

Comparative Study on the Characteristics of Jobs-Housing Separation between Tokyo Metropolitan Area and Beijing

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Abstract. Jobs-Housing separation would make a significant impact on the urban traffic, causing serious traffic congestion problem in the morning and evening peak periods. This paper uses spatial distribution of resident/employed population and the population ratio of day and night as the main methods for research on the characteristics of jobs-housing separation. By comparing the characteristics of jobs-housing separation between Tokyo Metropolitan Area and Beijing, and summarizing the experience of Tokyo Metropolitan Area in dealing with the jobs-housing separation and traffic congestion problem deriving from it, as well as the construction of new towns, this paper makes some suggestions for Beijing to deal with the same problems. To coordinate the development of new towns, government should continue to build up the public service facilities in new towns, construct the rail transit networks that connect the city center with new towns, and build the integrated transportation and transfer center in new towns. To decrease the degree of jobs-housing separation, some measures should be taken from the following aspects: to promote industrial development in new towns and guide the population transfer by implementing incentive policy. Public transportation subsidy policy and the development of large residential districts along the rail transit line are also beneficial to ease urban traffic congestion and reduce residents' travel costs.

1 Introduction

Currently, a majority of cities in China are in the process of rapid development of urbanization, population and industries continue to agglomerate in central cities. When population and industries in the central area gather gradually to a certain extent, increasing price of land will lead to the cluster of firms in central area and the migration of residential districts. Many residents may choose to live outside of the central area, resulting in the spatial separation between home and working. Zheng, Xu and Gu(2014) believe that jobs-housing separation has its inevitability and rationality from the perspective of agglomeration economies, labor market matching and travel demand diversification^[1]. Commuting time and distance, the JHB index, population density ratio of day and night, the Lorenz curve concentration index are the main indexes to measure the extent of jobs-housing separation^[2-3]. Some other scholars analyzed the jobs-housing separation based on the spatial distribution of population and employment^[4]. Regional commuter flow is also the important method to analyze the jobs-housing separation^[5]. For serious traffic congestion and long commuting time problems deriving from jobs-housing separation, some scholars consider that part of the industries and commercial facilities should be transferred to new towns, and urban central area should take on the living function^[6]. While some others consider that government should not design the ratio of residential and industrial land subjectively to reach the “jobs-housing balance”, instead of this way, providing more choice for residents with public policies on transportation, housing and public services may form the proper jobs-housing relationship^[1].

Most of the existing studies on jobs-housing separation focused on describing the current situation of urban jobs-housing separation by using the relevant indicators. Different from the previous studies, this paper concentrates on comparative analysis between the two cities. This analysis not only verifies the inevitability of jobs-housing separation, but also come up with the responding suggestions about jobs-housing separation for Beijing based on the experience of relevant measures in Tokyo Metropolitan Area.

2 Definition and research unit of jobs-housing separation

Jobs-housing separation is the situation that residents face with when home and working separate in space. Spatial analysis units are various, some are big, while others may small. Average spatial range of traffic analysis unit(TAZ), streets and districts in Beijing are 1.52km²,10.6km², and 171km² respectively. Some scholars used the range of street as their research unit, some others set their research unit based on the average commuting distance. Previous researches may pay more attention to measure the extent of jobs-housing separation on the basis of the research unit. Whereas, this paper sets severe traffic congestion as a research starting point and places an emphasis on the separation between employment and residential agglomeration area.

3 Situation of jobs-housing separation in Tokyo Metropolitan Area

Tokyo Metropolitan Area consists of four parts, central area is the district department of Tokyo. In addition to 23 districts, there are 26 cities, 5 towns, and 8 villages included in Tokyo. The inner ring of Tokyo metropolitan area is one of the most densely populated regions in Japan, which includes Tokyo, Kanagawa, Saitama and Chiba County. The outer ring incorporates the other four counties, Ibaraki, Tochigi, Gunma and Yamanashi into the whole metropolitan area. This paper focuses on the scope of inner ring.

Tokyo is the core of metropolitan area, and it has the highest concentration of employment in this region. Table 1 shows the population ratio of day and night in 2000 and 2010. As we can see from this table, Tokyo is the most highly concentrated area of employment in metropolitan area, while the population ratio of day and night in Kanagawa, Saitama, and Chiba is very low. Low ratio indicates that these three counties may take on the residential function relative to Tokyo. Residents who live in these three countries will commute to Tokyo.

Table 1 Population ratio of day and night in Tokyo Metropolitan Area

| District | 2000 | | 2010 | |
|-----------|--------------------------------|---------------------------------------|--------------------------------|---------------------------------------|
| | Population in daytime (people) | Population ratio of day and night (%) | Population in daytime (people) | Population ratio of day and night (%) |
| Tokyo | 14667000 | 122 | 15576000 | 118.4 |
| Kanagawa | 7634000 | 90.1 | 8254000 | 91.2 |
| Saitama | 5985000 | 86.4 | 6373000 | 88.6 |
| Chiba | 5182000 | 87.6 | 5560000 | 89.5 |
| Ibaraki | 2892000 | 96.9 | 2887000 | 97.2 |
| Gunma | 2018000 | 99.9 | 2005000 | 99.9 |
| Tochigi | 1993000 | 99.4 | 1990000 | 99.1 |
| Yamanashi | 881000 | 99.2 | 855000 | 99.0 |

Data source: Statistic data from Japan Statistics Bureau website

Figure 1 shows the inflow and outflow of commuters between Tokyo and adjacent county, which also reflects the serious jobs-housing separation problem faced by residents living in these areas. From the viewpoint of the whole Tokyo Metropolitan Area, employment is concentrated in Tokyo. Every day, a great number of people commute from the surrounding areas to Tokyo. Meanwhile, a small part of residents in Tokyo commute to the surrounding counties. These residents are faced with a greater degree of jobs-housing separation. Spatial distribution of employment centers on the three core districts(The Central District, Chiyoda District and Port area of Tokyo) and extends outward by circle. Three core districts above and Shinjuku district which are surrounded by residential areas are the main employment agglomeration areas in Tokyo. So, jobs-housing separation in Tokyo metropolitan area has an obvious feature that employment agglomeration areas are located in the city center, while residential areas are distributed in city periphery and the surrounding counties.

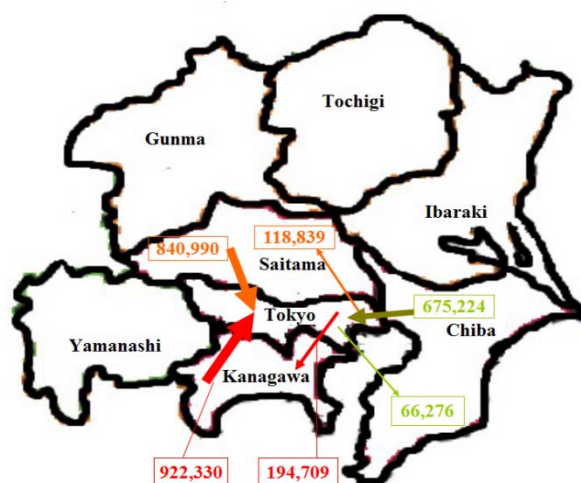


Figure 1 Inflow and outflow of commuter between Tokyo and adjacent counties in 2010
Data source: statistic data from Japan Statistics Bureau website

4 Situation of jobs-housing separation in Beijing

Beijing is the political, economic and cultural center in China, and its size of land area and population are similar with the inner ring of Tokyo metropolitan area. Residents living in functional core area, functional development zone and urban development district occupy 91% of citizens in Beijing, so this paper chooses 12 districts as main research objects. In order to match up with the age of employees, this study selects the number of residents during 15-64 years old as the index to describe the residential distribution in space, and the spatial distribution of employment is described by the number of employees in urban units.

4.1 The state of jobs-housing separation in Beijing. Figure 2 and 3 respectively show the spatial distribution of employment and residence in 12 districts. What we can see from figure 2 is that Dongcheng, Xicheng, Chaoyang and Haidian District are the main distributional area of employment. While, most of residents are concentrated in Haidian, Chaoyang, Fengtai, Changping, Daxing and Tongzhou District in figure 3. Comparing figure 2 with 3, we can conclude that the degree of employment agglomeration is higher than that of residence in 12 districts.

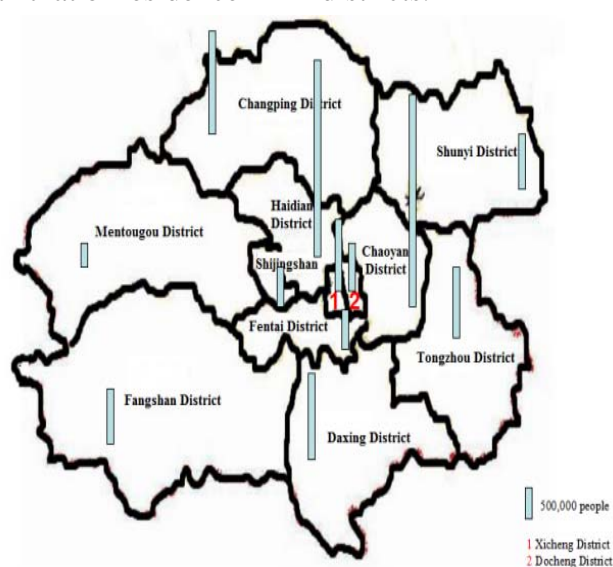
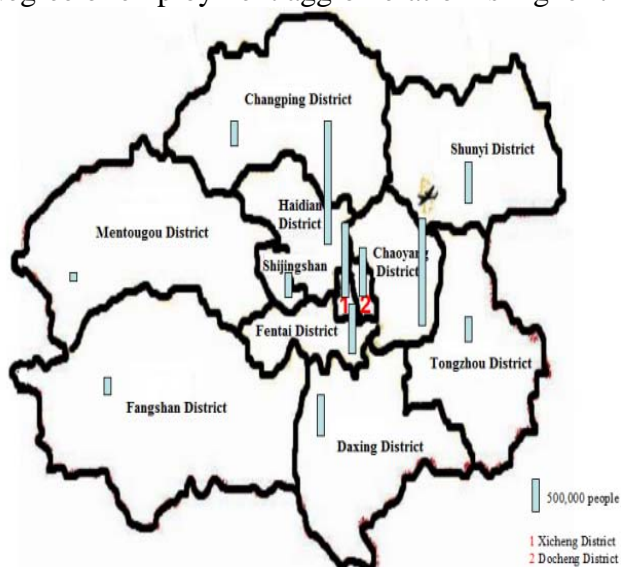


Figure 2 Spatial distribution of employment in 2014 Figure 3 Spatial distribution of residence in 2014
Data source: Statistical yearbook of Beijing in 2015

In 2004, in order to transfer population, functions and industries from central area, government proposed to focus on the construction of new towns that include Tongzhou, Shunyi and Yizhuang. However, in addition to Yizhuang, which relies on its own manufacturing base and airport industry,

has developed fast, all the other new towns have a slow pace in the development of industry. Changping District, and Tongzhou that planned as an administrative sub-center more incline to undertake the residential function transferred from city center rather than a role as new town. Many residents living in these new towns are faced with greater degree of jobs-housing separation and serious traffic congestion problem during morning and evening peak.

Table 2 shows several streets that distributed the most employed population in Beijing. These streets are all located in central area, including Dongcheng, Xicheng, Haidian and Chaoyang District.

Table 2 Numbers of employed population in several street in year 2013

| Street | Employed population (people) |
|-------------------------------------|---------------------------------|
| Jianwai (Chaoyang District) | 306411 |
| Financial Street (Xicheng District) | 296595 |
| Shangdi (Hiandian District) | 259055 |
| Zhongguancun (Hiandian District) | 235880 |
| Hiandian Street (Hiandian District) | 230807 |
| Exhibition Road (Xicheng District) | 199624 |
| Yangfangdian (Hiandian District) | 178096 |
| Beixiaguan (Hiandian District) | 168188 |
| Donghuamen (Dongcheng District) | 151248 |
| Chaowai (Chaoyang District) | 140886 |

Data source: Report on the third economic census in Beijing

4.2 Characteristics of the jobs-housing separation in Beijing. Originally, many service sector firms gathered in Dongcheng and Xicheng District, where are employment agglomeration areas in Beijing. Currently, Chaoyang and Haidian that close to the city center have developed very fast. These two districts are not only distributed by the most employed population, but also have the largest number of residents in Beijing. Different from Tokyo metropolitan area that has a clear jobs-housing separation relationship and a strong commuting inflow that is toward central areas, separate relationship between the employment and resident agglomeration areas may be more complex. So in addition to radial commuting flows between the employment area in the center and residential area in new towns, there are random commuting flows among central districts, "radial + random" commuting pattern is formed in Beijing.

5 Experience and suggestions on dealing with jobs-housing separation and traffic congestion deriving from it

5.1 Experience summarized from Tokyo metropolitan area

5.1.1 Reasonably determine the location of new towns, and constantly build the public service facilities. Tama New Town and Chiba New Town that have been built in Tokyo Metropolitan Area are all located at a position about 30 kilometers from the city center. This proper distance can not only ensure the economic radiation from city center, but also signify a proper commuting distance for residents living in these new towns above. After transferring population from centers to new towns, construction of public service facilities followed up subsequently. In the fourth plan designed for development of Tokyo metropolitan area, government proposed to gradually transfer educational, political and cultural functions to new town for changing the single function of new towns. Besides the two main commercial streets, there are also libraries, museums and other entertainment facilities, as well as schools and hospitals in Tama New Town.

With the increasing number of residents in new towns, public service facilities are still concentrated in city center, which is not conducive to the comprehensive development of new towns. Because of the long distance far away from the central area, it's also hard for some new towns to receive the economic radiation from city center.

5.1.2 Promote the development of new towns with the construction of rail transit. In order to promote the development of enterprises, Tokyo's private railway companies have developed some large-scale residential districts along the railway line. This practice is helpful to decrease the high commuting cost caused by jobs-housing separation. Considering the development of new towns and its connection to city center, two rapid rail transit lines and three stations were proposed in Tama New Town's plan. To support the construction of rail transit lines, government subsidy was up to 18%. What's more, government also made the transportation subsidy policy for staff living in new towns. Such a high density of population and industries that Tokyo metropolitan area can undertake and a large number of daily commuting demand that it can also meet are all attributed to the construction of the dense rail transit lines.

5.2 Suggestions on dealing with problems that derived from jobs-housing separation. New towns should develop leading industries according to their own industrial bases. At the same time, the construction of the public service facilities should follow up the pace of transfer of population and industry.

Urban planning and transportation planning should cooperate with each other, public transport hub stations set in new towns may bring a large number of passengers, which will drive the rapid development of new towns.

Government should connect city center to new towns with large capacity rail transit and develop large residential areas along the lines. In order to encourage the use of public transport and ease traffic congestion, government should also make some public transport subsidy policies for residents who live in new towns.

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