Measuring urban diversity of Songjiang New Town: A re-configuration of a Chinese suburb

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A B S T R A C T
Large-scale New Town projects being built in the developing world, including China, are often criticized for its lack of urban diversity. This is because these areas do not display the characteristics where urban diversity is normally found such as areas that are developed over longer periods of time, places of incremental change, and areas with small urban blocks. However, two aspects challenge the simplistic conclusion that New Towns are physically and socially monotonous: the diversification of the housing provision system in China; and rapid internal migration. Against this background, this study measures the housing and social diversity of four study areas in Songjiang, an outer suburb of Shanghai, using the entropy index to illustrate a more complicated understanding of where and how diversity occurs. The results showed that older, incrementally developed areas were diverse, but more interestingly, new comprehensively developed areas were also diverse through variations in building types and a wide housing price range. The study found disparate tendencies between housing and social diversity in other areas. In conclusion, the study highlighted the different contexts of urban diversity and its importance in drawing appropriate urban design measures which encourage the positive aspects of diversity such as urban vitality and equity.

1. Introduction

Urban diversity is a multi-faceted issue discussed in many academic fields including social sciences, urban design, and planning (Carmona, Tiesdell, Heath, & Oc, 2010; Jacobs, 1961; Laurence, 2014; Lynch, 1960), and recently, has also been recognized as an important aspect of sustainable urban development in China. Diversity not only creates aesthetically pleasing environments through vibrant streetscapes and buildings, but Qiu (2012) recognized diversity, alongside compactness, as an effective planning framework to ensure urban intensification and mixed-use development which would deter uncontrolled urban growth in China. Diverse, denser and more connected urban areas are particularly relevant as this would alleviate development pressures on various natural and built environment resources (Guan & Rowe, 2016; Song & Gerrit-Jan 2004). Furthermore, the government recently announced that housing supply needs to be diversified to meet the aspirations of different social groups as a measure of improving public services (CPC Central Committee and the State Council, 2016). However, in spite of such recognition, urban projects in China have been heavily criticized for its standardized urban forms and homogeneous identity (Abramson, 2016; Seto & Fragkis, 2005). Greenfield (2016) disapproved new large-scale developments sporadically emerging in various parts of China for creating empty, and physically homogeneous urban environments, while Caprotti (2014) expressed concerns that a socially resilient and diverse community may not emerge from New Town developments in China.

Yet urban diversity is not sufficient in creating desired urban environments if it fails to induce positive outcomes such as urban vitality and equity (Fainstein, 2005, 2010; Talen, 2006, 2008). However, achieving these qualities can often be elusive. From a planning perspective, Fainstein (2010) argued that, albeit diversity-oriented planning principles, globalized architecture end up creating places that are more alike rather than differentiated. Not only this, efforts to increase social diversity through planned
communities have failed in the past due to heightened group conflicts, eventually damaging community solidarity and worsening segregation (Johnston, 2002). In other words, while it is desirable to promote diversity, it is more important to not remain at an aggregate level and ensure the positive and synergistic outcomes of diversity — otherwise high levels of diversity could be inconsequential (Guan & Rowe, 2016).

Acknowledging the planning aspirations and criticism of urban projects in China, this study aims to highlight the post-socialist restructuring of China as a strong backdrop for investigating urban diversity, especially in its new large-scale developments. Investigating Songjiang New Town, an outer suburb of Shanghai, the research asks whether urban diversity is found in New Town projects, and how this is experienced in regards to the positive aspects of diversity. This would test and extend the previous literature on urban diversity. Furthermore, the case of China would have stronger implications in other developing countries where rapid urbanization is re-structuring the urban environment.

The study specifies urban diversity in terms of housing — a subcategory of physical diversity — and social diversity. Housing is particularly significant in the context of New Towns as it is one of the main driving forces of suburban development, and in this study, social diversity mainly refers to examining socioeconomic characteristics as opposed to ethnic or racial aspects.

2. Where is urban diversity found?

The following section reviews previous literature in relation to describing places where urban diversity is found (Fig. 1).

First, older and established areas within the city are identified to be more diverse than newly developed areas (Blanco et al., 2009; Jacobs, 1961). Older areas usually have undergone various building and regeneration processes, creating a physically heterogeneous environment through the mix of old and new properties. Once new buildings or housing stocks are introduced to an existing area, the physical environment diversifies through variations in building type, density, and street formations. The mix between old and new properties also creates an apt environment for various income levels as older units become more affordable through the downward housing filtering process — where higher-end properties eventually become cheaper and available for moderate income households (Chowdhury et al., 2011). More accurately, the housing filtering process can either happen ‘downward’ as stated earlier or ‘upward’ where cheaper estates are replaced through gentrification. Hence, areas with stalled gentrification where old properties are not necessarily replaced by higher-end housings may ensure high levels of diversity (Nyden, Maly, & Lukehart, 1997; Randolph & Freestone, 2012).

The second notion is to ensure incremental changes in the urban environment, which relates to the first notion of retaining existing buildings or housing stocks in a given area. A comprehensive report which empirically tested the contribution of diversity to urban vitality noted that “the rate of change is important,” and that neighborhood changes should be piecemeal (National Trust for Historic Preservation, 2014). In this sense, large-scale developments potentially erase the existing elements of diversity and create repetitive and monotonous places. More significantly, these areas may be subject to rigid design controls, prohibiting the possibility for individualistic change or adaption (Southworth & Owens, 1993) further countering the conditions of urban diversity.

Lastly, housing policies and urban design regulations could be implemented to promote urban diversity. In principle, infill developments are encouraged so as not to destroy the existing conditions of the urban fabric and ensure socioeconomic diversity and stability (Kim & Larsen, 2016), relating to the first and second notion of where urban diversity is found. Zoning regulations also have the potential to contribute towards diversity if land-use and housing unit type mix can be implemented on a varied scale (Blanco et al., 2009; Talen, 2012). Measures such as rent control and housing subsidization are also promoted to ensure a wide housing choice for the lower-income families and hence promote higher social diversity (Kleinhans, 2004; Musterd & Andersson, 2005).
3. Urban diversity in a Chinese suburb

Against such understanding, it is easy to dismiss the large-scale suburban developments of China as sites of homogeneity. However, there are two conditions to examine which may suggest a more complicated landscape.

First, the housing provision system in China experienced major changes ever since the 1990s which engendered new patterns of residents and housing diversification (Wang & Murie, 2000; Wang, 2000). After an experimental period of commercialization, in 1994, the government announced a two-tier housing provision system based on income levels (Wang & Murie, 2000; Wang, 2011). Housing commodification indicated that the market was now recognized as an important supplier of housing. In the wake of such change, developers experimented with various housing plans and residential complexes to accommodate for the differentiated social groups. However, the reliance on the housing market and rising prices became a serious issue during the mid-2000s and the government responded by introducing a multiple housing provision system since 2007 (Wang, 2011). Ever since, the notion of social housing and inclusionary housing has been emphasized and various types of affordable housing schemes are being introduced despite the problems of limited stock (Huang, 2015).

Second, there is an inherently social aspect which presupposes urban diversity in Chinese New Towns. This is due to the influx of migrant population, which is one of the driving forces of New Town projects (Wu, 2015). Rapid internal migration has followed the economic reforms in China, and the urban population is expected to reach 61.0% by year 2020 which is a drastic increase from 17.4% of 1975 (Zheng & Yang, 2016). The single most important factor of urban population increase is pointed towards internal migration, and in receiving cities such as Beijing, Guangzhou and Shanghai, the migrant population is approximately 40% of the total population (Zheng & Yang, 2016). In respect to Songjiang, the floating population in 2013 was approximately 1.1 million which accounted for 62% of the total population (Songjiang District Government, 2014). Migrants are attracted to newly developed areas as they provide housing, urban infrastructure, and also open up job opportunities to the city center (Won, Cho, & Kim, 2015). In the case of Songjiang, the metro line 9 extension from the Shanghai city center allowed the suburban area — located 40 km southwest of the city center — to be recognized as a connected and an opportunite place of settlement (Shen, 2011). Furthermore, the migrant population itself embodies diverse socioeconomic backgrounds ranging from rural migrants that are seeking to improve their living conditions to the highly-educated global talents attracted to the main city of Shanghai (Cui, Geertman, & Hoimeijer, 2014; Shen, 2011). Therefore, depending on the living situation and personal aspirations, migrants’ duration of stay may also differ (Zhu, 2007), implying a dynamic and ever-changing condition of social diversity.

4. Study area

Songjiang district is one of the main outer suburbs of Shanghai as presented by the ‘One City Nine Towns’ plan of 2001. Despite its primarily agricultural past, in 1958, Songjiang was recognized as one of the five satellite towns of Shanghai and administratively formed part of the Shanghai Municipality (Wu, 2015). However, it was only during the 1990s when Songjiang caught up with rapid urbanization, and authorities decided to develop the northern area of the Shanghai-Hangzhou Highway which bisected Songjiang district on an East-West axis (Tongji University, 2003). The 1998 Songjiang Central Urban District Masterplan was the first plan to integrate the original city area and this new expansion to the north, and in 2001 an international competition for the master planning of the Songjiang New Town was held (Tongji University, 2003).

In this study, within the master plan boundary, four areas were selected to measure urban diversity. The two criteria for site selection were the development period (old vs. newly developed areas) and the pace of change (incremental vs. rapid development). Areas A and B, located south of the Shanghai-Hangzhou Highway represent the old and established areas, whereas areas C and D form part of the comprehensive new developments of the late 1990s situated north of the Highway (Fig. 2). In relation to the pace of change, housing estates studied in area A were built over the longest period of time where the Chinese housing provision system transitioned from welfare to the housing market (Fig. 3). Hence, this area is expected to show the highest level of urban diversity as it is closest to being incrementally developed. On the other hand, estates studied in areas B, C and D were built over generally shorter periods of 8—11 years after the late 1990s. In particular, area C is the only area where housing development was concentrated in the housing market formation period where all properties were commercially developed.

The following section briefly describes the urban and housing characteristics of each study area (Table 1).

There are 17 housing estates in area A, with the largest estate accommodating for more than 3000 dwelling units while the smallest estate houses 120 dwellings. Area A is well-serviced by public transportation with the Songjiang Sports Center subway station located nearby and has commercial activities occurring along all of its main streets. Area B is an area where there is a mix between commercial housing and relocation housing estates built after the mid-2000s. While the southern boundary is cut off by a river stream, building activities continue towards the west where new high-end commercial developments stand in stark contrast to open fields. Areas A and B belong to the Yueyang jiedao and Yong-feng jiedao respectively. For both jiedao, there is a higher proportion of the aged population than areas C and D. In 2013, population aged 60 and above accounted for almost 24.5%, and those aged between 36 and 60 accounted for roughly 40% (Songjiang District Government, 2014).

Area C is near the new administrative center and central park of Songjiang New Town which consists of 14 housing estates. It is located south of the Songjiang University Town site and is relatively well-serviced through bus routes. Area D is an area directly served by the Songjiang University Town subway station, where there are visible sites of on-going housing construction. In terms of its built environment qualities, there are certain similarities with area B as it also borders the rural fields towards its northern boundary marking an abrupt edge between the built and unbuilt areas. Both areas C and D belong to the Fangsong jiedao, which has a comparatively younger population with those aged between 18 and 35 accounting for 48.6% (Songjiang District Government, 2014).

5. Methodology and data

5.1. Measuring diversity using the entropy index

In order to measure urban diversity, the study used the entropy index. Among various diversity indexes, the entropy index has been used in housing and residential studies for its suitability of measuring the variation of nominal variables (Livingston, Kearns, & Bailey, 2013; Musterd & Andersson, 2005; White, 1986). The entropy index is also applicable for this study as the diversity variables are categorically defined.

\[
h_i = -k \sum_{j=1}^{k} p_{ij} \ln(p_{ij})
\]
For the final reporting of results, the standardized entropy index value was used so that values ranged from 0 to 1, enabling a more intuitive understanding of the results. The minimum value of 0 indicates absolute homogeneity, while the maximum value of 1 indicates the highest level of heterogeneity.

Ten variables were examined in terms of the housing aspect (Table 2). Year of build, housing density, the area of the site, street intersection density, and green ratio capture the urban structure and density of the developments which are common descriptive attributes used in urban design and morphological studies (Moudon, 1994; Ryan, 2013; Talen, 2008). Specific to this study, housing type was divided into the economic and building type classifications to understand where specific social groups such as relocated residents or low-income households may be located. In addition, housing price and housing unit size were used to understand the variety of housing unit types provided by each individual estate.

For the social aspect, eight variables were set up. The household or family structure was represented by the marital status and family type, whereas the socioeconomic characteristics were represented by the employment status, occupation sector, education attainment and monthly household income. The research differentiated marital status and family type to better capture the household compositions of migrants. Finally, the hukou status and tenure years were included to understand the mix between migrants and original residents, as this may be a key social aspect in New Town areas.

5.2. Data collection

Housing data was obtained by personally visiting the residential committees and property management offices located at each housing estate from November 27 until December 4, 2015. While the property management offices held most of the required housing data, any missing information was supplemented by visiting the residential committee. Housing estate maps were photographed at each site, and average housing price of individual estates was obtained by inquiring local real estate offices. However, one property built in the 1980s in area A lacked proper documents so the total area of site and green ratio could not be found. These cases were eliminated when calculating the respective diversity aspects.

To collect the social diversity-related information, a resident survey was conducted through the intercept survey method. The survey was conducted from December 24 until 31, 2015 (i.e. two days for each study area) with the assistance of undergraduate students from Tongji University. For each study area, two main streets along the East-West axis were identified and surveys were conducted at designated street intersections. The assistants were divided into two groups, and each day conducted two sessions of three-hour long street surveys between 10 a.m. until 1 p.m. and 2 p.m. until 5 p.m. The assistants were asked to engage with all passers-by who were willing to respond, and only those identified to be living in one of the study area’s housing estates were eligible for the survey. In most cases, the assistants read out the survey and directly filled out the questionnaires to minimize mistakes or confusion. In total 98 people were surveyed from area A, 88 from B, 82 from C and 102 from D. Some respondents were unwilling to disclose information such as monthly income or education attainment, hence the total number of cases vary for different variables.

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1 The housing prices were current prices at the time of inquiry which was December 2015.

2 Hukou is the household registration system of China which allows the government to organize its population locationally. Under Maoist China the hukou system was comprehensively enforced as a national institution which rigidly controlled internal migration and also divided the population into rural or urban residents. Urban hukou holders were entitled to various goods and subsidies provided by the government which became the basis for social stratification. Although the hukou system has undergone changes in the economic reform era, its divisive function has largely survived.
6. Results

The results of the standardized entropy index values are shown in Table 3. For each diversity aspect, the area with the highest entropy index value is highlighted in bold, and the column on the right shows the average entropy index value. Scores have been given based on the individual area’s ranking of the entropy index value. For example, when considering ‘year of build’, area A ranked first scoring the highest entropy index value, whereas area C ranked the lowest. Hence, area A is given a score of four and area C is given a score of one for this particular diversity aspect. The total score is the sum of all individual ranking scores. The following section describes in detail where high housing and social diversity is found.

### Area A (1980–2012)

- **A1** (1980)
- **A2** (1981)
- **A3** (1982)
- **A4** (1987)
- **A5** (2001)
- **A6** (2002)
- **A7** (2003)
- **A8** (2004)
- **A9** (2005)
- **A10** (2006)
- **A11** (2007)
- **A12** (2008)
- **A13** (2009)
- **A14** (2010)
- **A15** (2011)
- **A16** (2012)

### Area B (2005–2015)

- **B1** (2005)
- **B2** (2006)
- **B3** (2007)
- **B4** (2008)
- **B5** (2009)
- **B6** (2010)
- **B7** (2011)
- **B8** (2012)
- **B9** (2013)
- **B10** (2014)
- **B11** (2015)

### Area C (2001–2006/2013)

- **C1** (2001)
- **C2** (2002)
- **C3** (2003)
- **C4** (2004)
- **C5** (2005)
- **C6** (2006)
- **C7** (2007)
- **C8** (2008)
- **C9** (2009)
- **C10** (2010)
- **C11** (2011)
- **C12** (2012)
- **C13** (2013)

### Area D (2005–2014)

- **D1** (2005)
- **D2** (2006)
- **D3** (2007)
- **D4** (2008)
- **D5** (2009)
- **D6** (2010)
- **D7** (2011)
- **D8** (2012)
- **D9** (2013)
- **D10** (2014)

### Table 3. Basic characteristic of study area.

<table>
<thead>
<tr>
<th>Location</th>
<th>Area</th>
<th>No. of housing estates</th>
<th>Total no. of households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Areas in between the Shanghai-Hangzhou Highway and Railway station</td>
<td>A</td>
<td>17</td>
<td>16,191</td>
</tr>
<tr>
<td></td>
<td>B</td>
<td>13</td>
<td>18,280</td>
</tr>
<tr>
<td>Areas developed to the north of the Shanghai-Hangzhou Highway</td>
<td>C</td>
<td>14</td>
<td>11,315</td>
</tr>
<tr>
<td></td>
<td>D</td>
<td>9</td>
<td>15,511</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>61,297</td>
<td></td>
</tr>
</tbody>
</table>

#### Fig. 3. Housing development period (Wang, 2011) and study area’s typical housing estates.

6.1. Where is urban diversity found? The two sides of housing diversity

The results showed that areas A and C had the highest level of housing diversity, indicating that both an incrementally developed area and a newly planned area driven by the housing market can be diverse.

Area A was diverse in ‘year of build’ indicating a good mix between old and new properties, and this key aspect related to other variables such as housing unit size and street intersection density. The ‘smallest housing unit size’ was highly differentiated due to an even distribution of units in the ‘less than 50 m²’ and ‘50 m²–70 m²’ categories, which was particularly characteristic of older properties. There rarely was a case in other areas where units smaller than 50 m² were provided. Another notable aspect was the ‘street intersection density’ indicating that properties ranged in having dense or loosely-structured estate plans. This was due to the properties with mid-ranging densities, which was in turn particularly characteristic of large estates that were built since the 1980s over multiple phases. In other places, estates with similar site area showed a mix between mid-rise parallel blocks and high-rise towers, but in area A, a simple plan dominated by six story parallel blocks was typical of these estates. While area A, in general, scored moderately high for other variables, it lagged behind in building type variations and also did not have a particularly wide housing value, scoring relatively low for both minimum and maximum housing price.
While the above-mentioned results confirm conventional knowledge, it was found that area C—a comprehensively developed area—also showed high levels of housing diversity. The four variables which showed the highest entropy index values were ‘building type,’ ‘green ratio,’ ‘minimum housing price’ and ‘maximum housing price.’ The high diversity of ‘building type’ and ‘green ratio’ seemed related, since ‘building type’ captured the mix between apartment-style estates such as parallel blocks or high-rises whereas the green ratio is lower, and villa compounds with generally higher green ratio. This created a more diversified built environment and the provision of villas indicated that this may be a preferred neighborhood of the upper-middle class. In fact, this is reflected in the diverse ‘maximum housing price.’ However, it is interesting to note that the ‘minimum housing price’ was also highly diverse indicating that lower-income households were also catered for in this area through cheaper apartment-type housing estates. In other words, the fully commercially developed area offered the widest range of housing value. However, area C obviously was not diverse in terms of the year of build—the only variable that the area scored the lowest—while this was the strong driving force behind area A’s high urban diversity.

The two areas B and D showed either moderate or low level of housing diversity, however, it is worth noting that area B was the most diverse in terms of ‘housing type’ due to the presence of relocation housing. Although a number of relocation mixed with commodity housings were found in area A, housing estates that purely consisted of relocation housing was only found in area B. On the other hand, area D did not score very high in terms of housing type purely consisted of relocation housing was only found in area B. On the other hand, area D did not score very high in terms of housing type, but the fully commercially developed area offered the widest range of housing value.

Table 2
List of housing and social diversity variables.

<table>
<thead>
<tr>
<th>Diversity variables</th>
<th>Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing diversity</td>
<td>Year of build</td>
</tr>
<tr>
<td></td>
<td>Housing density (total no. of dwelling units per 1,000m²)</td>
</tr>
<tr>
<td></td>
<td>Less than 5 dwellings/5–10 dwellings/10–15 dwellings/15–20 dwellings/More than 20 dwellings</td>
</tr>
<tr>
<td></td>
<td>Total area of site (m²)</td>
</tr>
<tr>
<td></td>
<td>Less than 50,000 m²/50,000–100,000 m²/100,000–150,000 m²/150,000–200,000 m²/More than 200,000 m²</td>
</tr>
<tr>
<td></td>
<td>Street intersection density (no. of intersections per 1000 m²)</td>
</tr>
<tr>
<td></td>
<td>Less than 0.2/0.2–0.3/0.3–0.4/0.4–0.5/More than 0.5</td>
</tr>
<tr>
<td></td>
<td>Green ratio</td>
</tr>
<tr>
<td></td>
<td>Less than 30%/30–35%/35–40%/40–45%/More than 45%</td>
</tr>
<tr>
<td></td>
<td>Housing type</td>
</tr>
<tr>
<td></td>
<td>Commodity housing/Relocation housing/Commodity and affordable housing (e.g. Economic and Comfortable Housing, Public Rental Housing etc.)/Commodity and relocation housing</td>
</tr>
<tr>
<td></td>
<td>Building type</td>
</tr>
<tr>
<td></td>
<td>Parallel block (6 floors or lower)/High-rise development/Block or high-rise development with community facilities/High-rise and villa compound/Villa compound</td>
</tr>
<tr>
<td></td>
<td>Min. housing price (000, RMB)</td>
</tr>
<tr>
<td></td>
<td>Less than 1000 RMB/1000–1500 RMB/1500–2000 RMB/2000–2500 RMB/More than 2500 RMB</td>
</tr>
<tr>
<td></td>
<td>Max. housing price (000, RMB)</td>
</tr>
<tr>
<td></td>
<td>Less than 3000 RMB/3000–4000 RMB/4000–5000 RMB/5000–6000 RMB/More than 6000 RMB</td>
</tr>
<tr>
<td></td>
<td>Smallest housing unit size (m²)</td>
</tr>
<tr>
<td></td>
<td>Smaller than 50m²/50–70m²/70–90m²/90–110m²/Larger than 110 m²</td>
</tr>
<tr>
<td>Social diversity</td>
<td>Family type</td>
</tr>
<tr>
<td></td>
<td>One person living alone/Husband and wife/Parents with unmarried children/Parents with married children/Others</td>
</tr>
<tr>
<td></td>
<td>Employment status</td>
</tr>
<tr>
<td></td>
<td>Employed/Full-time student/Peasant/Retired/Unemployed</td>
</tr>
<tr>
<td></td>
<td>Occupation sector</td>
</tr>
<tr>
<td></td>
<td>Government or public sector office/Professional technician/Office worker/Service sector/Industrial worker/Private business/Others</td>
</tr>
<tr>
<td></td>
<td>Education attainment</td>
</tr>
<tr>
<td></td>
<td>Illiterate or Primary school/Junior high school/Senior high school/University/Beyond university</td>
</tr>
<tr>
<td></td>
<td>Monthly household income (RMB)</td>
</tr>
<tr>
<td></td>
<td>Less than 3000/3000–5000/5000–10,000/10,000–15,000/More than 15,000</td>
</tr>
<tr>
<td></td>
<td>Hukou status</td>
</tr>
<tr>
<td></td>
<td>Shanghai non-agricultural hukou/Other city non-agricultural hukou/Agricultural hukou</td>
</tr>
<tr>
<td></td>
<td>Tenure years</td>
</tr>
<tr>
<td></td>
<td>Less than 3 years/3–5 years/5–10 years/10–15 years/More than 15 years</td>
</tr>
</tbody>
</table>

Table 3
Standardized entropy index value results.

<table>
<thead>
<tr>
<th>Diversity aspect</th>
<th>Old city</th>
<th>New development</th>
<th>Aver. value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Area A</td>
<td>Area B</td>
<td>Area C</td>
</tr>
<tr>
<td>Housing diversity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year of build</td>
<td>0.823</td>
<td>0.498</td>
<td>0.186</td>
</tr>
<tr>
<td>Housing density (total no. of dwelling units per 1,000m²)</td>
<td>0.814</td>
<td>0.666</td>
<td>0.678</td>
</tr>
<tr>
<td>Total area of site (m²)</td>
<td>0.800</td>
<td>0.964</td>
<td>0.870</td>
</tr>
<tr>
<td>Street intersection density (no. of intersections per 1000 m²)</td>
<td>0.947</td>
<td>0.641</td>
<td>0.812</td>
</tr>
<tr>
<td>Green ratio</td>
<td>0.861</td>
<td>0.641</td>
<td>0.870</td>
</tr>
<tr>
<td>Housing type</td>
<td>0.543</td>
<td>0.788</td>
<td>0.809</td>
</tr>
<tr>
<td>Building type</td>
<td>0.560</td>
<td>0.253</td>
<td></td>
</tr>
<tr>
<td>Min. housing price (RMB)</td>
<td>0.431</td>
<td>0.582</td>
<td>0.929</td>
</tr>
<tr>
<td>Max. housing price (RMB)</td>
<td>0.301</td>
<td>0.534</td>
<td>0.678</td>
</tr>
<tr>
<td>Smallest housing unit size (m²)</td>
<td>0.738</td>
<td>0.611</td>
<td>0.583</td>
</tr>
<tr>
<td>Housing diversity score based on ranking</td>
<td>27</td>
<td>24</td>
<td>27</td>
</tr>
<tr>
<td>Social diversity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marital status</td>
<td>0.391</td>
<td>0.287</td>
<td>0.435</td>
</tr>
<tr>
<td>Family type</td>
<td>0.763</td>
<td>0.791</td>
<td>0.926</td>
</tr>
<tr>
<td>Employment status</td>
<td>0.803</td>
<td>0.698</td>
<td>0.663</td>
</tr>
<tr>
<td>Occupation</td>
<td>0.761</td>
<td>0.852</td>
<td>0.886</td>
</tr>
<tr>
<td>Education attainment</td>
<td>0.828</td>
<td>0.824</td>
<td>0.781</td>
</tr>
<tr>
<td>Monthly income</td>
<td>0.855</td>
<td>0.787</td>
<td>0.790</td>
</tr>
<tr>
<td>Hukou status</td>
<td>0.903</td>
<td>0.882</td>
<td>0.929</td>
</tr>
<tr>
<td>Tenure years</td>
<td>0.957</td>
<td>0.722</td>
<td>0.893</td>
</tr>
<tr>
<td>Social diversity score based on ranking</td>
<td>22</td>
<td>15</td>
<td>22</td>
</tr>
</tbody>
</table>

| Total score based on ranking | 49 | 39 | 49 | 42 |

a The housing type for areas C and D consisted only of commercial housing hence the values have been omitted.
b The total score is based on the order of ranking amongst the four areas.
diversity. In fact, area D scored the lowest for 'minimum housing price' and 'smallest housing unit size' amongst others. In other words, area D consisted purely of post-2005 commercial developments with most of its smallest housing unit size belonging to the single category of 'larger than 50 m² less than 70 m²'. Also, all of the smallest units were priced less than 2 million RMB indicating that the price range and unit size of the dwellings were more standardized. Such homogeneous qualities were easily recognized and experienced when visiting the area as well, and unlike area C, the physical characteristics of area D did seem to align with the criticisms of newly developed areas creating a monotonous landscape.

6.2. High social diversity and the heterogeneity of the migrant population

When examining the social aspect, areas A, C, and D showed high levels of diversity which were either related to the mixing of different population groups (areas A and C) or diversity inherent within a specific population group (area D).

Area A was most mixed in 'tenure years' indicating a mix between newcomers and original residents. Newcomers in the category of 'less than 3 years' accounted for 14.3% in area A, which in fact is the lowest percentage compared to other areas, but due to the higher percentage of residents who had lived in the area for more than 15 years (31.70%), the entropy index value scored the highest. Area A was also diverse in terms of 'employment status' and 'monthly income.' While in other areas the 'employed' category was dominant, in area A there was a comparatively higher number of respondents in the 'full-time student' category. In terms of the different income levels, area A comparatively showed a higher percentage of low-income families with more even distribution in the three categories earning less than 10,000 RMB per month. This may be due to the higher proportion of the elderly and retired population in the area. Therefore, the high social diversity of area A may be associated with receiving new young families with moderate income into an area where original residents were dominant.

The high social diversity of area C was due to the mix between original residents and migrants with diverse household structures as indicated by 'hukou' status and 'family type.' In area C, the 'other city non-agricultural hukou' accounted for a relatively high 42.7%, and agricultural hukou residents accounted for 16.0%, showing a balance between all hukou statuses. While area A is also very diverse in its hukou composition, it was the presence of agricultural hukou holders in area C which contributed to the highest entropy index value (Fig. 4). Considering 'family type,' there was a relatively even distribution of single-person households to larger households but more importantly, there were those who belonged to the 'other' category which was mostly house-sharing respondents from workplaces.

Intriguingly, area D showed mixed messages because three variables — 'marital status,' 'occupation,' and 'education attainment' — showed highest levels of diversity while other three variables — 'monthly income,' 'hukou' and 'tenure years' — showed the lowest levels of diversity. As it is expected of a newly expanding area, most of the residents had arrived within the last three years (58.8%) with 64.0% of residents holding 'other city non-agricultural hukou.' The income level was generally higher than other areas with 52.2% of residents earning more than 15,000 RMB per month. This indicated that area D was where the most recently arrived, high earning migrants moved in.

Understanding that there is an identifiable dominant social group in area D, it is important to further explore the social aspects which scored the highest entropy index value. First, the reason behind a highly diverse marital status is due to a number of respondents belonging to the 'married, separated' category. In all cases, this condition was due to one of the spouses finding work in Shanghai, or in one particular case, a grandparent who had moved permanently to look after her grandchild. On the other hand, the highly diverse 'occupation' was due to the higher proportion of people working in the service sector, and those who answered in the 'others' category. This was evident at the survey conducting stage where a number of young, recently moved migrants were working as real estate agents or shop assistants, while there was also a unique job description of a freelance translator and artist. Another interesting characteristic of the area was its high educational attainment with most respondents evenly distributed across the categories of 'senior high school' to 'beyond university.' Evidently, area D's social diversity differed from areas A and C in that heterogeneity rose from within the migrant population that was inherently socioeconomically diverse.

6.3. How is diversity experienced? Understanding urban diversity in the real-world

Learning from the entropy index results, it is difficult to simply classify an area as being heterogeneous or homogeneous. Furthermore, if the purpose of promoting urban diversity relies on bringing vitality and equity to the urban environment, it is important to discuss where and how these areas may appear. The following section compares areas C and B to delineate urban characteristics which may encourage urban vitality in relation to diversity.

High urban diversity manifested through various housing types and different price points became apparent along a successful commercial street in area C, namely Songjiang-lu. Along Songjiang-lu was one of the cheapest estates in the area, C1, with an average housing price of 16,500 RMB/m², where coincidentally the highest number of agriculture hukou holders lived. Directly across the C1 estate was the second most expensive apartment estate, C4, which was built in 2013, with an average price of 26,000 RMB/m². These two estates faced each other and were serviced by the same bus routes and urban amenities such as small shops, banks, cafes, and restaurants. At the eastern end of Songjiang-lu was the only residential complex mixed with hotels and a shopping mall (C6) which provided housing for young professionals. This area livened up especially during the weekends when university students from the Songjiang University Town campuses came to shop and spend time with their friends. The young crowd was mixed with families who also did their weekend shopping near the mall area. Directly across this shopping and residential complex were C2 and C3 estates which comprised of low-rise apartments mixed with villas. Internally, these estates created a mix of building types and housing price differentiation, albeit catering more towards the middle-class. In general, housing estates with varying building types, target households and housing value seemed equally well-serviced along a successful commercial street, creating a balanced housing environment for a wide population.

Area B's high housing type diversity — due to the balance between relocation housing, relocation housing mixed with commercial housing, and commercial housing — indicated potentially a favorable condition towards high social mix and vitality. However, unlike area C, the area seemed spatially segregated, without any common streets or areas which bound the different housing types. The relocation housings were concentrated on the southern edge of the study area boundary, abruptly marked off by a wall and a natural stream. There were shop-lined streets within the area but not all spaces were occupied, and hence not many street activities were observed. Even with the opened shops, there seemed to be a lack of goods and stocks, by which one elderly complained that he had to travel far to do his daily shopping. However, traveling north two
urban blocks were where the higher-end commercial developments were located with a large shopping mall and a vibrant atmosphere. The high-end commercial developments implemented strict security controls and did not allow non-residents to enter into their estates. A particular housing estate developed by Vanke, a well-known real estate developer in China, was completely insulated through fences and security guards, which was actually one of the reasons for being popular among its residents. There was a large shopping mall near the area with shops and restaurants targeting a different income group from the shop-lined streets of the southern area. The stark physical boundaries coupled with large block sizes created a segregated environment where housing type diversity did not translate into a positive urban characteristic.

In conclusion, the housing and social aspects of diversity do not necessarily relate but rather create multiple conditions of urban diversity (Table 4). Area A was characteristic of accumulated diversity which depended on incremental changes over a long period of time, and area C demonstrated that planned diversity in conjunction with the housing commodification process could achieve a diverse environment as well. As for areas B and D, the housing and social aspects showed disparate tendencies, creating either uncoordinated or incongruous diversity. As demonstrated above, housing diversity was present in area B but the lack of coordination between the different housing types, further exacerbated by large urban blocks, indicated that moderate levels of diversity were ineffective. On the other hand, in area D, high social diversity was found but was contained in a homogeneous housing environment, exhibiting a mismatch and incongruity between the two aspects.

7. Discussion

The high housing diversity of area A confirms previous knowledge in that places that are older with a moderate pace of change are highly diverse. The development of the housing provision system from welfare to the market has contributed majorly to this area’s high housing diversity as properties ranging from the 1980s danwei-turned-commodity housing to recent commercial developments coexist. In fact, area A, where diversity has been reached through accumulation, is characteristic of diverse suburban areas that are not subject to gentrification with a high differentiation of middle to low-income households (Randolph & Freestone, 2012).

More importantly, this paper contributes to previous knowledge by showing that urban diversity can be found in comprehensive new developments. Insofar, the key to where urban diversity is found relies on preserving the existing urban fabric and cumulatively introducing new urban developments and population, which is why new comprehensive developments are considered unfavorably. However, in area C where new large-scale estates were built in a relatively compressed time especially while the housing market flourished — wide housing choice provided through building type diversity and housing price was found. In other words, the pivotal transitioning into the housing market period had contributed to this area’s high housing diversity which differs from the previous case of accumulated diversity. Hence, in the unique context of China, the role of the market should not be underestimated at least in respect to engendering diversity.

The high social diversity in both areas of accumulated and planned diversity was related to the balance between migrants and original Shanghai hukou holders. It is plausible that high housing...
diversity coupled with satisfactory urban infrastructure and amenities ensured that the two areas welcomed a stable mix of newcomers, migrants and households of various income levels. In particular, area C displayed areas of successful urban streets and communities ensured that the two areas welcomed a stable mix of new-cheap hotels for extended periods or in small migrants, mostly working as real estate agents, were either living in middle class. It was found through the survey that many young conditions in an area of standardized housing catered towards the it is the unskilled young migrants who endure unfavorable housing spectrum of migrants contributes to the area’s high social diversity, a suitable place for disparate populations such as younger unskilled through areas B and D.

The high social diversity potential of area D should be recognized despite the incongruity with the housing environment. The convenience of the metro line 9 station and the job opportunities generated by a newly urbanizing area seemed to have made area D a suitable place for disparate populations such as younger unskilled migrants as well as foreign or well-paid migrants. While the wide spectrum of migrants contributes to the area’s high social diversity, it is the unskilled young migrants who endure unfavorable housing conditions in an area of standardized housing catered towards the middle class. It was found through the survey that many young migrants, mostly working as real estate agents, were either living in cheap hotels for extended periods or in small flats with other co-workers. Although the high social diversity of area D is more of a transient and dynamic nature, there need to be housing opportunities for those who plan on longer term residency, and therefore in this respect, housing type and unit size can be more differentiated as in area C.

Lastly, the relatively high housing diversity of area B should be utilized to positively induce place vitality. Area B showed uncoordinated diversity where relocated residents were location-wise disadvantaged and had less access to urban services compared to commodity housing residents. This contrasts against the success of Songjiang-Iu in area C where different family types and income levels were serviced via the same route and facilities. In this respect, above all, there needs to be proper provision of urban services and amenities for the relocated housing estates. Moreover, while the already disadvantaged locations of relocation housing estates cannot be changed, the sense of marginalization can be reduced through urban design and planning measures by introducing shared spaces and better connections to the main northern blocks. This may also encourage exposure and interaction amongst relocation and commodity housing residents which would better utilize the conditions of housing diversity.

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References


