



Residential segregation and well-being inequality over time: A study on the local and migrant elderly people in Shanghai



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ABSTRACT

China achieved great economic success during the market transition, but is now facing increasing social problems and challenges, such as institutional inequality and population ageing. A consequence of this institutional inequality due to the Hukou system is the emerging segregation in cities between locals and migrants. This segregation is growing during last decades and exerts negative implications on the well-being distribution between locals and migrants including their older subcategories. This paper focuses on the residential segregation between local and migrant elderly people and its implications on their access to geographical resources and on their well-being in central Shanghai over the period 2000–2010. Access to geographical services and resources for the elderly is employed as the proxy for their well-being measurement. This paper concludes that the forthcoming housing market reform over the last decade has intensified the differentiations of housing price and new housing distribution, especially those of high-priced commercial housing, resulting in a slightly strengthened residential segregation between local and migrant elderly people. As a consequence, this segregation continues to produce inequality in the well-being distribution between these two elderly groups. However, this paper also shows that the inequality gap has been slightly narrowed due to the greater well-being improvement of migrant elderly.

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1. Introduction

China has achieved great economic success over the last three decades and is now the world's second largest economy. Despite this success, the country is facing increasing social problems and challenges, such as social inequality (Bian, 2002; Wu & Li, 2005) and population ageing (Mai, Peng, & Chen, 2013; Peng, 2011). The declining fertility rate, which is largely a result of the "one-child" policy introduced in the 1970s, and increasing life expectancy have turned China into one of the most rapidly ageing countries in the world (Chen & Liu, 2009). According to UN projections, approximately 35% of the Chinese population will be aged 60 years or older in 2050 (Banister, Bloom, & Rosenberg, 2012). Migrant elderly comprise an increasingly large percentage of the elderly in cities. Their number has grown rapidly in recent years owing to the persistence of China's migration and ageing trends (Meng et al., 2004). As a new social phenomenon, they have also

received more and more social and political attention over these years. Due to the institutional constraints of the Hukou (household registration) system, however, migrant elderly are not entitled to full citizenship rights or the benefits enjoyed by local elderly, which leads to inequality in their living conditions and well-being (Ren, 2011).

So far very little attention has been paid in literature to the residential inequality between local and migrant elderly. But relevant studies show that the Hukou system as a major source of institutional inequality between locals and migrants in general has led to their housing inequality and residential segregation in cities (Huang & Jiang, 2009; Wang, Wang, & Wu, 2010; Wu, 2008). Specifically, these studies suggest that the locals primarily inhabit public and commercial housing in the city center, whereas the migrants are distributed over private rental housing, factory dormitories, construction sites, and urban villages, mostly at the urban fringe. In addition, the distribution patterns of both locals and migrants are not static but change over time. The spatial distribution of migrants in many cities exhibits a gradual outward shifting tendency from the traditional city center to the fringe (Wu, 2008). Similarly, urban expansion and downtown redevelopment in recent years have led to a decentralization trend in local population (He, 2010). These dynamic changes are expected to have a

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substantial influence on the residential segregation between locals and migrants including their older subcategories.

The implication of residential segregation between local and migrant elderly for their well-being has hardly been studied. So far, well-being theories have been developed from philosophical, sociological, and psychological perspectives, but rarely from geographical and urban planning perspectives. Well-being related resources are primarily operationalized as individual resources referring to income, socio-economic status, health, and social networks (Diener, 2009; Nieboer, Lindenberg, Boomsma, & Van Bruggen, 2005). Little is known, however, about the geographical well-being resources associated with residential environments, such as the availability of and accessibility to certain well-being related resources including facilities, services, opportunities, healthy and safe environments, and supportive social relationships (Addae-Dapaah, 2008; Hao et al., 2011; Massey, Condran, & Denton, 1987). Even less knowledge is available on the specific well-being resources for the elderly, and the well-being implications of residential segregation. It is expected that residential segregation might lead to unequal access to these geographical well-being resources (Bullard, 1995), which might further exert unequal well-being effects on local and migrant elderly. Given the declining health conditions, physical capabilities, and mobility, and the limited income after retirement, the elderly face more difficulties in overcoming negative consequences of segregation compared to younger adults. This might seriously jeopardize the well-being of the segregated elderly.

This paper aims to analyze the residential segregation between the local and the migrant elderly and its implications on their access to geographical resources and their well-being in central Shanghai over the time period 2000–2010. Shanghai was selected for this study because it has a higher rate of population aging than any other large city in China (about 23.4% of the local population was aged over 60 years in 2010) (Chai, 2010) and because of its role as a major migration destination for already many decades. In Section 2 (theoretical framework), relevant segregation studies and well-being theory are introduced, and the interrelationships of institutional inequality, residential segregation, resource distribution, and well-being distribution are elaborated upon. In Section 3 (methodology), the measures for defining different types of residential communities, and the specific assessment methods of the elderly's well-being, are discussed. The changes in residential segregation and well-being inequality between the local and migrant elderly are analyzed and interpreted in Section 4. Conclusions and discussion are presented in the final section.

2. Theoretical framework

In this section we first explain how the Hukou system as a unique institutional system in Chinese context has resulted in the institutional inequality and residential segregation between locals and migrants (including the older subcategory) and how the local-migrant residential segregation affects their access to geographical well-being resources. Thereafter, a well-being theory for the elderly is introduced, which links various geographical well-being resources with elderly people's well-being.

2.1. Institutional inequality and local-migrant residential segregation in cities

As a unique Chinese institution, the Hukou system plays a key role in local-migrant inequality in cities (Liu, 2005; Logan, Bian, & Bian, 1999). The Hukou system was introduced in the 1950s to restrict rural–urban migration and to maintain social order in cities. Individuals were required to be registered and remain in

only one place of regular residence, holding either a local urban or a local rural Hukou. However, differences in Hukou status are associated with different rights and welfare provisions. This thus divides the Chinese population into a favored sector with full citizenship rights (urban residents with a local urban Hukou), and a marginal sector with fewer and more transient rights (rural population with a local rural Hukou) (Logan, Fang, & Zhang, 2009). Since the 1980s, the government has started to encourage migration and to facilitate economic growth, inter alia by gradually relaxing the rigid Hukou system. This relaxation has resulted into a massive influx of migrants into megacities like Shanghai and Beijing, however, except those wealthier and better-educated migrants, the greater majority of migrants are not granted local urban Hukou rights. Thus, Hukou's separation effect on locals (native urban residents and previous migrants who now hold a local urban Hukou) and migrants (migrant urban residents without a local urban Hukou) remains both potent and intact (Chan & Buckingham, 2008), shaping a new form of inequality not between urban and rural areas, but especially within megacities.

The institutional inequality due to the Hukou system is also reflected in the housing system, creating local-migrant housing inequality and residential segregation in cities (Huang & Jiang, 2009; Li, 2009; Logan et al., 1999, 2009; Wu, 2002, 2004, 2008; Wu & Li, 2005). Although since 1988 the urban housing reform has gradually introduced market mechanisms into China's socialist housing allocation system, the current housing system is still a quasi-market situation, in which socialist institutions such as Hukou are still functioning (Logan et al., 2009). Prior to 1999, the dominant route for urban residents to obtain housing was through a system of low-rent welfare housing distributed either by work units (state-owned enterprises) or by municipal governments (Wu, 2004). This urban welfare housing system, however, did not apply to the migrants. Since the end of 1999, the provision of all welfare housing (both work unit and municipal public housing) was ended, and sitting tenants (local urban residents) can choose to buy out the property right of their public housing at highly subsidized prices. However, migrants cannot acquire either the use right or ownership of municipal or work-unit public housing directly. Meanwhile, the locals who have purchased their public housing are allowed to sell them on the private market at a profit, which allows them to trade up on the housing hierarchy (Huang & Jiang, 2009). Thus, during this privatization process, the initial local-migrant inequality in accessing public housing has resulted in larger inequality in housing conditions and wealth accumulation. Moreover, after 1999 many state work units still offer housing subsidies to their local employees for purchasing commercial housing, which however are not available for migrants. Thus, migrants can only obtain their housing through market mechanisms. Still, they face institutionalized discrimination. In theory they may purchase commercial housing in the cities, but bank mortgages are not available to them (Wu, 2002). In the secondary housing market, participation generally requires a local Hukou, although theoretically migrants can purchase housing there after completing a lengthy process of official approval (Wu, 2004). Subsidized commercial housing for low- and middle-income families (the Economic and Comfortable Housing) is also reserved for local urban residents only.

Consequently, the rental housing in the housing market and factory dormitories, which are mainly located in peripheral areas, remain the key housing choices for migrants without a local Hukou (Logan et al., 2009; Wu, 2002). Compared to the locals who mostly live in the old housing district and work-unit compounds in city centers, the migrants are segregated in dilapidated areas of city centers and in migrant enclaves in the peripheries. As shown above, Hukou as the unique institutional system in China has largely limited the housing and locational choices of

migrants in megacities, which plays a crucial role in the local-migrant residential segregation.

Recent research shows the local-migrant segregation also applies to the local elderly and migrant elderly (Liu, Dijst, & Geertman, 2014). Migrant elderly is a rapidly growing subcategory of migrants, with a threefold increase in population in central Shanghai between 2000 and 2010. Yet, they have hardly been studied so far. Limited studies show that there are two major reasons driving their migration to another city in China: economic purposes (working or doing business) and family reunion (with migrant children and grandchildren after retirement) (Meng et al., 2004; Zhang, 2013; Zhou, 2002). A recent study by Zhang et al. (2013) shows that in a core district (Hongkou) of central Shanghai, the share of family reunion reasons (57.3%) is higher than economic purposes (26.3%). But the share of these two migration motivations in peripheral and other central areas remains unknown. A higher proportion of economic purposes is expected in peripheral areas than in core areas, as peripheral areas have more lower-skilled job opportunities and lower living costs. These migrant elderly attracted by economic opportunities constitute both the former younger migrants who became elderly people later and the newly arrived elderly migrants. Like other migrants discussed previously, they suffer from institutional inequality and residential segregation. Family reunion is a migration motivation associated with rapid population ageing, “one-child” policy, and the Confucian ideologies of family affection and relational obligation. A growing number of migrant elderly come to an unfamiliar city, and live adjacent to or cohabitate with their only migrant child, just for satisfying their affection needs and offering practical assistance on housework and childcare. Their living conditions are largely determined by the conditions of their children. Still, little is known so far about the Hukou and socio-economic status of their migrant children. Compared with those living in the privileged areas of city center, migrant elderly in the dilapidated and peripheral areas are more likely to live with their migrant children who do not hold a local urban Hukou, and therefore to suffer from institutional inequality and segregation.

Due to their limited income and their declining mobility and functional capability, migrant elderly are less economically and physically able to overcome the negative effects of residential segregation. As a consequence, their well-being levels might be more negatively influenced than that of other younger migrants, and that of their local elderly counterparts. It is expected that well-being related resources, services, and facilities are not equally but heterogeneously distributed in urban space. Different residential communities in terms of differential locations, building ages, qualities, and developers offer different quality and quantity of geographical well-being resources and different accessibility to distant well-being resources. The residential segregation between local and migrant elderly in different communities may influence their resource availability and accessibility, and consequently also influences their well-being level.

2.2. Well-being theory for the elderly

Well-being generally refers to a good life, which is primarily conceptualized on the basis of one's evaluation of life and feeling (Ettema, Gärling, Olsson, & Friman, 2010; Gasper, 2005). Well-being comprises both cognitive (life satisfaction) and emotional (happiness) facets (Diener & Ryan, 2009) that are associated with a wide range of factors. These factors vary largely from subjective needs satisfaction to objective health conditions, from social networks to physical built environments, and from life goals to instrumental behaviors and means (Diener, 2009; Diener & Suh, 1997; Walker & Mollenkopf, 2007). Nevertheless, these factors are derived from multiple disciplines such as social, psychological and

medical sciences, and little effort has been shown to integrate them in a comprehensive theoretical framework (Diener, 2009). A good exception is the theoretical attempt from Lindenberg. (Lindenberg, 1996; Nieboer et al., 2005; Ormel, Lindenberg, Steverink, & Verbrugge, 1999) developed a theoretical and assessment framework for well-being in which such concepts as subjective well-being, goals, needs, and objective resources are integrated in a social production function (SPF).

This theory states that people strive to improve their subjective well-being (see Table 1) by optimizing two universal goals, namely physical and social well-being. These two goals can be achieved and “produced” by five instrumental goals or basic needs: stimulation and comfort (for physical well-being), and status, behavioral confirmation, and affection (for social well-being) (Nieboer et al., 2005). The five basic needs can be further fulfilled and “produced” by lower level of resources. Those physical and social resources, as well as the five basic needs, are fundamental and significant for people's well-being production. However, the well-being resources are primarily operationalized as individual resources. Little attention has been paid by this sociological theory to the geographical and environmental well-being resources associated with residential environments such as availability of and accessibility to well-being related resources. The resources in residential environments are specified in more detail here in relation to the elderly. Retirement, abundant leisure time, and declining health would conjointly change elderly people's behavioral patterns, needs, needed resources, and understanding of well-being (Chai & Li, 2005; Chow, 2010; Gui, 2004).

Stimulation needs are related to the drive for arousal, including mental and sensory stimulation, physical effort, and competitive sports (Ormel et al., 1999). The stimulation needs of the elderly can be fulfilled by cultural and education facilities (e.g., cultural center and university for the elderly), entertainment facilities (e.g., activity center for the elderly), public spaces (e.g., parks), and facilities for non-daily consumption (e.g., retail stores) (Gui, 2004). Education facilities are relevant since they provide the elderly with opportunities to enjoy their life through, for example, music, painting, computers, foreign languages, and health care.

Comfort needs respond to the inner drives of seeking tension reduction against the somatic and psychological state, such as hunger, thirst, fatigue, pain, and fear (Ormel et al., 1999). They are related to such activities as eating, drinking, sleeping, and seeking personal safety and security for property. The comfort needs of the elderly can be met by physical resources related to food (e.g., markets, supermarkets, and restaurants), health care (e.g., hospitals, clinics, sanatoriums, and nursing homes), housing and money (e.g., post offices and savings banks) (Gui, 2004; Zhao, 2009). Post offices and savings banks are relevant, since they are where the elderly withdraw their pensions – their main source of income after retirement.

The *status needs* refer to a relative ranking based mainly on one's control over scarce resources such as political power, and social and economic capital (Lindenberg, 2001). The status can be translated into urban space, represented by one's control over privileged living conditions such as a superior location and neighborhood quality. For example, a good housing location gives the elderly greater control over limited public services, livable and healthy environments, and perceived privileged urban space, and thus an improved status needs fulfillment. Living in a physically and socially superior neighborhood, characterized by a good housing quality and the high socioeconomic status of its inhabitants, means the elderly's status needs are satisfied more effectively.

Behavioral confirmation needs refer to the experience of doing the right thing, having the right thoughts, and conforming to the right norms in the eyes of relevant others (Lindenberg, 2001). People seek social approval by obeying certain social norms for

Table 1
Lindenberg's theory of Social Production Functions (SPF).

Top level universal goals	Subjective well-being				
	Physical well-being		Social well-being		
First-order instrumental goals	Stimulation/activation (optimal level of arousal)	Comfort (absence of physiological needs; pleasant and safe environment)	Status (control over scarce resources)	Behavioral confirmation (approval for "doing the right things")	Affection (positive inputs from caring others)
Activities and endowments (means of production for instrumental goals) (examples)	Physical and mental activities producing arousal	Absence of pain, fatigue, thirst, hunger, vitality; good housing, appliances, social welfare, security	Occupation, life style, excellence in sports or work	Compliance with external and internal norms	Intimate ties, offering emotional support
Resources (examples)	Physical and mental effort	Food, health care, money	Education, social class, unique skills	Social skills, competence	Spouse, empathy, attractiveness

Source: Ormel et al. (1999).

appropriate action, thoughts, attitudes, and performance of their age and social group. From a spatial perspective, people belonging to the same social group tend to have similar spatial preferences, for instance for housing and residential location. In this sense, living alongside one's own social groups (one's relevant others and social resources) and consequently forming a relatively homogeneous community, facilitates one's behavioral confirmation. The same applies to the elderly, who can satisfy their needs by living close to, and socializing with, other elderly people.

Affection needs refer to feelings of love and caring between people in close relationships, and feelings of being accepted and belonging as a person. In this respect, family and friends can be regarded as the affective social resources of the elderly.

As it can be expected that geographical well-being resources are heterogeneously distributed in cities, we hypothesize that the residential segregation of local and migrant elderly leads to their unequal access to resources and to unequal well-being. In the next sections this will be measured for local and migrant elderly living in central Shanghai between 2000 and 2010.

3. Data and methodology

Information on the elderly, the resources, and the road networks in Shanghai in 2000 and 2010 was derived from five datasets, namely the 2000 and the 2010 Shanghai Population Census, the 2001 Shanghai Basic Establishment Census, the 2008 Shanghai Economic Census, and the digital street network database of Shanghai. The population census contains basic socio-demographic and housing information of the elderly. The basic establishment census and economic census comprise basic information on local workplace and economic activities, including various elderly-related resources like hospitals, markets and activity centers. The digital street network database contains detailed road information, which enables the calculation of accessibility from origins to destinations for multiple travel modes. The elderly were defined as the population aged 60 or over as recorded in the census, and the migrant elderly as those elderly migrants without Shanghai Hukous who have been in Shanghai for more than six months.

As physical and social resources "produce" five types of basic needs that subsequently "produce" the physical, social, and overall well-being of the elderly, resources were employed as proxies for well-being measurement. The assessment methods were based on the accessibility to and the availability of physical and social resources. Affection was not evaluated due to the absence of relevant data.

3.1. Defining residential typology in central Shanghai in 2010

Residential typology makes a difference in providing and accessing geographical well-being resources. Based on a

comprehensive community survey around 2000, a residential typology in central Shanghai consisting of five types of residential communities was proposed (Wang, 2002) (Fig. 1): (C1) traditional communities, (C2) work-unit public housing communities, (C3) high-priced commercial communities, (C4) lower-priced commercial communities, and (C5) marginalized communities. Although not explicitly provided by Wang, three major principles – time, place, and price – were employed to define this typology (Table 2). Time reflects different building age and housing sources of communities; place reveals the central and peripheral geographic distribution of communities; and price indicates the differentiated monetary value of commercial communities specifically. For instance, the traditional communities (C1) were built before 1949 and are highly concentrated in the city center. The work-unit communities (C2) were built, adjacent to the city center, for the staff of state-owned enterprises in the socialist era between the 1950s and the 1980s. Traditional and work-unit communities consist of public rental housing and purchased public housing, respectively. The commercial communities, both high-priced (C3) and lower-priced (C4), have mainly emerged since the 1990s, following the housing marketization reform that shifted housing provision from the public to the private sphere. The high-priced housing (>4500 RMB/m²) is mostly located in the city center, developed from the renewal projects, while the lower-priced housing (<4500 RMB/m²) is distributed at the fringes. The marginalized communities (C5) appeared in the 1990s along with the urban expansion and old town renewal of Shanghai. Such communities consist of urbanized villages, resettlement housing, and informal housing, mainly dispersed at the outer fringes of central Shanghai and making up the rural–urban continuum.

Between 2000 and 2010, this residential typology gradually evolved, primarily underpinned by the force of real estate development. This is expressed in particular in the substitution of newly constructed commercial communities for the original non-commercial communities in both the city center (urban renewal) and peripheries (urban expansion) (Liao, Xu, & Mei, 2012). In addition, the increase in housing prices also reshaped the patterns of high-priced and lower-priced commercial communities. Over the 10-year period, housing prices in central Shanghai increased by approximately 1000% as a result of the housing marketization reform. This change required us to redefine "high-priced" and "lower-priced" commercial housing: the standard we adopted for 2010 (50,000 RMB/m²) is about 10 times higher than the 2000 standard. On the basis of the land use data of Liao et al. (2012) and housing price data from an online dataset (<http://data.cityhouse.cn>), we captured the changes in commercial communities and projected the 2010 residential typology at the sub-district level (Fig. 2). We also considered and tested changes in sub-district boundaries, but they had little influence on the 2010 typology.



Fig. 1. Five types of residential communities in central Shanghai (source: Wang, 2002).

Table 2

Main principles considered in Wang's community typology.

	Time		Place		Price	
	Building age	Housing source	Center	Periphery	High	Low
(C1) Traditional	Before 1949	Public rental	Center	\	\	\
(C2) Work-unit	1950s –1980s	Purchased public	Center	\	\	\
(C3) High-priced commercial	Post-1990s	Commercial	Center	\	High	\
(C4) Lower-priced commercial	Post-1990s	Commercial	\	Periphery	\	Low
(C5) Marginalized	Post-1990s	Mixed	\	Periphery	\	\

Source: adapted from Wang (2002).

Note: “\” means the principle is not considered.

3.2. Measuring basic needs satisfaction

In general, the road-network based and location-based accessibility measure (Geurs & van Wee, 2004) was employed for physical needs assessment, whereas social needs were measured by the availability of social and physical resources within sub-district units (Table 3).

Comfort needs (Ci) refer to the most fundamental, urgent, and frequently used facilities during the daily lives of the elderly, for instance banks, markets, and hospitals. The nearest one is far more useful and meaningful than the distant ones, since the service quality is usually similar and there is no need to spend time, money, and energy travelling extra distances. Comfort needs were therefore measured by the reciprocal of the shortest time to the nearest facility.

Stimulation needs (Si), referring to cultural, leisure, and non-daily shopping facilities, are more concerned with the overall cumulative opportunities provided in the surroundings. For instance, in contrast to the nearest shop, the shopping districts provide more and better opportunities for the elderly to compare and buy things like clothes, electronic products, and jewelry. All the possible spatial interactions in the city were captured to reveal the aggregated accessibility level of a place, and closer resources

were assigned more weight based on a distance decay law. Hence, stimulation needs were evaluated by the potential accessibility measure, which took into account the cumulative opportunities and distance decay coefficient.

Behavioral confirmation (Bi) from a spatial perspective can be fulfilled by similar housing preference and thus locational behavior. The similarity of locational behavior can be reflected by the proximity (or density) and homogeneity (or proportion) of the elderly in the sub-district, which in turn stimulates the elderly's interaction and other behavioral confirmation. Accordingly, behavioral confirmation needs are equal to the sum of the values of elderly population density and their proportion of the total population.

Status needs (Sti) are associated with location and neighborhood quality. Location is reflected in the housing price. The areas with higher housing prices are normally regarded as having a better location and status. As for neighborhood quality, this usually consists of both physical and social aspects. The former are related to housing size and housing facilities (e.g., kitchen and bathroom) (Logan et al., 1999), while the latter are related to the education status (e.g., graduate and high school) and occupation status (e.g., manager or laborer) of the inhabitants. Thus, status needs were measured by the sum of the values of location and neighborhood quality.

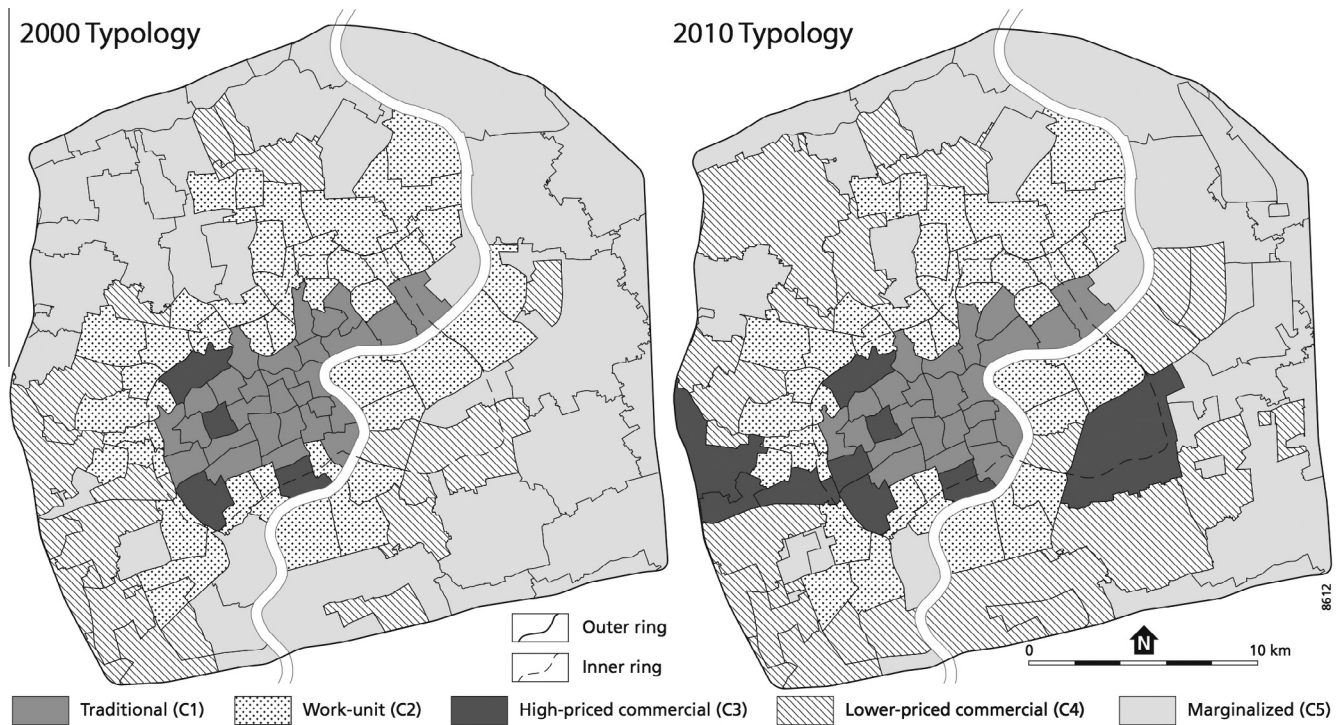


Fig. 2. The 2000 and the 2010 residential typology in central Shanghai.

Table 3
The assessment methods for four types of basic needs.

Well-being	Needs	Methods	Equations
Physical	Comfort	Shortest time accessibility measure	$C_i = 1/d_i$
	Stimulation	Potential accessibility measure	$S_i = \sum_{j=1}^n \frac{D_j}{d_{ij}^\beta}$
Social	Behavioral confirmation	Availability of similar social groups	$B_i = D_i + P_i$
	Status	Availability of good location and neighborhood quality	$St_i = L_i + N_i$

C_i = Satisfaction level of comfort needs
 d_i = Shortest distance to nearest service
 S_i = Satisfaction level of stimulation need
 D_j = Destination opportunities
 d_{ij} = Distance between i and j
 β = Distance decay coefficient
 B_i = Satisfaction level of needs
 D_i = Density of elderly population
 P_i = Proportion in total population
 St_i = Satisfaction level of status needs
 L_i = Location
 N_i = Neighborhood quality

3.3. Measuring well-being and assigning weights

The well-being of the elderly, including physical and social dimensions, was measured by aggregating the scores on various basic needs. Each type of basic need is made up of several sub-indicators, and their values were calculated by summing up the standardized scores of their sub-indicators. Based on two weighing principles, weights were assigned to each sub-indicator to perform the calculation (Table 4). The first principle was to weight the general indicators and sub-indicators at the same level equally, since they are considered to have equal importance. For instance, behavioral confirmation, status, comfort, and stimulation needs got the same weights, as did two sub-indicators of status (location and neighborhood quality) and seven sub-indicators of food (e.g., market and grocery stores). Due to the lack of information on the different qualities of the lowest-level facilities, all facilities within their own category such as all the general hospitals receive the equal weights. The second principle was to adjust the weights of the sub-indicators of comfort and stimulation needs

in accordance with the empirical activity-based evidence such as travel frequency. Travel frequency reflects the costs in terms of time, energy, and money that the elderly are willing to spend, which implies the relative importance of various activities in their daily lives. [Chai's \(2010\)](#) detailed survey of the elderly's travel behaviors in central Shanghai was used to bring the relative weights of sub-indicators of comfort and stimulation needs were brought into line with the relative shares of travel frequencies of various activities (Table 5).

Travel modes are important for the assessment of physical well-being, as various modes influence access to the physical resources in different ways. However, since the social needs (behavioral confirmation and status) are reflected by the attributes of the specific living environment rather than the accessibility to distant resources, they were not included in the analysis of travel modes. The satisfaction levels of comfort and stimulation need were analyzed for five travel modes: walking, cycling, metro, bus, and car. The composite needs satisfaction and physical well-being were calculated by assigning different weights to each travel mode

Table 4

Weights among basic needs and their sub-indicators.

Well-being	Basic need	Weight	Sub-indicator	Weight
Physical (0.5)	Comfort	0.5	Money	0.04
			Post office	0.02
			Bank	0.02
			Health care	0.1
			General hospital	0.017
			Specialist hospital	0.017
			Clinic	0.017
			Other hospital	0.017
			Sanatoriums	0.017
			Nursing home	0.017
			Food	0.86
			Market	0.12
			Supermarket	0.12
			Primary food stores	0.12
			Subsidiary food stores	0.12
			Grocery stores	0.12
			Fast food restaurant	0.12
			Snack shop	0.12
	Stimulation	0.5	Culture and education	0.14
			Library	0.047
			Culture center	0.047
			Elderly university	0.047
			Entertainment	0.54
			Elderly activity center	0.18
			Cinema and theater	0.18
			Park	0.18
			Non-daily consumption	0.32
			Non-daily shopping	0.16
			Retails stores	0.012
			Culture, sporting goods	0.012
			Watch, spectacles and camera	0.012
			Other daily necessities	0.012
			Textiles, clothing and footwear	0.012
			Household goods	0.012
			Hardware	0.012
			Drugs and medical devices	0.012
			Book and newspaper	0.012
			Furniture	0.012
			Computer, software and office goods	0.012
			Ornament	0.012
			Other retails	0.012
			Restaurant	0.16
Social (0.5)	Behavioral confirmation	0.5	Density	0.5
			Proportion	0.5
	Status	0.5	Location	0.5
			Housing price	0.5
			Neighborhood quality	0.5
			Housing size	0.125
			Housing facilities	0.125
			Education status	0.125
			Occupation status	0.125

and integrating their values. The weights for the various travel modes were derived from Chai's empirical study on Shanghai elderly's travel behaviors for shopping, leisure, and health care related daily activities (Table 6). The average values of activities were the weights for each travel mode.

Table 5

Travel frequency (times per week) and weights of sub-indicators for Shanghai elderly people.

Comfort					Stimulation			
Sub-indicators	Money	Health	Food	Total	Culture and education	Entertainment	Non-daily consumption	Total
Frequency	0.25	0.6	5.2	6.05	1.1	4.4	2.6	8.1
Weights	0.04	0.1	0.86	1	0.14	0.54	0.32	1

Source: adapted from Chai (2010).

Table 6

Modal split of the elderly in Shanghai (%).

Activity	Walking	Cycling	Bus	Metro	Car	Total
Shopping	75.5	11.9	9.7	2.7	0.2	100
Leisure	63.4	11.8	21.5	2.8	0.5	100
Health care	62.4	9.3	25.7	2.1	0.5	100
Average	67.1	11.0	19.0	2.5	0.4	100

Source: adapted from Chai (2010).

4. Results

Between 2000 and 2010, the number of local and migrant elderly people living in central Shanghai increased dramatically, from 1.60 to 2.11 million and from 52,880 to 149,320 respectively. The proportion of local elderly in the local population in particular rose from 19.8% to 23.3%. In addition to the rapid population ageing, both elderly groups also exhibited a changing spatial distribution during the 10-year period, which we expected to result in a change in their residential segregation. This part analyzes the change in residential segregation between these two elderly groups. Thereafter, the dynamics of well-being inequality related to these changes in residential segregation are examined and explained.

4.1. Changing residential segregation between local and migrant elderly

We investigated residential segregation both graphically, by comparing the spatial distribution patterns between two elderly groups, and numerically, by calculating the classic dissimilarity index (Duncan & Duncan, 1955; Wong, 2005). In Fig. 3, the location quotient is employed to show the concentration pattern of the elderly. Our analysis shows a changing concentration pattern for both elderly groups, moving from the center toward the fringes of central Shanghai. The concentration clusters of local elderly have expanded from the center to the fringes. High-concentration clusters, which used to exist only in the western part of traditional communities, are emerging in the surrounding work-unit communities. The previously monocentric residential pattern of local elderly has become more polycentric. Migrant elderly have become further concentrated at the fringes of central Shanghai. This is mainly characterized by the disappearance of most clusters in traditional communities and by the further outward expansion of clusters to the eastern side of Huangpu River (Pudong district). This analysis reveals a general picture of central Shanghai in which the segregation level between local and migrant elderly increases over the years. In 2000, local elderly and part of the population of migrant elderly were concentrated in the center, surrounded by other migrant elderly at the fringes. This center-fringe pattern becomes clearer in 2010, after the disappearance of concentration clusters of migrant elderly in the center. The specific segregation level and its change in each community type called for further quantitative analysis.

The dissimilarity index was calculated at the sub-district level for central Shanghai as a whole and for each type of residential communities separately. The index ranges from 0 to 1, indicating the levels from no segregation to full segregation. According to our results (Table 7), the dissimilarity index is 0.21 and 0.25,

respectively, in 2000 and 2010, indicating a slightly strengthened segregation condition between local and migrant elderly in central Shanghai. However, within the high-priced commercial communities, residential segregation has strengthened most strongly: the dissimilarity index rose from 0.06 to 0.31. Communities at the fringes (e.g., lower-priced commercial and marginalized communities) continue to show a relatively higher segregation level

compared to those in the center (e.g., traditional communities with the lowest segregation level).

The changes in residential segregation are affected by the redistribution of the elderly and other potential factors such as the greying, gentrification, and suburbanization of Shanghai. The traditional communities (C1) have seen a reduction in the number of local elderly (down by 95,000) and a slight growth in the



Fig. 3. Local and migrant elderly clusters in five types of communities in 2000 and 2010. Note: The sub-districts with location quotient scores above 1 (indicating a level higher than the Shanghai average) were selected to represent the elderly's concentration clusters, and sub-districts scoring above 1.5 were considered high-concentration clusters.

Table 7

Changes in dissimilarity index (ID) and elderly population in 5 types of communities.

	2000					2010					Change				
	ID	LE	%	ME	%	ID	LE	%	ME	%	ID	LE	%	ME	%
Traditional (C1)	0.06	425	27	11	20	0.08	329	16	14	10	0.02	−95	−18	4	4
Work-unit (C2)	0.14	680	43	17	33	0.14	811	38	38	25	0.00	132	25	20	21
High-priced commercial (C3)	0.06	58	4	2	3	0.31	141	7	12	8	0.26	83	16	11	11
Lower-priced commercial (C4)	0.20	190	12	10	19	0.17	549	26	55	37	−0.03	359	69	45	47
Marginalized (C5)	0.18	242	15	14	26	0.21	83	13	30	20	0.03	41	8	16	17
Total	0.21	1595	100	53	100	0.25	2113	100	149	100	0.04	518	100	96	100

Note: "ID" indicates the values of dissimilarity index. "LE" and "ME" stand for local elderly and migrant elderly, respectively. The units for population and share are thousands and percentages, respectively. The measurement of ID is carried out at the sub-district level. In total, 128 and 119 sub-districts in central Shanghai are selected for the ID measurements in 2000 and 2010, respectively.

number of migrant elderly (up by 4000) (Table 7). Extensive new-build gentrification in central Shanghai, mostly in the form of demolition–rebuild development involving the direct displacement and relocation of the original residents (He, 2010; Li & Song, 2009), has forced out many local elderly and left fewer cheap housing opportunities for migrant elderly. These dispersed gentrification projects might have changed the previously more homogeneous distribution of both elderly groups in the traditional communities, resulting in slightly increased heterogeneity and residential segregation.

Work-unit communities (C2) remained relatively stable during the 10-year period in terms of similar shares of population growth in five community types for local elderly (25%) and migrant elderly (21%), and limited new housing development, which contributes to an unchanged segregation level. In high-priced commercial communities (C3), spatial differentiation has been intensified. Migrant elderly living in such communities are mainly concentrated outside the city center and especially in the Pudong new district, being segregated from those local elderly near traditional communities (Fig. 3). The increasing housing prices and rents in the city center resulting from continuing gentrification and housing marketization, are expected to contribute to a concentration of migrant elderly in the less expensive Pudong new district.

The lower-priced commercial communities (C4) have experienced a huge rise in the number of local and migrant elderly, who account for 69% and 47% of the population growth, respectively. This massive increase is expected to be consistent with the population decentralization in Shanghai (Wang & Yang, 2012), caused by both displacement in the city center and voluntary locational decisions related to better and cheaper housing at the fringes (Li & Song, 2009). The substantial growth of both elderly groups in the lower-priced commercial communities is likely to shape more mixed and therefore less segregated residential communities. In marginalized communities (C5), the concentration areas of migrant elderly have gradually shifted from the north to the southeast outer fringes of central Shanghai, where many new housing units have been built. This has made migrant elderly more segregated from the local elderly concentrated in the north.

4.2. Changing well-being inequality among the elderly

The residential segregation between local and migrant elderly is expected to result in unequal resource and well-being distributions. The average well-being and needs satisfaction values of the elderly concentration sub-districts (location quotient scores > 1) were calculated to represent the values for both the local and the migrant elderly in five types of communities. The values are the standardized score of original calculations from both 2000 and 2010, which makes the standardized score comparable between the two years. In addition, the values are the standardized score of central Shanghai. For instance, 0 means the average level, and 1 means one standard deviation higher than the average for central Shanghai.

Changes in both total well-being and the inequality gap have occurred. The inequality gap was measured by the absolute value of well-being difference between the two elderly groups; change in the inequality gap was calculated by subtracting the 2000 score from the 2010 score. During the 10-year period, total well-being levels for both local and migrant elderly in the whole of central Shanghai improved, but more so for migrants (Fig. 4, top left). Specific variations are seen in different types of communities. Except for the migrant elderly in high-priced commercial communities (C3), the elderly in all community types, particularly in the marginalized communities (C5), have enjoyed an evident improvement in total well-being. Well-being levels continue to show a clear distance decay effect, declining from the centrally located to the peripheral communities. Although local elderly still enjoy a better total well-being than migrant elderly (except those in traditional communities), their inequality gap has been slightly reduced (from 0.43 to 0.38) (Table 8) due to the migrant elderly's larger well-being improvement. The inequality in total well-being appears to have declined evidently in lower-priced commercial communities (C4) and to have increased apparently in high-priced commercial (C3) communities.

The changes in specific types of basic needs vary among the different communities. Regarding the traditional communities (C1) (Fig. 4, top right), behavioral confirmation is the only basic need that has seen a decline in satisfaction level. A reduction of the elderly population might have reduced the social resources for socializing and interaction, making it less easy for the elderly to acquire social approval. Status needs are relatively less satisfied than other needs, which is largely caused by poor neighborhood quality in 2000. The neighborhood quality, however, has evidently improved 10 years later. This is the only community type where migrant elderly have a higher total well-being level than local elderly. These migrant elderly primarily live with their migrant children (Zhang et al., 2013), who mostly have a high socioeconomic status, a Shanghai Hukou, and advantageous living conditions. These younger migrants are more successful than the average urban natives in terms of human capital attributes, labor market entry, and housing achievement (Logan et al., 2009). The slightly intensified residential segregation has also contributed to a slight increase in well-being inequality.

In the work-unit communities (C2), local elderly generally have higher levels of needs satisfaction than the migrant elderly in both years, but the inequality gaps narrowed. This is likely to be a result of the unchanged segregation level (creating no more inequality in access to geographical well-being resources), and the improved provision of geographical well-being resources during these years.

In the high-priced commercial communities (C3), an obvious decline is seen for migrant elderly in all types of basic needs except status, while minor changes are observed for local elderly. This is largely caused by the re-concentration of migrant elderly. In 2000, most of high-priced commercial communities were located

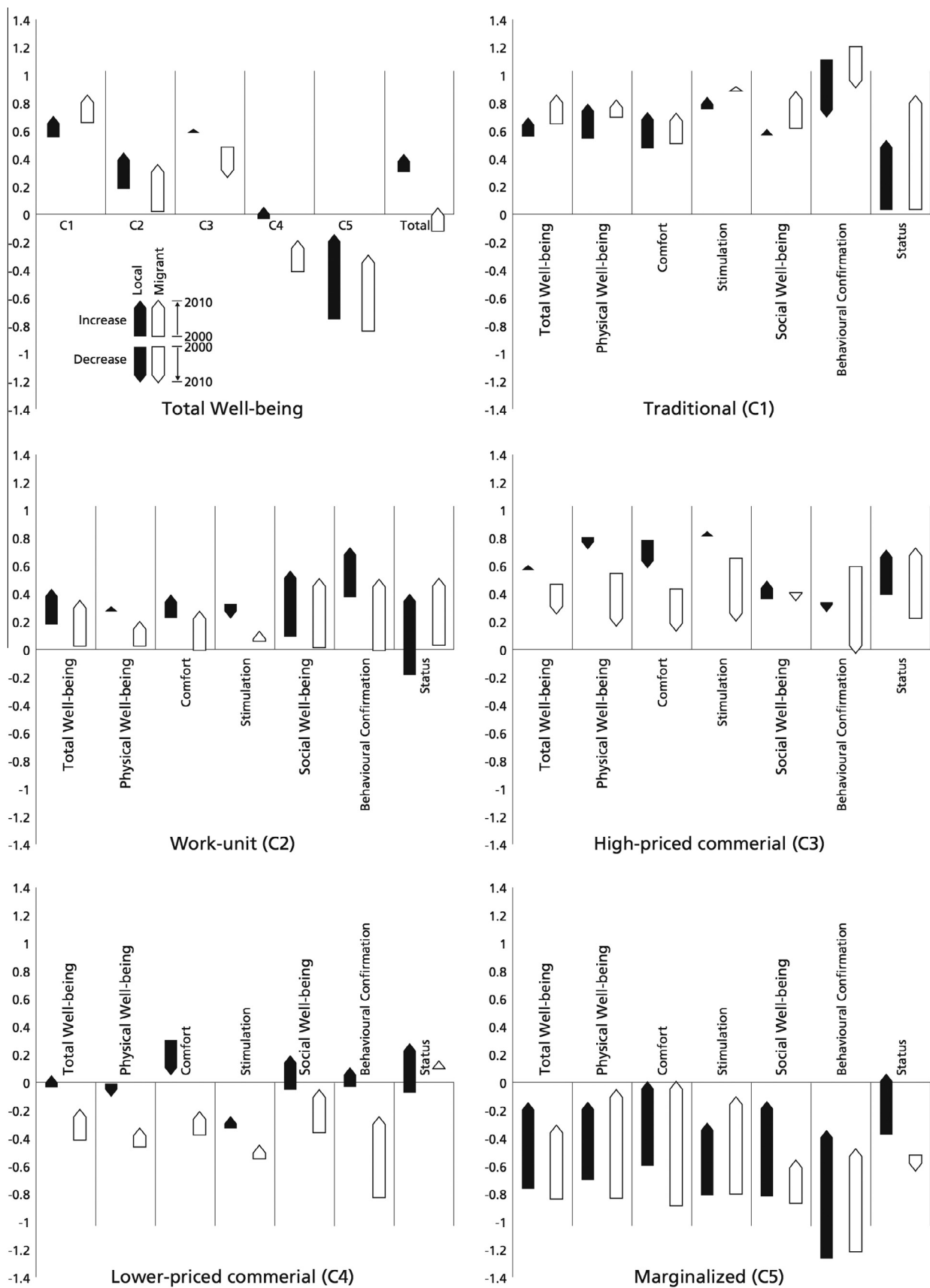


Fig. 4. Change of well-being and needs satisfaction in 5 types of communities from 2000 to 2010. Note: the standardized value means how many standard deviations higher or lower than the average value of central Shanghai, e.g., 1, 0, and, -1 mean one time higher, the same as, and 1 time lower, respectively.

Table 8

Changes in inequality gaps of total well-being in five community types.

	2000	2010	Change
Traditional (C1)	0.10	0.15	0.05
Work-unit (C2)	0.16	0.08	−0.08
High-priced commercial (C3)	0.11	0.35	0.24
Lower-priced commercial (C4)	0.38	0.24	−0.14
Marginalized (C5)	0.08	0.16	0.08
Overall central Shanghai	0.43	0.38	−0.05

in Jin'an and Xujiahui (the western part of the city center), where good access to social and physical resources has produced a high well-being level for both elderly groups. During the 10-year period, newly-built high-priced commercial communities emerged outside the city center, extending to Hongqiao and Huamu in the west and east, respectively. Concentration clusters of migrant elderly have shifted from the center to more peripheral communities, especially the Huamu sub-district, which have relatively lower well-being levels compared to the city center. This has led to a decline in their well-being. By contrast, local elderly still concentrate in the center. These changes in population concentration have intensified local-migrant spatial differentiation, bringing about the enlargement of the degrees of both segregation and well-being inequality.

The elderly in the lower-priced commercial (C4) and the marginalized communities (C5) have lower well-being levels compared to those living in centrally located communities. Yet, due to the rapid improvement of services for the elderly and public transport (e.g., metro system extended from 3 to 13 lines), well-being levels in these communities, especially in the marginalized ones, have increased tremendously. Well-being inequality in lower-priced commercial communities has been alleviated substantially. The decreased segregation between the two elderly groups seems to have reduced their inequality in access to geographical well-being resources.

5. Conclusions and discussion

This paper aimed to analyze the residential segregation between the local and the migrant elderly and its implications on their access to geographical resources and their well-being in central Shanghai over the period 2000–2010. In general, the results show a slight strengthening of residential segregation in central Shanghai, which however does not lead to a reduction in the well-being level or a widening in the well-being inequality between local and migrant elderly. Conversely, the total well-being of both elderly groups has improved and their inequality gaps have narrowed due to the larger well-being improvement of migrant elderly. More evident well-being implications of residential segregation are disclosed in the five community types, particularly among commercial communities. The high-priced commercial communities have seen the greatest intensification of residential segregation and well-being inequality, whereas the lower-priced ones have seen the greatest mitigation of such segregation and inequality. The enlarged spatial and price disparities in high-priced commercial housing exaggerated the socio-spatial differentiation and the inequality in access to geographical well-being resources between local and migrant elderly. By contrast, substantial housing provision and the growth of both elderly groups in lower-priced communities increased their probability of being spatially adjacent and of accessing resources equally. This research contributes to existing knowledge on the local-migrant residential segregation in megacities by providing additional evidence on their older sub-categories and on the changes of segregation over time. This research also assists in our understanding of the well-being

implication of residential segregation over time, which seems to be determined jointly by the changing distributive patterns of elderly groups and geographical resources. In addition, the research provides additional evidence with respect to the increasing influence of market mechanisms and persisting effect of Hukou system in creating local-migrant residential differentiation in urban China.

Well-being theories to date are primarily relevant for social, psychological and medical sciences, but hardly applied in geography and urban planning. One of the reasons for this underexposure might be the lack of identification of geographical resources relevant for well-being of its users. Although, in Lindenberg's integrative well-being theory some environmental attributes are mentioned (e.g., housing, social network, and normative environment), the relevance of his SPF-theory for geographers, planners and urban designers could be increased substantially by integrating a large variety of geographical resources. Our study has explored and extended these spatial aspects of well-being resources in Lindenberg's SPF theory and linked these to changes in residential segregation and well-being distribution. We have shown that access to a variety of urban facilities, such as health care, entertainment, banks, neighborhood quality and population composition show clear differences between various residential locations of the elderly over time. Based on SPF-theory these differences in availability of geographical resources have an influence on the subjective well-being of the elderly. This is an issue that will be further analyzed in an upcoming paper.

This paper has shown that market mechanisms play an increasingly important role in creating local-migrant segregation. However, the Hukou system is still the most crucial institutional factor, shaping a general center-fringe pattern of local-migrant segregation. However, the system is gradually being reformed. The new "public rental housing" policy is expected to benefit more migrants and their cohabitating elderly parents in future. Yet, the degree of Hukou reform still varies considerably between cities, resulting in variability in constraints and resources for migrant elderly. Less developed and smaller cities, which want to promote economic growth, normally have lower standards for Hukou application and welfare provision (Huang, Dijst, van Weesep, & Zou, 2013), while prosperous megacities like Shanghai selectively grant only the richer and better-educated migrants local Hukou and high welfare benefits (Chan & Buckingham, 2008). Policy recently approved by the Third Plenary Session of the 18th CPC Central Committee states that China will accelerate the Hukou reform in the coming years (China Daily, 2013). China will fully remove Hukou restrictions in towns and small cities, gradually ease restrictions in mid-sized cities, set reasonable conditions for settling in big cities, and strictly control the population of megacities. The aim of this new policy is to further facilitate China's urbanization and economic development by guiding migrants to smaller cities and away from megacities. This new policy has been implemented in many cities since the beginning of 2014, with the aim of benefiting migrants by allowing all migrants working and living in the city to apply for a residence permit (not a local Hukou), which also affords them more social rights and welfare provisions. We expect that the Hukou's separation effect on migrants will be significantly weakened in smaller cities and slightly alleviated in megacities. Hence, it might be relevant to start a study on local-migrant housing disparities in cities that differ in Hukou reform. In addition, the effects of these differences in Hukou reform and residential segregation on migrants' living conditions and subjective well-being could be analyzed.

The elderly's well-being tends to be further influenced by China's economic and social reform. The country's economic transition has shifted the task of housing provision and distribution from the state to the market. Market-driven central urban renewal

coupled with suburbanization has caused many elderly people to leave city centers and their territorial social/familial relations, which might have a negative impact on their social well-being (e.g., behavioral confirmation, affection, and status). This can harm the well-being particularly of those who have limited physical resources (e.g., energy, health, mobility) and social resources (e.g., family members and close friends) (Steverink & Lindenberg, 2006).

Regarding the social aspect, the decade-long “one-child” policy has reduced the size of Chinese families, and thus increased the eldercare burden on those only children (Zhang & Goza, 2006). Influenced by the Confucian virtue of filial piety (to love, respect, and support one’s parents and ancestors) and in the absence of a good social security system, these only children will play a key role in providing care for the elderly and ensuring their physical and social well-being (e.g., affection needs). This also means that losing or living far away from their only child will jeopardize elderly people’s well-being. The “one-child” policy was relaxed around 2000, allowing couples to have a second child if both partners were only children, and further loosened at the beginning of 2014, permitting couples to have a second child if either partner was an only child. However, its positive effects will not be felt in the short term. Further research is therefore recommended to investigate the impact of these social and economic reforms on the elderly’s subjective well-being, especially the non-physical aspect.

This paper has evidenced the elderly’s local-migrant segregation and inequality in Chinese megacities. In today’s China, the equity issue is becoming both more prominent and more complex. The tremendous economic and social transitions that have occurred in recent decades have made Chinese society much more diversified than ever before, in terms of increasing heterogeneity in people’s socioeconomic status, life styles, attitudes, values, and activity patterns (Lin, 2007). The same applies to the distinctive groups of local and migrant elderly, as shown in our analysis, who are also becoming more diversified. The increasing social diversity not only results in more heterogeneous pursuits for needs satisfaction and well-being, but also indicates the growing complexity of distributing resources equitably and achieving normative targets of equity and justice. Planning solutions like mixing building types and land uses, and striving for the social heterogeneity of residential and public spaces (Fainstein, 2010), might contribute to providing different social groups with equal rights to urban space and resources. We urgently need a better understanding of the growing diversities within Chinese society, and of how planning can help us to cope with this increasing diversity and distribute resources equitably is badly needed.

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