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Donggen Wang

*Hong Kong Baptist University*, [dgwang@hkbu.edu.hk](mailto:dgwang@hkbu.edu.hk)

Fei Li

*Georgia State University*, [feili@gsu.edu](mailto:feili@gsu.edu)

Yanwei Chai

*Peking University*, [chyw@pku.edu.cn](mailto:chyw@pku.edu.cn)

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# ACTIVITY SPACES AND SOCIO.SPATIAL SEGREGATION IN BEIJING

*Fei Li and Donggen Wang<sup>1</sup>*

**Department of Geography**

**Hong Kong Baptist University, Kowloon Tong, Hong Kong**

*Yanwei Chai*

**Department of Urban and Economic Geography**

**Peking University, Beijing, China**

*Abstract:* The worldwide prevalence of gated communities has generated much concern over urban fragmentation and social segregation. The social division and segregation between residents within and outside urban enclaves exist not only in their residential spaces, but also in their values, social relations and daily lives. In this paper, we argue that segregation studies should pay more attention to individuals' actual usage of urban space in daily life. By examining the activity space of the residents from privileged urban enclaves and other neighborhoods, we describe a spatiotemporal approach to studying socio-spatial segregation in Beijing, the capital city of China. Significant differences are found in the usage of time and space between different residential groups. Importantly, the study reveals that people of the same social class might have more similar space-time experiences in daily lives than those who live in neighboring areas. This suggests that the fragmentation of urban space is the result of not only residential segregation, but also of how different social groups use the space.

Key words: Socio-spatial segregation; Activity space; Spatiotemporal approach; Institutionally-privileged enclaves; Economically-privileged enclaves; Beijing.

## **Acknowledgement**

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## INTRODUCTION

The emergence and distribution of gated communities or urban enclaves has attracted worldwide attention. Due to the safety, privacy and exclusiveness they provide, gated dwellings have become a popular choice for middle class householders in cities around the world. Meanwhile, gated developments are often accused of segregating urban space and intensifying social division between residents within and outside the enclaves (Atkinson and Flint, 2004; Márquez and Pérez, 2008). While the policymakers and researchers used to be particularly concerned about slums and ghettos that trap the urban poor and ethnic minorities, they may now have to face another social issue: the splitting, disaffiliation or retreat of the affluent from the public spatial context (Low, 2003; Atkinson, 2006).

While it is generally believed that gated communities aggravate social distinction and isolation (Blakely and Snyder, 1997; Le Goix, 2005; Roitman, 2005; Blandy and Lister, 2005), the consequences of urban enclavism on segregation are not much discussed. As studies on segregation are mostly concerned with the imbalanced residential distribution of different social groups in urban districts (Musterd, 2005; Smets & Salman, 2008), the spatial form of neighborhoods – whether they are enclaves or not – is seldom taken into account. It should be noted, however, that the prevalence of gated developments is probably adding new features to socio-spatial segregation in modern cities. With gates and walls, people can live in close proximity without many common interests or interactions. The socio-spatial barriers brought by urban enclaves can hardly be described by conventional segregation measurements, regardless of their focus – unevenness, concentration, clustering, dissimilarity, and so forth (e.g. Wong, 2003; Musterd, 2005).

Urban enclavism is thus posing challenges to conventional segregation studies and the according inclusion policies (e.g., social mix policies), which are limited by their overemphasis on residential spaces and the underlying premise that segregation is generated from the fact that people live in different places. Actually, since modern transportation and the proliferation of private cars largely enhanced people's mobility in urban space, the role of residential location in defining individual's accessibility and daily life space has been greatly weakened. Individuals' living spaces in modern cities may depend less on their residential locations and more on personal values, lifestyles, social networks, and so forth. Consequently, people of different social groups may experience very different daily life circumstances. In that case, the division and isolation between inside and outside the enclaves can equally exist in,

and be revealed by, the daily life spaces of residents. This may explain why policy measures targeting on social mix usually cannot fulfill their objectives of reducing inequity, enhancing social integration or reinforcing neighborhood connections (Ostendorf et al., 2001; Musterd, 2003; Atkinson and Kintrea, 2000).

Socio-spatial inequities beyond residential segregation have been recognized by some scholars. Using the time-geography approach, feminist geographers point out that the different space-time prisms of men and women reflect gender-related inequities in society (Rose, 1993, Kwan, 1999a). Underprivileged people such as ethnic or religious minorities may also suffer from undesirable space experiences and have to face socio-spatial barriers in urban daily life (Kwan, 2008). On the other hand, privileged people (in terms of economic resources, social status, etc.) are provided with enormous socio-spatial advantages in modern cities, not only in their gated dwellings, but also in the ‘premium network spaces’ (Graham, 2000; Graham and Marvin, 2001; Atkinson, 2006, 2008) comprised of well-designed enclosed sites (homes, work places, and others) and privatized exclusive corridors (such as private cars, SUVs, first-class cabins, etc.), which isolate the affluent from the lower class in their daily lives. Such phenomena have been described as ‘time-space trajectories of segregation’ (Atkinson and Flint, 2004).

In this paper we advocate a spatiotemporal approach to studying the new dimensions of socio-spatial segregation in modern cities. We argue that differences in the daily usage of urban space – where, when, and for how long individuals conduct activities in their daily lives – may reveal socio-spatial segregation as well as differences in their residential locations do. As an exploratory study, we look into the *activity space* of residents within and outside urban enclaves to examine the socio-spatial segregation in modern cities. Beijing, the capital city of China, is chosen for the empirical study. We believe the discussion will benefit further studies regarding urban enclavism and segregation, and provide a new perspective for socio-spatial segregation studies.

In the following section we introduce the residential enclaves in Chinese cities. The concept of *activity space* and the theoretical framework are then elaborated. The case, data, and research methodology are explained in the fourth section. Next, the empirical results are presented and discussed. The final section contains our conclusions and suggestions for further studies.

## RESIDENTIAL ENCLAVES IN CHINESE CITIES

Although generally considered as a response to social problems such as crime, polarization or racism, modern gated developments have different features and indigenous origins in different regions around the world (Webster et al., 2002). As for the case of China, no direct analogies can be drawn from the literature in US or other developing countries. A little specification of the origin, classification and residents of Chinese urban enclaves is thus necessary before further discussion.

While ethnicity, socioeconomics, and family status are widely reported as social distinction and segregation factors in Western cities, the social differences of urban Chinese are based more on the institutional factors imposed by the socialist regime established in 1949. These factors include household registration (*Hukou*) and the ranking systems of work units as well as their employees (Wang and Murie, 2000; Feng et al., 2007). Differences in social status and entitlement to welfare, housing, and education benefits can be found between employees of work units and other employers, between employees of different work units, between workers and ‘cadre’ (a section of employees within the work-unit system), and most importantly, between the urban *Hukou* citizens and peasant migrants (Wu, 1996; Bray, 2005). These differences are manifested in spatial formality through the housing provision and allocation system which was formally abolished in 1998 (Wang and Li, 2004), and more recently through the possession or occupancy of land by work units (Although urban land is officially owned by the state, large work units including government departments, public institutions, and state or collective-owned enterprises have *de facto* ownership of the land they possess or occupy). The economic status (e.g., the affordability of housing) has only recently become an important factor of residential segregation (Wu, 2002) since commodity housing prospers in the real-estate market of urban China. While the institutional factors – both social and spatial – still play an important role (Wang and Murie, 2000), the joint forces of institutional and economic factors are shaping the socio-spatial landscape of Chinese cities.

Highly stratified as the society was, gated spaces and dwellings are not novelty to urban Chinese. Ancient Chinese cities had long embraced gating and walling as inherent spatial features to formalize social divisions, mainly between the gentry and the peasants (Wu, 2005). The tradition was even enhanced in the socialist era, in the form of work-unit compounds, which had been the most important spatial, social, and economic units in Chinese cities until the 1990s (Wang and Chai, 2009). As described in the literature, before the 1980s, Chinese cities were mostly a mosaic of big and

small enclosed work units (Lu, 2006). With restriction of access, autonomy of governance, and communality in identity (in the sense that a person's identity is usually reflected by his/her work-unit), the work-unit compound is similar to modern gated communities in many respects (e.g., Blakely and Snyder, 1997). While the urban reforms introduced since the 1980s have resulted in the disintegration of many work-unit compounds, some – mostly those of more powerful work-units – have remained. These compounds, as a symbol of the socialist legacy and the privileges that individuals 'within the system' (party and government officials, state-owned business or public institution employees, etc.) are reluctant to relinquish, stand out as a distinctive type of residential enclave in today's Chinese cities.

The prosperity of modern commodity housing communities in recent years has been influenced by the global spread of gated developments and driven by the needs of the new affluent in urban China. These high-grade communities by and large resemble their counterparts in other regions of the world. On the other hand, a large proportion of former work-unit compounds, which have lost their institutional identities and been transformed into ordinary neighborhoods in the urban reforms, together with some early commercial housing developments, constitute a type of 'gated but not exclusive' communities in the urban landscape of post-socialist China. These communities still have gates and walls, and sometimes gatehouses as well as other facilities. However, they are neither strictly managed nor exclusive. The enclosure walls and facilities often become functionless, especially in those old and deteriorated communities.

Based on this observation, we distinguish two types of enclave in Chinese cities: *institutionally-privileged enclaves* and *economically-privileged enclaves*, respectively referring to the remaining work-unit compounds and modern gated communities. A major division underlying this classification is the social composition of residents. *Institutionally-privileged enclaves* are mostly occupied by work-unit employees, mostly government officials or employees of large public institutions, who are favored by institutional welfare and government policies because they are either policymakers or have great influence over policies. *Economically-privileged enclaves*, as in the literal sense, provide luxury apartments or houses for the affluent individuals. The 'gated but not exclusive' communities, social housing communities, traditional neighborhoods of self-built houses, etc., are generally classified as '*other types of neighborhood*', which house the ordinary citizens outside the two types of urban enclaves.

## **A NEW APPROACH TO STUDYING SOCIO-SPATIAL SEGREGATION: ACTIVITY SPACE**

The actual usage of urban space and daily living circumstances of individuals can be delineated by their *activity spaces*. The notion refers to the space-time context in which individuals perform activities and live their daily lives. By using activity spaces to study socio-spatial segregation we attempt a behavioural and people-based approach as an alternative to conventional place-based measures. Similar suggestions are also proposed in health researches (Cummins et al., 2007; Kwan, 2009).

The conception of *activity space* can be traced to the discussion on social space (see in Buttimer, 1969, 1980) and the analyses of activity patterns (or activity systems) in urban time-space (Chapin, 1968; Hemmins, 1970). As defined by Horton and Reynolds (1971, p. 37), an individual's *activity space* is 'the subset of all urban locations with which the individual has direct contact as the result of day-to-day activities'. It involves both the objective spatial structure of destinations and the way (purpose, timing, intensity, etc.) the individual makes use of these urban places.

Difference in activity spaces reveals and constitutes an important aspect of socio-spatial segregation in modern cities. On the one hand, activity space defines the scope for individual's potential interaction with urban environment as well as with other people. If different social groups in a city show substantially different patterns of activity space, it can be deduced that they may have less chances of exposure to, or communication with, other kinds of people than in an urban context where different people share more common features in their activity spaces. On the other hand, individuals' activity spaces reflect their actual occupation and usage of urban spaces and resources. It should be noted that activity patterns and urban space usage also depend on non-social factors such as personal preferences. Difference in activity spaces hence cannot be simply considered as socio-spatial inequities. Nevertheless, activity space provides an effective, visible measure of individual's socio-spatial positions and relations in urban daily life.

The empirical studies, especially quantitative analyses of activity spaces can be quite challenging. Due to the complex determinants of activity space, individual differences can be hard to explain. Moreover, as the home location, where many daily trips begin or end and many activities are conducted, is usually an important node in activity space, it would be meaningless to compare people's activity spaces without considering their residential places. An applicable way is to consider the home as a

base point of activity space and to examine the relative spatial relations between locations as well as the relations between actor and locations (We do not claim to base our discussion on a ‘relational’ approach, but a relational view of space and places (Cummins et al., 2007) might be helpful to understand the socio-spatial relations in an individual’s activity space). Particularly, the collective patterns of activity spaces of different residential groups (as in this study, of people living in privileged enclaves and ordinary neighbourhoods) might reveal meaningful implications on socio-spatial segregation in modern cities.

It is also useful to interpret activity space in temporal and cognitive dimensions upon its spatial structure. The temporal attributes of destinations, such as time spending and frequency of visits, indicate the importance of the elements in that individual’s activity space. In terms of the cognitive dimension, the way one uses urban space and the activities (s)he performs will influence an individual’s perception of certain places. For instance, people who share the same path to a supermarket may have different perceptions of that path. Pedestrians or cyclists are most likely to be familiar with houses and gardens along the way. Motorists probably have only vague impressions about things along the way, because they need to concentrate on their driving and cannot divert their attention to observe what is on the way. Those who travel by subway may know nothing about what is above ground.

Considering all the complexity, here we suggest several dimensions along which activity space may be measured and compared:

- Extensity: the extent to which activity space spreads. Extensity refers to the geographical coverage of activity space. It is related to an individual’s socio-spatial mobility.
- Intensity: the temporal dimension of activity space. Intensity refers to the frequency and time duration of visits to certain places.
- Diversity: different types of places and activities involved in activity space. The greater the diversity, the richer an individual’s social life probably is. Long-term diversity may also indicate major changes in activity space.
- Exclusivity: the degree of exclusion, isolation or segregation of activity space. Exclusivity is determined by the places where activities are conducted and types of transport mode used in daily life. Traveling by private car has a higher degree of exclusivity than public transport; having meals at a standard restaurant has a lower degree of exclusivity than a private club.



Another difficulty lies in the observation and reconstruction of activity spaces. As a dynamic space-time entity, activity space changes from time to time, allowing equilibrium to be achieved in periods of life. In order to depict the current equilibrium of activity space, a substantial amount of daily activities should be observed and aggregated, from which a reliable pattern can be derived. Such longitudinal studies are often infeasible in practice, but cross-sectional analysis of daily behaviour may omit important elements in activity space. Being aware of the day-to-day variability and long-term stability of activity space, we introduce two sub-concepts – *habitual space* and *daily space* – to jointly construct a more complete description of activity space in the following discussion.

By *habitual space*, we refer to the backbone of activity space, which involves the places that are frequently visited on a routine basis. Individuals' habitual space consists of the most important elements of their activity space. It contains the space-time contexts in which individuals conduct activities or spend time with the highest frequencies. For example, an individual's habitual space may be formed by home, workplace, favorite shopping and recreation places, as well as the activities performed at these places. *Habitual space* represents individuals' best cognition and usage of the urban space.

*Daily space*, on the other hand, is the realization of individuals' activity space on a daily basis. To a large extent, daily space overlaps habitual space, because central elements of habitual space (home and work place, for instance) are also likely to be key nodes in daily space. Nevertheless, there could be discrepancies between the two. Spontaneous activities and time spending are involved in daily space, and habitual activities may not be conducted on a particular day. A combination of the two provides more accurate depiction of activity space.

The investigation on activity space would be helpful in unravelling the intricacies underlying distinction, exclusion, and segregation. The fragmentation of urban space is the result not only of gated developments, but also of how different social groups use the space. Individuals' activity space helps build the perceptions, identities, and symbols of social groups in urban space. Consequently, it provides a promising approach to the studies concerning the separation and segregation of social groups.

## CASE, DATA, AND METHODOLOGY

As one of the largest cities of China, Beijing has gone through most of the changes that Chinese cities have experienced in the past few decades, including the urban reform, urbanization and suburbanization. As the national capital, Beijing has accommodated the concentration of central government departments and national institutions before and after the introduction of economic reform. Beijing is also an economic center attracting rural immigrants, foreign investments, and real-estate developments. The diversity of social groups and urban enclaves discussed above can be readily identified in Beijing.

More importantly, while (as other Chinese cities) experiencing rapid urban development, Beijing has undergone the social polarization and segregation often observed in Western cities. Not only has residential segregation emerged, but also the territories used by people of different social classes in their daily lives differ: that is, they have different activity spaces. The types of place they visit and the ways they move around in the city are stratified by their affordability and accessibility.

The data for this study comes from a household survey conducted in October and November, 2007. The survey sampled ten neighborhoods located in different districts of Beijing. For details and the spatial distribution of these neighborhoods, readers are referred to Wang, et al. (2009). Five of the ten neighborhoods are institutionally- or economically-privileged enclaves, while the other five can be classified as other types of neighborhood. In each neighborhood, a sample of around 50 to 60 households was randomly selected. Household heads and other household members aged 16 years old or more were invited to participate in the survey. Respondents were given detailed explanations about the survey and instructions on how to complete the questionnaire.

Besides household and individual socioeconomic characteristics, respondents were requested to complete a two-day (48 hours) activity-travel diary and provide information on their habitual activities. The two-day activity-travel diary provides detailed spatial-temporal information on individuals' activity and travel engagements on two consecutive days: Sunday and Monday. A total of 16 activity types are differentiated. For each activity, respondents were asked to report the type of activity, location, the starting and ending time. For each trip, information on the origin and destination, travel time, travel mode and companies (if any) was recorded.

As for the habitual space, three categories of habitual activities were investigated: work (or school attendance for students), shopping, and recreation. For each activity respondents were required to report the destination where the activity is usually conducted, the history and frequency of visiting, average duration and travel cost (if any), and so forth.

Table 1 shows the composition of the sample by gender and residential groups. The residents from different types of neighborhood represent the three typical social groups identified earlier.

Table 1. Sample composition by gender and type of neighborhood<sup>2</sup>

	N	Male	Female
Institutionally privileged enclaves	320	153	167
Economically privileged enclaves	202	103	99
Other neighborhoods	565	281	284
Total	1087	537	550

Their activity spaces are analyzed at both aggregate and disaggregate levels. At the aggregate level, we applied the three dimensional (3D) geovisualization methods proposed by Kwan (1999b, 2000) to represent and compare the collective patterns of habitual and daily spaces for the three residential groups. Using kernel estimation tools embedded in ArcGIS, 3D density surfaces (Silverman, 1986; Gatrell, 1994) are generated based on the observed distribution of individuals' activity locations. The kernel estimator can be written as:

$$f(x) = \frac{1}{nh^2} \sum_{i=1}^n w_i K\left(\frac{x - X_i}{h}\right),$$

where  $x$  is a general location in the study area and  $X_i$  represents a particular point location  $i$ ;  $n$  is the total number of points; and the search radius  $h$  (or bandwidth, window width) is a smoothing parameter. Actually, the kernel density at location  $x$  depends on the contribution of observed points within the circle with  $x$  as the center and the radius equal to  $h$ . The kernel function  $K(x)$  applied here follows the quartic function that Silverman (1986, p.76) described:

$$K(x) = \begin{cases} 3\pi^{-1}(1 - x^T x) & \text{if } : x^T x \leq 1 \\ 0 & \text{otherwise} \end{cases}$$

Kernel density surfaces are employed differently in representing habitual and daily spaces. The components of habitual space – locations of the three categories of habitual activities are visualized in multilayer models. Stacked density surfaces show intuitively the distribution of destinations for habitual activities of the residents from each neighborhood. As for the discussion of daily spaces, activities observed are represented in a space-time plane instead of the real geographical space, in order to eliminate (not completely, of course, but to a largest extent) the effects of the dispersion of home locations. It is hence possible to compare the aggregate patterns of daily spaces of the three residential groups.

At the disaggregate level, individuals' activity spaces are compared and discussed in terms of extensity, intensity and exclusivity. The extensity of activity space is measured by the standard distance of point locations. The intensity is estimated by time allocation on out-of-home activities in daily spaces; the longer the time an individual spends away from home in a day, the more his/her activity space matters in his/her social life apart from the residential place (especially for those privileged individuals living in urban enclaves). ANOVA tests were conducted to examine the between group differences. The exclusivity of activity space is scanned through a comparison between the types of places and transport modes used by the three groups of individuals.

## **SOCIO-SPATIAL SEGREGATION IN BEIJING ENCLAVES**

### *Residential Segregation and Socioeconomic Stratification*

The three types of neighborhoods can be found in different areas of Beijing. Institutionally-privileged enclaves, many of which were developed in the pre-reform era, are usually located in the inner suburbs surrounding the traditional urban center. Economically-privileged enclaves mostly emerge in newly-developed suburban areas. The other neighborhoods, including traditional neighborhoods, deteriorated work-unit compounds, and social housing communities, can be found in different parts of the city, ranging from the city center to the outer suburbs.

As argued above, although the privileged enclaves usually look more pleasant, tidy, and secure than other neighborhoods, the fundamental difference lies in the social status of the residents. Residential segregation and socioeconomic stratification between different types of neighborhoods are evident in the sample of this study. As

shown in Table 2, more than 50% of the residents in the institutionally-privileged enclaves are employees of government and public institutions, a much higher share than in the economically-privileged enclaves and other neighborhoods. Similarly, the economically-privileged enclaves have higher percentages of entrepreneurs and employees of business enterprises than the other two categories. On the other hand, the other neighborhoods accommodate a higher percentage of the underprivileged including the unemployed, retired, students, and factory and service workers than the privileged enclaves do.

While nearly 50% of the residents of the other neighborhoods have only middle-school or primary-school education, over 60% of the economically-privileged residents and almost 50% of the institutionally-privileged residents have university or higher vocational education. In terms of household income, Table 2 shows that the economically-privileged enclaves have the largest proportion of high-income households (more than 10,000 RMB per month), whilst the other neighborhoods have the largest proportion of low-income households (less than 3,000 RMB per month). About 74% of the households in the institutionally-privileged enclaves have middle incomes: between 3000 and 10,000 RMB per month.

Table 2. Socioeconomic stratifications of the sample (percentage)

		Institutionally- privileged enclaves	Economically- privileged enclaves	Other neighborhoods
Occupation	Employees of government and public institutions	54.3	28.1	18.6
	Employees of enterprises	15.7	42.2	28.5
	Entrepreneurs	1.9	5.5	4.8
	Factory and service workers	7.7	4.0	21.0
	Others (unemployed, retired or students)	20.4	20.1	27.2
Education	Primary or below	2.2	1.0	2.1
	Middle	28.4	13.9	47.3
	College	20.2	21.3	23.8
	University or above	49.2	63.9	26.8
Household income per month <sup>3</sup>	Below 3000	15.2	4.0	36.2
	3000-10000	74.5	64.6	56.9
	Above 10000	10.3	31.3	6.9

In general, the residents of the institutionally-privileged enclaves are characterized by pleasant socioeconomic conditions and secure jobs with various institutional benefits. Those economically-privileged residents, as the name implies, usually have middle-to-high incomes, as business owners, white-collar employees of enterprises, and so forth. The residents in the other neighborhoods include people with various occupations and backgrounds, mostly with lower socioeconomic status.

### *Socio-spatial Segregation in Activity Space*

We first present the comparison and discussion of the collective patterns of habitual and daily spaces of different residents groups. Results of the disaggregate analysis on individuals' activity patterns are presented afterwards.

- Habitual spaces aggregated by neighborhoods

It might be helpful to give the readers an initial impression of the visualization method in advance. An illustrative example is provided in Figure 1. Specifically, it is the density surface of work spaces of the residents in one of the 'other neighborhoods'. The density surface is set as semitransparent so that the urban map beneath can be seen. The spatial distribution and concentration of working activities are represented in both elevation and color gradation. An obvious bulge appears around the home location, suggesting a large proportion of the individuals work near the neighborhood.

As also shown in Figure 1, the urban structure of Beijing is marked by its ring-road system (Tian et al., 2010). The concentric 2<sup>nd</sup> to 5<sup>th</sup> ring-roads construct the major spatial framework of urban area<sup>4</sup>. Although subcenters have emerged in urban expansion, the traditional inner city (generally defined as areas within the 3<sup>rd</sup> ring-road or the four central districts) still serves as the center of many urban functions. The four major ring-roads are marked in bold lines, while the dashed lines denote the boundaries of urban districts. It can be seen that the working activities of the residents in 'Other neighborhood I' largely concentrate within the inner city area. Clustering is also found near the new CBD at the middle piece of east 3<sup>rd</sup> ring-road.

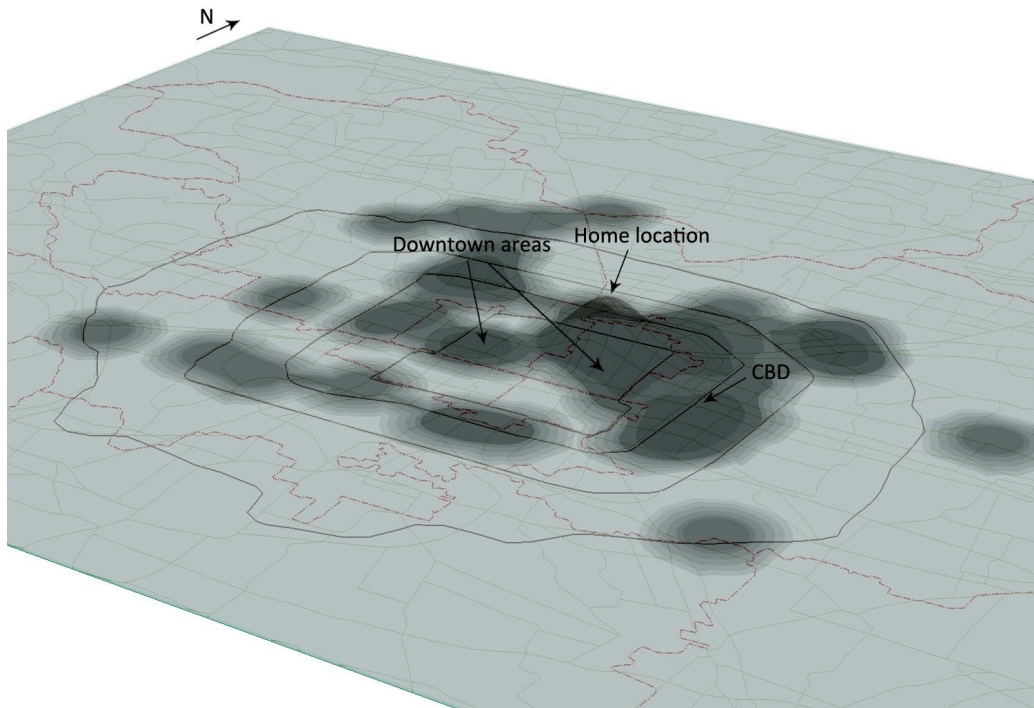


Figure 1. A close shot of the working space of residents in ‘Other neighborhood I’ (the density surface of work places over the urban map of Beijing)

The habitual spaces of residents from all the ten neighborhoods are represented in Figure 2. For the sake of clarity, the four ring-roads are shown in each layer of the models. The locations of the neighborhoods are marked by vertical dashed lines. It can be noticed that ‘Other neighborhood’ I & II are located right in the city center; ‘Institutionally privileged enclave I’, ‘Other neighborhood III’ and ‘Other neighborhood IV’ fall within or on the edge of (as the case of ‘Other neighborhood IV’) the 3<sup>rd</sup> ring-road; the rest five neighborhoods lie either in between the 4<sup>th</sup> and 5<sup>th</sup> ring-roads, or outside the 5<sup>th</sup> ring-road. We consider the former five neighborhoods as inner-city neighborhoods, and the latter five as inner-suburban or suburban neighborhoods.

As shown in Figure 2, while the habitual spaces of some residents concentrate at their home locations, in many neighborhoods, especially those suburban ones, habitual activities actually disperse in the outer urban space. This justifies the importance of looking into individuals’ activity space besides their residential places. Moreover, some intuitive differences can be identified between the habitual activity patterns of the three residential groups.

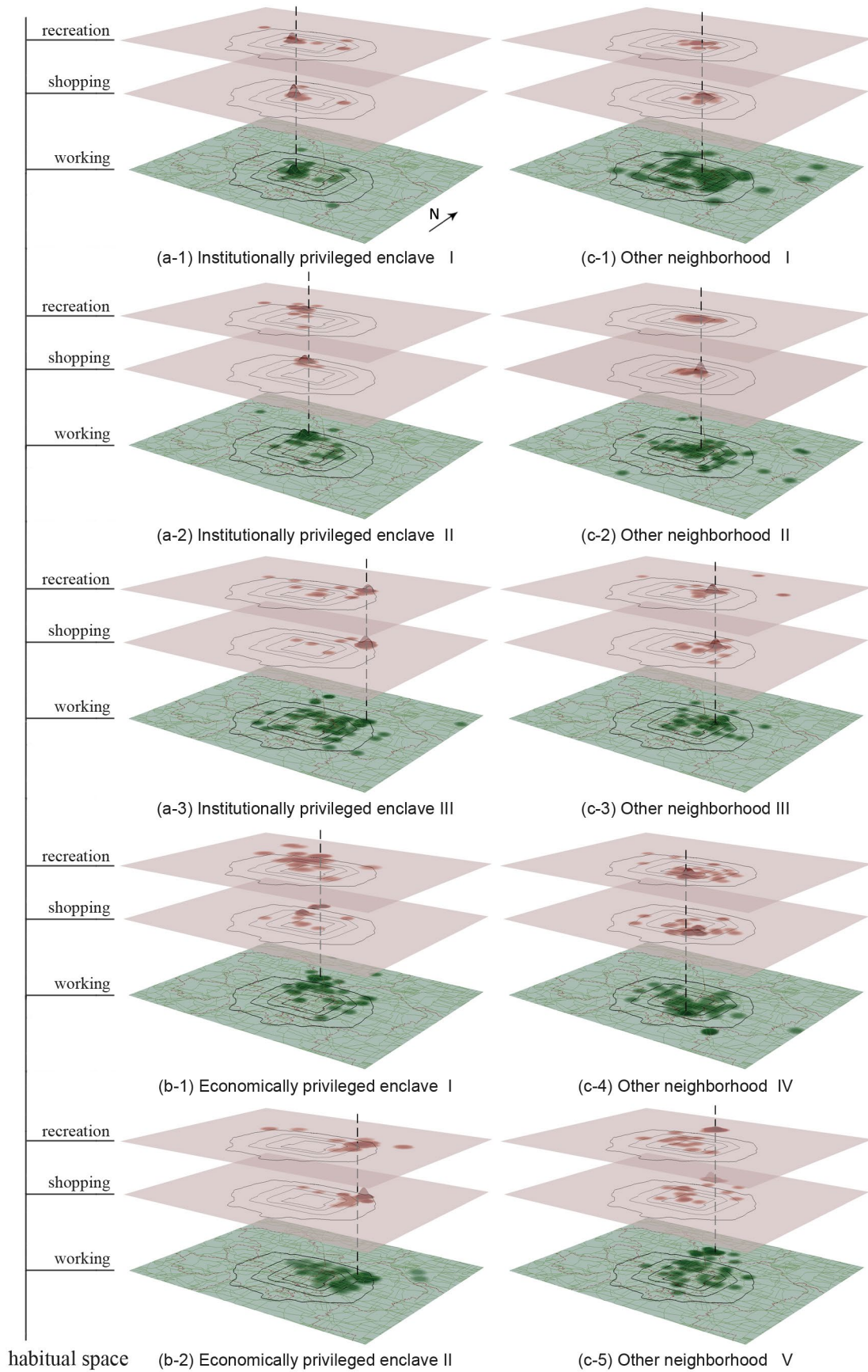


Figure 2. Habitual spaces of the residents in each neighborhoods



The institutionally-privileged residents, either living in inner city or suburbs, have the most contracted and concentrated habitual spaces. This can be explained by the job-housing proximity and the availability of various living facilities in traditional work-unit compounds (a-1 and a-2). The case of ‘Institutionally privileged enclave III’ is a little different: it was built after the urban reform and co-developed by a number of work units. The working locations in (a-3) are thus dispersed, while the shopping and working spaces still largely concentrate in the neighborhood.

The habitual spaces of the residents in ‘other neighborhoods’ shall be discussed according to their home locations. Inner-city residents (typically, c-1, c-2 and c-3) generally have diffuse working spaces and compact shopping and recreation spaces concentrated in the downtown area. The residents of ‘Other neighborhoods IV’ which lies in the periphery of inner city show broader coverage of shopping and recreation activities. It can be found, however, the dispersion of their shopping or recreation locations (especially those outside the inner city) to a large extent resembles that of their working places (c-4). Similar patterns appear in (c-5); the suburban residents conduct habitual activities either downtown, or in their neighborhood.

The situation for the economically-privileged residents is quite different. If the residents from ‘other neighborhoods’ tend to shop or recreate in the city center, these people living in gated communities seem to be the opposite (b-1, b-2). Working places are clustered at the new CBD and the high-tech zone in the northwest of Beijing. Habitual activities are conducted in other suburban areas rather than the downtown area. Notably, while the economically-privileged residents usually shop at adjacent places, their recreation destinations are less concentrated at home locations and even extend further to the outer suburbs.

- Daily spaces aggregated by neighborhood types

In order to remove the influence of home locations, the daily spaces of the residents are simulated in an X-Y coordinate plane, with the X axis representing distance from home (between 0 and 48 km) and Y the time of the day (24 hours). The plane is divided into 1920\*1920 grids; each grid has 0.75 minutes in time and 25 meters in distance (i.e., the unit of the X axis is 25 meters and that of the Y axis is 0.75 minutes). Activities are located in the grids and kernel densities are computed in the same way. Specifically, work or work-related activities are not included, as they usually last for hours and would weaken the representation of other activities.

In-home activities are also excluded, so activities appearing '0km from home' are mostly conducted in the neighborhoods.

Figure 3 presents the space-time densities of daily activities for the three residential groups. Space-time patterns derived from the workday and weekend diaries are shown in paired surfaces. Understandably, non-work activities on Monday were concentrated at noon, before or after work, whilst those on Sunday were more likely to be performed in the morning or afternoon and could last for the whole day.

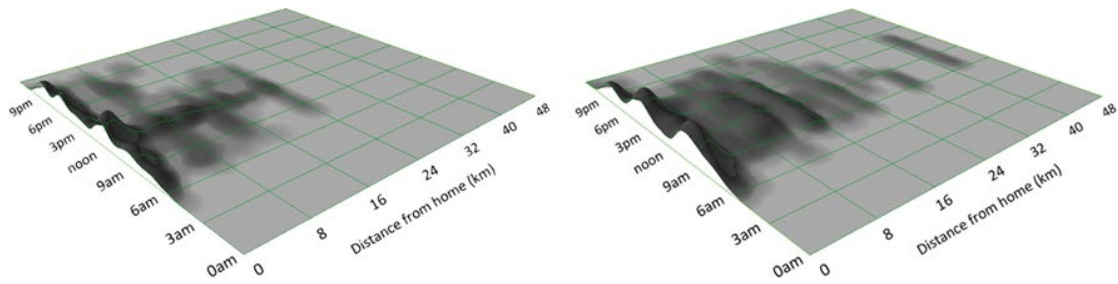
As shown in Figure 3, the daily spaces on the weekday of the institutionally- and economically-privileged residents are rather compact in the space-time surface. Residents of other neighborhoods, perhaps because of the dispersion of their working places, have a wider spatial coverage of daily space on Monday. In contrast, daily spaces in the weekend for privileged-enclave residents is extended and fragmented. Some of the affluent households might travel a longer distance to spend a weekend in the countryside; others may prefer to stay in places near neighborhood amenities. A large percentage of non-work activities were performed at places 10–15 km from home by the institutionally-privileged residents and 5–8 km from home by the economically-privileged residents.

On the other hand, the daily spaces of the other-neighborhoods residents on Sunday are relatively small. As the bottom right plane in Figure 3 shows, most of the discretionary activities undertaken by the residents of other neighborhoods on Sunday are within a range of 20 km from home. Their daily activities are also found to spread over the space-time surface. Specifically, they have a longer time span in daily space than do the privileged individuals. The privileged-enclave residents seldom perform out-of-home non-work activities later than 9pm, which might reflect a higher sensitivity to possible crime or a more orderly schedule, while the active time of the other residents could last until midnight.

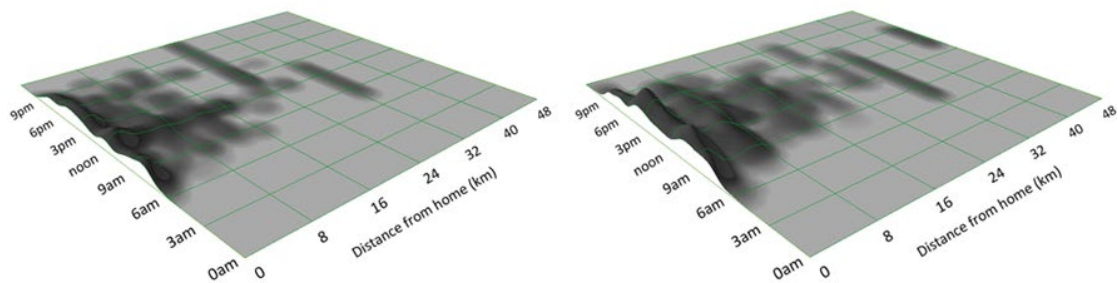
In summary, Figure 3 reveals two findings. First, the daily space of the residents from 'other neighborhoods' in general has a higher intensity than that of the privileged-enclave residents. Second, the spatial extensity of the daily space of the privileged residents on Sunday is larger than that of the other residents.

Monday

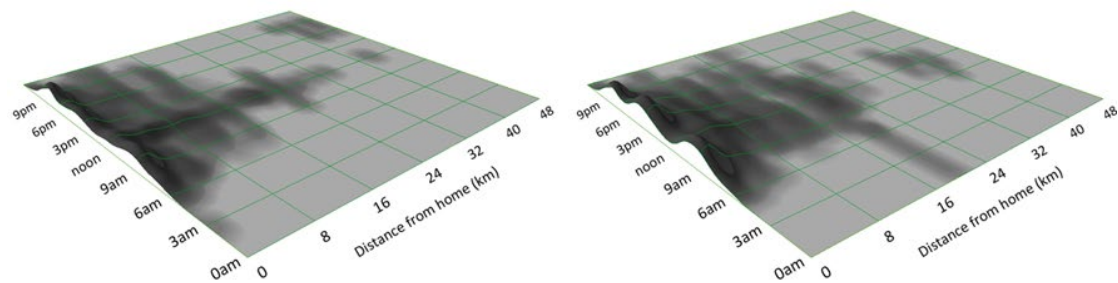
Sunday



(a) Institutionally privileged enclaves



(b) Economically privileged enclaves



(c) Other neighborhoods

Figure 3. Daily spaces of the three residential groups<sup>5</sup>

- Activity spaces analyzed at the individual level

To verify and complement the above findings, disaggregate analyses on individuals' habitual and daily spaces are conducted. Specifically, the extensity of habitual and daily spaces and the intensity of daily spaces are estimated and compared for the residents in different types of neighborhoods. The 95% confidence intervals

for the means and the results of ANOVA tests are displayed in Figures 4 to 8. Most of the means differ significantly between groups. The most obvious differences appear in the extensity of habitual spaces (Figure 4), which confirms the different patterns shown in Figure 2. The economically-privileged residents have the largest average extensity, whilst the institutionally-privileged residents have the smallest. The extensity of daily spaces differs similarly, although not so statistically significant on weekend (Figure 5 & 6). However, the economically-privileged individuals, who have the greatest extensity in activity space, have the least intensity among the three groups (Figure 7 & 8). The institutionally-privileged residents also spend much less time on out-of-home activities on the weekend, whilst the residents of other neighborhoods have the largest intensity in daily space on both days.

Evidently, residents of the economically-privileged enclaves have the most extended but least intense activity space. Residents of the institutionally-privileged enclaves have the most compact activity space, while the other residents spend most time in activity space out-of-home within a modest spatial range.

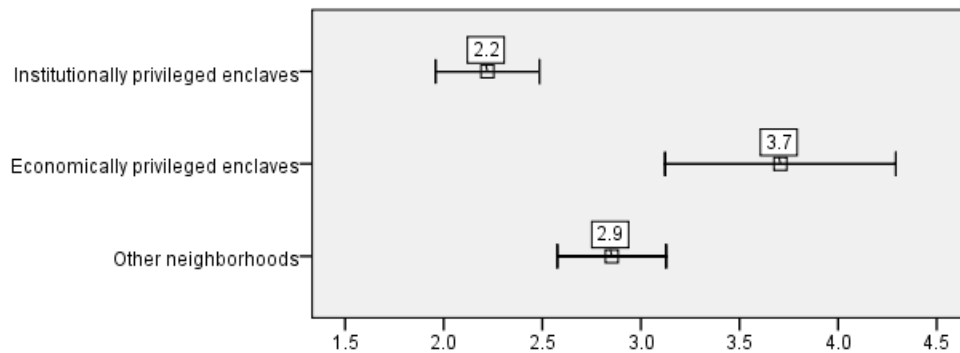


Figure 4. Extensity of habitual space (p-value = 0.000)

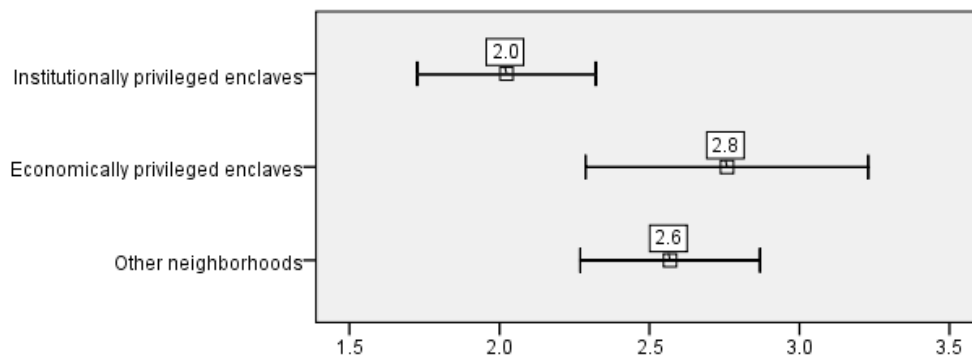


Figure 5. Extensity of daily space on weekday (p-value = 0.022)

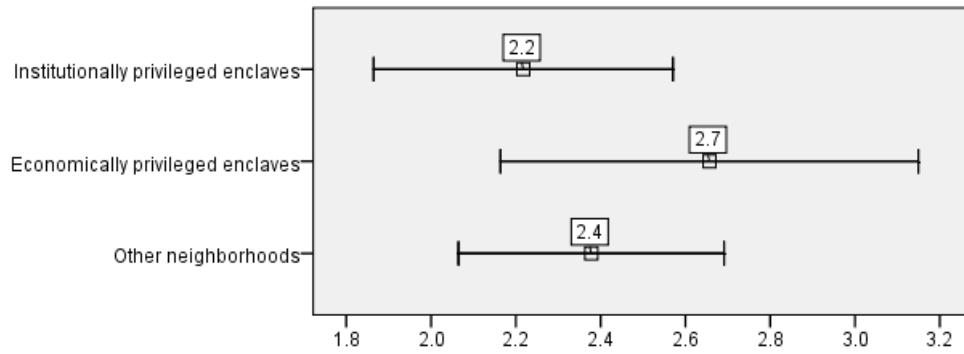


Figure 6. Extensity of daily space on the weekend (p-value = 0.398)

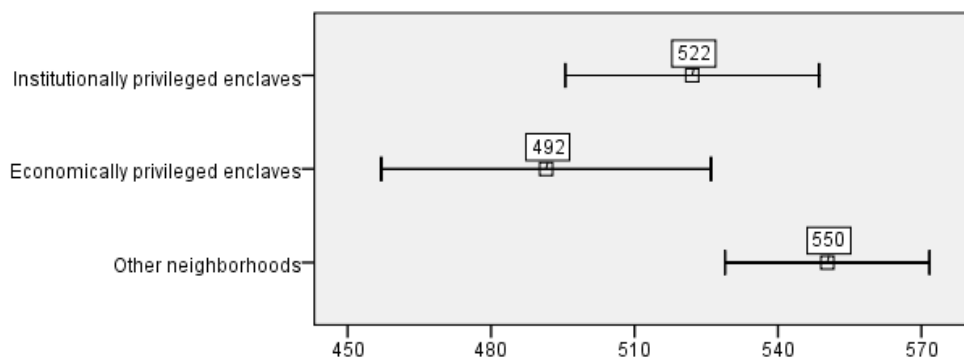


Figure 7. Intensity of daily space on a weekday (p-value = 0.013)

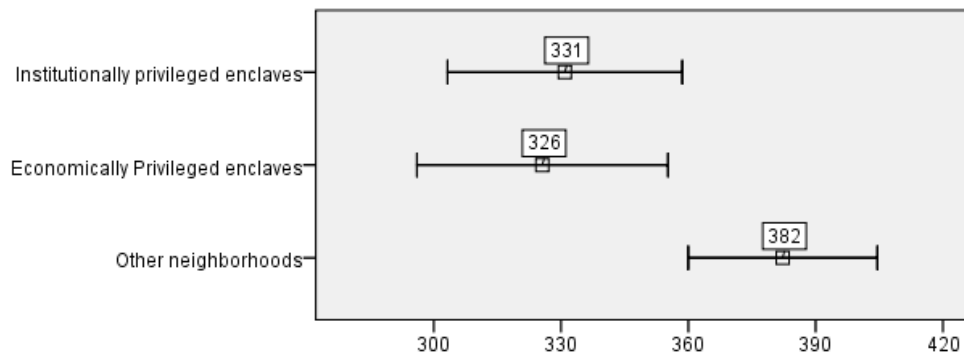


Figure 8. Intensity of daily space on the weekend (p-value = 0.003)

Comparisons of the exclusivity in activity spaces also support the assumption that the privileged enclaves residents may tend to stay away from the public space. Table 3 shows the shares of travel time using private transport for the three residential groups. ‘Private transport’ here includes private car, taxi, and work-unit car (usually accessible to high-rank officials or executives). Significantly, the economically-privileged residents use private transport more than other residents do. The residents of other neighborhoods are more likely to use public transport or

non-motorized travel modes, which provide them with more opportunities for social contacts and encountering different social groups.

Table 3. Share of private transport in daily space (percentage)

	Weekday	Weekend
Institutionally-privileged enclaves	20.4	27.7
Economically-privileged enclaves	36.1	46.6
Other neighborhoods	15.0	20.5

While the use of private transport reflects exclusivity in *corridors* (Atkinson & Flint, 2004), the destinations of habitual activities show exclusivity in *nodes* of the activity space. Tables 4 & 5 compare the habitual destinations of shopping and recreation activities for the three residential groups. While more than 60% of the residents in ‘other neighborhoods’ usually shop in neighborhood supermarkets or the market, the economically-privileged residents often patronize shopping malls, which are more comfortable, high-class, and free from the crowding, long queues, and cheap sales that are often observed in neighborhood shopping places in Chinese cities.

Differences in recreation places are also evident (Table 5). As mentioned earlier, many institutionally-privileged residents perform habitual recreation activities in communities or neighborhood fitness clubs. A considerable proportion of the economically-privileged residents prefer suburban parks or vacation villages. On the other hand, the residents of other neighborhoods are more likely to pursue their recreation in public gardens or common amusement spots, such as KTV or nightclubs.

Table 4. Habitual shopping places of the different residential groups (percentage)

	Institutionally-privileged enclaves	Economically-privileged enclaves	Other neighborhoods
Neighborhood store or market	5.9	1.5	7.7
Supermarket	51.7	36.7	61.9
Shopping mall	26.5	47.3	12.9
Commercial center	2.8	3.5	6.8
Other (specialty store or market)	5.3	4.0	4.1
No habitual shopping place	7.8	7.0	6.6

Table 5. Habitual recreation places of the different residential groups (percentage)

	Institutionally-privileged enclaves	Economically-privileged enclaves	Other neighborhoods
In the community	11.9	8.4	4.2
Public or neighborhood garden	22.3	21.3	37.9
Fitness club	21.9	10.9	9.4
Amusement place (KTV, pub, sauna center, fairground, cafeteria, etc.)	1.9	5.4	6.2
Entertainment place (cinema, theatre, concert, museum, library, teahouse, etc.)	3.5	1.5	1.6
Shopping center	2.2	4.5	2.7
Suburban parks	2.8	10.4	2.1
Other (work-unit or association)	0.6	1.5	0.9
Recreation at home or no habitual place	32.9	36.1	35.0

These findings are fairly consistent with those of the aggregate analysis. We have reason to believe that socio-spatial segregation does exist in the activity spaces of different social groups in urban China. The compact activity space of the institutionally-privileged residents could be attributed to the intensive lifestyle in the work-unit compounds, and the extended and fragmented activity space of the economically-privileged residents reflects a similar tendency of isolation from society and urban space, as has been found in western cities (Atkinson and Flint, 2004; Atkinson, 2006). While the privileged-enclave residents enjoy their transportation and activity places with exclusivity, the ordinary people seem to make full use of urban public spaces – parks, squares, and municipal centers.

## CONCLUSION

The increasing social polarization and fragmentation of urban space around the world have attracted considerable research attention (Caldeira, 1996; Grant, 2005; Smets and Salman, 2008). While geographers usually consider residential distribution as a determinant in social inequity and segregation, this paper argues that the actual usage of urban space by different social groups should receive more attention. This pilot study in Beijing, China supports our hypothesis that, in modern enclave cities, the differentiation of individuals' activity space is no less significant than that of residential space.

Although the three groups of residents are identified by different types of neighborhood, they are actually differentiated by socioeconomic status rather than location of residence. As the case study shows, individuals from institutionally- or economically-privileged enclaves in different regions of the city have similar patterns in activity space, while residents from privileged enclaves and other neighborhoods who live in the same region may have very different space-time experiences in their daily lives. These similarities and differences, which cannot be demonstrated in residential segregation studies, reveal the ‘trajectories of segregation’ (Atkinson and Flint, 2004).

The examination of the activity space of privileged residents in Beijing reveals similar trends found in the gated communities of Western cities: the retreat of the elites from the urban public realm (e.g., Low, 2003; Atkinson and Flint, 2004). While the institutionally-privileged residents are more secluded in their residential enclaves, the economically-privileged residents seemingly make more use of the ‘premium network spaces’ (Graham, 2000; Graham and Marvin, 2001) in urban daily life. Their self-isolation reflects an avoidance of social interaction, which may be rooted partly in the intolerance of disorder and urban problems (similar to the ingrained pursuit of purity argued by Sennett, 1970), and partly in apathy towards public duties and responsibilities.

This study raises an interesting question for enclave urbanism and urban segregation researchers: Is residential segregation necessarily the key aspect of socio-spatial stratification? We believe that differences in daily life and activity space are also important elements underlying urban fragmentation and stratification. As this study shows, individuals’ activity patterns in urban space are not completely defined by geographical accessibility. The underlying mechanism of activity space – *social accessibility*, which is determined by socio-professional position as well as economic status – deserves more research attention. Without efforts to encourage social equity, interaction and integration, social mixing in neighborhood development may prove to be ineffective in reducing urban segregation and socio-spatial barriers. We therefore suggest more comprehensive socio-spatial segregation studies, which may lead to more effective policy measures.

The present study could be improved in several aspects. More detailed measurements of activity space should be examined towards specific objectives. The relationship between residential choice and activity space needs more exploration and interpretation. Researchers may find it interesting to particularly compare the activity



space of residents from adjacent gated community and ordinary neighborhood. Furthermore, the rural migrants may be taken into account in later studies regarding Chinese cities. While urban migrants are a relatively privileged group in Chinese cities (Logan et al., 2009), the rural migrants probably form the most marginalized and excluded group. Through the *Hukou* system, these migrants have ‘peasant’ tags even though they have been urban workers for years. They are the ‘Bottom out of Sight’ that Fussell (1983) described, as they come and go ‘without a trace, as if from nowhere’ (Lu, 2006, p. 149). Exploring the activity space of these ‘invisible’ residents could conceivably enhance our understanding of the socio-spatial segregation of urban China.

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<sup>1</sup> Correspondence concerning this article should be addressed to Donggen Wang, Department of Geography, Hong Kong Baptist University, Kowloon Tong, Kowloon, Hong Kong; email: [dgwang@hkbu.edu.hk](mailto:dgwang@hkbu.edu.hk)

<sup>2</sup> Institutionally-privileged enclaves include *Sanlihe*, *Yandong Yuan* and *Wangjing Huayuan*. Economically-privileged enclaves include *Dangdai Chengshi Huayuan* and *Fangzhou Yuan*. Other neighborhoods include *Jiaodaokou*, *Qianhai Beiyuan*, *Hepingli*, *Tongren Yuan*, *Huilong Guan*.

<sup>3</sup> Household income per month is counted in RMB; 3000 RMB equals roughly 400 USD at the 2007 exchange rate, while 10000 RMB approximates to 1333.3 USD.

<sup>4</sup> The ring-road system in Beijing usually do not include the '1<sup>st</sup> ring-road', which may refer to the road around the Forbidden City. The 6<sup>th</sup> ring-road was not completed in 2007, and it is mainly located in outer rural areas. Considering the situation at the time this survey was conducted, we focused on the major urbanized area of Beijing, namely, the four central districts and the four inner-suburban districts. For a detailed introduction of the eight districts and the spatial structure of Beijing, the readers may refer to Wang and Li (2004).

<sup>5</sup> In order to make the intensity of daily space comparable, the elevations in the space-time density surfaces are standardized by a Z factor inversely proportional to

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the sample sizes of different residential groups. As a result, the space-time density surfaces of the two privileged resident groups may look a little sharper than those of residents from the other neighborhoods, but will not influence the main discussion.