

Spatial Differentiation and Influencing Factors Dataset of Housing Rents in the Guangdong-Hong Kong-Macao Greater Bay Area

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Abstract: Research on housing rents and influencing factors in the Guangdong-Hong Kong-Macao Greater Bay Area (GBA) is of great interest for the sustainable development. This study took 58 counties/districts in GBA as its research units and integrated to the data from CITYRE and statistical yearbook data to build a dataset containing price-to-rent ratios, housing rents in 2019, and the influencing factors (collected prior to 2019) for 58 counties/districts in the GBA. The dataset is archived in .xls and .shp formats, consisted of 9 data files, with the data size of 1.64 MB.

Keywords: Housing rents; price-to-rent ratio; influencing factor; Guangdong-Hong Kong-Macao Greater Bay Area

DOI: <https://doi.org/10.3974/geodp.2022.01.05>

CSTR: <https://cstr.science.org.cn/CSTR:20146.14.2022.01.05>

Dataset Availability Statement:

The dataset supporting this paper was published and is accessible through the *Digital Journal of Global Change Data Repository* at: <https://doi.org/10.3974/geodb.2021.02.17.V1> or <https://cstr.science.org.cn/CSTR:20146.11.2021.02.17.V1>.

1 Introduction

The Guangdong-Hong Kong-Macao Greater Bay Area (GBA), composed of the 9 cities of the Pearl River Delta (PRD) and the 2 special administrative regions of Hong Kong and Macao, is one of the most innovative, open and economically dynamic urban agglomerations in China and plays an important strategic role in the overall development of China. While a

Received: 01-03-2021; **Accepted:** 23-10-2021; **Published:** 25-03-2022

Foundations: National Natural Science Foundation of China (41871150); GDAS Project of Science and Technology Development (2020GDASYL-20200104001, 2020GDASYL-20200102002); the Institute of Strategy Research for Guangdong, Hong Kong, and Macao Greater Bay Area Construction (2021GDASYL-202104001); Key Program of the National Natural Science Foundation of China (42130712)

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Data Citation: [1] Wang, Y. Wu, K. M. Zhang, H. O., *et al.* Spatial differentiation and influencing factors dataset of housing rents in the Guangdong-Hong Kong-Macao Greater Bay Area [J]. *Journal of Global Change Data & Discovery*, 2022, 6(1): 37–44. <https://doi.org/10.3974/geodp.2022.01.05>. <https://cstr.science.org.cn/CSTR:20146.14.2022.01.05>.

[2] Wang, Y. Wu, K. M. Zhang, H. O., *et al.* Dataset of housing rents and influencing factors in Guangdong-Hong Kong-Macao Greater Bay Area (2019) [J/DB/OL]. *Digital Journal of Global Change Data Repository*, 2021. <https://doi.org/10.3974/geodb.2021.02.17.V1>. <https://cstr.science.org.cn/CSTR:20146.11.2021.02.17.V1>.

chief goal of GBA development is to create a living environment with superior quality of life, housing prices and housing rents are excessively high, which has imposed a heavy burden on residents of the area^[1-3] and seriously impeded efforts to develop a quality living circle^[4]. Because the core cities of the GBA have high proportions of rental housing, the issue of rents is particularly worthy of attention.

The differentiation in housing rents has gradually attracted the attention of Chinese and foreign scholars of urban geography^[4-6], who have variously addressed the issue of housing rents from the perspectives of spatial segregation^[5-7], influencing factors^[8,9], relevant policies^[10,11], characteristics of spatial and temporal changes^[12], and the home price-rent relationship^[7]. These studies have generally focused on one city or one country, however, and there has been little research on the cross-boundary area in the GBA, which can be characterized as being “1 country, 2 systems, and 3 administrative regions”. Because the GBA receives extensive support from the national government, has an extremely important status in the country, and exhibits great differentiation in rents^[4], there is a compelling need for an in-depth analysis of spatial differentiation in GBA housing rents and of the influencing factors, and the dataset collected in this study could provide a basis for research on this issue.

Considering the availability of data and the region’s characteristics, this dataset includes 58 counties/districts in the GBA, includes housing rent grades, spatial distribution, and chief influencing factors, and focuses on differences in rents across administrative divisions. By making new progress in terms of research scope and data on influencing factors, this dataset has significant basic research value and can be used as a new reference for research on housing in the GBA.

2 Metadata of the Dataset

The metadata of the Dataset of housing rents and influencing factors in Guangdong-Hong Kong-Macao Greater Bay Area (2019)^[13] is summarized in Table 1. It includes the dataset full name, short name, authors, year of the dataset, data format, data size, data files, data publisher, and data sharing policy, etc.

3 Data Sources and Research Area

3.1 Data Sources and Processing

Data on county/district boundaries in the GBA were chiefly obtained from the National Geomatics Center of China, while boundary data for the Hong Kong and Macao Special Administrative Regions were drawn manually based on a standard map from the National Bureau of Surveying and Mapping. Data on boundaries of residential clusters near Dongguan were drawn based on a map^[15] from the website of the Department of Natural Resources of Guangdong Province¹. Data on boundaries of residential clusters near Zhongshan were drawn based on a map^[16] website of the Department of Natural Resources of Guangdong Province².

Housing rent and price data^[17] for March 2019 were obtained from cityre.cn³. For Hong Kong housing rents and prices, only the data for 40–69.9 m² private houses were obtained from the Hong Kong Annual Digest of Statistics (2019 Edition)^[18]. Macau housing rent data were calculated from property listing data on ganji.com, and Macau housing price data were obtained from Macao Statistical Yearbook 2018^[19]. Price indexes were used to correct

¹ Website of the Department of Natural Resources of Guangdong Province. <http://nr.gd.gov.cn/map>.

² Website of the Department of Natural Resources of Guangdong Province. <http://nr.gd.gov.cn/map/bzdt>.

³ cityre.cn. <https://www.creprice.cn/rank/index.ht-ml>.

housing rent and price data for Hong Kong and Macau to ensure that they were normalized to the 2019 data.

Influencing factor data were chiefly from 2018. Data on 4 influencing factors, i.e., number of additional permanent residents per km² during the 2016–2018 period, average wage of staff and workers, gross domestic product (GDP) per capita, and economic value added by tertiary industry as a share of GDP, were largely obtained from the 2019 Guangdong Statistical Yearbook^[20], 2019 China Statistical Yearbook^[21], 2019 Dongguan Statistical Yearbook^[22], and 2019 Zhongshan Statistical Yearbook^[23].

Table 1 Metadata summary of the Dataset of housing rents and influencing factors in Guangdong-Hong Kong-Macao Greater Bay Area (2019)

Items	Description
Dataset full name	Dataset of housing rents and influencing factors in Guangdong-Hong Kong-Macao Greater Bay Area (2019)
Dataset short name	HousingRents_Factors_GBA_2019
Authors	Wang, Y. AAG-2293-2021, Faculty of Geography, Yunnan Normal University, wyxkwy@163.com Wu, K. M. P-6938-2014, Guangzhou Institute of Geography, Guangdong Academy of Sciences, kangmwu@163.com Zhang, H. O., Guangzhou Institute of Geography, Guangdong Academy of Sciences, hozhang@gdas.ac.cn Yue, X. L. AAD-7909-2021, Guangzhou Institute of Geography, Guangdong Academy of Sciences/School of Architecture and Urban Planning, Guangdong University of Technology, yx1199766@163.com
Geographical region	Guangdong-Hong Kong-Macao Greater Bay Area (GBA) (not including 5 mountainous counties, i.e., Guangning county, Deqing county, Fengkai county, Huaiji county, and Longmen county)
Year	2015–2019 Data format .xls, .shp
Data size	1.64 MB (994 KB after compression)
Data files	(1) Housing rents and influencing factors data (.xls) file in Guangdong-Hong Kong-Macao Greater Bay Area; (2) Housing rents and influencing factors data (.shp) file in Guangdong-Hong Kong-Macao Greater Bay Area
Foundations	National Natural Science Foundation of China (41871150, 41671128); GDAS Project of Science and Technology Development (2020GDASYL-20200104001, 2020GDASYL-20200102002); the Institute of Strategy Research for Guangdong, Hong Kong, and Macao Greater Bay Area Construction (2021GDASYL-20210401001); Ministry of Science and Technology of P. R. China (2019YFB2103101)
Data publisher	Global Change Research Data Publishing & Repository, http://www.geodoi.ac.cn
Address	No.11A, Datun Road, Chaoyang District, Beijing 100101, China
Data sharing policy	<i>Data</i> from the Global Change Research Data Publishing & Repository includes metadata, datasets (in the <i>Digital Journal of Global Change Data Repository</i>), and publications (in the <i>Journal of Global Change Data & Discovery</i>). <i>Data</i> sharing policy includes: (1) <i>Data</i> are openly available and can be free downloaded via the Internet; (2) End users are encouraged to use <i>Data</i> subject to citation; (3) Users, who are by definition also value-added service providers, are welcome to redistribute <i>Data</i> subject to written permission from the GCdataPR Editorial Office and the issuance of a <i>Data</i> redistribution license; and (4) If <i>Data</i> are used to compile new datasets, the ‘ten per cent principal’ should be followed such that <i>Data</i> records utilized should not surpass 10% of the new dataset contents, while sources should be clearly noted in suitable places in the new dataset ^[14]
Communication and searchable system	DOI, CSTR, Crossref, DCI, CSCD, CNKI, SciEngine, WDS/ISC, GEOSS

The number of additional permanent residents per km² during the 2016–2018 period was obtained by dividing the number of additional permanent residents in the 2016–2018 period by the area of the administrative area; for the 9 PRD cities, the average wages of staff and workers were calculated as the monthly wage by dividing annual wages by 12 months, and for Hong Kong and Macau, the median monthly income of all employing industries was used; the other 2 influencing factors, i.e., average housing area per capita and proportion of the employed population with a bachelor degree or above, were obtained in November 2015 and in 2015, respectively, from The 1% Population Sample Survey of Guangdong Province in 2015^[24], Hong Kong Annual Digest of Statistics (2016 Edition)^[25], and Macao Statistical Yearbook 2016^[26]. In particular, for calculating the proportion of the employed population

with a bachelor's degree or above in Hong Kong and Macau, only the population over the age of 15 and 14, respectively, were used. Studies have found that the effect of various factors on prices in the real estate market is subject to a certain time lag^[27,28]. This study referred to the approach employed by Gu *et al.*^[29] to get a better understanding of this issue, i.e., the selected year for the independent variable was earlier than that for the dependent variable. Therefore, data of factors influencing housing rents were obtained prior to 2019.

Table 2 Sources of data on influencing factors of housing rents differentiation in GBA

Factor evaluation index	Unit	Main time of data	Data source
the number of additional permanent residents	person/km ²	2016–2018	2019 Guangdong Statistical Yearbook ^[20] , 2019 Dongguan Statistical Yearbook ^[22] , 2019 Zhongshan Statistical Yearbook ^[23] , 2019 China Statistical Yearbook ^[21] , Hong Kong Annual Digest of Statistics (2019 Edition) ^[18]
Per capita housing construction area	m ² /person	Nov. 2015	The 1% Population Sample Survey of Guangdong Province in 2015 ^[24] , List of per capita housing area of countries (regions) in the world ^[30] , Hong Kong Annual Digest of Statistics (2016 Edition) ^[25]
Average wage of staff and workers	Yuan/month	2018	2019 Guangdong Statistical Yearbook ^[20] , 2019 Dongguan Statistical Yearbook ^[22] , 2019 Zhongshan Statistical Yearbook ^[23] , 2019 China Statistical Yearbook ^[21] , Hong Kong Annual Digest of Statistics (2019 Edition) ^[18]
Per capita GDP	Yuan	2018	2019 Guangdong Statistical Yearbook ^[20] , 2019 Dongguan Statistical Yearbook ^[18] , 2019 Zhongshan Statistical Yearbook ^[23] , 2019 China Statistical Yearbook ^[21]
Economic value added by tertiary industry as a share	%	2018	2019 Guangdong Statistical Yearbook ^[20] , 2019 Dongguan Statistical Yearbook ^[18] , 2019 Zhongshan Statistical Yearbook ^[23] , 2019 China Statistical Yearbook ^[21]
Proportion of the employed population with a bachelor's degree or above	%	Nov.2015	The 1% Population Sample Survey of Guangdong Province in 2015 ^[24] , Hong Kong Annual Digest of Statistics (2016 Edition) ^[25] , Macao Statistical Yearbook 2018 ^[26]

Note: The economic, industrial and price data of Hong Kong and Macao have been converted into RMB, and the housing area has been converted into m²; “Bachelor's degree or above” includes bachelor's degree.

3.2 Research Area

According to Outline Development Plan for the Guangdong-Hong Kong-Macao Greater Bay Area, the GBA consists of 9 cities in the PRD and the Hong Kong and Macao Special Administrative Regions. The research area in this study did not include 5 mountainous counties in the peripheral area of the PRD, i.e., Guangning county, Deqing county, Fengkai county, Huaiji county, and Longmen county, and used 58 counties, county-level cities, and districts as the basic units (referred to below as “county/district”). Among these counties/districts, Hong Kong was divided into the 3 units, i.e., Hong Kong Island, Kowloon, and New Territories, and Macau consisted of a single unit. Based on the 2017 strategic plan for Dongguan's Industrial Park Planning District Joint Coordination and Development Work Advancement Association, Dongguan was divided into 6 major districts: the urban district, Songshanhu, Binhai, Shuixiang Xincheng, Eastern Industrial Park, and Southeastern Linshen. In accordance with the Zhongshan Urban Sub-region Group Development Plan (2017–2035), Zhongshan was divided into 5 residential clusters: Central, Northeastern, Northwestern, Eastern, and Southern.

3.3 Methodology

The methodology used to gather the GBA housing rent and their influencing factor data and analyze the spatial differentiation characteristics is shown in Figure 1.

(1) Boundary data for the counties/districts in the GBA were integrated to the basic geographic boundary data.

(2) Attribute data for counties/districts in the GBA, including housing rents, housing prices,

and influencing factors, were collected and analyzed, and then, attribute data were linked with the boundary vector data for each county/district based on the same fields in ArcGIS, in order to complete the vector data for housing rents and influencing factors in the GBA.

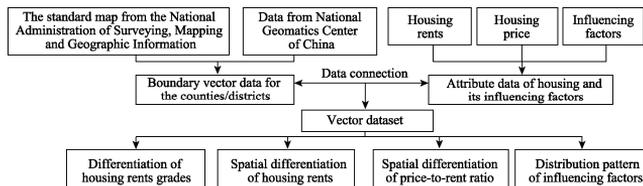


Figure 1 Technical route of the dataset

(3) The first step in the analysis of spatial differentiation in GBA housing rents was to grade the rent levels in each unit based on the housing rent data, generating a housing rent grade distribution chart in the form of a pyramid. ArcGIS was then used to produce a pattern chart of the spatial differentiation in housing rents. The last step was to calculate price-to-rent ratio data for each county/district based on housing rents and housing price data and produce a pattern chart of spatial differentiation in the price-to-rent ratio for housing in the GBA, in order to analyze the characteristics of spatial differentiation in housing rents.

(4) To analyze spatial differentiation in the chief factors influencing GBA housing rents (geographic detection factors), the representative indicators of various factors were assigned to 5 grades, i.e., high (15%), medium-high (20%), medium (30%), medium-low (20%), and low (15%), based on the value; ArcGIS was used for visualization, and spatial distribution charts were drawn for factors influencing housing rents in the GBA.

4 Data Results

4.1 Dataset Composition

The dataset for the spatial differentiation in housing rents in the GBA and influencing factors consists of the following 2 parts: (1) an .xls file of housing rents and influencing factor data for the area; and (2) a .shp file of housing rents and influencing factor data for the area.

4.2 Data Results

4.2.1 Data on Spatial Differentiation in Housing Rents in the GBA

Housing rents in the individual GBA counties/districts were assigned to 5 grades, i.e., <25, 25–40, 40–60, 60–100, and >100 Yuan·m⁻²·month⁻¹, and these grades correspond to low, medium-low, medium, medium-high, and high rent levels. Descriptive statistics of units in each rent grade are shown in Table 3.

The GBA housing rent statistics show a pyramid distribution, i.e., the higher the rent grade, the smaller the units occupied by that rent grade. The 4 high-rent units with rent > 100 Yuan·m⁻²·month⁻¹ are Hong Kong Island, Kowloon, and New Territories in Hong Kong and Macau; among these units, rents in Hong Kong Island and Kowloon are 387 and 319 Yuan·m⁻²·month⁻¹, respectively. Among the 6 districts in Shenzhen (including Nanshan district, Futian district, Luohu district, Yantian district, Baoan district, and Longhua district) and the main urban area of Guangzhou (Yuexiu district and Tianhe district) are units with medium-high rents, with the highest rents of the 9 cities in the PRD. Seven units, including the peripheral areas of Shenzhen (Pingshan district, Longgang district, and Guangming district) and 4 districts adjacent to the main urban area of Guangzhou (Haizhu district, Liwan district, Baiyun district, and Panyu district) have medium rents. Thirteen units, including the peripheral area of Shenzhen (Dongguan districts/counties adjacent to Shenzhen), peripheral areas of Guangzhou (Guangzhou peripheral area and Foshan), and main urban areas of Zhuhai, Huizhou, and Jiangmen, have medium-low rents; most of the 26 other units, which are relatively long distances from Hong Kong, Shenzhen, and Guangzhou, have low rents. In general, regarding the spatial differentiation in rents within the GBA,

Hong Kong and Macau have the highest rents, the main urban areas of Guangzhou and Shenzhen have the second highest rents, and rents gradually decreased toward the periphery of these areas.

Table 3 Descriptive statistics of the grade interval of housing rents in GBA

Rent grades	Rent intervals (Yuan·m ⁻² ·month ⁻¹)	Number of counties and districts	Minimum	Maximum	Mean	Median	Standard deviation
High rent	>100	4	167.40	386.93	278.71	280.25	95.09
Medium-high rent	60–100	8	60.55	98.26	74.64	66.20	14.80
Medium rent	40–60	7	40.60	57.46	47.79	45.81	6.95
Medium-low rent	25–40	13	25.66	38.71	29.11	27.59	4.48
Low rent	<25	26	18.22	24.57	21.70	21.81	1.80
Total	18.22–386.93	58	18.22	386.93	51.54	25.95	68.79

The price-to-rent ratio of housing in the various counties/districts in the GBA was obtained by dividing the housing price per m² by monthly rent per m². This statistic is used to assess whether rents are reasonable. Price-to-rent ratio data were divided into 5 grades employing thresholds of 400, 500, 600, and 700; descriptive statistics for each grade are shown in Table 4. In general, the price-to-rent ratios for counties/districts in Guangzhou, Shenzhen, and Zhuhai were universally quite high, while those in the peripheral area of the GBA and Hong Kong were relatively low. Hong Kong had the highest rents but a relatively low price-to-rent ratio, which reflects the high rents in Hong Kong.

Table 4 Descriptive statistics of the grade interval of price-to-rent ratio in GBA

Price-to-rent ratio grades	Price-to-rent ratio grades intervals	Number of counties and districts	Minimum	Maximum	Mean	Median	Standard deviation
High price-to-rent ratio	>700	14	705.60	930.27	796.61	796.37	65.21
Medium-high price-to-rent ratio	600–700	10	621.46	681.26	655.04	656.11	17.99
Medium price-to-rent ratio	500–600	8	500.19	591.44	542.98	540.49	35.21
Medium-low price-to-rent ratio	400–500	11	407.72	479.54	450.59	452.05	24.53
Low price-to-rent ratio	<400	15	285.90	400.00	348.03	358.38	39.10
Total	285.90–930.27	58	285.90	930.27	555.58	519.67	176.48

4.2.2 Data on Chief Factors Influencing Rents in the GBA

Employing a “rental demand + urban fundamentals” theoretical perspective, a model of factors influencing rents was constructed by including 6 influencing factors, i.e., recently added population, housing area per capita, income level, economic development level, industry structure, and educational structure^[4]. The 6 influencing factors in this model were represented as the number of additional permanent residents per km² during the 2016–2018 period, average housing area per capita, average wage of staff and workers, GDP per capita, economic value added by tertiary industry as a share of GDP, and proportion of the employed population with a bachelor’s degree or above; descriptive statistics are provided in Table 5.

Regarding the number of additional permanent residents per km² during the 2016–2018 period, the main urban areas of Shenzhen and Guangzhou, Kowloon in Hong Kong, and Hong Kong Island had high values, other counties/districts close to the Pearl River Estuary had moderate values, and Zhaoqing, Jiangmen, and Huizhou, had low values. For average housing area per capita, Hong Kong, Macau, and Shenzhen had significantly lower values than those for other areas. The average wage of staff and workers was universally high Hong Kong, Macau, Shenzhen, and Guangzhou, but universally low in Zhaoqing and Jiangmen, which are in the western part of the GBA. High levels of GDP per capita existed in Hong Kong, Macau, Nansha district in Shenzhen, and Yuexiu district, Tianhe district, and Huangpu district in Guangzhou, but GDP per capita tended to be low in the peripheral counties/districts. For economic value added by tertiary industry as a share of GDP, clusters of high values were found in the core counties/districts of Hong Kong, Shenzhen, and Guangzhou, and high values also existed in the central parts of other prefecture-level cities.

High proportions of the employed population possessing a bachelor's degree or above were residing in Hong Kong, Macau, Yuexiu district and Tianhe district in Guangzhou, and Nanshan district in Shenzhen.

Table 5 Descriptive statistics of the grade interval of the main influencing factors of housing rents in GBA

Influencing factors	Factor index	Unit	Minimum	Maximum	Mean	Median	Standard deviation
Added population	the number of additional permanent residents per km ² during the 2016–2018	person/km ²	0.42	1,605.64	215.07	62.49	305.06
Housing area per capita	Per capita housing construction area	m ² /person	16.00	44.43	28.23	28.94	6.24
Income level	Average wage of staff and workers	Yuan/month	5,082.00	14,447.40	7,587.41	6,623.29	2,444.68
Economic development level	GDP per capita	Yuan/person	39,218.00	570,751.90	149,066.96	112,432.00	99,952.82
Industry structure	Economic value added by tertiary industry as a share of GDP	%	22.80	98.48	53.86	46.51	20.26
Educational structure	Proportion of the employed population with a bachelor's degree or above	%	0.93	32.07	9.42	5.84	8.05

5 Conclusion

Behind only the San Francisco Bay Area and New York Bay Area in the United States and the Tokyo Bay Area in Japan, the GBA is the world's fourth largest bay area and has crucial economic, social, and political importance to China. In the context of substantial variations in housing rents throughout this region and the high rents in core cities, this study aimed to investigate spatial differentiation in housing rents and influencing factors in the GBA based on data from 58 counties/districts, and the following results were obtained. (1) Differentiation in rents within the region chiefly form a two-tier variation pattern, with the main differentiations occurring between Hong Kong and Macau, on one hand, and the 9 cities in the PRD on the other and secondary differentiations occurring between the main urban areas of Shenzhen and Guangzhou and other areas. Differences in rents across the boundaries of the 2 special administrative regions are significantly greater than those between the core and peripheral areas of the 9 cities in the PRD. (2) The 6 influencing factors of recently added population, housing area per capita, income level, economic level, industry structure, and educational structure were used to investigate housing rents in the GBA. In this study, the number of additional permanent residents per km², average housing area per capita, average wage of staff and workers, GDP per capita, economic value added by tertiary industry as a share of GDP, and proportion of the employed population with a bachelor's degree or above were selected as evaluation indicators for these factors. There were differences in the spatial distribution of the different factors affecting housing rents. The dataset built in this study can provide data support for scholars' research on issues of housing rents in the GBA, and can further provide a basis for real estate enterprises and organizations to analyze the housing market in the GBA.

Author Contributions

Wang, Y. and Zhang, H. O. made the overall design for the development of dataset; Wu, K. M. collected and processed the data; Wang, Y. and Wu, K. M. designed the model and algorithm of the dataset. Yue, X. L. did data verification; Wang, Y. and Yue, X. L. wrote the data paper.

Conflicts of Interest

The authors declare no conflicts of interest.

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