Residential Segregation and the Spatial Pattern of Housing Provision in Post-Reform Chinese Cities: A Case Study of Shenzhen

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Abstract

The growth and transformation of cities in China continues to absorb migrants from both ends of the economic spectrum, giving rise to socially mixed cities. Concurrent with this transformation is the elevated level of residential segregation owing to the emergence of new forms of enclave urbanism, such as gated communities and urban villages. Factors including the historical legacy, land institution and property-led development have contributed to a divided residential pattern at the neighbourhood level. However, at larger geographical scales, the degree of segregation depends on whether the provision of different housing types is systematically segregated among urban districts. This paper unravels the spatial logic of the divided pattern of the population by analysing the distribution of both urban residents and housing provisions in Shenzhen. As expected, migrants are segregated from local citizens due to their constrained housing choice, but owing to the widespread distribution of urban villages, a rather low degree of segregation is manifest at the sub-district level. This residential pattern is salutary as it maintains a spatially equitable setting that enables deprived groups to reside within short catchment areas of jobs and amenities. Nevertheless, urban renewal programmes targeted at urban villages are likely to jeopardize the somewhat reasonable composition and distribution of the housing market and can aggravate segregation at the large geographical scales.

Key words: segregation, migrants, urban village, low-income housing, Shenzhen

Introduction

China is an increasingly industrialized and urbanized country with an estimated 666 million people, or nearly half its population, now living in urban areas, an increase of 13% over the 2000 figure. Rapid urban expansion has been a major contributor to the loss of around 124,000 km2 of arable land (a 10% loss) between 1980 and 2008 (Peng 2011). As peri-urban agricultural areas are also usually heavily populated, many rural village settlement areas have been engulfed by this expansion, forming village-like enclaves within the new urban landscape. These so-called urban villages[24] (or chengzhongcun in Chinese) are seen as one of the main sources of residential segregation in Chinese cities (Liu and Wu 2006; Song et al. 2008).

Residential segregation refers to the spatial concentration of ethnic or socioeconomic groups, often resulting in a residential mosaic across urban spaces. Ghettos, immigrant enclaves, and gated communities are some examples of segregated urban spaces. Caused by the voluntary or involuntary separation of people (Marcuse 1997), residential segregation works against the goal of assimilation and integration of different social groups. Moreover, as resources and amenities are unevenly distributed across urban spaces, places of residence have potentially important consequences for the life-chances of residents and their progeny. High levels of segregation are believed to be an important factor that reduces societal opportunities in labour market participation and in areas including politics, education, and culture (Musterd 2005), often leading to concentrated and enduring poverty.

Ethnic or racial segregation is the most prominent form of segregation in European and North American cities, where the concentration and isolation of ethnic minority groups has received substantial attention. The effect of such segregation is regarded as a major hurdle for obtaining social equality between ethnic majority and minority groups and the assimilation process

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[24] In western literature, the term 'urban village' often refers to the urban planning concept that aims to create communities that are environmentally friendly and self-sustainable. However, in this research, the urban village refers to the village settlements located within urban built-up areas.

for immigrants. In China, however, ethnic segregation is only present at the regional scale due to the distribution of ethnic minorities in the western region and a Han dominance in most coastal and central cities. The intra-urban residential pattern is mainly manifest as socioeconomic segregation (Li and Wu 2008). While housing the new wealthy class, Chinese cities have also become home to a growing number of poor households, disproportionately composed of rural migrants. The dramatic urban transition has led to a widening wealth gap within the urban population and an urban space that is increasingly divided.

Research has found that residential segregation in post-reform Chinese cities is achieved through differentiated tenure groups, which stem from pre-existing institutional privileges rather than household preference or life stages (Li and Wu 2008). As a legacy of state-led urban development and socialist housing provisions, urban poverty is associated with certain housing types (i.e., dilapidated inner-city neighbourhoods, declining workers' villages and urban villages) (Liu and Wu 2006). Especially for rural migrants who are excluded from obtaining subsidized housing, most of them can only afford low-rent apartments in places like urban villages. Such migrant enclaves segregate their residents from the more privileged local residents, the result of which can have socioeconomic consequences. It is thus hypothesized that the spatial distribution of different housing types might determine the residential pattern of different social groups, creating concentrations of privileged or under-privileged classes.

This paper examines the residential segregation of migrants and local *hukou* holders25 with an emphasis on the provision of urban village housing in Shenzhen, one of the cities where the urban transition have been most profound. Shenzhen was one of the first Special Economic Zones, where foreign manufacturers set up plants, closely followed by local manufacturing centres. The migration to Shenzhen has been astonishing: of the 14 million residents in Shenzhen, 95% were born elsewhere. This paper unravels the spatial logic of the divided pattern of the population by analysing the distribution of both urban residents and housing provisions in Shenzhen. To

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[25] A *hukou* is a record in the system of household registration required by law in China. The *hukou* system divides people into two tiers—rural *hukou* holders who benefit from rural land distribution and urban *hukou* holders who have access to urban resources such as education, medical care and subsidised housing.

address the inconsistency of segregation measures due to the scale effect, multi-scale analyses are employed to obtain a more comprehensive understanding of the implications of residential segregation at different geographical and administrative levels. Dedicated local segregation indices are determined using high-resolution data of population and housing provisions, helping to suggest reasons and implications for the differentiated segregation levels and patterns.

Segregation with Chinese Characteristics

The increased spatial mobility of capital and labour gives rise to greater segmentation of the urban space based on ethnicity, occupation, income and other socioeconomic attributes. The processes of social differentiation inevitably lead to residential segregation—the uneven distribution of social groups across space. Segregation denotes socio-spatial inequalities, as groups living in different places have unequal access to resources and opportunities. It also impedes interactions of social groups and the establishment of social relations.

Residential segregation has a long historical standing in Chinese cities. In numerous dynasties, residential separation between the ruling class and the masses was maintained through physical walls and building codes (Chang 1970). Both class and ethnic segregation existed and were characterized by occupational homogeneity (such as official elite) and personal wealth heterogeneity (Belsky 2000). Even though Chinese cities in the imperial era had visible walls, their "soft edges" allowed free urban–rural interaction and suburbanization (Lin 2007). By contrast, in the post-1949 era, cities under Mao had their visible walls removed and replaced by many "invisible walls" that separated them from the rural society and controlled population mobility (Chan 1994). This rigid household registration (hukou) system of rural–urban segregation and differential treatment has underpinned China's social, economic and political structures ever since.

With the rural population ruled out of urban jobs, access to housing in cities was intimately tied to urban hukou status. Within cities, residential segregation was unacceptable to the socialist regime and a neighbourhood concept was introduced to arrange the city into uniformly self-contained

units (danwei). In this system, where people lived and what amenities they had, depended on their workplaces rather than their socioeconomic attributes (Logan et al. 1999). With uniform apartment buildings accommodating employees from high-ranking officials to ordinary workers, the residential pattern in socialist Chinese cities has been characterized by relatively homogeneous work-unit compounds. Consequently, social spaces in the pre-reform era were mainly built upon different land uses rather than social stratification (Yeh et al. 1995).

The 1998 urban housing reform in China has significantly changed cities' residential profile and improved residents' housing consumption. The reform abandoned China's old system of linking housing distribution with employment and led to the rapid development of the housing market. Concurrent with these changes is the dramatically worsened housing inequality and residential segregation (Huang 2004). With privatization of public sector housing and the emphasis on commodity housing development, the lack of local hukou is of less significance in constraining migrants' housing choices. However, soaring housing prices entails a major concern, and housing options for migrants are extremely constrained (Li 2012). More affordable housing options are accessible for households with local urban hukou, while migrants, regardless of their income level, do not qualify for such options. As China's market economy deepens, the mechanism of market remuneration is becoming increasingly important in shaping poverty patterns, especially for groups who are excluded from state welfare, such as rural migrants and laid-off workers (He et al. 2010). With the transition of the determinant of residential segregation from institutional factors to socioeconomic factors, social groups are increasingly divided through the spatial variation of housing forms—from privileged neighbourhoods to low-income enclaves (Li and Wu 2008). Complex tenure forms characterize the housing market, where the provision of different housing choices provides a key to understanding the segregated urban population.

Measuring Multi-scale Segregation

Though there are significant social implications, the study on segregation is inherently a geographical problem (Brown and Chung 2006). It basically

examines whether different phenomena are more divided or mixed in space. To measure the levels of such spatial division, segregation indices like the index of dissimilarity (ID) (Duncan and Duncan 1955) are the most effective method. First employed to measure the segregation of the white and black population in American cities, the index is defined as:

$$D = \frac{1}{2} \sum_i \left| \frac{w_i}{W} - \frac{b_i}{B} \right|$$

Where wi and bi are black and white population counts in spatial unit i, and W and B are the total white and black population counts of the entire region. D ranges from 0 to 1, indicating no segregation to perfect segregation, respectively.

Segregation measures like ID are highly sensitive to scales. As the index D is purely a function of the homogeneity within a spatial unit, in general, the smaller the spatial unit, the more homogeneous the population mix and thus the higher the value of D. When data are aggregated to adjacent values, they are spatially "smoothed", and thus less variation is preserved at the aggregated level. This is referred to as the so-called modifiable spatial unit problem (MAUP) (Wong 2004). To deal with the problem, multi-scale analyses were recommended to gain more comprehensive insight into the spatial segregation pattern of population (Fotheringham 1989).

To examine and relate the segregation values obtained from different scale levels, Wong (2003) proposes a methodological framework to decompose segregation values derived from the dissimilarity index at the local level to the pure local segregation and regional segregation. The decomposition accounts for the sources of segregation at different scale levels so that segregation values from different scales can be associated conceptually.

According to the decomposition framework, the regional segregation (RDj) of region Ωj is calculated using:

$$RD_j = \left| \frac{\sum_{i \in \Omega_j} w_{ij}}{W} - \frac{\sum_{i \in \Omega_j} b_{ij}}{B} \right|$$

Meanwhile, the local segregation is introduced by the local unit level for region Ωj. When the regional segregation is separated, the local segregation (LDj) can be defined as:

$$LD_j = \sum_{i \in \Omega_j} \left| \frac{w_{ij}}{W} - \frac{b_{ij}}{B} \right| - \left| \frac{\sum_{i \in \Omega_j} w_{ij}}{W} - \frac{\sum_{i \in \Omega_j} b_{ij}}{B} \right|$$

Different from ordinary local segregation measures, the local D index measures the segregation at the local level conditioned by the regional level. When the local D is mapped, it can indicate the spatial variation of segregation contributed purely by the local units. Using both the local D and regional D allows us to explore the spatial variations of segregation at different scales and from different sources. This methodology is adopted in this study to develop a consistent depiction of segregation patterns of population and housing provisions at multiple scale levels.

Study Area and Data

Shenzhen is a young migrant city established in 1979 as an experiment of China's open-door policy. The operation of a market economy in Shenzhen has enabled its astonishing urbanization and economic growth. Shenzhen's rapid economic growth drives the equally large-area mass production of the built environment. Spatial expansion of urban land has swallowed its rural hinterland, creating 320 urban villages (Figure 1). With urban development in the surroundings, urban villages distributed throughout the city become an interwoven component of the urban economy and society (Hao et al. 2012).

Shenzhen used to comprise two distinctive administrative divisions: a Special Economic Zone (SEZ), functioning as the city centre for tertiary development; and a non-SEZ area, featured by extensive industrial development. In both regions, former collective farms were replaced with urban built-up landscapes, and their village settlements left untouched have become one of the most conspicuous by-products of Shenzhen's urban explosion. In a state of quasi-urban jurisdiction where rural collective land ownership remains, the villages enjoyed a high level of autonomy, allowing the indigenous villagers to build illegal housing for migrant tenants.
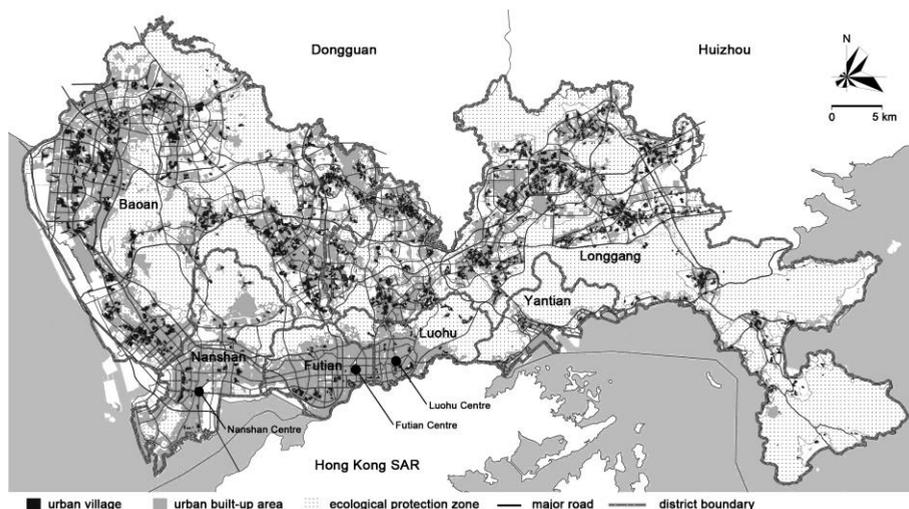
Figure 1- The distribution of urban villages in Shenzhen, 2009 (Source: Urban Planning and Land Resources Commission of Shenzhen Municipality)

In 2009, urban villages were a housing market of a total floor space of 173 million m2, equivalent to 42% of the total floor space of the entire housing sector. Urban villages are thought to accommodate over 7 million people, the vast majority of whom are rural migrants. The physical growth of urban villages during 1999–2009 was striking, contributing to an increase in floor space of 105 million m2. By contrast, the development of commodity housing yielded 58 million m2 floor space in the same period (Shenzhen Statistics Bureau 2010).

Data for this research comes from the Household Registration Database provided by the Shenzhen Public Security Bureau. The 2009 population data, including 14.8 million resident records, are believed to more accurately keep track of the presence of migrants. Data on housing types, their capacity and locations, are provided by the Shenzhen Municipal Building Database. The 2009 building data cover physical and spatial information of all 615,702 buildings in Shenzhen, including that of all urban village houses and ordinary housing estates. The following analysis primarily uses these two databases to determine various segregation measures and to compare spatial

segregation of non-hukou residents and local hukou holders, as well as of urban village housing and ordinary properties.

Segregation and Housing Provision in Shenzhen

As a migrant city, Shenzhen's 14.8 million people are composed of only 2.3 million local hukou holders (15.2%) and a majority of the 12.6 million migrants (84.8%) do not have local hukou. In all six districts, the proportions of migrants are considerably higher than the proportions of local hukou holders. It is also evident that the four central districts—Futian, Luohu, Yantian and Nanshan—have much higher percentages of local hukou holders (22-31%) than the outer districts (7-8%). This is because urban development is diverse and different groups of the residents are unevenly distributed across districts. The central districts are home to company headquarters, government organizations and high-end service sectors, all of which provide better pay and more secure jobs. In the outer districts, the prevalence of factories and lower-end services is a magnet for non-hukou migrant workers.

In Shenzhen, urban villages provide 38% of the total residential floor space, while ordinary housing provides the other 62%. Nevertheless, the urban villages house half of the total population, reflecting the substantial contribution of urban village housing to the city. Across the six districts of Shenzhen, neither the urban village housing nor the ordinary housing is evenly distributed. Urban village housing is mostly distributed in Baoan and Longgang, where this particular housing market supplies almost half of the total housing space. The four central districts still maintain a large stock of urban village housing, with percentages in total residential floor space that range from 16% to 21%. In the central districts, the smaller number of urban villages and the smaller size of each village determine a lower share in the total housing provision than their counterparts in the outer districts; however, the building and population densities of those centrally located urban villages are the highest in Shenzhen (Hao et al. 2013a).

The uneven distribution of population and housing across space at three levels—district, sub-district and residents' committee26—is captured by the ID (Table 1). Residential segregation at larger scales is low, because while the uneven distribution of urban population is significant at smaller scales, when the data are aggregated to adjacent values, less variation is preserved at the aggregate level. However, even at the level of the district, segregation between migrants and local hukou holders is considerably high, which is largely due to the over-representation of local hukou holders in the central districts and the over-representation of migrants in the outer districts. There is relatively little variation between the inner districts or the outer districts. This pattern is a direct result of the functional difference between the city's SEZ and non-SEZ areas.

	Migrants vs. *hukou* holders	**Village vs. ordinary housing**
ID_district (6 units)	0.379	0.282
ID_sub-district (56 units)	0.418	0.315
ID_residents' committee (633 units)	0.593	0.538

Table 1- Segregation of migrants and housing types at different levels

As urban development is diverse and migrants with different socioeconomic status are unevenly distributed, the social structures of urban village residents also vary across districts. The socioeconomic status of the residents of an urban village may be linked to the types of jobs available in the respective district. For instance, in the SEZ, significant proportions of urban village tenants are office and tertiary sector employees. Outside the SEZ, the majority of urban village tenants are industrial workers and employees in small and/or informal businesses. Because the population composition of migrants and local hukou holders is much more unbalanced than the housing type composition of urban villages and ordinary housing,

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[26] A residents' committee is an urban residential area and its residents administrated by a sub-district. In Shenzhen, the population of a residents' committee ranges from 682 to 286140, with an average number of 23432. As of 2004, all urban villages in Shenzhen were administratively converted to residents' committees.

the ID for population is significantly higher than the ID for housing provision.

At the level of the sub-district, the ID between migrants and local hukou holders is 0.418; and ID for segregation between village housing and other housing increases to 0.315. Judging from the small changes from the value at the district level, the segregation at the sub-district level is mostly contributed by segregation at the district level and especially by the difference between the SEZ and outer districts. At the sub-district level, since urban villages are distributed across almost all units, the added degree of segregation is limited.

At the level of the residents' committee, the levels of segregation are extremely high for both population and housing provisions. While a residents' committee has an average population of about 23,432, the ID indicating segregation between migrants and local hukou holders is almost 0.6. To put it into perspective, in Shanghai, a residents' committee has an average population of only 3,000, and the ID between migrants and local hukou holder is still lower than 0.3 (Li and Wu 2008). In accordance with the residential segregation, it is evident that urban village housing and ordinary housing are also highly segregated indicated by a very high ID of 0.538.

At the level of the district, Baoan has the highest level of RD between migrants and local hukou holders, while the RD of Futian is moderately high due to the under-representation of migrants (Figure 2a). In terms of housing provision, both Baoan and Longgang have the highest RD because of the higher proportion of urban village housing (Figure 2b). The moderately high RD of Futian is a result of the under-representation of urban village housing in the city's central business district.
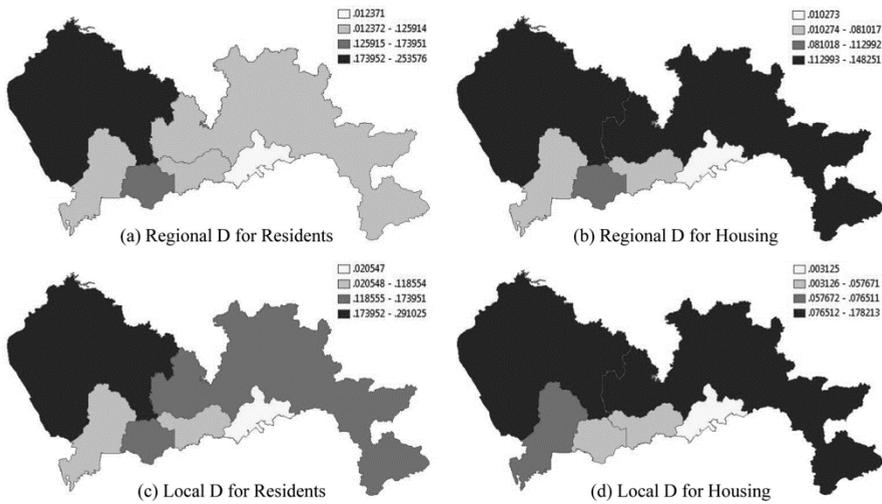
Figure 2. Decomposed segregation measures at district level

The maps of LD (Figures 2c and 2d) illustrate intra-district segregation of population and housing provision, regardless of the segregation across districts. For population data, the highest LD for Baoan indicates that the level of segregation between migrants and local hukou holders is the highest in Baoan, followed by Longgang and Futian. Baoan has the most segregated districts at both regional and local levels. While Baoan has the highest concentration of migrants, certain sub-districts in Baoan have become the most segregated migrant enclaves. Although migrant population in Futian is under-represented, the relatively high local D indicates that the small proportion of migrants in Futian is highly segregated at the sub-district level. Luohu and Nanshan have relatively low levels of local segregation. In Yantian, the level of segregation of migrants and local hukou holders is the lowest.

LD for housing provision identifies that Baoan and Longgang have the highest level of local segregation between urban village housing and ordinary housing. Some sub-districts are concentrated with more urban village housing than other sub-districts. When urban village housing is more scattered in distribution, the local segregation becomes comparatively less prominent. The outer districts are the most segregated at both regional and

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local levels, representing urban villages in certain sub-districts in Baoan and Longgang are the most segregated residential areas in Shenzhen.

At the level of the sub-district, Figure 3 shows regional and local Ds for population and housing provisions respectively. For both population and housing, RDs identify the highest valued sub-districts in both the centre and peripheries of the city. However, similar to what was explained for the district level RDs, a high RD in the city centre is actually a result of under-representation of migrants and urban village housing. High RD in the outer districts (Figures 3a and 3b), which is due to the concentration of migrants or urban village housing in certain sub-districts, explains the high local Ds at the district level shown in Figures 2c and 2d.
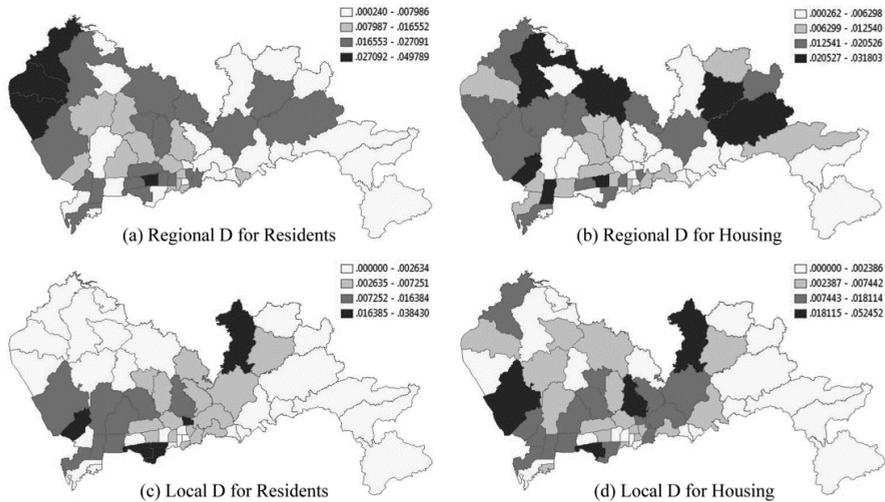

Figure 3. Decomposed segregation measures at sub-district level

From Figures 3c and 3d, the segregation identified by LD shows a completely different pattern. The comparison between Figures 3a and 3c indicates that units with the highest regional D exhibit a low local D. This reflects that when different spatial scales are under scrutiny, the degree of segregation may significantly vary between scales. Certain sub-districts accommodate a larger proportion of migrants and thus exhibit higher segregation at the regional level, but the migrants living in the sub-district

are relatively more evenly distributed within the sub-districts, showing low segregation at the local level. Moreover, in a migrant city like Shenzhen, migrants also include many people who are highly educated and well paid in employment. They do not possess a Shenzhen hukou because of institutional constraints or the preference of keeping their hukou affiliated with another place.

The measure of regional and local D indices illustrates how the segregation of migrants and local hukou holders is created at each geographical and administrative scale. While the segregation at the district level is already significant due to the concentration of local hukou holders in the SEZ, the segregation at the sub-district and residents' committee levels adds an additional dimension to the problem. At the sub-district level, the outer districts manifest high degrees of residential segregation because of the differentiated development of local economies. But at the residents' committee level, the outer districts generally have low residential segregation because of a highly even distribution across these small administrative units. By contrast, due to the demolition of numerous urban villages in the city centre, the central districts suffer greater residential segregation at the small scale. Urban villages that still remain in the centre become pockets of the most segregated enclaves.

Conclusions

This analysis discovered that residential segregation in Shenzhen is formed in a structure of systematic division at three administrative levels: the separation of population between the SEZ and the non-SEZ due to their distinct modes of development; the separation of population among sub-districts due to specific local economies and associated employment opportunities; and the separation of population among residents' committees due to the availability of housing types. Migrant labourers were absorbed into the city. However, being seen as merely a means of production, migrants are confined to the city's labour-intensive hemisphere. Ironically, rural migrants are "walled" in certain districts that were only recently expropriated from rural communities and in urban villages that are still under de facto rural jurisdiction.

Given the socioeconomic status of migrants, the presence of urban villages has decisively shaped the segregation pattern in Shenzhen. As constellations of cheap rental neighbourhoods, urban villages play a dual role: At the neighbourhood level, such spaces are undoubtedly a form of segregation rather than a locus for genuine integration; but at higher geographical and administrative levels, they allow the penetration of migrants into the city's capital-intensive hemisphere and enable a relatively even distribution of migrants across urban sections. Assimilating migrants into prime urban locations enables them to have a closer proximity to employment and amenities, and thus better situates them to seek life chances (Hao et al. 2013b).

The implementation of village demolition and redevelopment may reduce the degree of segregation at the neighbourhood level. However, residential segregation will inevitably be exacerbated at the district level, which is likely to deprive the migrants of the opportunities in the city in terms of labour market participation and access to public amenities. Research has shown that rapid residential and job decentralization are found for low-income earners and the residential distribution of high-income households has a trend toward centralization. All the evidence shows an alarming sign that the lowest strata of the society are being driven out of central districts of cities or even the cities as a whole. The invisible hand of the market has been deepening segregation at greater geographical scales and establishing an invisible wall around the core of China's big cities. To investigate the process more closely, future research should examine the changing patterns of population distribution due to the redevelopment of urban villages and other types of low-income neighbourhoods. Moreover, it would be useful to explore to what extent migrant's access to employment opportunities and urban resources are influenced by displacement and relocation as a result of large-scale urban renewal projects.

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