

Impacts of the Built Environment on Job Accessibility: A Case Study of Hong Kong

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Key Points

- ▶ Higher employment density improves job accessibility in sparse areas but not in dense areas.
- ▶ Hong Kong residents rely heavily on employment opportunities in and around the Central Business District (CBD).
- ▶ A more even distribution of employment across the city can improve job accessibility for residents living in most areas.
- ▶ Allocating more land around rail stations for residential use rather than commercial use can reduce residents' commute distance and time.

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Policy Focus

The built environment can significantly influence job accessibility. Nevertheless, the relationship between the built environment and job accessibility varies across cities in light of local characteristics. Previous studies of the relationship between the built environment and job accessibility have centered on low-to-medium-density Western cities. These studies' empirical results may not apply entirely to Hong Kong, which is highly dense. For instance, higher employment density may reduce residents' commute distance and time in sparsely populated cities. As a city becomes denser, further concentration of employment in particular neighborhoods will cause traffic jams and hamper job accessibility (Jin et al., 2017). Moreover, the transportation modes available to Hong Kong residents differ substantially from those available to residents living in the West. According to the 2016 Population By-Census (Census and Statistics Department

(Hong Kong), 2017), nearly 80% of the working population with fixed places of work in Hong Kong were public transit users, while residents in the West, especially in low-to-medium-density cities, commute mainly by private vehicles. Therefore, a well-designed empirical study is needed to analyze the unique relationship between the built environment and job accessibility in Hong Kong. This bulletin, based on a paper written by Zhu et al. (2020), analyzes the following issues:

1. What are the impacts of built-environment features on job accessibility for Hong Kong residents, measured by commute time and commute distance?
2. How do these impacts vary across commuters using public transit and private vehicles?
3. How do these impacts vary across public transit commuters using rails, buses, and both rails and buses?

4. How do these impacts vary across commuters living in specific neighborhoods?

Research Methodology

This study examined the statistical relationship between the built environment and job accessibility in Hong Kong. Job accessibility was measured by the commute distance and time that residents experienced. For the purposes of the study, the built environment included employment density, residential density, building mix, distance from home to rail stations, the proportion of residential areas within 500-meter radiuses of railway stations, the proportion of commercial areas within 500-meter radiuses of railway stations, etc. (See Table 1 for a brief description of selected variables).

Data were collected from the Transportation Department, the Land Department, the Planning Department, the Census and Statistics Department of the Hong Kong SAR, OpenStreetMap, and CentaMap.

This study divided residents into sub-samples according to transportation modes (rails, buses, both rails and buses, and private vehicles) and residential neighborhoods (see Figure 1 for the categorization of neighborhoods) to analyze the homogeneous and heterogeneous impacts of built-environment features on job accessibility across groups. Each sub-sample was analyzed independently using multi-regression models.

Findings and Analysis

1. General impacts of the built environment on commute distance and time

In general, higher employment density and a higher proportion of residential areas within 500-meter radiuses of railway stations around home, and commuting to a workplace farther away from the Central Business District (CBD), i.e., Central, reduce commute distance and time, whereas higher residential density, a more complex building mix, and a higher proportion of commercial areas within 500-meter radiuses of railway stations around

home, and living farther away from the CBD, increase commute distance and time. Figure 2 shows the spatial distribution of the average commute times for Hong Kong residents.

2. Heterogeneous impacts of the built environment on commuters using public transit and private vehicles

Because they use less flexible transportation modes, the commuting behaviors of public transit users are more sensitive to the built environment than the commuting behaviors of private vehicle users. For example, higher residential density and a more complex building mix around home, and longer distance between home and the CBD substantially increase commute distance and/or commute time of public transit commuters but not those of private vehicle commuters.

A higher proportion of residential areas within 500-meter radiuses of railway stations reduces commute distance and time for public transit commuters but increases commute distance and time for private vehicle users. This is because rail stations and nearby public transit facilities enhance the convenience of public transit commuters but lead to traffic congestion that adversely affects private vehicle users.

3. Homogeneous and heterogeneous impacts of the built environment on specific types of public transit commuters

Living farther away from the CBD implies longer commute distance and time for all residents irrespective of public transit types. However, the impact is greater on commute distance than on commute time because of the efficiency of the city's public transit system.

Moreover, having a higher proportion of residential areas within 500-meter radiuses of railway stations around home reduces the commute distance and time for both rail-based and non-rail-based public transit commuters, indicating that rail stations and public transit facilities nearby benefit both types of public transit users.

Table 1 Brief Description of Selected Variables

Built-Environment Feature	Description
Commute Distance ^a	Distance from Home to Workplace Address
Commute Time ^a	Commute Time of All Trip Legs of the Day
Employment Density [*]	Employment Density = Employment / TPUSB Zone Area
Residential Density [*]	Residential Density = Residential Population / TPUSB Zone Area
Building Mix [*]	The mixture of various types of buildings, including residential, commercial, industrial and transport-related
Distance from Home to the CBD [*]	Average Household Distance to the City Centre (i.e. Central)
Distance from Workplace to the CBD [*]	Average Workplace Distance to the City Centre (i.e. Central)
Proportion of Residential Areas located within 500-meter radiuses of rail stations [*]	% of Residential Areas within 500-meter radiuses of railway stations
Proportion of Commercial Areas located within 500-meter radiuses of rail stations [*]	% of Commercial Areas within 500-meter radiuses of railway stations

^aVariables were measured at the individual resident level.

^{*}Variables were measured at the Tertiary Planning Unit / Street Block (TPUSB) level. The TPUSB level is the finest grained zoning system for planning studies in Hong Kong, which divides the city into 4,816 zones.

In addition, having more job opportunities near home, measured by employment density, reduces commute distance for all types of public transit users. However, this benefit is much more substantial for non-rail-based public transit commuters because they tend to have jobs located close to home.

4. Homogeneous and heterogeneous impacts of the built environment on commuters living in specific neighborhoods

Hong Kong's spatial distribution of employment density is more highly concentrated than residential density in the CBD (see Figure 3 and Figure 4). Longer distance from home to the CBD increases commute distance for public transit users living in all neighborhoods in Hong Kong. This circumstance indicates that even residents living in remote areas rely heavily on job opportunities in the CBD. It also increases commute time for public transit commuters living in job-dense downtown neighborhoods (e.g., Central and Tsim Sha Tsui) and new town neighborhoods (e.g., Shatin).

Having a workplace located farther away from the CBD decreases commute distance and time for public transit commuters living in rural neighborhoods (e.g., Kwu Tong) and new town neighborhoods, indicating that residents in these neighborhoods benefit from the decentralization of employment opportunities across the city.

Contrary to previous research, this study suggests that higher residential density and employment density around home reduce commute distance and/or time only for residents of low-density neighborhoods, e.g., rural neighborhoods and new town neighborhoods. Further concentration of residents and jobs has a detrimental impact on job accessibility in dense areas, such as job-dense downtown neighborhoods.

Commuters living in non-downtown urban neighborhoods (e.g., Wong Tai Sin and Sham Shui Po) are the most sensitive to land-use allocation around rail stations. For example, every 1% decrease in the proportion of residential areas and every 1% increase in the proportion of commercial areas located within 500-meter radiuses of railway stations lengthen commute distance for public transit users living in these neighborhoods by 13.2% and 20.6%, respectively.

Recommendations

1. Developing employment sub-centers in peripheral areas

Because of the non-linear effects of employment density on commute distance and time, higher employment density will improve job accessibility in sparse neighborhoods but hamper job accessibility in

Figure 1 Spatial distribution in Hong Kong by neighborhood type

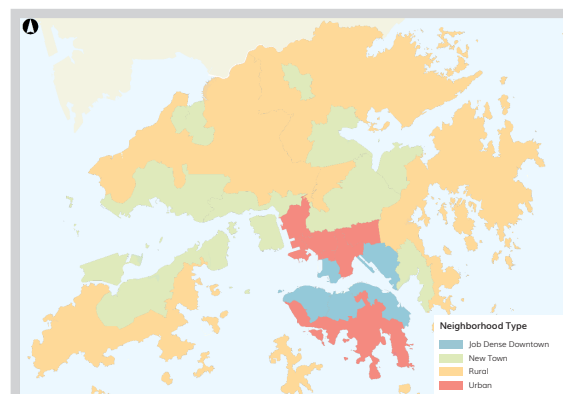


Figure 2 Spatial distribution of the average commute times for residents by Tertiary Planning Unit / Street Block (TPUSB)

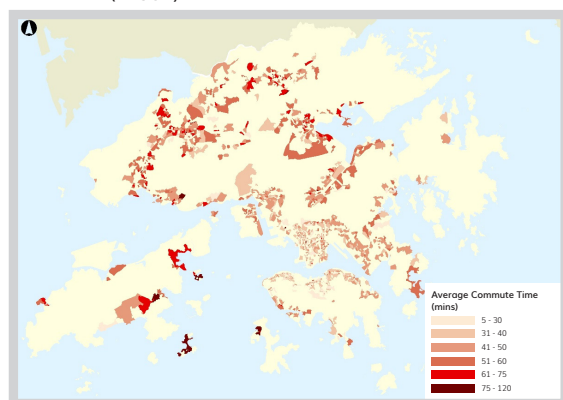


Figure 3 Spatial distribution of employment density by Tertiary Planning Unit / Street Block (TPUSB)

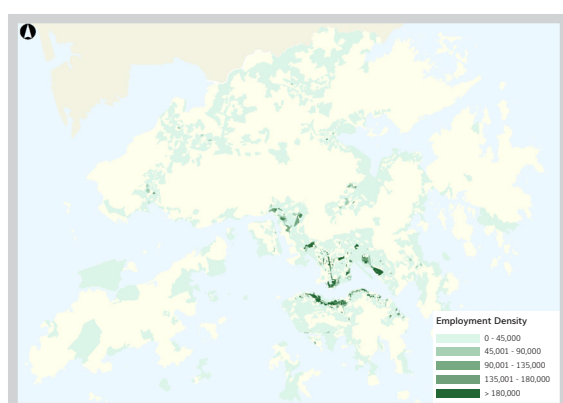
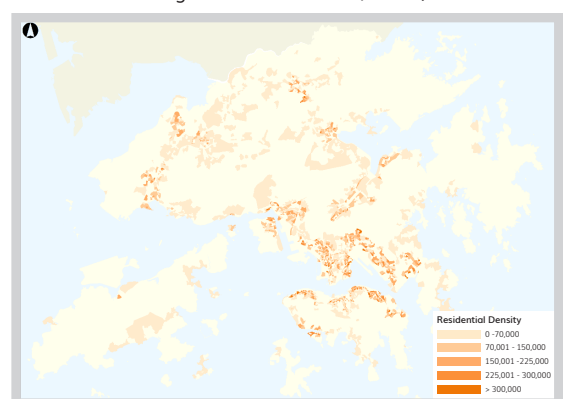


Figure 4 Spatial distribution of residential density by Tertiary Planning Unit / Street Block (TPUSB)



dense neighborhoods. Hong Kong should avoid further concentration of employment in/around traditional high-density downtown areas. Instead, it should promote industrial and commercial activities in newly developed peripheral areas, such as Lantau Island, Sheung Shui, and Sai Kung. Decentralization of employment not only could reduce commute distance and time for residents living in remote areas but also could distribute traffic loads more evenly across the city and relieve traffic congestion in dense areas.

2. Further strengthening the rail system

Hong Kong residents heavily rely on public transit, especially rails. The rail system substantially reduces commute time for long-distance trips. Facilities located near rail stations also enhance the capacity of other public transit services. Therefore, Hong Kong could utilize the rail network as the backbone of future public transit development.

Main Reference

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3. Allocating more land around rail stations for residential use

Residents living around rail stations can access rail transit more easily and benefit from public transit hubs built near the rail stations. Therefore, more land around rail stations should be allocated to residential use. Moreover, the proportion of commercial use around rail stations should be reduced because commercial development forces residents to live farther away from public transit facilities.

4. An optimal built environment depends on transit modes and neighborhood characteristics

This study reveals the heterogeneous impacts of the built environment on job accessibility for residents using various transit modes and living in various neighborhoods around the city. It is crucial for urban planners to understand the unique characteristics of neighborhoods and the specific needs of commuters if they wish to enhance job accessibility through optimizing the built environment.



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