacant homes in the market. In contrast, Huadu District, situated in the northern part of Guangzhou, benefits from convenient transportation links, including its proximity to Guangzhou Baiyun International Airport. The district has experienced rapid economic growth in recent years, attracting a considerable influx of businesses and investments, which has enhanced employment opportunities. Additionally, the ongoing improvement of supporting facilities, such as education, healthcare, and commercial services, has made Huadu District an appealing location for residents, thereby contributing to a reduction in the housing vacancy rate. Qiaozhong Street, located in the central area of Liwan District, features a property market that attracts numerous investors, with some properties being perceived as investment assets rather than personal residences. This trend has led to an increase in the vacancy rate for this street. Conversely, Tangjing Street benefits from significant commercial and industrial development in the surrounding area, resulting in high housing demand, particularly among young families and migrant workers. The well-developed supporting facilities, good transportation accessibility, and an active rental market with moderate rental prices contribute to a notably low housing vacancy rate of just 1.54% in this area.

Based on the preceding analysis, it is clear that a significant imbalance exists between employment and housing across various administrative districts in Guangzhou, with certain districts displaying notably high housing vacancy rates. Effectively leveraging these vacant properties to address the employment-housing imbalance experienced by new residents in Guangzhou could not only mitigate the issue of housing vacancies and reduce resource waste but also enhance the employment-housing relationship for these residents, thereby alleviating the overall imbalance. In this context, the present study integrates employment-housing balance indicators for new residents in Guangzhou with housing vacancy rates to offer targeted recommendations for employment-housing location choices in specific streets and towns within selected administrative districts (as illustrated in Table 6). It is anticipated that these recommendations will play a significant role in addressing the challenges of housing vacancy and the employment-housing imbalance.

District	Employment Location	Residence Location
Haizhu District	Sha Garden Street	Liwan District Hua Di Street, Lingnan Street
	Ruibao Street, Nanshitou Street	Haizhu District Nanzhou Street, Fengyang Street
Tianhe District	Qianjin Street	Tianhe District Huangcun Street

	Longdong Street	Tianhe District Fenghuang Street
Huangpu District	Huangpu Street	Huangpu District Changzhou Street, Dasha Street
	Yuzhu Street	Huangpu District Changzhou Street, Dasha Street
	Xiagang Street	Huangpu District Sui Dong Street, Panyu District Hua Long Town
Baiyun District	Shi Jing Street	Baiyun District Shi Men Street, Baiyun Lake Street, Songzhou Street, Tongde Street
Liwan District	Shiweitang Street, Duo Bao Street	Liwan District Qiao Zhong Street, Lingnan Street, Changhua Street, Hua Di Street
Panyu District	Xin Zao Town	Panyu District Xiao Gu Wei Street, Nan Cun Town, Hua Long Town
Nansha District	Longxue Street, Heng Li Town, Wan Qing Sha Town, Huang Ge Town, Nansha Street, Da Gang Town, Zhu Jiang Street, Dong Yong Town	Panyu District Xiao Gu Wei Street, Nan Cun Town, Hua Long Town
Zengcheng District	Pai Tan Town, Xiao Lou Town, Xian Cun Town, Zhu Cun Street, Zhong Xin Town, Shi Tan Town	Panyu District Xiao Gu Wei Street, Nan Cun Town, Hua Long Town
Conghua District	Liangkou Town, Liu Xi He Forest Farm, Wen Quan Town, Jiangpu Street, Ao Tou Town, Lv Tian Town, Cheng Jiao Street	
Huadu District	Chi Ni Town, Ti Mian Town, Hua Dong Town, Shi Ling Town, Tan Bu Town	Choose nearby streets or towns based on local residence or in conjunction with the actual work location and the availability of housing supply in the market.
Baiyun District	Tai He Town, Jiang Gao Town, Baiyun Lake Street, Ren He Town, Shi Men Street, Tong He Street	
Huangpu District	Jiu Long Town, Yong He Street, Sui Dong Street, East District Street	
Panyu District	Shi Lou Town, Hua Long Town	

Table 6: Recommendations for Employment-Housing Location Matching

5 Conclusions

From the above discussion, it is evident that the administrative districts and sub-districts/towns in Guangzhou exhibit varying degrees of job-housing imbalance and different levels of housing vacancy rates. The sizes of various streets and towns in Guangzhou exhibit significant variation. The central urban districts are characterized by smaller, densely populated areas, while the suburban regions cover larger expanses. Therefore, it is crucial to develop housing supply policies that are specifically tailored to the unique conditions of the central urban area, thereby guiding new residents to reside either within the area or in nearby regions that have higher housing vacancy rates. In contrast, the non-central urban districts—including Conghua District, Huadu District, Zengcheng District, Nansha District, as well as certain streets and towns in Baiyun District, Huangpu District, and Panyu District—are marked by their vast areas and comparatively underdeveloped public transportation systems. This results in longer average commuting times for residents. Consequently, it is advisable to encourage workers to either live locally or choose nearby streets or towns that align with their actual

work locations. Through the preceding analysis of the self-sufficiency of employment and residence, commuting times, and housing vacancy rates for new residents in the streets and towns of various administrative districts in Guangzhou, this study offers a framework and methodology for government departments to better understand the relationship between employment-residence dynamics and housing vacancy rates. This approach can be leveraged to tackle two significant urban development challenges. Based on the discussion of the data presented in this paper, the following three recommendations are proposed.

First, it is crucial to ensure a dedicated supply of affordable rental housing for newly introduced talents and recent graduates. This provision will facilitate their access to housing, encourage them to remain in the area, enable comfortable living conditions, and support their professional development. Furthermore, it is important to develop cost-effective housing solutions specifically designed for frontline builders who play a vital role in urban operations. This strategy not only addresses housing challenges but also aligns with and supports various urban development initiatives.

Second, building on the policies of the national affordable housing program, it is essential to establish a shared ownership housing system to address the housing challenges faced by the "sandwich" group, which exists between low-income and market-rate populations. This initiative aims to support struggling families in achieving their aspiration of homeownership. Under this system, beneficiaries who purchase shared ownership housing will be permitted to list their properties for sale after a five-year period. They will have the option to either buy out the government’s share or sell their own share, with the government retaining the right of first refusal for repurchase. During the homeowner's occupancy, the housing rights associated with the government’s share will be transferred to the homeowner at no cost. However, the homeowner will be responsible for all maintenance and property management expenses related to the entire property. This approach not only facilitates access to homeownership for disadvantaged groups but also promotes a sustainable housing market by ensuring that properties remain available for future buyers.

Third, a public rental housing system should be established based on a "government-supported, enterprise-operated" management model, with a strong emphasis on promoting stable employment in Guangzhou. This system will eliminate household registration and income restrictions, adopting a leasing strategy characterized by "limited leasing, rental only without sale, and slightly below market rates." Furthermore, a standard will be set to ensure that the total lease term does not exceed six years. However, beneficiaries will have the option to exit the program "flexibly" after this six-year period, allowing them to continue renting at market rates within public rental housing for an additional one to two years as a transitional measure. This approach upholds a "people-centered" philosophy while maintaining the essential characteristics and functions of the public rental housing system in addressing temporary housing challenges.

Acknowledgments

This work was funded by the Fundamental Research Funds for the Central Universities, China under Grant [2023ZYGXZR075] and the Guangdong Basic and Applied Basic Research Foundation, China under Grant [2023A1515011006].

References

Blumenberg, E.;King, H. (2024). Young workers, jobs-housing balance, and commute distance: Findings from two high-housing-cost US regions. *Cities, 147*.

Cervero, R. (1989). Jobs-housing balancing and regional mobility. *Journal of the american planning association, 55*(2), 136-150.

Giuliano, G. (1992). Is Jobs-Housing Balance a Transportation Issue? *Transportation Research Record Journal of the Transportation Research Board, 1305*(1305), 305-312.

Howard, E. (1902). Garden cities ofto-morrow. *Swan Sonnenschein & Co., Ltd., London*.

Huang, J.;Hu, Y. J.;Wang, J. E.;Li, X. (2021). A tale of two cities: Jobs-housing balance and urban spatial structures from the perspective of transit commuters. *Environment and Planning B-Urban Analytics and City Science, 48*(6), 1543-1557.

Huang, Y. D.;Du, Q.;Li, Y.;Li, J. T.;Huang, N. (2022). Effects of Metro Transit on the Job-Housing Balance in Xi'an, China. *Journal of Urban Planning and Development, 148*(1).

Rabe, B.;Taylor, M. P. (2012). Differences in opportunities? Wage, employment and house‐price effects on migration. *Oxford Bulletin of Economics and Statistics, 74*(6), 831-855.

So, K. S.;Orazem, P. F.;Otto, D. M. (2001). The effects of housing prices, wages, and commuting time on joint residential and job location choices. *American journal of agricultural economics, 83*(4), 1036-1048.

Song, C.;Jin, A.;Ma, X. Y.;Ieee. (2019, Jul 14-17). Job-Housing Spatial Relationship Evolution in Guangzhou Analysis, Reflection and Coping Strategies. [2019 5th international conference on transportation information and safety (ictis 2019)]. 5th International Conference on Transportation Information and Safety (ICTIS), Liverpool, ENGLAND.

Wang, P.;Li, K.;Zhang, W. (2024). China's New Housing Security Model: Evaluation of the Job-Housing Balance in Affordable Rental Housing, Shanghai. *Land, 13*(7).

Xiao, W. Y.;Wei, Y. D.;Chen, W. (2023). Skills mismatch, jobs-housing relationship and urban commuting. *Travel Behaviour and Society, 33*.

Zeng, H.;Ke, Q.;Yu, X. (2021). Investigating the factors affecting the residential satisfaction of new-generation migrants: a case study of Hangzhou in China. *International Journal of Urban Sciences, 25*(1), 16-30.

Zhao, P.;Lü, B.;De Roo, G. (2011). Impact of the jobs-housing balance on urban commuting in Beijing in the transformation era. *Journal of Transport Geography, 19*(1), 59-69.

Zheng, Z.;Zhou, S. H.;Deng, X. D. (2021). Exploring both home-based and work-based jobs-housing balance by distance decay effect. *Journal of Transport Geography, 93*.