Spatial Mismatch, Different Labor Markets and Precarious Employment: The Case of Hong Kong

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Abstract

Spatial mismatch theory argues that geographic barriers have significant adverse effects on (un)employment, especially with respect to disadvantaged workers. Existing debates on spatial mismatch have focused on its influence on unemployment, but few studies have paid attention to the impact of spatial factors on increasingly precarious employment in today's labor market. Using data from four waves of the Hong Kong Panel Study of Social Dynamics (HKPSSD), the 2011 Population Census and the 2016 Population By-census, this study aims to investigate the effects of spatial mismatch on precarious employment in the low- and high-skilled labor markets in Hong Kong with multi-leveled modeling. The results suggest that with higher levels of spatial mismatch, workers in the low-skilled labor market are more likely to be in precarious employment. In the high-skilled labor market, sub-degree holders are also more likely to engage in precarious employment. Even worse, spatial mismatch in Hong Kong has deteriorated over time. Based on these results, we offer policy recommendations and show how the study of spatial mismatch can inform policy-making. Overall, we contribute to the literature by demonstrating that spatial mismatch can lead to precarious employment among employed workers and has differentiated effects on low- and high-skilled labor markets.

Keywords Spatial mismatch · Precarious employment · High-skilled · Low-skilled · Hong Kong

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1 Introduction

Spatial mismatch theory has generated wide interest in the fields of urban studies and economic geography for decades (Kain, 1992; Ihlanfeldt & Sjoquist, 1990; Qi et al., 2018; Andersson et al., 2018; Easley, 2018; Theys et al., 2019; Delmelle et al., 2021). The key argument of the spatial mismatch hypothesis is that ethnic minorities (African-Americans in most studies) living in urban centers face more geographic barriers to employment opportunities and employment information due to suburbanization, discrimination, residential segregation and concentrated poverty (Kain, 1992). Subsequently, researchers have extended the application of the spatial mismatch hypothesis to examine the relationship between spatial mismatch and unemployment among other disadvantaged groups, such as women (McLafferty & Preston, 1996; Thompson, 1997), the low-income population (Hess, 2005; Liu & Kwan, 2020) and welfare recipients (Blumenberg & Manville, 2004). With the processes of de-industrialization and suburbanization in the Global North, manufacturing jobs in urban centers have moved abroad and new employment opportunities in the service sector have been concentrated in suburban areas. With limited resources to move, less access to private transport and poor public transport coverage, disadvantaged workers living in urban centers have been hit by higher rates of unemployment and concentrated poverty. In a society where employment continues to be the main source of income for survival, spatial mismatch has a significant effect on people's well-being, especially for those who are already disadvantaged.

Studies on the thesis of spatial mismatch also go beyond the physical separation between jobs and workers' housing. Scholars further investigate other factors that moderate the relationship between spatial mismatch and (un)employment, such as commuting modes (Patacchini & Zenou, 2005; Taylor & Ong, 1995), quality of public transit (Lyons & Ewing, 2021), and commuting costs (Li et al., 2021). Patacchini and Zenou (2005), for example, suggest that both commuting distances and commuting modes have significant effect on workers' job searching behaviors and outcomes. Paying attention to different aspects of public transit quality, such as distances to nearest transit stop, job access via transit and commute time, Lyons and Ewing (2021) argue that the quality of public transit do moderate the effect of spatial mismatch on unemployment. Investigations on such moderating factors have yielded important implications for policymaking. However, the roots of the geographic disadvantage for certain groups of workers continue to lay on the physical distribution of jobs and housing, in other words, the spatial accessibility of jobs.

Although the focus of early research on the spatial mismatch hypothesis has been unemployment among disadvantaged workers, unemployment is no longer the main risk for most workers in this "new brave world of work," where "the work society is coming to an end" and "the 'job for life' has disappeared" (Beck, 2000, p 2). Indeed, with the intensification of de-industrialization and neoliberalization in developed societies, the labor market offers fewer and fewer stable employment opportunities. Job security is also declining. In addition to unemployment, workers now face higher risks of underemployment, low pay, limited opportunities for upward mobility, little protection from their employers and low levels of unionization (Standing, 2011). Therefore, precariousness, instead of unemployment, has become the new risk facing by a growing number of disadvantaged workers (Vosko, 2000; Standing, 2011; Wong & Au-Yeung, 2019; Padrosa et al., 2020; Lozano & Rentería, 2019; Olsthoorn, 2013).

Gobillon and colleagues have identified seven mechanisms through which spatial mismatch hinders people's access to employment: (1) commuting costs; (2) job search efficacy;

(3) job search intention; (4) job search costs; (5) employers' discrimination against residentially segregated workers; (6) effects of long commutes on workers' productivity; and (7) customer discrimination against residentially segregated workers (Gobillon et al., 2007). These obstacles may not only lead to unemployment among disadvantaged workers but may also affect people's opportunities for better employment. Delmelle and colleagues' study (2021), for example, finds no significant impact of improved job accessibility on the unemployment rates among low-income workers while finds significant positive association between job accessibility and median household income in that region. Barufi and Haddad (2017) have also found strong correlations between spatial mismatch and workers' wages. Researchers, thus, argue that improved job accessibility leads to better employment opportunities that offer higher income for workers to choose from (Barufi & Haddad, 2017; Delmelle et al, 2021). Beyond income, living in areas with limited employment opportunities and concentrated poverty, people also face stiffer competition for existing stable employment. For those who cannot afford the commute time and economic costs for better employment opportunities, the only choice is to take any job that their local labor market has to offer, leading to precarious employment. However, limited attention has been paid to the relationship between spatial mismatch and precarious employment. To fill this research gap, we first examine whether living in an area with fewer employment opportunities can push people into precarious employment based on employment types and job benefits.

In addition, early studies have mainly used job inaccessibility in the labor market as a measure of spatial mismatch among disadvantaged populations (Kain, 1992). Most studies have been ambiguous as to whether individuals experience spatial mismatch in the labor market based on their skill levels. Although some studies have indicated that low-educated workers are more sensitive to job-housing mismatch (Hellerstein et al., 2008), limited attention has been paid to the potentially differentiated effects of spatial mismatch on low- and high-skilled labor markets and on groups with different education levels in each labor market.

There have been debates on spatial and skill mismatches (Houston, 2005). The skills mismatch hypothesis suggests that people are unemployed because their skills do not meet market demands (Thisse & Zenou, 2000). However, this skill mismatch theory does not explain the geographic distribution of unemployment among workers with similar levels or types of skills (Houston, 2005). In contrast, spatial mismatch theory does not pay enough attention to the differentiated effects of geographic barriers on workers with different skill levels. A recent study by Theys and colleagues suggested that although high-skilled workers experienced less spatial mismatch between 1980 and 2010, spatial mismatch actually increased for low-skilled workers (Theys et al., 2019). However, their study did not investigate the consequences of this deterioration in spatial mismatch for low-skilled workers. In contrast, by recognizing spatial mismatch as a characteristic of a specific labor market (high- or low-skilled labor market), we clearly show how workers are disadvantaged by spatial mismatch in their specific labor market.

This study contributes to the literature on the spatial mismatch hypothesis in two ways. First, focusing on precariousness, we examine the impact of spatial mismatch on employment disadvantages. Second, by differentiating between the spatial mismatch specific to low- and high-skilled labor markets, we investigate how geographic barriers work differently for workers with different education levels in each labor market.

2 Spatial Mismatch and Precarious Employment in Hong Kong

Hong Kong is a suitable case to investigate the link between spatial mismatch and precarious employment. Despite of its high population density and extraordinary transit system (Zhu et al., 2020), Hong Kong is still far from achieving a jobs-housing balance. According to Moovit, one of the leading consultant companies on mobility solutions, only 21.4 percent of Hong Kong workers are employed in their home districts, and people spend no less time commuting comparing with workers in other developed metropolitan cities. In Table 10, we contrast Hong Kong's public commuting patterns with that of Singapore, which is also a densely populated island. The average commuting time for people who take public transit in Hong Kong on weekdays is 45 min (comparing with 46 min in Singapore) among which 46% have to spend more than 2 h every day on public transportation. It is also suggested that the average commuting distance Hong Kong people ride in a single trip with public transit is 8.1 km while Singapore workers travel 6.3 km on average via public transit in a single trip to work (Moovit, 2021).

Hong Kong's spatial mismatch problem has its geographical and historical roots. Hong Kong's territory is composed of three regions: Kowloon, Hong Kong Island and the New Territories. As the city's development initially revolved around Victoria Harbor (between Hong Kong Island and Kowloon), Hong Kong exhibits a rather unbalanced development between regions, with most employment opportunities concentrated in central urban areas (Hong Kong Island and Kowloon) and a growing number of people residing in suburban areas (the New Territories) (Hui & Yu, 2013). In addition, since the early 1970s, the Hong Kong government has developed new towns (in suburban areas) to decentralize the population from overcrowded central urban areas. Public housing projects ushered in the development of new towns. Hong Kong's public housing-led new town development (Wang & Yeh, 1987) has accelerated the concentration of grassroots families in these new towns while failing to attract enough employment opportunities for residents of these areas (Hui et al., 2015; Sha et al., 2020). Statistics based on 2016 By Census suggest that there are more than 0.5 million Hong Kong workers traveling from homes in Kowloon and New Territories to work in Hong Kong Island while the number of workers taking a reverse commute (from homes in Hong Kong Island to work in Kowloon or New Territories) is only 0.1 million (Wong, 2021).

Therefore, the disparities of the geographic distributions of work and housing remain an important issue for Hong Kong workers. The investigation of effects of spatial mismatch, thus, would shed light on policymaking not only in Hong Kong, but also in other developed metropolitan cities worldwide.

Spatial mismatch has serious consequences for the disadvantaged in Hong Kong. For example, Hui and Yu (2013) suggest that residents of suburban areas in Hong Kong must travel longer distances to work, compared with residents of urban areas. A study of Public Rental Housing (PRH) and House Ownership Scheme (HOS) residents finds that PRH and HOS residents in new towns (in remote areas of the New Territories) face worse job-residence matching than private housing residents and public housing residents in urban areas (Hui et al., 2015). From a quality of life perspective, Wong (2011) shows that people living in remote areas of Hong Kong (specifically Tuen Mun, Yuen Long, Tin Shui Wai, Sheung Shui, Fan Ling and Tai Po) face serious geographic barriers to employment due to insufficient employment opportunities in their communities, high commuting costs to urban areas and limited information on employment provided in disadvantaged neighborhoods. Research in Tin Shui Wai (an archetypical improvised suburban district in Hong Kong)

has further suggested that spatial mismatch, in terms of commute times, costs and limited choices of transport modes, significantly hinders people's access to employment (Lau, 2010). Tao and colleagues also indicate that low-income minority groups are more likely to concentrate in peripheral areas with grave job inaccessibility, compared with other groups (Tao et al., 2020). In summary, previous research has shown that the mismatch between the concentration of population and the geographic distribution of employment opportunities has led to serious unemployment problems among different disadvantaged groups residing in remote areas of Hong Kong. However, the studies discussed above did not examine the association between job inaccessibility across areas and precarious employment.

As mentioned earlier, precarious employment has become the main employment risk in developed societies (Beck, 2000; Standing, 2011; Wong & Au-Yeung, 2019; Padrosa et al., 2020; Lozano & Rentería, 2019; Olsthoorn, 2013). Although Hong Kong's economy seems to have recovered from the 2008 Great Recession, with economic growth resuming and the unemployment rate falling, flexibility and uncertainty in employment have continued and normalized (Chan, 2016). A report by the Census and Statistics Department shows that the number of people working part-time in Hong Kong has increased significantly by 76.7% from 2007 to 2017, compared with an increase of 4.0% for full-time workers (Census & Statistics Department of Hong Kong SAR, 2018b). In addition, the younger generation is more exposed than ever to increased uncertainty and job insecurity under neoliberalism and globalization (Lam & Tang, 2020; Wong & Au-Yeung, 2019).

Despite the deepening of precarization among workers in developed societies, few studies have paid enough attention to the potential effects of spatial mismatch on precarious employment with the intensification of de-industrialization and neoliberalization. Jordan and colleagues have mapped the geographic distribution of housing and employment precariousness among immigrants in Hong Kong, suggesting that precarious residential areas dispersed outward from the central city core between 2001 and 2011 (Jordan et al., 2017). However, their study does not investigate the link between the supply of jobs in a district and precarious employment of an individual. Research on the relationship between spatial factors and precarious employment remains scarce.

Another research gap that needs to be filled involves the differentiated effects of spatial factors on low-skilled and high-skilled labor markets. As the process of de-industrialization deepens, the low-skilled labor market in Hong Kong has expanded rapidly with a significant increase in employment opportunities in service sector industries such as retail, accommodation and food services. Take the example of the food and beverage service industry: the number of people employed in this industry increased by 16.7% from 2009 to 2019 (Census & Statistics Department of Hong Kong SAR, 2020). However, as customers work and reside in urban centers, employment opportunities of the service sector have mostly been concentrated in central business districts (CBDs) as well. With relatively low wages and more opportunities to live in remote suburban areas, low-skilled workers are more likely to be forced either to travel further for work or to take less favorable jobs in their community. High-skilled workers, on the other hand, have more resources to relocate with their job opportunities thus would experience lower levels of spatial mismatch comparing with their low-skilled counterparts. Even when they do live far from better employment opportunities, they are also more resourceful to overcome the possible commuting burdens (both in terms of commuting time and costs) from spatial mismatch. Therefore, spatial mismatch in the low-skilled labor market is more likely to have deleterious effects on workers' employment status.

We follow previous studies and use workers' educational attainment as an indicator of their skill levels in the job market (Hellerstein et al., 2008). Individuals without a diploma

are classified as low-skilled workers, and those with a degree or sub-degree are classified as high-skilled workers. Sub-degree holders belong to both labor markets because of their intermediate position in the education–employment link in Hong Kong. Sub-degree education in Hong Kong is the result of higher education massification. On the one hand, as part of higher education, sub-degree education aims to help young people continue their education or train them for “employment in administrative and management positions at entry level,” according to the Committee on Self-financing Post-secondary Education of Hong Kong.¹ On the other hand, the astonishing expansion of sub-degree programs since the 2010s and their de facto inferior status in the qualifications system have weakened public confidence in the quality of self-financed sub-degree programs (Lee, 2015). Although sub-degree holders are considered to be trained with “technical skills” that are “transferable” to specific positions (Lam & Tang, 2020), they are still at a disadvantage compared with degree holders. Indeed, the median monthly income for sub-degree holders (in terms of main employment) was HK\$11,700 (approximately US\$1,508) lower than that of degree holders in 2016 (Census & Statistics Department of Hong Kong SAR, 2018a).

In light of the discussion above, we propose the following hypotheses:

Hypothesis 1 Living in areas with higher job inaccessibility is significantly associated with the possibility of falling into precarious employment for low-skilled workers.

Hypothesis 2 Living in areas with higher job inaccessibility is significantly associated with the possibility of falling into precarious employment for sub-degree holders, but not for degree holders.”

3 Data

This study uses data from two sources. First, we use data on working adults from the four waves of the Hong Kong Panel Study of Social Dynamics (HKPSSD) to investigate the relationship between spatial mismatch and precarious employment. The HKPSSD is a city-wide representative household panel survey that collects data at the household and individual levels to monitor social and economic changes in Hong Kong (Wu, 2016). So far, the HKPSSD has collected four waves of panel data in 2011, 2013, 2015 and 2017. Second, we use data from the 2011 Population Census and the 2016 Population By-census from the Census and Statistics Department of Hong Kong to compute the spatial mismatch indices of each of the 18 districts of Hong Kong in 2011 and 2016. The 2011 indices are used as a proxy for job inaccessibility in 2011 and 2013 (Wave 1 and Wave 2 of the HKPSSD survey) and the 2016 indices are used for 2015 and 2017 (Wave 3 and Wave 4 of the HKPSSD survey).

¹ For detail, please see <https://www.cspe.edu.hk/en/Overview-GovPolicy-Locally-SubDegree.html>.

4 Measures and Modeling Strategy

This study measures spatial mismatch as the rate of the working population residing in a district relative to the number of people working there, which is a proxy for residents-to-jobs ratio, thus indicating local inaccessibility to employment. In this way, our measure is basically the inverse of job density, which parallels studies using job density in the spatial mismatch literature (Hellerstein et al., 2008). This measure is appropriate for our objective, as Hong Kong's unemployment rate was relatively low during our study period (below 3.5% according to the Census and Statistic Department of Hong Kong SAR). In many studies on spatial mismatch, job inaccessibility has been measured using observed commuting patterns of employed workers (Houston, 2005; Ihlanfeldt & Sjoquist, 1990; Wang et al., 2011). Although commuting data have the advantage of being more fine-grained, they are not as widely available as job density data.

Moreover, although there are incidences of education–job mismatch, educational attainment is a major indicator of a worker's skill level. In this study, we use educational attainment as the main indicator to differentiate between low-skilled and high-skilled workers. Therefore, low-skilled (spatial) mismatch is measured as the rate of the working population without a diploma residing in an area relative to the number of people without a diploma who work there. High-skilled (spatial) mismatch is measured as the rate of the working population with a sub-degree or above residing in an area relative to the number of people with a sub-degree or above who work there. For comparison with earlier studies, we also construct a variable on general spatial mismatch, defining as rate of the working population residing in an area relative to the number of people who work there, regardless of education levels. Thus, a spatial mismatch value greater than one indicates an undersupply of jobs in a given area.

We construct another variable, employment precariousness, based on three pertinent variables in the HKPSSD, namely part-time employment, short-term employment and lack of employment benefits, which are the most visible elements of employment issues suffered by workers in Hong Kong. Part-time employment refers to working part-time, either short-term or long-term. Short-term employment refers to contracts with a specific end date within 2 years, with the possibility of renewal subject to mutual agreement between the employer and the employee. Lack of employment benefits is operationalized as having none of the following benefits: medical benefits, dental benefits, pension (excluding Mandatory Provident Fund²), children's education allowance and housing allowance. These three characteristics capture two of the five characteristics (i.e., more nonstandard work arrangements and lack of work benefits) identified by Kalleberg (2009) as precariousness. The employment precariousness variable, thus, is constructed with four indicators: each indicates the number of the three characteristics that the workers have (stable indicating workers who have none of the three characteristics, mild indicating those who have one of the three characters, medium indicating those who have two of the three characters, grave indicating those who have all the three characteristics). Table 1 shows that only 36.30% of the workers in the low-skilled labor market have engaged in stable employment compared with 61.19% in the high-skilled labor market.

Multi-levelled modeling is adopted to learn the effects of spatial mismatch on precarious employment.

² Mandatory Provident Fund (MPF) System is a mandatory, privately managed, fully funded contribution system for all regular employees in Hong Kong, thus, is not considered as pension benefit in this study. Detail on MPF system please see to https://www.mpfa.org.hk/eng/mpf_system/background/index.jsp.

Table 1 Descriptive Statistics of the Variables, HKPSSD 2011 to 2017 (Pooled Data)

	Percentage/Mean		
	All	Low-skilled	High-skilled
Precariousness			
Stable	42.14	36.30	61.19
Mild	37.15	39.85	27.99
Medium	10.32	11.62	6.32
Grave	10.39	12.23	4.50
Education (%)			
Lower Secondary or below	32.50	40.59	–
Upper Secondary	38.61	48.22	–
Tertiary (Non-degree)	8.96	11.19	30.99
Tertiary (Degree) or above	19.94	–	69.01
Age	41.50	42.99	35.33
Male (%)	54.50	55.08	51.77
Married (%)	58.82	62.81	41.48
Born in mainland China (%)	29.31	33.18	15.46
Housing (%)			
Own-private	29.90	25.26	42.03
Rent-public	36.67	41.28	22.04
Rent-private	10.56	9.95	11.59
Own-public	23.43	23.51	24.33
Observations (Person-year)	8776	7026	2536

5 Results

5.1 Spatial Mismatch in Each District

Tables 2 and 3 show the value and ranking of spatial mismatch in each district of Hong Kong. Figures 1 and 2 divide the severity of job inaccessibility for low- and high-skilled workers into four levels for each census year and represent the degree of spatial mismatch in Hong Kong. The spatial mismatch indices reveal that all workers (both low- and high-skilled workers) in the districts of the New Territories (suburban areas of Hong Kong such as Sha Tin, Yuen Long and Tuen Mun) experience higher levels of job inaccessibility, compared with workers living in urban centers (such as Wan Chai District, Central and Western District and Southern District). Consistent with previous studies, our findings suggest that employment opportunities are concentrated in urban centers, but limited in suburban areas (Hui & Yu, 2013). In addition, while the district rankings in 2016 and 2011 are similar, the absolute values of the spatial mismatch indices for most districts increase for low-skilled workers, indicating that spatial mismatch in Hong Kong deteriorated for low-skilled workers during the sampling period. In the case of high-skilled workers, there are more districts reporting spatial mismatch indices higher than one in 2016 compared to 2011. This indicates that the incidences of spatial mismatch for high-skilled workers are also becoming prevalent.

Low-skilled workers suffer from high levels of job inaccessibility in most districts of Hong Kong compared with their high-skilled counterparts. The absolute values of the spatial mismatch indices (14 indices being greater than one in 2011 and 15 in 2016, indicating

Table 2 Spatial Mismatch by District, 2011 Hong Kong Census

District	Low-skilled mismatch	Ranking	High-skilled mismatch	Ranking	General mismatch	Ranking
Sha Tin	4.083	1	2.335	1	1.60	3
Yuen Long	3.532	2	1.215	3	1.41	6
Tuen Mun	3.048	3	1.067	4	1.34	10
Sai Kung	2.898	4	1.657	2	1.85	1
Kwai Tsing	2.873	5	1.040	5	1.34	9
Kwun Tong	2.780	6	0.993	6	1.25	12
North	1.918	7	0.683	12	1.41	7
Tai Po	1.905	8	0.844	10	1.51	4
Wong Tai Sin	1.827	9	0.640	14	1.18	13
Tsuen Wan	1.622	10	0.979	7	1.44	5
Kowloon City	1.417	11	0.913	8	1.25	11
Sham Shui Po	1.413	12	0.661	13	1.13	14
Yau Tsim Mong	1.302	13	0.846	9	1.38	8
Eastern	1.219	14	0.786	11	0.86	17
Islands	0.951	15	0.504	15	1.76	2
Southern	0.656	16	0.368	17	1.00	15
Central and Western	0.388	17	0.390	16	0.83	18
Wan Chai	0.255	18	0.275	18	0.93	16

Table 3 Spatial Mismatch by District, 2016 Hong Kong By Census

District	Low-skilled mismatch	Ranking	High-skilled mismatch	Ranking	General mismatch	Ranking
Sha Tin	4.334	1	2.355	1	1.71	3
Yuen Long	3.957	2	1.472	3	1.53	5
Kwun Tong	3.167	3	1.198	4	1.35	11
Kwai Tsing	3.150	4	1.137	6	1.46	9
Tuen Mun	3.150	5	1.196	5	1.44	10
Sai Kung	3.138	6	1.802	2	1.99	1
Wong Tai Sin	2.053	7	0.781	12	1.25	13
North	2.043	8	0.775	13	1.48	8
Tai Po	1.963	9	0.899	10	1.60	4
Tsuen Wan	1.864	10	1.027	7	1.52	6
Sham Shui Po	1.705	11	0.796	11	1.23	14
Kowloon City	1.704	12	1.006	8	1.33	12
Yau Tsim Mong	1.648	13	0.934	9	1.49	7
Eastern	1.270	14	0.765	14	0.94	17
Islands	1.066	15	0.557	15	1.85	2
Southern	0.691	16	0.358	17	1.10	15
Central and Western	0.430	17	0.365	16	0.89	18
Wan Chai	0.355	18	0.299	18	0.99	16

Panel A: Low-skilled job inaccessibility by district, 2011

Panel B: High-skilled job inaccessibility by district, 2011

Fig. 1 Job inaccessibility by District, 2011

Panel A: Low-skilled job inaccessibility by district, 2016

Panel B: High-skilled job inaccessibility by district, 2016

Fig. 2 Job inaccessibility by District, 2016

Table 4 The effect of low-skilled mismatch on precariousness, HKPSSD 2011–2017 (Multilevel Models with Panel Data)

	(1)	(2)	(3)	(4)
Low-skilled mismatch		0.06** (0.02)	0.05 (0.03)	0.07* (0.03)
General mismatch	0.19** (0.07)	0.03 (0.07)	0.07 (0.11)	−0.01 (0.13)
Education (ref. lower secondary or below)				
Upper secondary			−0.48*** (0.03)	−0.58*** (0.13)
Sub-degree			−0.59*** (0.04)	−0.54** (0.19)
Low-skilled mismatch*Education				
Mismatch*secondary				−0.07* (0.03)
Mismatch*sub-degree				0.02 (0.05)
General mismatch*Education				
Mismatch*secondary				0.20 (0.12)
Mismatch*sub-degree				−0.07 (0.18)
Age			−0.01*** (0.00)	−0.01*** (0.00)
Male			−0.20*** (0.02)	−0.20*** (0.02)
Married			−0.06* (0.03)	−0.06* (0.03)
Born in mainland China			0.29*** (0.03)	0.29*** (0.03)
Housing (ref. own-private)				
Rent-public			0.16*** (0.03)	0.16*** (0.03)
Rent-private			−0.09* (0.04)	−0.09* (0.04)
Own-public			0.01 (0.04)	0.01 (0.03)
Constant	0.73*** (0.09)	0.84*** (0.08)	1.38*** (0.13)	1.42*** (0.15)
Observations	7,026	7,026	7,026	7,026
Number of districts	18	18	18	18

Standard errors in brackets

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$

Table 5 The effect of high-skilled mismatch on precariousness, HKPSSD 2011 to 2017 (Multilevel Models with Panel Data)

	(1)	(2)	(3)	(4)
High-skilled mismatch		0.02 (0.07)	0.03 (0.06)	−0.06 (0.07)
General mismatch	0.09 (0.09)	0.06 (0.13)	−0.07 (0.10)	−0.01 (0.12)
Education (ref. degree)				
Sub-degree			0.54*** (0.09)	0.65 (0.46)
High-skilled mismatch*Education				0.25* (0.10)
General mismatch*Education				−0.15 (0.17)
Age			−0.01*** (0.00)	−0.01*** (0.00)
Male			−0.06* (0.03)	−0.07* (0.03)
Married			−0.09* (0.04)	−0.08* (0.04)
Born in mainland China			0.20*** (0.04)	0.20*** (0.04)
Housing (ref. own-private)				
Rent-public			0.07 (0.05)	0.06 (0.05)
Rent-private			−0.08 (0.05)	−0.08 (0.05)
Own-public			0.07 (0.04)	0.06 (0.04)
Constant	0.43*** (0.12)	0.45*** (0.13)	0.82*** (0.12)	0.84*** (0.14)
Observations	2,536	2,536	2,536	2,536
Number of districts	18	18	18	18

Standard errors in brackets

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$

an undersupply of jobs) for low-skilled workers in all districts are significantly higher than those of high-skilled workers (with only 5 of the spatial mismatch indices in 2011 and 8 in 2016 being greater than the value of one). Among the various districts, those in the New Territories are at the top of the list for low-skilled mismatch, those in Hong Kong Island are the most abundant in terms of low-skilled jobs relative to the number of relevant workers residing there, and those in the Kowloon area fall in between. The district rankings are similar for the high-skilled mismatch index, with the exceptions of North District and Tai Po in the New Territories (Tai Po is where the Hong Kong Science and Technology Parks Corporation is located and offers a relatively high number of high-skilled jobs).

For reference, in each table we include a column for general job inaccessibility, showing that the district rankings for this index in the two census years are very different from those for the high-skilled mismatch index and the low-skilled mismatch index.

5.2 The Effects of Spatial Mismatch on Precariousness

Table 4 shows the effects of spatial mismatch in the low-skilled labor market on precarious employment. Model 1 shows that with no control variables, general job inaccessibility has a significant and negative effect on precarious employment. When low-skilled job inaccessibility is added, as in model 2, the significant effect of general spatial mismatch disappears, and it is revealed that low-skilled job inaccessibility matters. Low-skilled workers living in a district with a higher spatial mismatch index are more prone to precarious employment, but its significance vanishes after taking into account a set of socioeconomic controls. However, as model 4 reveals, the effect of job inaccessibility different education groups in the low-skilled labor market is uneven. Though spatial mismatch has no significant effect on those with upper secondary education, it has an equally strong and significant effect on both workers with a lower secondary education or below and sub-degree holders, lending partial support to Hypothesis 1.

Table 5 shows the effects of spatial mismatch in the high-skilled labor market on precarious employment. Without controlling for other variables, neither general nor high-skilled job inaccessibility has a significant effect on precarious employment among high-skilled workers (models 1 and 2). This fact remains after taking into account the controls, as shown in model 3. However, with the interaction of education and spatial mismatch, model 4 shows that high-skilled mismatch has a significant effect on sub-degree holders but not on degree holders, supporting Hypothesis 2.

Taken together, our findings suggest that sub-degree holders are the most affected by spatial mismatch in both low- and high-skilled labor markets: they are more vulnerable to low-skilled spatial mismatch than workers with upper secondary education and more vulnerable to high-skilled spatial mismatch than degree holders.

6 Concluding Remarks and Policy Implications

Our study examines the effects of spatial mismatch on precarious employment in Hong Kong. This study contributes to the literature on spatial mismatch in several ways. First, it calls for a more nuanced analysis of the differentiated effects of spatial mismatch in low- and high-skilled labor markets. As the values of the mismatch indices suggest, the rankings for general spatial mismatch differ significantly from those for low-skilled and high-skilled mismatch. Furthermore, when taking into account low-skilled mismatch, the significant effect of general spatial mismatch on precarious employment among low-skilled workers disappears. These findings indicate that it is the specific spatial mismatch of each market in terms of skill levels that matters. In comparison with workers in the low-skilled labor market, those in the high-skilled labor market are less susceptible to spatial mismatch.

Second, this study highlights the effects of spatial mismatch on precarious employment, in addition to unemployment. Our findings suggest that spatial mismatch increases the risk of precarious employment for disadvantaged workers, specifically low-skilled workers. Low-skilled workers living in districts with a higher density of low-skilled residents and fewer low-skilled employment opportunities are more likely to engage in precarious employment.

In contrast, among high-skilled workers, only sub-degree holders are significantly impacted by the effect of spatial mismatch. Our findings suggest that geographic barriers not only hinder people's access to employment opportunities, as suggested by previous research, but also force people to take precarious jobs that are insecure and offer little protection.

There are also limitations in this study. Firstly, while the district division based on district council district adopted in this study seems to be a reasonable choice of geographic unit of aggregation since district council district could be counted as basic units where Hong Kong residents organize their political and public life, it may not sufficiently capture the nuances of the geographic dynamic of job selections. For instance, how does the abundance of jobs available in adjacent districts may affect the relationship considered here? Alternatively, one may use district council constituent districts as the analysis unit to explore the extent to which job availability in a smaller area would exert a similar influence on job precarity. These are promising avenues for future studies. Secondly, there is the possible impact of the nonrandom spatial distribution of low-skilled and high-skilled workers due to self-selection. In Hong Kong, the public housing system exerts a strong impact on many families' choice of residence. The locations of the public housing estates are determined by the government and the allocations are randomized by computer. With nearly half of the population (46.8% in 2016 By Census) living in public housing (including public rental housing and subsidized home ownership housing), the self-selection problem can be partially alleviated. Further to that, the ongoing Covid-19 pandemic has, to a great extent, changed ways people work and ways people get to work. The effects of spatial mismatch on employment, thus, might have also undergone serious change. Therefore, future studies could pay more attention to the current influence of pandemic and its possible prolonged influences on people's mobility and employment.

Adding to the problem, as indicated by our findings, the situation of spatial mismatch in Hong Kong deteriorated between 2011 and 2016, especially for the low-skilled labor market. Although spatial mismatch theorists in the West have argued that the processes of de-industrialization and suburbanization have moved employment opportunities to the suburbs while leaving most of the disadvantaged population in urban centers (Houston, 2005; Kain, 1992), the development of new towns in Hong Kong has displaced large numbers of low-income families to the suburbs while leaving most employment opportunities in urban centers. This concentration of public housing in suburban areas is intensifying, as many new public rental housing projects continue to be developed in the New Territories (Housing Authority, 2020). Although Hong Kong is a small transit-oriented city, multiple studies have indicated that residents of suburban areas, especially PRH residents, face serious geographic barriers to employment (Hui & Yu, 2013; Lau, 2010; Lui & Suen, 2011; Wong, 2011). The significant impact of spatial mismatch on Hong Kong workers' precarious employment calls for policymakers in metropolitan cities to pay more attention to geographic inequalities.

Existing transportation allowance policies in Hong Kong (from TSS to I-WITSS) may have alleviated some financial burdens on low-income workers (Sha et al., 2020). However, these policies have not changed the geographic mismatch of population and jobs. Among the seven mechanisms of spatial mismatch presented earlier (Gobillon et al., 2007), transport allowances only concern one of them. Ihlanfeldt and Sjoquist (1998) grouped policies addressing spatial mismatch into three categories: "moving jobs closer to the workers (inner-city development strategy), moving people closer to the jobs (desegregation strategy), and making it easier for workers to get to existing jobs (mobility strategy)" (pp. 882–883). Scholars have called for a more balanced jobs–housing ratio to shorten people's commute times and promote more active modes of transportation (Badland et al., 2017). To move jobs closer to workers or move people closer to jobs, public housing development projects will have to take into account the geographic matching of jobs and workers instead of only considering the cost of development.

Appendix

See Tables 6, 7, 8, 9, 10 and Fig. 3.

Table 6 Directionality of commuting flows of low-skilled workers in 2016, 2016 Hong Kong By Census

Work district (%)	Residential district														
	CW	WC	EA	SO	SS	KC	WT	KU	YT	KI	TW	TM	YL	NO	TP
CW	49.37	19.39	15.29	19.09	7.78	7.98	6.65	7.55	10.56	6.42	7.31	5.09	5.49	3.34	4.36
WC	11.5	34.72	15.93	15.14	6.93	7.17	6.72	8.35	7.24	5.3	5.08	3.75	3.72	3.71	4.36
EA	7.03	10.83	33.92	6.94	3.2	3.6	3.94	6.47	2.8	1.96	2.23	1.96	1.56	1.63	2.56
SO	4.28	2.71	3.85	34.6	1.17	1.52	1.06	1.58	1.74	0.91	0.99	0.66	0.86	0.37	0.51
SS	2.18	2.11	2.13	1.8	25	5.06	5.6	4.88	5.53	8.46	6.93	5.47	4.6	3.47	3.8
KC	1.6	2	1.93	1.86	4.89	24.65	8.51	6.22	5.21	3.05	2.96	2.07	2.58	3.19	3.75
WT	0.69	1.14	0.83	0.39	2.01	3.21	14.63	3.8	1.35	1.32	1.4	1.07	0.88	0.92	1.54
KU	4.24	6.93	7.66	3.92	7.14	10.09	14.56	29.01	6.03	5.49	5.1	4.55	4.68	6.09	7.99
YT	6.5	7.69	6.5	6.15	18.47	17.78	16.58	13.43	41.05	11.93	10.06	8.42	8.71	10.35	10.24
KI	2.03	2.28	2.3	1.47	6.87	3.6	4.5	3.11	4.06	27.72	14.19	7.66	6.05	3.43	3.51
TW	4.28	3.41	3.98	3.33	6.33	5.57	4.66	4.03	5.87	14.15	31	9.76	9.51	5.82	6.48
TM	0.99	1.19	0.6	0.56	0.78	0.62	0.85	0.48	1.02	1.29	1.65	31.47	10.32	1.71	0.83
YL	0.88	1.03	0.57	0.37	1.27	0.8	0.76	0.73	0.77	1.29	1.62	9.01	30.08	4.18	1.63
NO	0.46	0.43	0.29	0.2	0.53	0.82	0.61	0.55	0.5	0.35	0.72	1.67	2.78	28.95	4.31
TP	0.46	0.76	0.39	0.23	0.87	1.36	1.12	0.95	0.56	0.85	1.15	0.88	1.48	8.99	30.15
ST	1.15	0.76	1.23	1.52	2.56	2.55	3.77	2.53	2.19	2.85	3.05	1.8	2.17	10.64	10.24
SK	0.57	1.08	1.39	0.73	1.29	1.62	2.94	4.19	0.95	1.17	1.04	0.39	0.41	0.79	1.27
IS	1.8	1.52	1.23	1.69	2.92	2.01	2.56	2.14	2.57	5.49	3.52	4.32	4.12	2.42	2.46
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

CW Central & West, WC Wan Chai, EA Eastern, SO Southern, SS Sham Shui Po, KC Kowloon City, WT Wong Tai Sin, KU Kwan Tong, YT Yau Tsim Mong, KI Kwai Tsing, TW Tsuen Wan, TM Tuen Mun, YL Yuen Long, NO North, TP Taipo, ST Sha Tin, SK Sai Kung, IS Islands

Table 7 Directionality of commuting flows of high-skilled workers in 2016, 2016 Hong Kong By Census

Work district (%)	Residential district																	
	CW	WC	EA	SO	SS	KC	WT	KU	YT	KI	TW	TM	YL	NO	TP	ST	SK	IS
CW	44.12	29.77	21.76	26.78	15.14	15.81	9.82	12.52	19.16	11.56	12.95	9.56	10.35	7.92	9.14	9.79	13.19	19.29
WC	12.69	24.19	16.32	15.27	10.56	9.78	9.53	10.22	9.61	8.42	7.54	7.86	6.98	6.16	7.57	8.4	10.86	8.68
EA	9.8	12.42	21.34	10.93	6.64	7.14	7	10.48	5.55	5.14	5.29	3.96	4	4.54	4.01	5.86	12.23	5.73
SO	4.45	3.31	3.45	14.28	1.71	1.9	1.75	1.61	2.14	1.58	1.65	1.2	1.51	1.07	1.03	1.44	1.84	2.4
SS	2.24	1.83	2.55	2.32	11.31	4.56	6.39	4.51	4.67	7.41	6.4	6.21	4.91	4.03	4.92	5.34	4.41	3.72
KC	1.99	2.7	2.8	3.15	4.79	11.21	7.49	5.02	4.97	4.18	4.69	2.73	3.48	4.82	4.46	5.55	4.56	2.4
WT	0.32	0.7	0.83	0.5	2.15	2.17	7	2.54	1.07	1.5	1.58	1.57	1.29	1.39	1.82	2.65	2.46	1.01
KU	4.17	7.59	9.81	6.66	9.43	10.94	15.05	21.8	8.61	8.59	7.88	7.32	6.76	10.93	10.17	10.88	17.28	4.96
YT	8.39	7.24	7.96	7.78	13.79	15.27	12.55	10.59	22.83	11.84	10.67	9.85	10.74	10.28	11.12	11.62	10.13	9.14
KI	2.08	1.83	2.32	2.48	6.49	4.24	4.44	3.23	4.39	15.29	10.2	7.14	5.85	3.75	4.67	4.43	2.91	4.26
TW	3.94	4.1	4	3.19	5.51	4.73	4.96	3.83	6.23	8.85	15.14	8.74	8.41	6.02	7.52	5.52	3.88	6.58
TM	0.51	0.31	0.39	0.46	1.83	0.89	0.88	0.73	1.31	1.75	2.94	17.48	7.89	2.41	0.79	0.95	0.3	0.77
YL	0.22	0.13	0.26	0.46	1.29	0.99	0.78	0.84	1.01	1.41	1.74	5.81	15.53	2.22	1.98	0.78	0.39	0.23
NO	0.1	0.31	0.25	0.12	0.63	0.57	0.65	0.51	0.37	0.34	0.79	1.82	2.28	14.73	3.8	1.91	0.64	0.39
TP	0.8	0.7	0.88	0.66	1.94	1.85	1.46	1.61	1.34	1.13	1.74	1.11	2.37	5.88	13.39	4.21	1.67	1.16
ST	1.41	1.18	1.5	2.48	3.11	4.21	4.6	3.69	3.23	3.76	4.02	2.79	3.26	10.1	10.05	16.09	3.23	1.63
SK	0.64	0.78	1.94	0.83	1.59	1.72	3.18	4.05	1.13	1.47	1.3	0.63	0.79	1.16	1.61	1.75	8.72	0.7
IS	2.11	0.92	1.64	1.66	2.09	2.04	2.46	2.21	2.38	5.77	3.48	4.24	3.6	2.59	1.94	2.83	1.29	26.96
Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

CW Central & West, WC Wan Chai, EA Eastern, SO Southern, SS Sham Shui Po, KC Kowloon City, WT Wong Tai Sin, KU Kwan Tong, YT Yau Tsim Mong, KI Kwai Tsing, TW Tsuen Wan, TM Tuen Mun, YL Yuen Long, NO North, TP Tai Po, ST Sha Tin, SK Sai Kung, IS Islands

Table 8 The effect of low-skilled mismatch on precariousness, HKPSSD 2011–2017 (Multilevel Models with Panel Data, with additional controls)

	(1)	(2) + Breadwinner	(3)	(4) + Length
Low-skilled mismatch	0.09* (0.03)	0.08* (0.03)	0.06 + (0.03)	0.05 (0.03)
General mismatch	0.01 (0.13)	−0.01 (0.12)	−0.04 (0.13)	−0.00 (0.12)
Education (ref. lower secondary or below)				
Upper secondary	−0.54*** (0.14)	−0.53*** (0.13)	−0.55*** (0.14)	−0.47*** (0.14)
Sub-degree	−0.40 + (0.20)	−0.35 + (0.20)	−0.66** (0.20)	−0.60** (0.20)
Low-skilled mismatch*Education				
Mismatch*secondary	−0.08** (0.03)	−0.08** (0.03)	−0.05 (0.03)	−0.04 (0.03)
Mismatch*sub-degree	0.02 (0.05)	0.04 (0.05)	0.02 (0.05)	0.02 (0.05)
General mismatch*Education				
Mismatch*secondary	0.20 (0.13)	0.18 (0.12)	0.13 (0.13)	0.08 (0.13)
Mismatch*sub-degree	−0.19 (0.19)	−0.24 (0.19)	−0.03 (0.19)	−0.05 (0.19)
Age	−0.01*** (0.00)	−0.01*** (0.00)	−0.01*** (0.00)	0.01*** (0.00)
Male	−0.20*** (0.02)	−0.10*** (0.02)	−0.21*** (0.02)	−0.16*** (0.02)
Married	−0.05 + (0.03)	0.02 (0.03)	−0.08** (0.03)	−0.09** (0.03)
Born in mainland China	0.29*** (0.03)	0.31*** (0.03)	0.28*** (0.03)	−0.07 (0.05)
Housing (ref. own-private)				
Rent-public	0.15*** (0.03)	0.19*** (0.03)	0.17*** (0.03)	0.15*** (0.03)
Rent-private	−0.11* (0.04)	−0.13** (0.04)	−0.06 (0.05)	−0.09 + (0.05)
Own-public	0.01 (0.04)	0.01 (0.04)	0.03 (0.04)	0.03 (0.04)
Breadwinner ratio		−0.17*** (0.01)		
Length of staying				−0.02*** (0.00)
Constant	1.38*** (0.16)	1.67*** (0.15)	1.58*** (0.15)	1.58*** (0.15)
Observations	6,393	6,393	6,171	6,171
Number of districts	18	18	18	18

Standard errors in brackets

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$

Table 9 The effect of high-skilled mismatch on precariousness, HKPSSD 2011–2017 (Multilevel Models with Panel Data, with additional controls)

	(1)	(2) + Breadwinner	(3)	(4) + Length
High-skilled mismatch	-0.09 (0.07)	-0.10 (0.07)	-0.05 (0.07)	-0.05 (0.07)
General mismatch	0.03 (0.12)	0.04 (0.12)	-0.05 (0.13)	-0.05 (0.13)
Education (ref. degree)				
Sub-degree	0.31 + (0.18)	0.32 + (0.18)	0.12 (0.19)	0.10 (0.19)
High-skilled mismatch*Education	0.34** (0.11)	0.35*** (0.10)	0.25* (0.10)	0.25* (0.10)
General mismatch*Education	-0.33 + (0.18)	-0.37* (0.18)	-0.12 (0.18)	-0.11 (0.18)
Age	-0.01*** (0.00)	-0.01*** (0.00)	-0.01*** (0.00)	0.00 (0.00)
Male	-0.09* (0.03)	-0.06 + (0.03)	-0.06 + (0.03)	-0.06 + (0.03)
Married	-0.07 + (0.04)	-0.03 (0.04)	-0.07 + (0.04)	-0.08* (0.04)
Born in mainland China	0.20*** (0.05)	0.19*** (0.05)	0.19*** (0.05)	-0.00 (0.07)
Housing (ref.own-private)				
Rent-public	0.07 (0.05)	0.14** (0.05)	0.05 (0.05)	0.05 (0.05)
Rent-private	-0.09 + (0.05)	-0.14* (0.05)	-0.08 (0.06)	-0.09 (0.06)
Own-public	0.07 (0.04)	0.09* (0.04)	0.04 (0.04)	0.04 (0.04)
Breadwinner ratio		-0.14*** (0.02)		
Length of staying				-0.01*** (0.00)
Constant	0.84*** (0.14)	1.01*** (0.14)	0.94*** (0.14)	0.97*** (0.14)
Observations	2,304	2,304	2,307	2,307
Number of districts	18	18	18	18

Standard errors in brackets

*** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, + $p < 0.1$ **Table 10** Key statistics on public commuting patterns in Hong Kong and Singapore

	Hong Kong	Singapore
Average commuting time on weekday (min)	45	46
Average commuting distance (km)	8.1	6.3
Percentage of people who travel more than 2 h every day (%)	46	47
Percentage of people who travel more than 12 km in a single trip (%)	45	32
Percentage of people who transfer at least once during a single trip (%)	39	27

Data source: Moovit insights: Hong Kong public transit statistics. Retrieved from https://moovitapp.com/insights/en/Moovit_Insights_Public_Transit_Index_China_Hong_Kong-2741. Accessed on September 2, 2021

Fig. 3 Commuting flow in Hong Kong. *Notes:* Workers with no fixed places of work or work in Mainland/ at home/in places outside Hong Kong are excluded. Adopted from: Wong (2021). *The great migration of workers: Where do workers working in your district live, and where do the workers living in your district work.* Retrieved from: <https://kenneth-12.shinyapps.io/place-of-work-od/>. Accessed on September 2, 2021

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