

## **Public Housing and Unemployment in Postindustrial Hong Kong**

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## **Abstract**

The impact of living in public rental housing on employment has been the subject of substantial debate internationally. Restrictions on residential mobility, neighborhood effects, and the place-based housing subsidy itself are theorized to contribute to unemployment. However, recent evidence from Europe show that when the endogeneity of housing tenure and employment is modeled properly, the effect of living in public housing on employment is not significant. This paper examines the employment impacts of Hong Kong's public rental housing system, one of the largest in the world. Hypothesis tests using simultaneous probit models show that unlike Europe, being a public housing tenant does increase the probability of unemployment. Access to employment also significantly impacts employment outcomes of public housing tenants, illustrating a major challenge of a maintaining a successful supply-side housing subsidy system when a city's economic geography changes.

Keywords: Housing, Public Policy, Regulatory Regimes

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# **Public Housing and Unemployment in Postindustrial Hong Kong**

## **Introduction**

Hong Kong is renowned for its adherence to free market principles, and as such has a limited social safety net (Lee, 2000). Yet, one outstanding contradiction in the city is the importance of publicly provided housing. Roughly half of Hong Kong lives in public rental or subsidized ownership housing. This public housing system has often served as evidence for the positive potential of public rental housing. In contrast to the United States or parts in Europe, where public rental housing is connected to concentrated poverty, social stigmatization, and other social problems (Blanc, 1993; Massey and Kanaiaupuni, 1993; Schill, 1993), the Hong Kong system is generally seen as providing a decent standard of living for the lower-income residents of a city with high housing costs (Lee and Yip, 2006).

In recent years, however, unemployment has grown among public housing tenants and other social issues have appeared, most notably in estates located far from the center of the city. The most emblematic of these estates, Tin Shui Wai, became known popularly as the “city of sadness” due to a series of cases of violent crime, suicide and child abuse (Lau, 2010). This paper focuses on understanding the causes of unemployment among public housing tenants and seeks to answer two questions. First, to what extent can the observed difference in unemployment between residents of public rental housing and other types of housing in Hong Kong be attributed to their housing tenure? Secondly, is there a connection between unemployment and residential location among tenants of public rental housing, that is, do they suffer from spatial mismatch?

The first question is answered with a simultaneous probit model that accounts for the endogeneity of public housing tenancy and employment outcomes. The number, age and gender composition of children are used as instruments. The second hypothesis is tested with a probit that includes district-level data on location. By limiting the sample to residents of public housing, who do not freely choose the location of their housing, the importance of spatial mismatch can be observed.

The paper is organized as follows. The next section is a review of international literature on the connections between public housing and employment. Then, data on employment outcomes and public housing are presented for different housing tenures and residential locations in Hong Kong are presented. The fourth section describes the empirical estimation strategy and results. The paper concludes with policy implications for Hong Kong and China.

## **Research on Public Housing and Employment**

There are three ways in which housing and housing subsidies have been theorized to effect employment outcomes. First, reserve wages of public housing tenants might be higher than those of households without subsidized housing, enabling them to spend a longer time looking for the right job and making them more willing to leave a job with which they are unsatisfied. Secondly,

restrictions to residential mobility are posited to negatively impact labor market outcomes through reductions in the efficiency of the job search and increases in transportation costs, and public housing tenants have been shown to move less frequently than those in private housing and to move a greater distance when they do move (Lui and Suen, 2010).

Thirdly, certain residential environments can create a disadvantage for job seekers. There are two different reasons for this; a large distance to jobs, or spatial mismatch, or the effects of living in a neighborhood with a concentration of poverty or unemployed individuals. Living in a neighborhood with a concentration of poverty and unemployment is argued to reduce employment prospects as it limits informal networks for job seekers and possibly leads to a stigma when searching for work.

All of these mechanisms of disadvantage can be exacerbated for residents of public rental housing, as their ability to move is generally restricted, public rental housing estates tend to be badly located vis-à-vis employment, and frequently there is a concentration of low-income households in public housing. Additionally, due to the large subsidy obtained through lowered rent, there is the potential for residents of public housing to have less incentive to work. In the United States, it was these connections that in part led to the Moving to Opportunities program, which facilitated recipients of subsidies for housing to move into neighborhoods with lower rates of unemployment (Feins and Shroder, 2005).

Research on residential mobility and employment tends to focus on market level characteristics. It began with empirical observation that regions with higher homeownership rates or more strictly regulated rental markets had higher rates of unemployment *ceteris paribus* (Oswald, 1996) More recent theoretical work has formally modeled the seeming paradox between the above findings and the observation that at a household level, renters are more mobile and more likely than homeowners to be unemployed, by how expected wages after a move and foregone wages due to unemployment affect households of different skill levels (Dohmen, 2005; Wasmer and Zenou, 2006). Hong Kong is an ideal case for a within-market analysis of residential mobility as migration into and out of the city is quite costly, especially for low-skilled workers.

The second area of research posits a reduction in employment opportunities in certain neighborhoods for certain groups. The spatial mismatch hypothesis was first proposed by Kain (1968) to explain the employment disadvantages of inner-city African-American youth as jobs suburbanized. Since then, however, the phenomenon has been observed to exist in many countries where restricted housing choice affects behavior (Fieldhouse, 1999; Fieldhouse, and Tranmer, 2001; Suárez-Lastra and Delgado-Campos, 2007; Dujardin, Selod, and Thomas, 2008). In most other places, however, such as Paris or Mexico City, spatial mismatch is found in an inverted pattern from that of the United States, with low-skilled individuals living in suburban areas distant from centrally located jobs (Dujardin, Selod, and Thomas, 2008; Suárez-Lastra and Delgado-Campos, 2007) . This is the shape of spatial mismatch found in Hong Kong (Lau 2010) and as in some European cities public housing is one reason low-skilled workers live in these outlying parts of the city.

Though the mechanisms of spatial mismatch are varied, the central issue is that when jobs are farther away, commuting becomes increasingly costly, less information is available to job

seekers, and the efficiency of the job search can drop considerably (Ihlandfeldt, 1997). Yet the impact of residential location must be considered along with other neighborhood effects, i.e. other characteristics of residential location that can affect employment, such as discrimination on the part of employers against residents of certain neighborhoods or limitations in learning of job opportunities through social networks (Granovetter 1995; Gobillon, Selod, and Zenou, 2007).

In spite of solid theoretical foundations, empirical work on spatial mismatch faces a central challenge—separating a “skills mismatch” component from spatial location. In most cities, due to the nature of land markets, low-skilled or otherwise less employable people are more likely to live in areas with less access to employment (Houston, 2005). Thus, assessment of spatial mismatch is complicated by a need to control for the endogeneity of employability and residential location, as well as neighborhood effects separately from job accessibility. The spatial mismatch hypothesis has been tested with a variety of empirical approaches (Fieldhouse 1999; Fieldhouse and Tranmer 2001; Dujardin, Selod, and Thomas, 2008).

Housing tenure is often used as an analytical tool because it influences the cost of moving as well as the choice of residential location (Battu, Ma, and Phimister 2008; Dujardin and Goffette-Nagot 2009). The approach in this paper is simply to isolate the analysis to residents of public housing because new entrants into the public housing system do not have a choice in the location of their new home. Moreover, they often have to move greater distances to access public housing and once allocated a housing unit, are less likely to move again (Lui and Suen, 2010).

Early empirical work estimating the causal connection between living in public rental housing and unemployment (Hughes and McCormick, 1981; Hughes and McCormick, 1987) has recently been challenged. Studies from the Australia, the United Kingdom, and France on the connection between public housing and employment have all found that when properly accounting for the endogeneity of housing tenure, the apparent effects of living in public rental housing are no longer significant (Flatau et al., 2003; Battu, Ma, and Phimister, 2008; Dujardin and Goffette-Nagot, 2009). In the United States, though no work on unemployment has been carried out in this framework, other previously accepted effects of public housing, such as negative outcomes for children, have also been shown not to hold when properly modeled (Currie and Yelowitz, 2000).

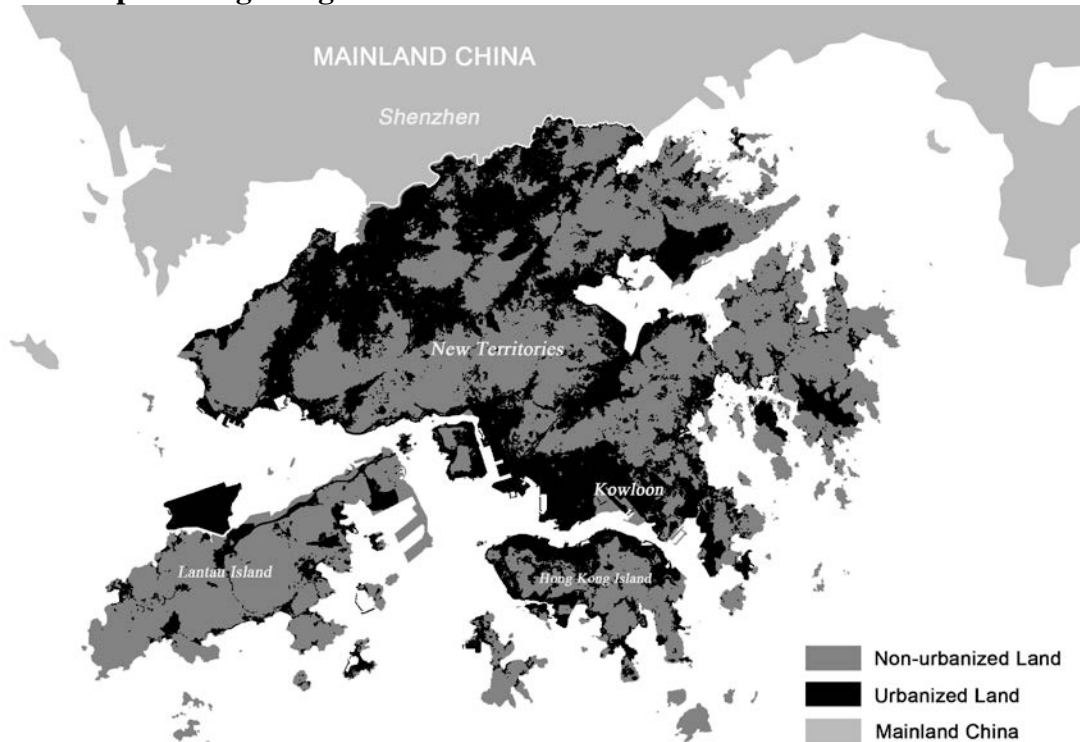
### **Public Housing, Economic Changes, and Employment in Hong Kong**

Hong Kong’s public housing system began in the early 1950s as squatter resettlement, though it has been argued that its true purpose was to subsidize the British colony’s industrial development by providing worker housing (Castells, Goh, and Kwok, 1990; Smart, 2006). The Hong Kong government began building public housing estates to develop areas at the urban edge in a new town model as early as the 1960s. New towns were conceived as self-sufficient sub-centers that would contain both housing and jobs, principally in manufacturing (Wang and Yeh, 1987).

The new town model of housing development continued into the end of the 20<sup>th</sup> century and the city’s population decentralized into outlying areas of the territory (Loo and Chow, 2011), in spite of changes in the city’s economic structure during the 1980s and 1990s. Over half of the city’s population lived in the Kowloon region in 1981 and less than a quarter lived in the New

Territories. By 2001, these proportions had almost flipped with half of the population living in the New Territories and 30 percent living in Kowloon. The share of the population living on Hong Kong Island decreased only slightly during this time period.

**Figure 1: Map of Hong Kong Land and Urbanized Area in 2007**



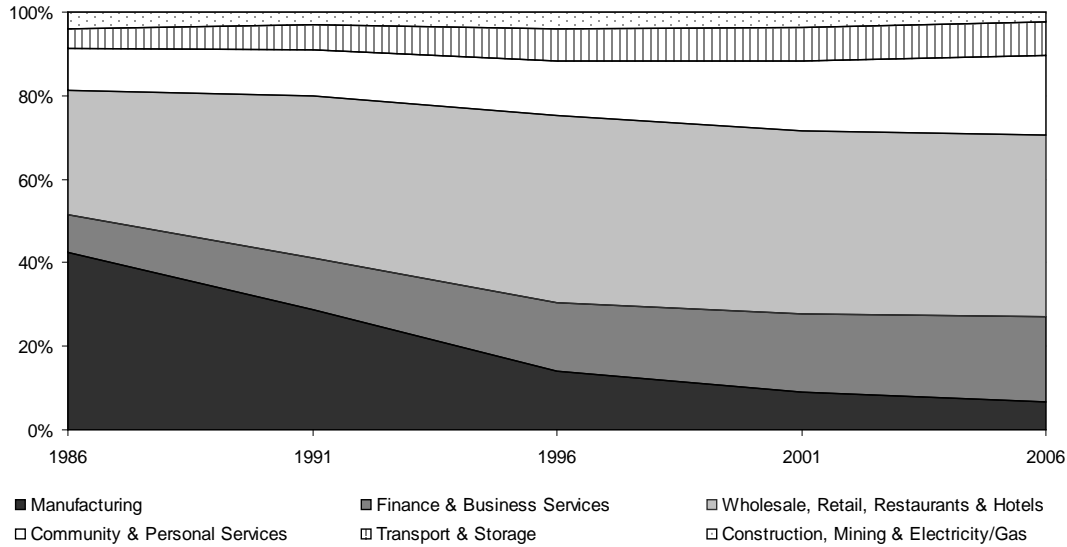
Source: Hong Kong Planning Department, 2007.

Figure 1 is a map of Hong Kong that gives a picture of the city's complicated physical geography and identifies the three major regions of the city; Hong Kong Island, the Kowloon peninsula, and the New Territories. The central urban area includes the northern shore of Hong Kong Island and the Kowloon peninsula, spanning Victoria Harbour. The New Territories are separated from this central urban area by mountains.

The city de-industrialized rapidly after China's economic opening in 1978, as factory owners from Hong Kong moved manufacturing operations to cities in the nearby Pearl River Delta region (Tao and Wong, 2002). In 1986, 42 percent of all employment was in manufacturing in 1986, while by 2006 this had dropped to only seven percent. Figure 2 shows changes in the relative importance of different sectors. As manufacturing jobs decreased in importance, transport, storage and import/export sectors saw large increases. Additionally, there was an expansion and consolidation of the financial services industry, jobs in business services went from nine to 20 percent of total employment between 1986 and 2006.



**Figure 2: Share of Jobs by Sector, 1986–2006**

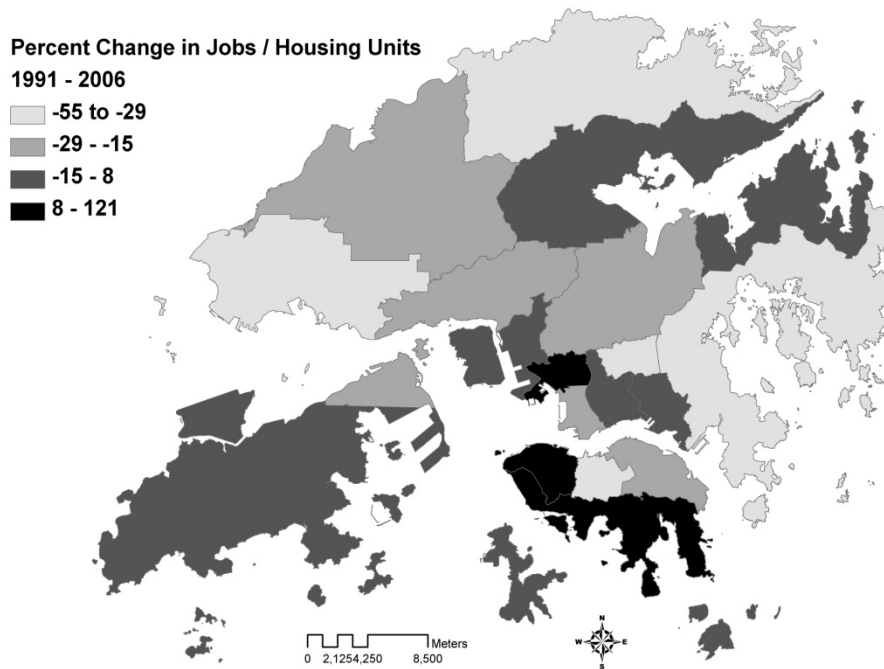


Source: Hong Kong Census and Statistics Department, 1986, 1991, 1996, 2001, and 2006.

Yet, the deindustrialization process in Hong Kong was quite different from that of cities in Western countries or even in more established Asian economies like Japan. On account of the proximity of Hong Kong to the Pearl River Delta region of China, a large number of jobs in producer services were created to support industrialization nearby (Tao and Wong 2002). Nevertheless, because manufacturing jobs were located further from the city center than service sector jobs are, the city has experienced a centralization of employment and a reduction in job accessibility overall (Hui and Lam 2005; Sui 1995).

A jobs-housing ratio is a metric to measure the balance between employment and housing in a region (Cervero 1989). It is relevant in the Hong Kong context as the city's expansion occurred in new towns that were intended to be relatively self-contained (Dimitriou and Cook 1998). The average jobs-housing measure across the city's 18 districts decreased between 1991 and 2006, with only 6 having a ratio of greater than 1.3. In order to visualize the change in the jobs-housing ratio across the city, Figure 3 depicts the percent change between 1991 and 2006.

**Figure 3: Change in Jobs / Housing Units Balance by District, 1991–2006**



Source: Hong Kong Census and Statistics Department, 1991 and 2006.

The significant drop in the jobs-housing ratio in the New Territories districts is mostly attributable to a change in the denominator. Large numbers of new housing units were built in the New Territories in the 1990s and 2000s, many of which were public rental and subsidized ownership housing. Table 1 presents the number and share of the Hong Kong population by housing tenure over two decades. The government's Long Term Housing Strategy (LTHS) launched in 1987, led to the rapid expansion of the public ownership housing tenure; one million people purchased subsidized ownership units between 1986 and 2006. It is worth note that many of those that purchased these units moved from public rental housing, a self-selection process through which more-skilled people moved out of public rental housing (La Grange 1998).

**Table 1: Population by housing type, 1991–2006**

Housing Type	1986		1996		2006	
	Million People	Percent	Million People	Percent	Million People	Percent
Private						
Rental	0.84	15.1	0.76	12.5	0.70	10.2
Owned	1.73	31.0	2.04	33.3	2.40	34.9
Public						
Rental	2.38	42.7	2.39	38.9	2.12	30.9
Owned	0.23	4.1	0.72	11.8	1.23	17.9
Other <sup>a</sup>	0.41	7.3	0.21	3.5	0.42	6.1
Total	5.59	100.0	6.13	100.0	6.87	100.0

Sources: Hong Kong Census and Statistics Department, 1986, 1996, and 2006.

Notes: <sup>a</sup>Other includes collective households, marine housing, institutions, squatters and illegal dwellings, and rent-free or employer provided housing.

Table 2 reports the employment status of the working age population (18 to 65 years old) without disabilities from 1986 to 2006 according to different housing tenures. The first set of percentages describes the share of people that are economically active. The drop in labor force participation among public housing tenants since the early 1990s is notable and only a small share of this is due to there being more people with disabilities living in public rental housing. In fact, the economically inactive population had a similar division of activities across different housing tenures in 2006; most were homemakers, students, or retirees.

**Table 2: Economic activity status and unemployment in working-age population<sup>a</sup>, 1986–2006**

Housing type	Percent economically active				
	1986	1991	1996	2001	2006
Private					
Rental	78.0	81.5	78.5	74.9	74.9
Owned	72.8	76.7	74.7	75.2	74.1
Public					
Rental	75.6	74.1	69.3	66.6	65.9
Owned <sup>b</sup>	72.8	76.5	74.7	73.7	73.3
Housing type	Percent unemployed <sup>a</sup>				
	1986	1991	1996	2001	2006
Private					
Rental	2.5	3.1	2.9	4.4	4.6
Owned	2.3	2.2	2.2	2.9	2.9

Public					
Rental	3.5	4.4	4.8	6.9	8.5
Owned <sup>b</sup>	2.4	2.1	2.3	3.6	4.4

Sources: Hong Kong Census and Statistics Department, 1986–2006.

Notes: <sup>a</sup> Unemployment is defined in the census under economic activity status as “job seekers available for work”.

Not only did labor force participation change much more among public rental tenants, the difference in unemployment rates among people living in different housing tenures increased substantially from 1986 to 2006. Residents of public rental housing had a less than one percent higher rate of unemployment as compared to residents of private rental or private ownership housing in 1986, but by 2006 this difference had more than doubled. It is important to note that available data do not detail the reason for being unemployed. In some cases, a job is available but the unemployed person is expecting a better one thus chooses not to take the available job. In other cases, a person is unable to secure a job due a low level of employability.

The difference in unemployment rates between residents of public rental and other types of housing tenure is even larger when the sample is restricted. Two different restricted samples are used. The first restriction is to males in single family married couple households. A second sample of married couple households with two children or more is used, in order to employ the gender composition of children as instruments (Dujardin and Goffette-Nagot, 2009).

Single-person and multiple-family households are excluded due to a selection bias connected to employment and household formation. Women are also excluded as their employment outcomes will be complicated by the use of variables related to the presence, age, and gender composition of children as instrumental variables. We also exclude those who have moved to Hong Kong within the last 7 years as they are not eligible to live in public housing. People living in institutions are also excluded (Hong Kong Housing Authority, 2011).

Much of the unemployment among public rental housing tenants can be explained by their lower education levels or immigrant status. Thus, changes in these characteristics over time, or changes in the needs of employers with respect to these characteristics likely explain the some of the increasing gap in unemployment rates between residents of public rental and private housing. Table 3 reports relevant characteristics of working-aged males in married couple households in 1986, 1996, and 2006. Although there was already a significant difference in characteristics like education and place of birth between public rental tenants and the rest of the population, the difference has increased over the decades. The share of people with a specialized education doubled in the general population and remained stagnant among public rental tenants. The share of people born in mainland China dropped by almost half among the general population and by roughly 15 percent among public rental tenants.

**Table 3: Selected characteristics of working-age males in married couple households, 1986 – 2006**

Characteristic	1986		1996		2006	
	Non-PRH <sup>a</sup>	PRH <sup>a</sup>	Non-PRH <sup>a</sup>	PRH <sup>a</sup>	Non-PRH	PRH <sup>a</sup>
Economically active	94.1	90.2	93.4	88.7	88.7	80.2
Unemployed (%) <sup>b</sup>	1.8	2.3	1.8	3.8	2.9	10.2
Secondary plus (%)	41.9	15.2	56.0	18.1	60.8	20.7
Field specialism (%)	15.9	2.8	23.3	3.5	29.2	3.3
Born in China (%)	56.0	65.7	37.8	56.2	28.1	53.9
Age (years)	42.3	45.6	43.0	47.3	46.3	49.7
HH size (persons)	3.8	4.7	3.6	4.1	3.5	3.8
Kilometers to central <sup>c</sup>	13.8	17.3	16.8	20.3	18.2	20.0
Kilometers to work <sup>b,c</sup>	NA	NA	11.2	12.1	13.2	13.4
N	4,991	3,507	5,979	3,120	7,612	2,641

Sources: Hong Kong Census and Statistics Department, 1986, 1996, and 2006.

Notes: NA indicates not available. <sup>a</sup>Public Rental Housing Resident. <sup>b</sup>These numbers are from the sample of the working population. <sup>c</sup>These distances were estimated based on road distances between the 24 districts for which microdata are available.

During this same time period, the economy of Hong Kong shifted from a one based on manufacturing exports to one dominated by producer and financial services (Tao and Wong, 2002). As an economy undergoes this type of shift, skills become more important for labor market success (Machin and Van Reenan, 1998). In the case of Hong Kong, Hsieh and Woo (2005) found that there was a five percentage point increase in the return to education between 1986 and 1996, its most rapid period of economic change. Additionally, public housing tenants were more likely to work in the manufacturing sector, with 43 percent employed in manufacturing in 1986 as compared to 32 percent of those in other housing tenures (Hong Kong Census and Statistics Department, 1986).

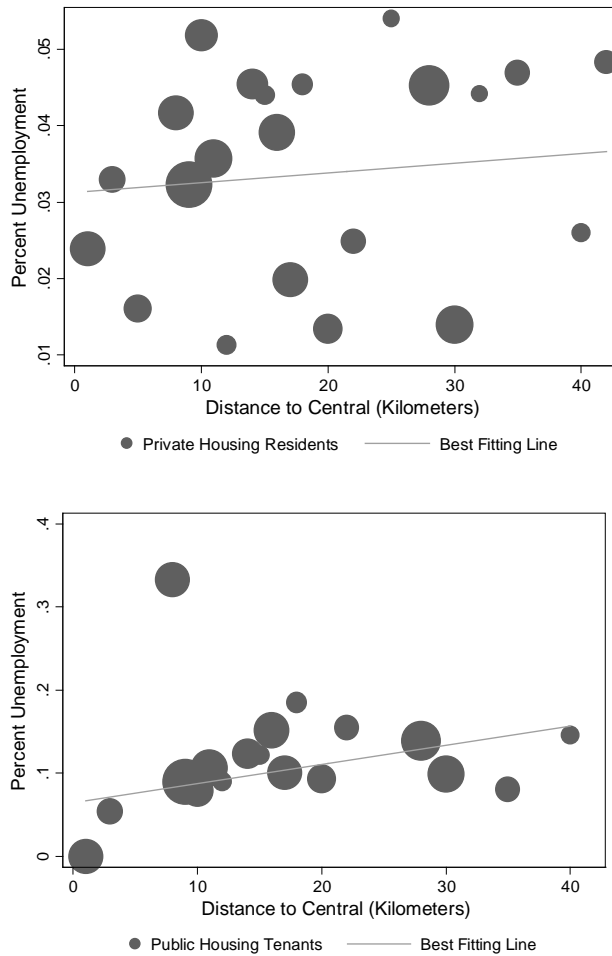
A final factor in the growth in unemployment among public housing residents is the distant location of new public rental housing estates, and a spatial mismatch between public rental housing residents and jobs, which has been documented in case studies (Lau, 2010). Thus, it is important to note that the average distance between public housing tenants and the city center has remained consistently higher than among the general population but the distance to work for employed persons is the same. This suggests that public housing tenants are not willing to commute farther to work.

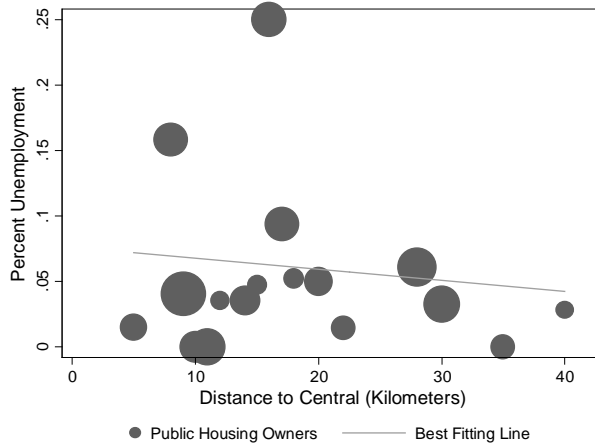
Given that Hong Kong is a geographically small area considering its population (approximately 7 million people in 1,000 square kilometers in the year 2006), access to employment might not be expected to arise as a problem. In fact, the average distances to the city center and to individual's place of work reported in Table 3, which range from 13 to 20 kilometers, do not seem excessive. Nevertheless, the city's physical geography—a combination of mountains and

islands, an extremely high population density, and a widespread reliance on public transit combine to make commute times long. Roughly 90 percent of trips in 2002 were made by public transit and the average commute time was 46 minutes (ARUP, 2003).

Figure 4 shows rates summarized for the 18 political districts of Hong Kong arranged by the road distance of the district center to the city center. It is important to note that districts do not contain an equal number of people, and for this reason, markers in the scatter plots are sized according to the district population. There is also variation in the number of public housing by district. There is a clear positive correlation between the distance to the city center and the unemployment rate among public housing tenants. This correlation is much stronger than for non-public housing tenants, and it would be even stronger but for an outlier, the Yau Tsim Mong district. Yau Tsim Mong has a high unemployment among public housing tenants, but the absolute numbers are quite small (0.5 percent of the city’s public housing residents live in Yau Tsim Mong), thus its overall importance is minimal.

**Figure 4: District Unemployment Rates by Road Distance to Central, 2006**





Notes: Dots represent districts of the city, sized by the population in a given tenure.

Source: Author with Hong Kong Census and Statistics Department, 2006.

As discussed previously, public housing residence also is likely to effect employment due to the limitations imposed on residential mobility. Previous academic work in Hong Kong has shown that residential mobility is much lower for those living in public housing, even when controlling for all observable differences between individuals and households (Lui and Suen, 2010). Not only were public housing tenants found to be 25 percent less likely to have moved within a recent time period than residents of other housing types, if they did move, they were more likely to have moved a greater distance across the city.

### Data and Empirical Models

The one percent sample of the Hong Kong by-census of 2006 is used for both empirical models. The sample is limited to working-aged male household heads of married-couple households. People with disabilities are excluded, as are people who have lived in Hong Kong for less than 7 years. A more restricted sample of those households with two or more children is also used for the first model. Consistent with previous work on this and similar topics (Dujardin and Goffette-Nagot, 2009; Lui and Suen, 2010), control variables are included for individual and household characteristics that influence the probability of unemployment, including education and primary language of the spouse.

Table 4 presents a summary of the three different sub-samples of the census used in later models; working-age males in married couple households, working-age males in married couple households with two or more children, and working-age males in married couple households living in public rental housing.

**Table 4: Summary characteristics of working-age men in married couple households, 2006**

<b>Variable</b>	<b>All</b>	<b>2 or more children</b>	<b>Public rental housing only</b>
Unemployed	5.41	6.22	11.58
Public rental tenant	23.75	31.07	100.00
Age (years)	45.96	47.79	48.18
Recent move, same district	12.74	11.63	9.89
Recent move, different district	20.62	15.77	25.31
Distance to Central (km)	18.16	18.65	19.79
District public housing (%)	31.14	32.44	42.59
Any children	49.45	100.00	54.76
Different gender	NA	49.23	NA
Oldest child over 17	NA	44.09	NA
<b>Birthplace</b>			
Hong Kong	64.20	56.37	44.91
Mainland China	31.60	39.34	51.44
Other	4.20	4.29	3.65
<b>Language</b>			
Cantonese	94.16	94.52	91.5
Other Chinese	3.74	3.74	7.35
Other	2.10	1.74	1.15
<b>Education</b>			
Primary or less	18.97	25.33	37.11
Some secondary	51.76	52.97	56.44
Secondary	12.39	10.30	5.24
Secondary plus	11.07	7.60	1.59
First degree plus	5.82	3.81	0.19
<b>Spouse birthplace</b>			
Hong Kong	60.30	53.74	37.37
Mainland China	33.61	40.21	55.91
Other	6.09	6.05	6.72
<b>Spouse education</b>			
Primary or less	21.08	28.80	39.76
Some secondary	53.92	54.39	53.75
Secondary	12.07	9.45	6.48
Secondary plus	9.97	5.43	0.91
First degree plus	2.98	1.93	0.10
<b>N</b>	<b>8,768</b>	<b>4,146</b>	<b>2,077</b>

Source: Hong Kong Census and Statistics Department, 2006.

Two modeling strategies are employed; the first to isolate the impact of living in public housing on the probability of unemployment, and the second, to assess the importance of access to the



city on the probability of employment. Cross-sectional data are used with the current employment status as the dependent variable. Although some empirical work in this area uses the duration of unemployment spells or the number of unemployment spells as a dependent variable (Flatau et al., 2003; Battu, Ma, and Phimister, 2008), we use current employment status due to the limits of available data.

Unobservable determinants of living in public rental housing and being unemployed are often assumed to be correlated. In order to account for this endogeneity, we jointly estimate the probability of the two outcomes, following the strategy of Dujardin and Goffette-Nagot (2009), using a simultaneous probit model. This is a standard method to deal with endogenous binary variables as it corrects for the correlation between unobservable variables in both equations, which would otherwise bias coefficient results for the endogenous variable (Maddala, 1983; Greene, 1998).

The simultaneous probit model is based on a latent variable, represented by  $y_i^*$ , that determine the observed variables, being unemployed or being a public tenant, represented by  $y_1$  and  $y_2$ , respectively. Latent variables related to the observed variables as follows:

$$y_i = \begin{cases} 1 & y_i^* > 0 \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

The two equations describing the latent variables for unemployment and being a public renter are as follows:

$$\begin{aligned} y_1^* &= \alpha y_2 + \beta_1 X + u_1 \\ y_2^* &= \beta_2 X + \gamma Z + u_2 \end{aligned} \quad (2)$$

All exogenous variables are included on the right hand side of both equations, represented by the vector  $X$ , whereas the vector  $Z$  represents the instrumental variables used to identify the endogenous variable,  $y_2$ , public rental tenancy. On account of the fact that unobserved characteristics influence both the move into public rental housing and unemployment, residuals of the two probit models,  $u_1$  and  $u_2$  in the above equations are assumed to be correlated. Their correlation coefficient is  $\rho_{12}$  is then included in the likelihood function below, as is the term  $q_{ij}$ , which is equal to  $2y_{ij} - 1$ , so that it is 1 when  $y_{ij}$  is 1 and -1 when  $y_{ij}$  is 0.  $\Phi_2(\cdot)$  is the bivariate normal cumulative distribution function.

$$P(y_{i1}, y_{i2}) = \Phi_2 [q_{i1}(\beta_1 X_i + \alpha y_{i2}), q_{i2}(\beta_2 X_i + \gamma Z_i), q_{i1} q_{i2} \rho_{12}] \quad (3)$$

The sample log-likelihood function written below can then be estimated using a maximum likelihood method.

$$\ln L = \quad (4)$$

Instrumental variables are used to identify the effects of public housing in the system of equations. Finding the ‘right’ instrument is always a challenge. We follow previous work and use

the gender composition, number, and age of children (Currie and Yelowitz, 2000; Dujardin and Goffette-Nagot, 2009). For the first sample of working-aged males in married couple households, the presence of any children is used as an instrument. Having more children is considered to strongly impact the probability of living in public rental housing, and to be exogenous to the father's employment outcomes (Dujardin and Goffette-Nagot, 2009). In a separate linear model estimated using the generalized method of moments (GMM), the F statistic of the variable is found to exceed the standard criteria for weak instruments many times over (Stock and Yogo, 2005).

Although the first instrument is relevant, there might be some question about whether it is orthogonal to error terms in the equations of public housing tenancy and unemployment. Thus, a model is run on the sample of married couple households with two or more children. By doing this, the gender composition of children can be used as an instrument, as having children of different genders is exogenous, and has been shown to have a strong influence on having more children and housing consumption (Currie and Yelowitz, 2000; Dujardin and Goffette-Nagot, 2009). In the restricted sample of data from Hong Kong, households where the oldest two children are of different genders were an estimated 9 percent less likely to have three children in a probit model including the same controls as below, and their house had an estimated 0.1 more rooms in a regression model of the number of rooms that included the same controls as below.

However, the dummy for having two children of different genders is a weak instrument according to standard criteria; its F statistic in a separate GMM model was 6.5, less than the commonly accepted 10. Thus, the additional instrument of a dummy variable indicating whether the oldest child is over 18 was added. This variable is strongly negatively associated with living in public housing, as moving to a larger flat is difficult even as children become adults (Lui and Suen, 2010). For the purposes of determining flat size, the Hong Kong Housing Authority considers younger and older children as equivalent, and once a child turns 18 they are eligible to apply for their own flat (Hong Kong Housing Authority, 2011). Together, an F test of weak instruments on these two variables yields an acceptable 13.7, and the test for over identification is not significant.

Table 5 presents the results of two simultaneous models of unemployment and public housing tenancy using the two different samples described above. The most striking results of is that many of the independent variables are not significant. This is in sharp contrast to work in other countries where characteristics like being younger, foreign born or having a foreign primary language are associated with higher probabilities of unemployment (Arulampalam and Stewart 1995; Battu, Ma, and Phimister, 2008; Dujardin and Goffette-Nagot, 2009). These characteristics are not statistically significant in a simple probit model of unemployment either. This likely reflects the nature of the labor market in Hong Kong, where low levels of unemployment are argued to stem from the limited and flexible regulations (Fields, 1994), and the lack of unemployment insurance.

**Table 5: Marginal effects from simultaneous probit models**

Variable	Full sample		2 or more children	
	Unemployed	Public tenant	Unemployed	Public tenant
Age	0.027 [0.029]	-0.068 [0.005]	0.034 [0.058]	-0.413 [0.107]**
Age <sup>2</sup>	-0.000 [0.000]	0.001 [0.000]	-0.000 [0.001]	0.004 [0.001]**
Birthplace (base is Hong Kong)				
Mainland China	0.006 [0.006]	0.072 [0.011]**	-0.006 [0.010]	0.101 [0.018]**
Other	-0.002 [0.014]	0.024 [0.026]	0.001 [0.021]	-0.003 [0.043]
Language (base is Cantonese)				
Other Chinese	-0.001 [0.011]	0.057 [0.023]**	0.008 [0.019]	0.058 [0.040]
Other	0.028 [0.029]	-0.044 [0.032]	0.050 [0.054]	0.053 [0.086]
Education (base is Primary/less)				
Some secondary	-0.011 [0.007]	-0.092 [0.011]**	-0.013 [0.010]	-0.124 [0.018]**
Secondary	-0.021 [0.008]**	-0.155 [0.009]**	-0.019 [0.014]	-0.213 [0.018]**
Secondary plus	-0.028 [0.008]**	-0.180 [0.009]**	-0.040 [0.013]**	-0.259 [0.017]**
First degree plus	-0.022 [0.009]*	-0.189 [0.007]**	-0.023 [0.022]	-0.284 [0.012]**
Spouse birthplace (base is Hong Kong)				
Mainland China	0.001 [0.007]	0.130 [0.011]**	0.001 [0.011]	0.149 [0.018]**
Other	0.003 [0.011]	0.112 [0.024]**	-0.014 [0.016]	0.169 [0.040]**
Spouse education (base is Primary/less)				
Some secondary	0.013 [0.007]*	-0.074 [0.011]**	0.023 [0.010]**	-0.092 [0.018]**
Secondary	0.018 [0.012]	-0.096 [0.012]**	0.003 [0.019]	-0.116 [0.026]**
Secondary plus	0.017 [0.016]	-0.171 [0.010]**	0.070 [0.044]	-0.237 [0.024]**
First degree plus	0.017 [0.025]	-0.160 [0.016]**	omitted omitted	omitted omitted
Public rental housing	0.123 [0.062]*		0.191 [0.096]**	
Any children		0.093 [0.009]**		

Different gender		-0.039 [0.014]**
Oldest child over 18		-0.077 [0.018]**
<hr/>		
F –statistic on first stage [p-value]	107.56 [0.000]	13.72 [0.000]
Hansen’s J [p-value]		0.02 [0.977]
Correlation of residuals [p-value]	-0.22 [0.180]	-0.36 [0.344]
LR test of ( $\rho_{1,2}=0$ )	1.55	1.70
Log-likelihood	-5,643	-3,061
Pseudo R <sup>2</sup>		
N	8,768	4,146

Notes: Standard errors are in brackets \* and \*\* indicate significance at the 0.05 and 0.01 levels respectively.

On the other hand, education does have the expected impacts on unemployment and public housing tenancy, with a secondary school level of education or higher being associated with a chance of unemployment that is several percentage points lower, and a much lower chance of living in public rental housing—over 20 percent in some cases!

In both models, public rental tenancy is a strong positive determinant of being unemployed; marginal effects are 12 and 19 percent respectively. These strong effects are larger those found in naïve probit models of unemployment. We do not report their full results here, but the marginal effects of living in public housing controlling for personal characteristics were around six and seven percent for the two samples. Other variable coefficients were similar in size and significance. This striking result is the opposite of findings in France (Dujardin and Goffette-Nagot, 2009). The implications are twofold. First, it implies that individuals who are less likely live in public rental housing are more selective in terms of the job they accept, but upon becoming public tenants, they are more likely to be unemployed for that reason.

Secondly, it suggests that individuals with less ability to get a job offer for unobservable reasons, those with low employability, are less likely to live in public housing. This is not surprising, given that gaining entry into the public housing system selects, at least among working-age individuals without disabilities, those with more affinity towards following bureaucratic procedures. The implementation of a marking scheme to control anti-social behavior by the Hong Kong Housing Authority in 2003, also means that those people that cannot follow rules will be evicted (Yau, 2008).

The second estimation effort is more straightforward. We take advantage of the strong limitations in choice of public housing tenants in terms of residential location and mobility (Lui and Suen, 2010), and make the assumption that unlike for residents of private housing, housing and land markets do not determine residential location. In this way, moving decisions and residential location distance to city center can be taken as exogenous in a model of unemployment.

Table 6 presents the marginal effects from two standard Probit models of unemployment. The same controls as used previously and various job accessibility measures are employed. Standard errors are clustered for the 22 districts in which public housing tenants live and for which district level data are available. Though the model is highly significant, its predictive power is quite low, with a Pseudo R<sup>2</sup> of only two percent.

**Table 6: Marginal effects from probit models with clustered standard errors**

<b>Variable</b>	<b>Unemployed</b>	<b>Unemployed</b>
Age	0.018 [0.009]*	0.019 [0.009]*
Age <sup>2</sup>	-0.000 [0.000]	-0.000 [0.000]
Birthplace (base is Hong Kong)		
Mainland China	0.026 [0.012]*	0.029 [0.013]*
Other	-0.017 [0.031]	-0.016 [0.031]
Language (base is Cantonese)		
Other Chinese	-0.005 [0.019]	-0.005 [0.018]
Other	0.131 [0.136]	0.130 [0.134]
Education (base is Primary/less)		
Some secondary	0.026 [0.015]	-0.028 [0.015]
Secondary	0.064 [0.021]	-0.065 [0.019]
Secondary plus	-0.037 [0.040]**	-0.038 [0.040]**
Spouse birthplace (base is Hong Kong)		
Mainland China	0.011 [0.011]	0.009 [0.011]
Other	-0.040 [0.018]**	-0.041 [0.019]**
Spouse education (base is Primary/less)		
Some secondary	0.017 [0.019]	0.016 [0.018]
Secondary	0.016 [0.035]	0.012 [0.034]
Secondary plus	0.061 [0.097]	0.053 [0.095]

Recent mover, same district	-0.004 [0.016]	-0.008 [0.016]
Recent mover, different district	0.033 [0.016]**	0.034 [0.016]**
District level variables		
Distance to Central	0.031 [0.012]**	
Public housing concentration (%)		0.040 [0.039]
Wald chi <sup>2</sup>	299.94	730.55
Log-likelihood	-727.85	-729.83
Pseudo R <sup>2</sup>	0.02	0.02
N	2,077	2,077

Notes: Sample is limited to public housing tenants. Standard errors, clustered at the district level (n=220, are in brackets. \* and \*\* indicate significance at the 0.05 and 0.01 levels respectively.

In spite of a low explanatory power, the results in Table 6 regarding residential location are clear. Access to the city has a strong and significant impact on employment success, as does having moved to a different district recently. Public housing tenants are three percent more likely to be unemployed if they recently moved to a different district, and are three percent more likely to be unemployed for every 10 percent further they live from the city center. The concentration of public housing, measured by the share of households in a district that are public rental tenants, is not a statistically significant determinant of unemployment.

Additionally, unlike the models of unemployment for the entire sample of working-aged males in married couple households, the coefficients on age and being born in mainland China attain statistical significance when restricted to public housing tenants only. One difference from other countries where similar analyses have been performed, however, is that being older is associated with a higher chance of being unemployed. This is likely related to the changing demands in Hong Kong's service-based economy (Hsieh and Woo, 2005).

### **Conclusions and Implications for Public Housing in China**

This paper examines the relationship between public housing residence, unemployment and residential location in detail for the year 2006, but emphasizes that these relationships have changed in recent years with the economic and spatial restructuring of Hong Kong. When Hong Kong's economy was based on manufacturing, public housing was argued to be a policy used to promote the industrial development of the territory by subsidizing the wages of workers (Castells, Goh, and Kwok, 1990). In contemporary Hong Kong, however, public housing plays a social welfare function. It houses a disproportionately large share of elderly, disabled, foreign-born and unemployed people.

The changing role of the public rental housing system is a policy decision but the results presented in this paper show that the current system contributes to the higher rate of unemployment. Overall unemployment rates in Hong Kong and the difference in unemployment between public tenants and other types of tenure are lower than in many other countries. In France, for example, unemployment among public tenants is 15.7 percent, almost three times the

unemployment rate of people in other tenures (Dujardin and Goffette-Nagot, 2009). Nevertheless, this difference is shown to stem from other characteristics of public tenants and the endogeneity of living in public housing and being unemployed. In Hong Kong, public housing tenancy leads to a larger probability of being unemployed even when properly modeled, suggesting that some reform of Hong Kong's public housing system is needed.

The present analysis has two policy implications for the reform of the public rental housing system. First, the impact of location on unemployment suggests that creating a more flexible system of moving within public housing would be beneficial. Currently, the Hong Kong Housing Authority limits transfers of public rental flats to medical reasons, loss of income and need for a cheaper flat, changes in family circumstances, accidents, or rehabilitation of the flat (Hong Kong Housing Authority, 2011). Thus, reform of the public rental housing system could include the expansion of options of transfer or flat swapping for employment reasons. Many of the older estates, which are located more centrally, have a disproportionate share of elderly people whereas those of working age live farther out. Thus, there is potential efficiency gain from encouraging elderly tenants to move to newer estates, perhaps by installing more services and care, which would free up space for working aged residents closer to jobs.

Additionally, the Hong Kong Government might consider the possibility of expanding housing assistance to include a rental assistance voucher scheme. This might begin gradually, starting with support for those currently living in outlying estates who cannot find appropriate employment so that they can move closer to the city center. Although a full-scale shift to a demand-side housing subsidy scheme is a major undertaking, it has been shown previously that public rental housing system is an inefficient way to ameliorate the city's high level of income inequality (Lui, 2007). This and other methods for making residential location more flexible for those receiving subsidies should be considered.

In spite of the differences between Hong Kong and cities in mainland China, the present analysis has an additional importance with regards to China's emerging public rental housing system. In the 12th five-year-plan, released in March 2011, the Chinese government announced a target of 36 million affordable housing units to be built over the next five years. Although this number of units might not actually be built and many of these units will not be rental housing (Deng, Shen, and Wang, 2011), cities in mainland China can nonetheless learn from several aspects of the experience of Hong Kong as they design their own programs. This paper has found that beyond the subsidy implied by public housing and the lower skill level of tenants, two elements of the public rental housing system in Hong Kong—mobility and distance to employment—lead residents to have a higher probability of being unemployed.

On the one hand, new entrants into the public housing system that must move far away from their current residence in order to receive a subsidized unit are more likely to be unemployed even five years after moving, while on the other hand, those public housing tenants who live in remote estates far from the city center and jobs are also more likely to be unemployed. This latter distance factor is more important for those who have moved recently. These two factors will likely be more important in the large metropolitan areas of China, where commuting times are longer than in Hong Kong. Although the direct implication of these findings is that greater consideration should be given to job accessibility when siting new public housing estates, this

might not be feasible given funding constraints for new construction. Additionally, as the Hong Kong case demonstrates, changes in the internal economic geography of a city have dramatic impacts on the access of different locations to employment.

Nevertheless, other efforts can and should be made to ameliorate the impacts of public housing tenancy on unemployment, especially efforts related to the flexibility of residential moves. As described above, this could be a system of flat swapping within the system or some type of voucher system that is interchangeable with subsidized units. Just because public rental housing is supply-side subsidy does not mean it has to be inflexible.



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