

# **The struggle to belong**

## ***Dealing with diversity in 21st century urban settings***

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### **Residential location of local and migrant households across concentric zones in 2006 Beijing**

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## **Abstract:**

Since economic reforms, the migrant population and social polarization in Chinese cities have both seen a steady rise. This paper tries to explore whether these processes are also accompanied by spatial sorting of population along concentric pattern of residential location in Beijing based on the migrant status. Using data from a 2006 household survey, this paper examines whether households living in different concentric land value zones are significantly different in terms of their individual socio-economic and institutional characteristics. Our analysis reveals that the concentric zones based on residential land values in Beijing can explain significant variance of households' spatial differences. The socio-spatial pattern shows a clear urban-suburban divide in terms of housing tenure, housing conditions, and specifically household's *hukou* status. This paper uses this snapshot of Beijing in 2006 to predict possible restructuring in the future.

*Key words: socio-spatial difference, concentric zone, local and migrant households*

## **Introduction**

This paper investigates whether there are signs of residential socio-spatial differences in Beijing 30 years after the economic reform. The main reason that residential socio-spatial differences is of concern is because spatial difference may lead to further inequality in opportunities on upward social mobility. The disadvantaged group, either lower income, certain minority group, or other kind of marginalized group might concentrate in certain urban area which further leads to their insufficient access to opportunities that are common for other groups.

Comparing with cities in market economies, the spatial pattern of socialist cities was thought to be socio-economically homogeneous, with very little or no observable spatial segregation (Sykora, 1999). Many have argued that in Chinese socialist cities inequalities did exist in terms of households head job rank (Logan & Bian, 1993) and political party membership (Pan, 2004), while these different households were spatially mixed. However, work units with different levels of administrative affiliations in Chinese socialist cities were found to be different in terms of their quality of community public good (Logan et al., 1999). Spatially these work units in cities appeared as a honey-comb pattern of social differentiation.

Studies in western cities have found that households with different socio-economic characteristics (race, income, education etc.) were sorted into spatially different locations in relation to the city center. Most studies have focused on spatial differences between the rich and the poor, or among racial and ethnic divisions (e.g. Massey, 1996). Empirical studies have confirmed the existence of these spatial differences in many western cities.

Income related residential segregation is often analyzed with relation to the distance to the Central Business Districts (Park et al., 1925). The socio-spatial patterns in different cities around the world historically vary due to varied cultural, environmental or historical reasons. US cities generally appear to have the poor households living in the city center while the high income group spread into suburban areas: higher income households choose to live in single family housing with bigger plot of land while the poor would compromise the size of housing for the access to employment. On the contrary, European cities generally hold a relatively higher income center because better and highly subsidized public transportation system allowed the working class to commute to work daily (Glaeser et al., 2008). No matter what reasons behind, these socio-spatial pattern is reinforced by the fact that, the rich households' housing location

decision tend to bid up the price of local housing. The increased housing price, in turn, displaces families with lower income.

Race or ethnicity related residential segregation follows a somewhat different logic. The new comers/immigrants in cities start their livelihood mostly with limited resources. They settle more often in certain areas in the city where they can find affordable housing, family ties, a familiar culture, and/or help in finding jobs (Thomas & Znaniecki, 1974).

There are usually strong overlaps in the locations of the poor and those of migrants. The migrants are most likely to be the poor in cities. As soon as their economic situation improves and their outlook broadens, their preference in terms of residential location becomes more mainstream and they move out of “enclaves” (Wirth, 1982). Therefore new comers go through a phase of segregated living that is followed by a phase of “spatial assimilation” (Massey, 1985). Cities under market economy are often characterized by its magnitude of socio-spatial differences. 30 years after the economic reform in China, the more market-oriented economy is similarly sorting various households spatially in cities. Spatial patterns of Chinese cities going through dramatic housing reforms have undoubtedly come under the pressure of restructuring (Wang & Murie, 2000). In this process, the differentiation between the rich and the poor, and between the local and migrant households are also evident.

Beijing's real estate development have shown escalating housing price towards the city center, which suggests that only the rich can afford to live in these new development projects.

Meanwhile, enclaves that used to be occupied by migrants originated from common provinces (such as '*Zhejiang cun*', and '*Xinjiang Cun*') were mostly removed in recent years because of government's determination in removing 'criminal activities' (Zhang, 2001) and migrants were displaced towards suburban areas. On the other hand, migrant households also become a strong

purchasing group in big cities' real estate market. In 2007, migrants bought more than 50,000 units of commercial housing in Beijing, which was around 40% of all commercial housing sales. These home buyers are most likely not the same group who used to live in enclaves, and their preference of residential location should be close to the mainstream.

All these restructuring dynamics make it interesting to take a snapshot of these processes. In this paper, we use 2006 household survey data to investigate the residential socio-spatial pattern in Beijing. The social group differences we would like to explore are between the rich and the poor, between local and migrant households. The spatial pattern under investigation is about the distance to CBD. Since the household survey data does not have continuous data in all spatial divisions of the city, we won't be able to explore other form of patterns in this paper. We hypothesize that the distance to CBD in Beijing, like in any other market economies, is differentiating households with different income and migration status.

## **Socio-spatial patterns in Chinese cities**

The choice of the residential location is usually the result of a complex set of inter-related factors. For a given level of housing affordability, households have to balance their choice on housing tenure, condition and location. Generally, housing characteristics such as tenure type and housing condition (unit size, building age, and included amenities) vary across different parts of the city. This may either because of the history of urban development (e.g. older buildings are more likely to be in the city center with smaller size and poorer facilities) or due to differences in the nature of demand for different housing types across different locations. The differences in demand are due to a number of factors, inter alia, employment opportunities (Clark & Withers, 1999; Levine, 1998), transportation cost (Glaeser et al., 2008), environmental amenities

(Brueckner et al., 1999), and household characteristics. Household characteristics may include income (Massey et al., 1991), education, marital status, life cycle (Rossi, 1980), and immigrant status (Pamuk, 2004; Rosenbaum & Friedman, 2001), among others.

### **Previous research findings and challenges**

One major challenge in studying socio-spatial patterns of Chinese cities since the housing reform is that the pattern is so dynamic that it may change towards another direction within a short period of time. Sometimes by the time the research is published, the development policies may have pointed to another direction of change. Earlier studies found that majority affluent households in Chinese cities still lived in public housing rather than in residential enclaves for the rich (Hu & Kaplan, 2001). Gu and others (1999) argued that in Beijing the rich tend to move into the near suburban districts due to the declining living standards in the inner city districts; and the poor may concentrate in the city center. They were not able to foresee the large scale urban redevelopment in early 2000s in the inner city Beijing. New housing redevelopment replaced the old and dilapidated courtyard housing, so as the original households, a process similar to 'Gentrification' (Smith, 1996) in western cities' inner city revitalization processes. The large scale redevelopment greatly upgraded the living standards, as well as the cost of living. Recent data shows a skyrocketing price of housing when approaching the CBD. Zheng and others (2006) found that high-income residents appear to locate more centrally in Beijing. Meanwhile, the dramatic urban redevelopment in Chinese cities have pushed away migrant villages in the name of fighting migrant disorder and crimes, first from central city to suburbs (Zhang, 2001: 159), and then from suburban area 'urban villages' (Song et al., 2008) to other undeveloped countryside, nearby towns or return to their home provinces. The 2000 census

shows that in Beijing migrants are more concentrated in a ring shaped urban rural boundaries (Logan et al., 2009b).

A second challenge is the availability of city wide demographic data. To empirically identify a socio-spatial pattern, it requires census level large scale survey at a finer geographic unit. The lack of good quality data leads to two major impact on the qualities of current studies on Chinese cities' socio-spatial patterns. First is the use of district level data so that the conclusion can only be drawn at geographic units with administrative boundaries. For example, (Feng et al., 2007) studies socio-spatial pattern of Beijing and finds that migrant status is an important factor in predicting residential location at district level. The district size in Beijing is so big that the heterogeneity within districts is therefore overlooked. The second impact is that some scholars turning to use other data sources to deductive reasoning the spatial patterns (e.g. e.g. Wang & Murie, 2000). For example, Wu & Yeh (1999) studies aerial photographs to decode the urban development and land-use changes in the city of Guangzhou. They identified a pattern of change that was from a more compact city to a more dispersed metropolitan area with leapfrog development happening in suburban area. The third impact is the on the limitation of city population data coverage. Most survey focus only on local registered population that mostly lead to a biased study (e.g. Meng et al., 2005). Some more focused survey data leads to findings on even more specific social group and is unable to provide an aggregated general picture of the city as a whole (Li & Wu, 2006). All these studies can conclude on the increasing impacts of market forces in Chinese cities restructuring process, few of them could empirically confirm a city-wide pattern.

With aggregated sub-district level census data, a few studies attempted to provide a better picture of socio-spatial pattern in Chinese cities. Li & Wu (2008) studies the city of Shanghai, and found

its pattern to be a combination of concentric layers, clusters, and multi nuclei. It discovers that migrant status, retirees, working class, and knowledge workers show up to be the four major factors that differentiate the residential space. And it fails to identify any socio-economic factors in spatial differentiation in Shanghai. They conclude that the residential spatial differentiation is mainly the differentiation of housing stocks rather than household head socio-economic status. The concentric pattern includes layers of a retiree concentrated city center, a following concentric layer of socialist housing, another layer of new developed housing, and the outer layer of rural villagers. If socio-spatial patterns in Chinese cities are segregated according to housing tenure (Li & Wu, 2008), and housing access in Chinese cities are still strongly influenced by the institutional differences (Logan et al., 2009a), we have all the reason to believe that institutional factors relating to household registration could be strong indicators of spatial distribution. Housing segregation in Chinese cities can be a representation of institutional segregation. One limitation of previous studies (e.g. Li & Wu, 2008; Logan et al., 2009a) is the missing of household income data, which is the major indicator of households' class position in a market economy. Although they find that institutional factors are important, they were unable to identify the impact of economic differences among households. There has been no clue on how much are these institutional factors correlated with social income groups (Massey, 1996). The inclusion of household level income data may help to discover their possible interrelationships. Although with all these limitations, most studies agree that socio-spatial patterns in Chinese cities are going through a process of restructuring. The housing reform has changed the structure of Beijing from a work-based city to a residence-based one (Wang & Murie, 2000). Due to historical development reasons, there were three spatially distinctive concentric zones in large Chinese cities. The central area is the legacy of the old self-sufficient economy and has

undergone changes under the new market economy. The inter-mediate work units ring is the legacy of the socialist planned economy. The outer ring of housing estate and related facilities is the direct product of the market economy. Some suggest that restructuring direction of Chinese cities is similar to other market economies. However, we have plenty of reasons to doubt whether the distance to CBD in Beijing really follows what was found in western market economies.

Apparently there are very heterogeneous groups of households living in all these three rings. In the historic central city, it has a very large legacy of prior housing types, partly in the persistence of public rental housing that served many different kinds of people, along with some redevelopment areas sold at market price. It has a mix of households from central government officials, and old Beijingers who still do not have their own household toilets. The middle work units ring has the history of 50 years' socialist development, for which the spatial differences was more across institutional hierarchies (Logan & Bian, 1993) while inequalities within work units depend on household heads' political positions and connections (Logan et al., 1999). In the outer ring that was developed under the new market economy, the picture is even more mixed: there are rural villagers who have been historically poor (Wu & Treiman, 2004); there are increasing number of urban villages where migrants can find relatively cheaper rental housing (Song et al., 2008); there are large scale development where land is relatively cheaper, targeting the mass market and accommodating displaced inner city people; there are also newly affluent people seeking space for their villa developments and buying cars to deal with the transportation problem.

All these have painted a rather complex picture of the socio-spatial patterns in Chinese cities. This paper will explore, whether there is a general concentric socio-spatial pattern under these

contrasting socio-spatial settings with the mosaic distribution of the rich and the poor (Iossifova, 2009).

### **Differences among local and migrant households**

The institutional divide, in terms of household registration, *hukou* status, has been consistently found to be the major division in all spheres of livelihood in Chinese cities. The housing reform in cities has let the housing needs of migrant households to be taken care of by the market forces, while local urban households are able to access subsidized housing. Based on 2000 China's census micro-level data, Logan et al (2009a) discover that residential status, defined as population *hukou* registration and the length of dwelling in cities, is a strong factor in predicting access to different housing tenures. Households without a local hukou registration are steered toward market and collective housing, which represents a concrete disadvantage since subsidized housing are overall much more affordable, and most probably in a more preferred location .

Migrant living in cities as individuals and those living as households are different in their housing decisions. When they live in cities as individuals, their intention to spend on housing is even less. Housing results for rural migrant population living in cities although vary (Wu, 2002), in any case are not much better than a bed in a crowded dorm (Solinger, 1999). For those who live in Beijing as households, Feng and others (2007) point out that they live under two extreme situations with some (mostly rural migrants) struggle to pay their marginal rents every month, and some (mostly urban migrants) can purchase an apartment in the real estate market.

Immigrants' homeownership is seen as a symbol of residential assimilation in US cities (Myers & Lee, 1998). Owning a house and settling in Beijing is also the desire of many migrant households. Being the capital city, Beijing is a strong real estate attraction to national and international buyers, whom are mostly counted as migrants. With these two extremes of housing

choices for migrant households, we are expecting to find heterogeneity among migrant households' housing location results as well.

Overall, this paper analyzes residential spatial differences using a more comprehensive city level household survey data. The Beijing 2006 household survey includes detailed household information for both local and migrant households proportionally sampled in eight city districts, and it is possible to obtain a more complete picture of the socio-spatial pattern. First, the inclusion systematically sampled city-wide household income data allows us to explore the impact of market force in Beijing, over and above the *hukou* status. Second, this household survey data allows us to examine the whole city residents proportionally sampled between local or migrant households. Third, this city-wide survey data also avoids the bias of previous studies which used to be mostly towards the group of poor migrant households. It expects to identify the diversity of housing choice among migrant households.

## **Research Design**

In this study, we use data from a household survey conducted in 2006 to explore the relationship between individual household characteristics and their residential location. Household characteristics include both the institutional characteristics (urban or rural, local or non-local *hukou*), and socio-economic characteristics (household head age, income, education etc.). The survey differentiates local and migrant households in terms of their registration, whether it is in Beijing or not. Our hypothesis is that the relation between residential location and household socio-economic characteristics of a household with a local Beijing *hukou* is different from that of a household with a non-Beijing *hukou*. In the following, we further explain the 2006 survey data, and the spatial division in Beijing we adopted in this study.

## 2006 Survey Data

The 2006 household survey titled "Housing relocation and urban restructuring under market transition" was conducted by Chinese Academy of Social Science. It used a combination of two similar but not identical questionnaires - one covers 1200 local households (with Beijing urban *hukou*), and the other covers 300 migrant households (including those with either urban or rural non-Beijing *hukou*). Respondents were proportionately sampled according to the official statistics on local registered and migrant population in eight city districts. The distribution of sample in each district is a round-up reversed calculation according to the ratio of local and migrant population, in each district, proportion to the city total<sup>1</sup>.

Following the nature of data collection process, household location data was based on the location of sampled residential committees. Being in a common residential committee implies that these households are geographically proximate to each other, and will be coded as in a common location relative to the city spatial location.

Due to the nature of our survey data, we are limited to residents in Beijing living in "family" households only. In China households are grouped into two types: family households or collective households (referring to those living in dormitory buildings provided by employers or by educational institutions for their students). According to the 2000 census, comparing to 96% local registered population living in family households, only around 55% migrant population living as household units in Beijing (Logan et al, 2009). Our study based on the 2006 household

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<sup>1</sup> It was predetermined that 25 local households and 20 migrant households would be sampled in each selected residential committees. For example, if one city district accommodates 20 percent of city total migrant population, it suggests that  $300 \times 20\% = 60$  households should be sampled from this district. Since 20 migrant households would be surveyed in each selected residential committee, three residential committees in this city district would be randomly selected for survey. It is possible that both local and migrant households were approached from one common residential committee.

survey only covers the proportion of migrant population who live in Beijing as a family household. Therefore our analysis is unable to claim a full picture of migrant spatial pattern in Beijing since it misses a big share of the migrant population living in collective households. To some extent, it captures those migrants who have moved to the city with their family members, and who choose their own housing location independent of their employers.

The relatively biased sampling method used in this survey has resulted in no migrant households sampled in four inner city districts. The reason given by the survey enumerators was that it was hard to find 20 migrant households in one residential committee in these districts. Although this does not mean that there are no migrants in the inner city, it creates problems in our later discussion to have any conclusions on migrant households' housing choice in central Beijing.

### **Defining Beijing's concentric zones**

In Chinese cities, the history of the socialist period has witnessed central planning dominated the spatial distribution of urban development around the historical core. The economic reform since then has facilitated dramatic urban expansion that has led to the new development zones outside the previous built up areas. Both of these two historical processes suggest a concentric pattern of development.

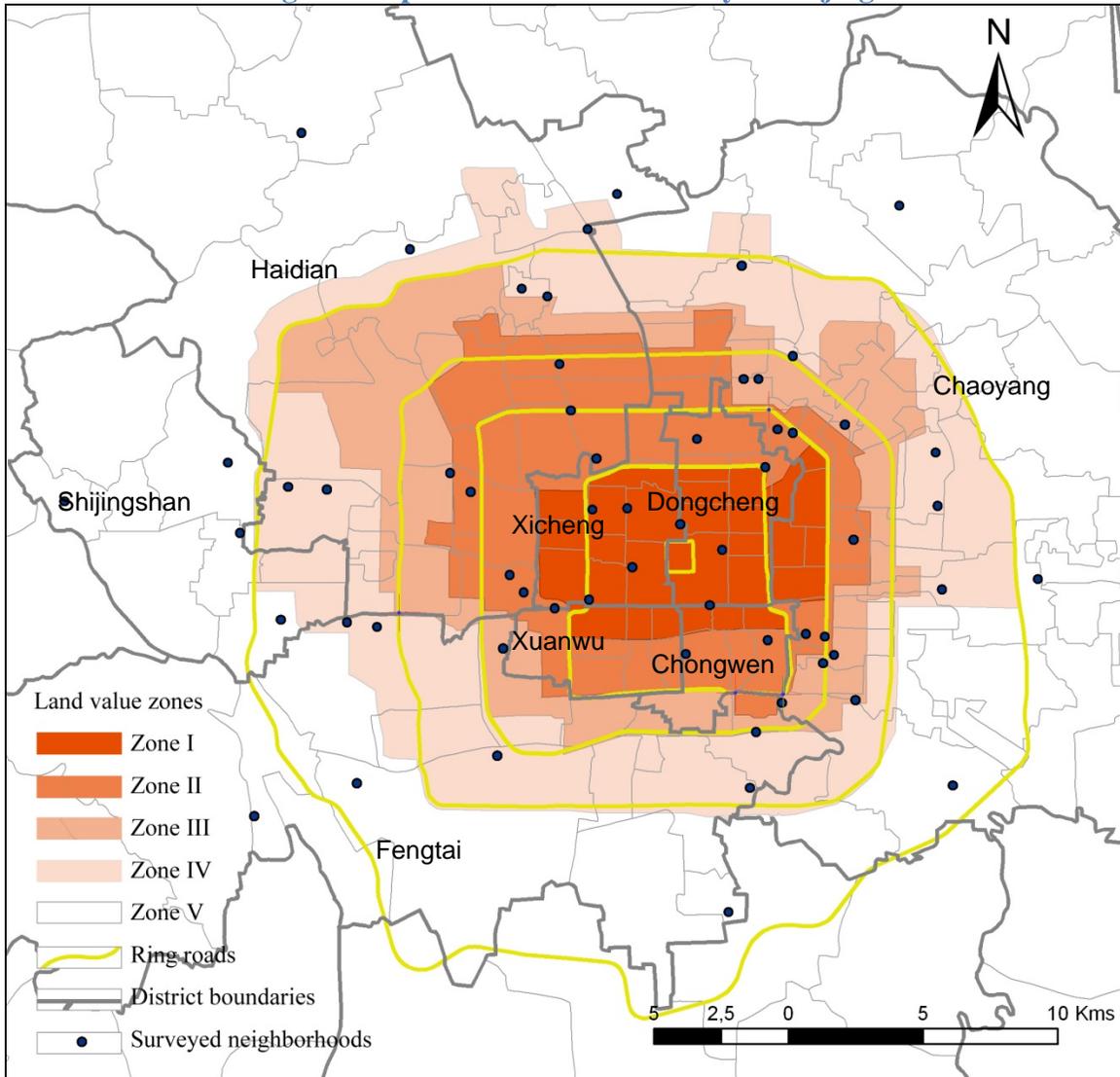
To study whether the distance to CBD of residential locations are related to characteristics of households, it is necessary to measure the 'distance to CBD' of each household. Forbidden City being the central point, Beijing's urban development is generally skewed towards the north-west corner. Therefore it is biased to use point to point absolute distance. On the other hand, we could have used the natural concentric zone division in Beijing - the ring-road system as a proxy for the 'distance to CBD'. The ring road number plus the north, south, east, and west direction have been widely used in daily life as spatial referencing. However these ring-roads do not always

match as loci representing similar residential preference in terms of housing locations. The north west Beijing with its mountains and green landscape was historically favored for construction of royal palaces. Today, housing in the northern third ring road is preferred over those around the southern second ring road. As a result, using the ring road concentric division may skew the results of residential location if we simply assume that second ring road is always favored over the third ring road.

In this study we use the 2003 map of residential land value zones that was published by the Beijing municipal government. This specific map was based on a market survey of residential land values (China Real Estate Regulation, 2003). It has been used since as a spatial reference for new urban development projects, and also as a reference for property tax collection. This map, based on the generalized economic value of land, provided us with the closest proxy for location advantage and disadvantage within Beijing's residential land market.

The residential land value map divided the major built-up area into seven concentric levels. As going further away from the city center, the land value decreases. These levels do not coincide with the five ring roads in the city. For the purpose of this study, we regrouped the seven levels of residential land value rings into five zones. Because the household survey data we used has very few residential committees studied in Level 1 and Level 7 of these mapped residential land value levels, we combined Level 1 with Level 2 as a single zone and call it Zone I, and also merged Level 6 and Level 7 and call it Zone V. At the end, we have five concentric residential land value zones in total. They are called Zone I through Zone V. Figure 1 shows the map of these five zones and the overlay of administrative boundaries of city districts, and the ring roads. It also shows the locations of all the residential committees studied in the 2006 survey.

Figure 1: Spatial divisions in the city of Beijing



In this paper we aim to explore whether there is a correlation between household characteristics and their residential location in terms of five different concentric zones. In the following analysis, we first provide some descriptive statistics to show the macro-level *differences between migrant and local population*. Later, we use the multinomial regression to test our hypothesis that *household socio-economic characteristics are related to their residential location in terms of five concentric zones in Beijing, and this relationship is different between local and migrant households*. Residential location is treated as one aspect of the housing outcome, others being

housing tenure type and housing condition. Therefore, although residential location is the main focus of this paper, the multivariate analysis will control for housing tenure and housing condition variables. An appropriate strategy to test this hypothesis would be to conduct multivariate regression separately for local and migrant households. However, the sample size for migrant households is too small (300) to run the multinomial models separately. Therefore, we first run the regression model using the whole sample, and then with only the sample of local households. We will try to interpret the change of coefficient between these two models to identify the effect of being migrants in the city.

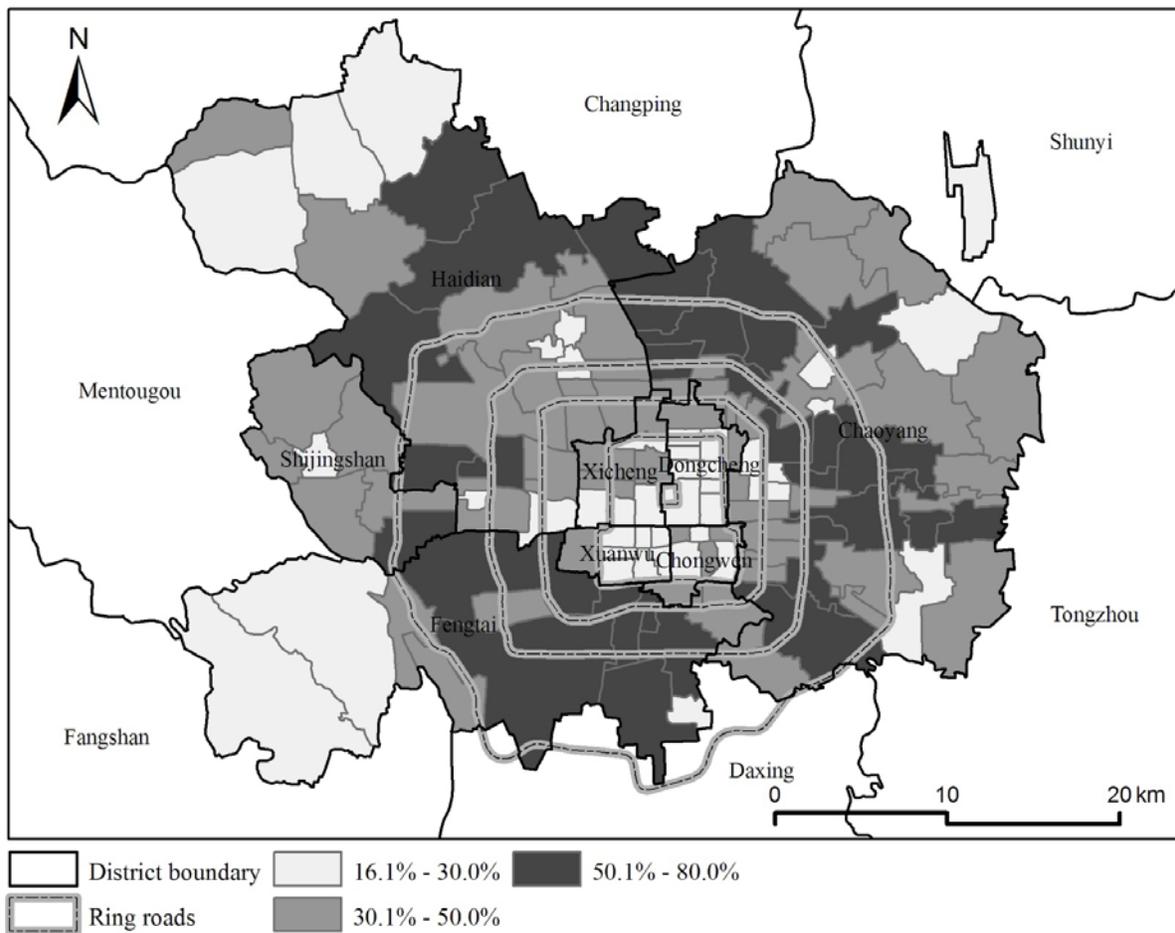
## **Data analysis**

### **Descriptive statistics**

The 2000 Census sub-district level aggregated data shows that the distribution of percentage of migrant population across Beijing is not at all even (Figure 2). In the areas around the fourth and fifth ring-road, many sub-districts had their majority population as migrants. It clearly shows the concentric pattern of concentration of migrant population. Over time, at the district level, the uneven distribution of migrant households has increased even more dramatically. This is evident from the yearly data from Beijing's Statistics Yearbooks. Overall, there is a population decrease in inner city districts and strong increase in four near suburban districts. Local registered population in the Inner city districts have decreased 7% from 1997 to 2008 due to the strong government policy in directing new urban development to suburban areas through land leasing decisions (Li, 2005). Within the same period, the local registered population in the four near suburban districts have seen a 31.5% increase. Meanwhile, the number of migrant population in the districts classified as the inner city districts have had a much lower increase (74%)

comparing to that in near suburban districts (450%). Figure 3 shows the percentage change in the ratio of migrant population to the total population in eight city districts from 1997 to 2008. If we would have to estimate a distribution map similar to Figure 2 for the year of 2006, the contrast between the inner city districts and near suburban districts should be even greater. The share of migrant population has been more than doubled in the near suburban districts: an increase from around 14% in 1997 to almost 40% in 2008.

**Figure 2: Percentage of migrant population at subdistrict level in Beijing, 2000 Census**



The actual loss of local registered population in the four districts within the inner city districts is expected to be higher than what the statistics above suggest, because the official statistics does not take into account the fact of *renhufenli* (Li & Li, 2010) that the inner city districts have a higher percentage of population who are registered but do not actually reside there. Some

residents have kept their *hukou* there to continue their access to better service facilities including schools. The near suburban districts have received more households resettling from the inner city area while their numbers might be under counted in the official statistics.

**Figure 3: Share of migrant population change in eight city districts from 1997 to 2008**

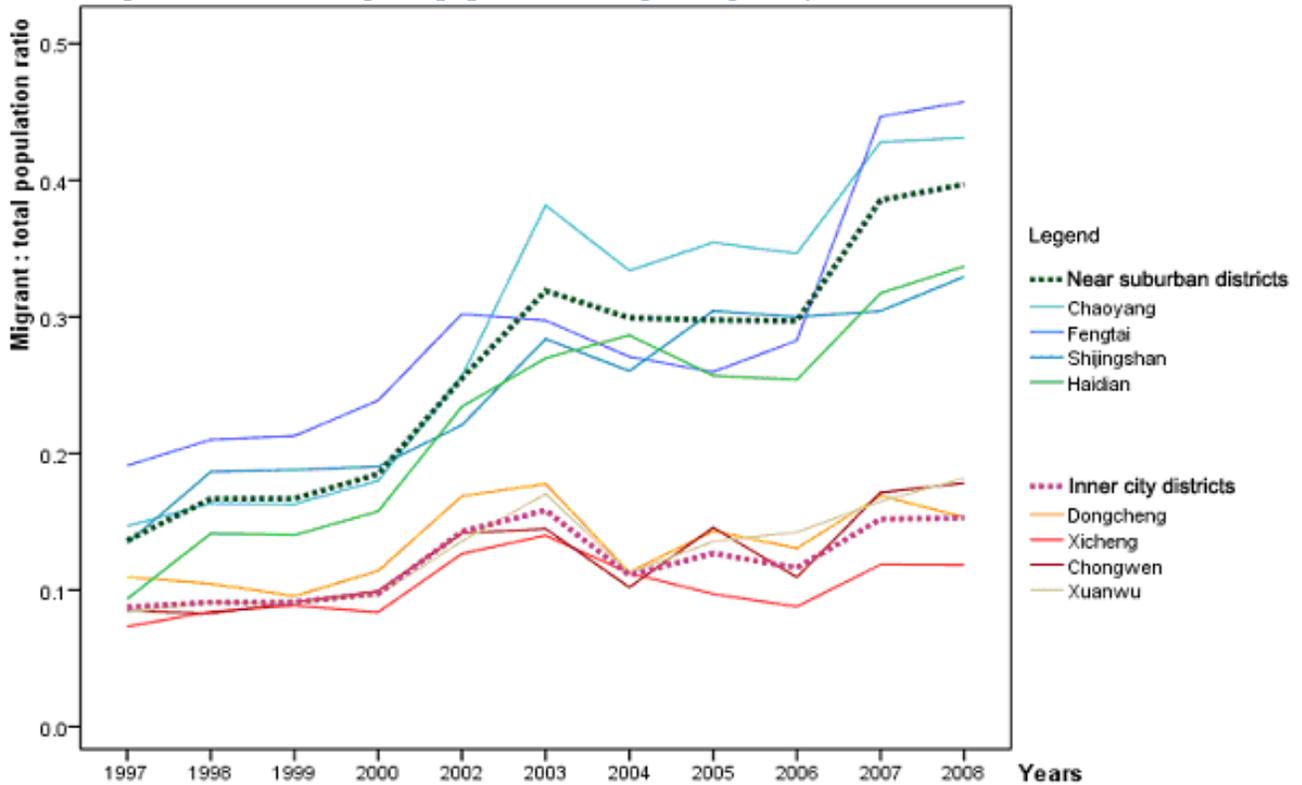


Figure 3 shows that there is a change in the share of migrants within the total population of the eight districts but the change is not uniform for all districts. These changes could be a combination of two processes: the outward relocation of both local and migrant population towards suburban areas, and a higher likelihood of new migrants settling in suburban areas. However, moving behavior recorded in 2006 survey only recorded moving that happened across districts. Four near suburban districts are too big an area to identify their moving directions. The

whole survey only identified fifteen cross districts moves - too few to draw any meaningful conclusions<sup>2</sup>.

Based on the survey data, we explore whether households living in different land value zones are similar, in terms of their household and housing characteristics. If households surveyed in different residential committees in each concentric zone are more similar between committees than within committees, we can conclude that each zone is homogeneous. If we discover that households across concentric zones are heterogeneous, while homogeneous within zones, we can conclude a socio-spatial differentiation across concentric zones. Table 1 gives the mean values of some key variables in each zone, and also the F test with significance level. We present the data for migrant and local households separately to highlight their differences. For example, the per capita income for local households in zone II is 8.202\*\*\*, where the F test is found to be significant. It indicates that the income differences among surveyed residential committees in Zone II are significantly different: although these committees were all surveyed in Zone II, there are still significant differences across these committees than within committees with regard to per capita income. Mean statistics of each variable gives a general idea on their value differences across zones. Overall from the table, we can see that migrant households are more homogeneous within each spatial zone in terms of those listed household and housing characteristics, while heterogeneous across concentric zones. For local households, there is more heterogeneity even within the same concentric zones. This is consistent with previous studies that have observed the mosaic structure of spatial distribution in Beijing (Iossifova, 2009).

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<sup>2</sup> This paper can only present a snapshot of spatial pattern at the time of the survey, rather than the households moving directions. Future studies may be combined to investigate the changing patterns.

**Table 1: Descriptive statistics on selected household and housing characteristics: mean value and variance F test across and within concentric zones (2006 survey data)**

		Local households						Migrant households				
		Across zones	Zone I	Zone II	Zone III	Zone IV	Zone V	Across zones	Zone II	Zone III	Zone IV	Zone V
# of neighborhoods		48	7	15	8	10	8	15	2	2	4	7
Number of households		1200	175	375	200	250	200	300	40	40	80	140
Household head age (years)	mean	51.4	57.3	51.4	48.9	50.7	49.6	34.1	35.0	30.9	34.5	34.5
	F test	11.414***	6.464***	7.206***	5.583***	9.737***	1.139	2.061	0.506	0.289	1.614	2.137
Family size	mean	2.95	2.93	2.95	2.81	3.01	3.01	2.29	2.35	2.40	2.24	2.26
	F test	1.36	1.97	4.027***	4.527***	3.724***	5.606***	0.347	3.105	1.385	0.64	3.909***
Head school (years)	mean	11.17	11.22	11.69	11.54	10.46	10.65	9.95	9.78	10.38	9.23	10.30
	F test	6.388***	3.616***	5.203***	3.333***	5.033***	3.454***	3.076*	1.552	0.118	4.643***	14.081***
Per capita income (RMB/year)	mean	13,292	13,891	14,385	16,336	10,950	10,618	13,556	11,060	16,842	8,730	16,089
	F test	12.217***	1.435	8.202***	3.203***	8.653***	6.203***	0.906	3.428	0.007	1.425	2.425*
Dwelling years	mean	21.58	25.78	21.18	16.53	22.82	22.16	5.25	7.90	2.48	6.14	4.77
	F test	9.926***	3.28***	25.979***	5.391***	23.035***	15.429***	13.876***	0.085	1.578	2.682	1.572
Per capita dwelling size (M <sup>2</sup> /person)	mean	23.30	14.38	17.22	18.38	36.82	30.47	11.10	12.24	8.15	8.16	13.29
	F test	30.060***	8.242***	15.832***	4.223***	11.532***	8.237***	3.997***	3.45	0.199	0.171	12.779***
Building age (years)	mean	26.61	42.87	26.61	18.06	24.44	23.65	8.60	3.05	4.75	12.78	8.90
	F test	36.977***	27.365***	45.094***	17.814***	10.122***	8.542***	6.720***	2.119	1.101	17.186***	3.123**

Table 1 provides evidence of spatial sorting among migrant households. However, the mean values of all variable do not show a simple patten in relation to the distance from the city center. China's housing reform from a administrative housing allocation to market provision has allowed a mix of power with market forces in forming a much more complicated housing results. In the following section, we use multinomial regression models to examine the likelihood of different households settling in certain zones in the city.

### **Multinomial analysis**

The multinomial data analysis is composed of two steps of regression models. Zone II is set as the reference zone. The dependent variable is the likelihood of settling in the listed zone comparing to settling in Zone II.

a) The first step tests the hypothesis that in Beijing the housing characteristics are significantly related to housing location. The sprawling pattern of development in Beijing that historically started from the center has allowed certain kinds of houses being constructed in certain locations relative to the city center (path dependence). This step will try to find if the *housing characteristics* (housing tenure and housing condition) can predict their location. The categorization of the housing tenure follows an earlier paper by Logan et al (2009). The models are run twice: once with data for all households and then with data from only local households excluding the migrant households in the sample<sup>3</sup>.

b) The second step tests the hypothesis that controlling for the housing characteristics, *household characteristics* (i.e. socio-economic, and institutional) are significant predictors of households'

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3 There are too few cases (300) to run the same regression for migrants in our sample. We therefore test the same models, once with all households and once with only local households to see the difference between the results.

residential location. Similar to the first step, the models are also run twice: once with data for all households and then with data from only local households.

*Step 1: Housing condition and tenure types*

Table 2 shows the multinomial regression models of our first step analysis. If we control for housing tenure, housing conditions (housing size, housing age, with or without individual kitchen or toilet etc.) can significantly determine the likelihood of that housing location in a certain concentric zone. Consistent with Beijing's development history, building age in Zone I is the oldest, and those in Zone III, IV and V are significantly newer than Zone II. Housing unit size is smaller in Zone I and III comparing to Zone II, while in Zone IV and V the sizes of housing units are generally larger. Housing in Zone I are more likely to be in high-rise buildings, while those in Zone IV and V are significantly less likely to be in high-rise. Housing units in Zone III are more likely to have balcony, while those in Zone V are less likely to have balconies. All these physical conditions of housing are consistent with our expectations. The center of the city has older buildings with smaller units, but more in high-rise apartments. Later development spread towards outer zones starting with Zone III having newer residential developments, bigger size, more balconies, and fewer high-rises. The findings that units size in Zone III are relatively smaller than those in Zone II is a somewhat surprising, although the significance level is low. When the same models are tested using only the local households in our sample (i.e., excluding the migrants), some coefficients are significantly different. First is that the differences in housing condition differences between Zone II and III are greatly reduced. This suggests that in the previous model, differences between Zone II and III are mostly attributable to the inclusion of migrant households. Migrant households living in Zone III settles more likely in newer but smaller size apartments.

**Table 2: Multinomial regression on likelihood of living in certain concentric zones with housing characteristics data**

	Comparing to Zone II						
	Zone I	Zone III		Zone IV		Zone V	
	Local	All	Local	All	Local	All	Local
<b>Housing tenure (ref=public rental)</b>							
Market purchase	0.613	1.063	0.765	3.114**	2.05	1.097	0.64
Self-built	.162**			4.911**	6.834**	6.213**	9.973**
Economic purchase	0.933	2.505*	1.86	5.812**	3.969**	0.546	0.49
public purchase	1.38	1.576	1.145	0.666	.504*	1.828*	1.558
Market rental	2.086	3.296**	2.785*	4.845**	4.790**	7.818**	2.504
Others	1.74	2.644*	1.791	2.089	2.36	2.685*	4.479*
<b>Housing conditions</b>							
Apartment size	.982**	.986*	0.988	1.018**	1.020**	1.014**	1.011*
Building age	1.031**	.982**	0.994	.972**	.967**	.972**	.965**
Building levels (ref=3-7 stories apartment)							
Courtyard housing	2.556	2.930**	1.086	8.133**	2.523	1.459	1.191
High-rise building	4.101**	0.866	0.804	.549*	.538*	.152**	.229**
Unit with balcony	1.368	6.931**	12.381**	0.955	0.441	.461*	.276**
Unit with individual kitchen	0.888			1.451	1.709	1.19	2.171
Unit with individual toilet	1.773			0.933	1.079	1.159	2.636
Constant	.110**	.215**	0.121	.096**	.205*	.385*	.235*
Nagelkerke R square	0.245	0.162	0.18	0.517	0.518	0.42	0.384
N	550	655	575	745	625	755	575
Degree of freedom	13	10	10	13	13	13	13

With the full sample (i.e., including the migrant households) if we control for housing conditions, there is also a clear pattern of differences in the distribution of housing tenure across concentric land value zones. Compared to Zone II, all other zones show different composition of housing tenure types. Market purchased and economic purchased housing are more likely to be in Zone IV. Market rental housing is more likely to be in zone III to V. Self-built housing is significantly less in Zone I, while significantly higher in Zone IV and V. Self-built housing used to be common in inner city districts. Clearly by 2006 it is not the case any more due to the inner city redevelopment efforts. The newer type of housing tenure (market and economic purchase) are mixing with more rural dwelling related tenure (self-built) in outer zones IV and V.

Again, if we run these models only with the data for local households, the results are different. Controlling for the housing conditions, other than a decrease in self-built housing in Zone I and an increase in market-rental housing in Zone III, the inner three zones are more or less alike. But the difference between the inner three zones and the outer two zones is still significant for most of the tenures. Self-built housing is more likely to appear in the outer two zones, which can be explained by the existence of rural dwellings. Also, for local households there are higher proportions of economic-purchased, market rental housing and lower proportions of public-purchased housing existing in the outer zones. These differences are significant only in Zone IV but not V. Economic-purchase developments have been the main reason for moving local households to suburban areas. This suggests that Zone IV has become the frontier of the large scale urban development in Beijing for the resettlement of locally registered households.

Housing tenure and condition characteristics can explain a significant amount of variances among the likelihood of housing in different land value zones. The spatial differences appear to show different patterns when considering only local or migrant households. The variation across

zones among local households is overall less significant than that among migrant households. Spatially with similar housing condition, there is clear division of housing tenure distribution between inner three zones and outer two zones.

*Step 2: Household characteristics*

In the second step of the analysis, we want to explore if residential location of households can be predicted by the household characteristics, over and above the differences in housing characteristics. Table 3 shows the results of our regression analysis. All these models have included housing tenure and condition variables as control variables. The coefficients for housing variables have not changed much from those in Table 2, thus we do not report them again in Table 3.

Table 3 shows that controlling for housing characteristics, the socio-economic and institutional variables of households do contribute to explain significantly more variances among the likelihood of living in different concentric zones. With similar housing characteristics, household head is significantly older in Zone I and significantly younger in Zone III comparing to zone II. Gender wise, Zone I have significantly more female headed households. All other zones have similar ratio of household head gender.

Table 3: Multinomial regression on likelihood of living in certain concentric zones with household characteristics data

	Comparing to Zone II							
	Zone I	Zone III		Zone IV		Zone V		
	Local	all	Local	All	Local	All	Local	
<b>Demographic variables</b>								
Household head age	1.066**	.967**	.960**	1.008	1.003	0.978	.965*	
Household head gender	.511**	1.396	1.211	1.281	1.108	1.089	1.101	
Household head marital status	0.703	1.183	1.45	0.876	0.86	1.706	3.572**	
Family size	1.215	1.056	0.928	0.822	0.811	0.947	0.993	
<b>Socio-economic variables</b>								
Per capita income (natural log)	2.180**	1.666**	1.316	0.952	0.953	1.027	0.801	
Household head years of school	1.127**	.925*	.912*	0.969	0.953	0.974	0.927	
Household head working status (ref=employed)								
Retired	1.492	2.354**	2.332*	2.022	1.748	1.966*	1.852	
Unemployed	2.738*	1.12	0.897	2.16	1.626	1.995	1.543	
Household head working sector (ref=public sector)								
Private or foreign enterprises	1.121	1.915*	1.954*	1.561	0.984	0.945	0.365	
self or collective enterprises	0.533	.496*	0.584	2.180*	2.713**	0.562	0.792	
Household head occupation rank (ref=entry level)								
Senior level professional	0.478	0.605	0.714	0.907	1.343	0.292	0.32	
Middle level professional	0.721	0.878	0.913	0.38	0.423	.363*	.305*	
Clerk or technician	1.597	1.212	1.228	0.807	1.136	0.669	0.718	
manual or service work	0.578	1.964	1.918	0.845	1.043	0.822	0.968	
others	0.995	3.007*	2.873*	1.165	1.165	0.415	0.264	
<b>Institutional variables</b>								
Household head hukou status (ref=rural)		0.35		0.391		1.823		
household head hukou at birth (ref=urban)	2.541	1.608	3.905	3.058**	13.273**	7.644**	17.490**	
Household head hukou location (ref=Beijing)		2.331		14.286**		0.741		
Years moving to current location	0.99	0.99	1.016	.950**	.961**	.953**	.966*	
Constant	.000**	.009*	0.045	0.067	0.976	0.726	16.062	
Nagelkerke R square	0.396	0.269	0.267	0.599	0.602	0.504	0.499	
Degree of freedom	30	29	27	32	30	32	30	
Number of cases	550	655	575	745	625	755	575	

The socio-economic variables are significantly related to residential location. Based on the all households sample, those with higher income are more likely to live in Zone I and Zone III. However the effect of income in Zone III disappears when only considering the local households. It suggests that for locally registered households, living in zone I are more associated with higher income, while higher income migrant households are more likely to live in Zone III. In terms of educational attainment of household head, those living in Zone I have the highest level education than Zone II, while Zone III household heads are slightly less educated than those in Zone II both for the whole sample and for the sample with only local households. Zone I has generally attracted higher income and higher educated local households comparing to zone II.

Comparing to Zone II, retirees are more likely to live in Zone III and V. Zone II and I have the lowest likelihood of accommodating retirees. This pattern is different from findings in Shanghai where the retirees concentrates in the center (Li & Wu, 2008), while it is similar to findings from other countries that shows a trend of metropolitan-decentralizing migrations around the age of retirement (Warnes & Ford, 1995). However, the reasons in Beijing is more likely due to the large scale urban redevelopment and resettlement projects in which retired households are more likely to have moved to suburban areas, since for them there is less constraints on working commute. The spatial differences in terms of household head occupation rank do not show much variations, while in terms of working sectors, there are some significant differences among five zones. Zone III has slightly higher likelihood of household head working in private or foreign enterprises, while lower likelihood of working in self or collective sectors. On the other hand,

households living in Zone V show higher likelihood of working in self or collective sectors, which may relate to their greater involvement in rural economic activities.

Institutional differences among households, usually defined under the household registration system, are well studied and found to affect residential housing access in China (Logan et al, 2009). Our analysis also reveals their significance in explaining the housing location differences among different zones. Similar to our findings in step one that in terms of housing characteristics, there are significant differences between the inner three zones and outer two zones, coefficients for institutional variables also show this spatial divide in both models. Households institutional status in the inner three zones are more similar to each other, while significantly different from those living in outer two zones.

We include variables that cover three aspects relating to *hukou* status: urban or rural, Beijing or non-Beijing, and urban or rural at birth. Since all local households in our sample have Beijing- and urban-*hukou* status, the model with only local households have to skip these two variables. The variable indicating *hukou* status at birth can identify the group of people who have changed their *hukou* status from rural to urban either from education or urbanization process. The distribution of migrant households between urban and rural household heads across zones are similar across zones. Zone IV has the highest likelihood of hosting non-Beijing *hukou*, i.e. migrant households, but not in Zone V. The outer two zones both show a significantly higher chance of household head with rural *hukou* registration at birth. This corresponds with the increasing urbanization process in recent years when suburban rural land is taken for urban development, rural households were able to change their registration to urban *hukou*. This is also

confirmed by the fourth variable we include in the analysis as an institutional variable: the length of living in the current dwelling. Households living in the outer two zones appear to have a significantly shorter dwelling period in the current housing.

In both steps, we see a clear spatial divide between the inner three zones and the outer two zones, which we can describe as an urban-suburban divide in Beijing. Housing tenure, conditions, and household characteristics (specifically the household institutional characteristics) appear to show similar attributes in the three inner city zones, while being significantly different from the outer two zones. Zone IV marks the clear division from the urban zones, appearing to be the frontier of the urban development in Beijing, and the most likely location for migrant households. On the other hand, Zone V shows more characteristics of rural living, which suggests that it is still not fully reached by the large scale urban development in Beijing.

## **Conclusions**

In this paper, we focus on examining how household social, economic and institutional characteristics affect its likelihood to reside in the different concentric land value zones in Beijing. We examine the effect on a household's residential location (with respect to its distance to the CBD) due to individual household characteristics. Although some have discovered segregation in Chinese cities along housing characteristics (Li & Wu, 2008), our intention is to test whether, over and above housing characteristics, household characteristics also explain the spatial distribution of households across different land value zones. More importantly, we focus

our analysis on the spatial differences between local and migrant households, and identify their varied socio-spatial patterns in the city of Beijing.

Based on the statistical analysis of data from the 2006 household survey, we can construct a socio-spatial pattern of the city of Beijing in 2006. We find that overall there is a clear urban-suburban division (between three inner zones and two outer zones) in Beijing. This spatial divide is not only characterized by the different distribution of housing condition and housing tenure, but also featured by differences in household characteristics, especially relating to their *hukou* registration status. Over and above housing characteristics, household characteristics contribute to sharpen the divide between urban and suburban zones. This division is especially characterized by some institutional differences: household *hukou* status at birth, and the length of dwelling in the current location. This is especially true for Zone IV.

Our data analysis have confirmed a concentric pattern in Beijing, however different from what the classic Park and Burgess' concentric model based on their study in Chicago. There are variances in the spatial distribution of local and migrant households across different zones, while the direction is more complicated in Beijing. There are a few more findings in this paper that are worth noting:

1. Unlike US cities where households tend to move outwards as their economic positions improve, higher income households (both local and migrants) in Beijing tend to settle in the towards the center. Explanation for such a distribution may need further investigation. Literature comparing the different spatial pattern between US and European cities (Brueckner et al., 1999) may suggest that Beijing being a city with long history, its central city still holds a great

cultural and historical value to attract households to settle around. On the other hand, despite rapid increase in car ownership, the reliance on automobile for daily commute in Beijing is still low compared to US cities. Better public transportation network in the inner zones is still a big attraction not only for the poor but for all households. In this competition process, higher income group is more likely to win in a more market-oriented housing system. The recent fast development of rail transportation system and the government increasing subsidy on public transportation system may push a future socio-spatial pattern in Beijing which allows the poor living in the suburbs and the rich in the center (Glaeser et al., 2008).

2. Within the urban zones, Zone I and Zone III both have significantly higher household per capita income than Zone II in the whole survey sample. Part of the reasoning why it appears this sandwich pattern is because most of the housing stocks in Zone II are from the socialist time and urban redevelopment pressure started from Zone I and yet to reach Zone II, since its building stock is still relatively in better condition. However, with higher income households living at both inside and outside, Zone II is most likely to feel the pressure of redevelopment in the near future given its location proximity to the center.

3. Higher income and better educated households are slowly concentrating towards the center of the city in Beijing. With missing Zone I data for migrant households, the data is still able to show that this process of concentration towards the inner city has different implications for local and migrant households. Housing decision is far from a merely affordability issue. Despite being relieved from discrimination in the newly emerging housing market, migrants' housing decisions are still conditioned on their access to other social services in the city including health care and

education. In general, migrant households in Beijing are more disadvantaged relative to the local residents in terms of housing location. Our findings identified that high-income group of migrant households are more likely to settle in Zone III rather than Zone II. This might be because of the lower availability of market housing in Zone II. In the near future if previous subsidized housing in Zone II slowly enters into the second hand housing market, we could expect a likely increase of migrant households in the inner zones.

4. The spatial pattern in terms of homogeneity within each land value zones in Beijing differ that local households are more heterogeneous in each zones while migrant households are much more homogeneous in each zone. The relative homogeneous Zone I in terms of household income for local residents suggests that the inner city redevelopment in Beijing in recent years have allowed a more homogeneous group of households to settle. As the urban development keeps taking suburban land, Zone V is expected to become similar to Zone IV. The heterogeneity of concentric zones, especially for local households, implies that a simple concentric zone model is not enough to explain fully the spatial distribution differences in the city of Beijing. More research with better quality data could lead to further findings.

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