Exploring Self-Containment of Discretionary Activities in an Aging New Town of Japan Based on a Destination Choice Model with Social Network Effects

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Abstract: Across Japan, the rapidly aging population is becoming more visible, especially in “aging new towns”. Since mobility levels usually decline with age, having a self-contained neighborhood could be more important than before. This paper therefore explores the self-containment status of a new town for discretionary activities (shopping, volunteering, recreation, and so on), by using multiperiod (two waves) and multiday (two weeks) panel survey data collected in Koyo New Town located in Hiroshima, Japan. For this purpose, we develop a panel mixed logit model of destination choice with a focus on the impacts of social networks. We also examine whether or not the self-containment contributes to the improvement of residents’ subjective well-being. The result reveals that social networks have a positive impact, not only on self-containment of discretionary activities, but also on residents’ subjective well-being.

Keywords: Self-Containment, Aging New Town, Destination Choice, Social Network

1. INTRODUCTION

Japan experienced rapid population growth from the 1950s to the 1980s, leading to the development of new neighborhoods, so-called “new towns”, in suburban areas. A rapidly aging population has recently been observed in Japan, especially in “aging new towns”, since many of the residents living in the new towns belong to a specific age group (over 65 years old). Mobility levels usually decrease with age because of reduced physical capabilities and also because of a reduction in the level of services available on local public transport. It can also be expected that the activity space of the elderly tends to be smaller after retirement, since they may not need to make long-distance trips to working places (mainly located in the CBD). Instead, going to the park, walking around, visiting friends, and so forth may become dominant trip purposes, most of which are done within the neighborhood. As a result, having a self-contained neighborhood could be more important than before.

The concept of self-containment (“balance”) was embodied in the planning objectives of many new towns, especially in Europe but also in some cases in the United States. This concept was first promoted by Ebenezer Howard through the Garden City Movement, which advocated the construction of self-supporting communities (Howard, 1898, cited from Cervero, 1995a).

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in order to relieve overcrowding in London in the post-World War II period. Conventionally, self-containment has usually been interpreted as a balance between jobs and housing (job–housing balance) in a community. Thus, a number of studies have discussed self-containment in relation to commuting (Cervero, 1995a; Curtis & Olaru, 2010; Hui & Lam, 2005; Yigitcanlar et al., 2008). Taking a broader perspective, self-containment was considered as a form that allows people to live, work, shop and create within a community (Burby & Weiss, 1976, cited from Cervero, 1995a; Cervero, 1995b; Hui & Lam, 2005; Lee & Ahn, 2005; Pakzad et al., 2007; Yigitcanlar et al., 2008). Nonworking trips are said to account for the majority of total commuting trips in metropolitan areas; for example, in approximately three-quarters of all trips in American metropolitan areas and Europe (Richardson and Gordon, 1989, cited from Cervero, 1995b; Salomon et al., 1993). Thus, some studies have recently focused on the issue of self-containment from the perspective of nonworking trips. Lee and Ahn (2005) state that five new towns and nearby residential areas in the Seoul metropolitan area have a fairly favorable degree of self-containment in terms of nonworking trips. Merlin (2014) also examines measures of urban forms across a range of community scales relating to self-containment with respect to nonworking trips and tours. Since working trips constitute a minor portion of all travels in aging new towns in Japan, where a number of residents are retired, this paper focuses on discretionary trips, namely shopping, volunteering, recreation, and so on to examine the self-containment status of new towns, which can be understood as a collective nature of each individual’s destination choice.

People’s social networks are formed through family relations and friendships, as well as through various activities and places, indicating how important social contact is among people (Páez & Scott, 2007; Páez et al., 2006). The impacts of social relations on travel decisions have been widely studied in the field of transportation (Harvey & Taylor, 2000). According to Dugundji and Walker (2005), decision makers are influenced by both social (e.g. interactions with other people) and spatial (e.g. locations where they live) networks. Social networks often create a demand for traveling (Carrasco & Miller, 2009; Farber & Páez, 2009), and hence travel behavior and mobility are coupled with social bonds and locations (Ryley & Zanni, 2013). In particular, social networks may be important factors in destination choices for discretionary activities, since these activities are often done with family members, relatives and/or friends. Thus, individuals may not be able to decide on the destination based solely on their own preferences.

This purview, this paper explores the self-containment status of a new town as regards discretionary activities, with a focus on the impacts of social networks. For this purpose, a panel mixed logit model of destination choice is developed and the impacts of social networks and other relevant factors on destination choice are empirically examined using multi-period and multi-day panel survey data, collected in Koyo New Town located in Hiroshima, Japan. We then focus on the impacts of their destination choice and social networks on subjective well-being, to understand whether or not having a more self-contained neighborhood contributes to having a better quality of life. Answering these questions would be crucial for anticipating the possible impacts of urban planning policies, such as the “compact city” policy. For example, when residents are encouraged to move from their current neighborhood to another, their social networks and activity locations could be mismatched, potentially causing negative impacts on their quality of life, especially for those who have higher mobility constraints.

The paper is organized as follows. It begins with the description of a multi-period and multi-day panel survey conducted in Koyo New Town. We also give some definitions of choice set for the destination choice model and social network groups, followed by aggregate analysis based on the panel data. Section 3 introduces a panel mixed logit model to represent destination choice behavior with a focus on the impacts of social networks. Section 4 presents and discusses
the model estimation results. In Section 5, the relationships among destination choice, social network and well-being are discussed. Finally, Section 6 summarizes the findings of this study and discusses future tasks.

2. SURVEY AND DATA

2.1. The Survey Area and Data Used in This Study

The survey area is Koyo New Town, located in a hilly suburban area of Hiroshima City. Koyo New Town (current population of 17,000) was built about 11 kilometers northeast of the CBD of Hiroshima City. The new town is a typical aging new town in Japan, with a rapid rate of aging (people over 65 years of age accounted for approximately 26.7% of the new town’s population in 2013). While there are various railway and bus services to the CBD of Hiroshima City, public transport within the new town is relatively poor. Koyo New Town has better self-containment than other new towns in Japan: it has a community hall, shopping center, post office, banks, hospital and sports club located in the center of the neighborhood.

A multiperiod (two waves) and multiday (two weeks) panel survey was carried out in 2010 and 2011. A two-week diary survey was employed to capture the infrequent irregular trips, because after retiring, travelers tend not to make regular daily trips. In addition, in the second wave, with the support of the local government, a social experiment was implemented and personal mobility vehicles (i.e. PMVs) were provided to some respondents, in order to investigate any changes in the activity levels and travel decisions of the elderly.

The survey was designed based on a sampling strategy that selected households that had at least one elderly member (60 years old and over). Nearly 50 households participated in the survey for each wave (38 households remained in both waves). The respondents not only filled out a paper-based trip diary, but also recorded each trip trajectory using a GPS device for two consecutive weeks. The paper-based questionnaire included questions relating to household structure (number of household members, members’ individual attributes, their relationship with the household head, etc.), social networks (number of friends inside and outside the new town, number of relatives), vehicle ownership (number and type of vehicles owned), and travel behavior (trip purpose, departure/arrival time, destination, and travel mode). In 2011 in particular, respondents were asked to report on their level of happiness, measured on the Likert scale (0 to 10).

Among 38 panel respondents, the number of valid samples available for both waves is 31 for GPS data and 26 for paper-based data. While paper-based data provide trip purpose and travel mode information that cannot be collected through GPS devices, GPS data provide the precise activity location information. Thus, in this study, to utilize the advantages of having these two data sources, GPS data and paper-based data were merged. For GPS data processing, first, trip ends are detected within GPS data streams by searching for time periods of nonmovement. The GPS data (decomposed to trips) and paper-based data are then merged based on departure and arrival time information. Many literature reviews have identified thresholds in detecting trips and merging GPS data with paper-based data. These thresholds vary primarily depending on the characteristics of local activities. Wolf et al. (2001) state that a two-minute threshold yielded the best prediction of true trip ends. A gap is considered to exist whenever the time interval or the distance between consecutive points is greater than two minutes or 250 meters, respectively (Chen et al., 2010), while a trackpoint is removed when the distance between two consecutive trackpoints is less than 10 meters (Bohite & Maat, 2009). Schüssler and Axhausen (2008) also use a two-minute threshold to assume a stopped activity.
Based on the findings of existing studies, in the current paper, we consider a movement to be a trip when the movement leads to more than 100 meters being covered within two minutes, and we use a time-interval condition with a 30-minute threshold to merge two kinds of data.

Here, we would like to define the terms used in this study. First, to analyze destination choice behavior, two destinations are set in this study: destination is classified into “inside new town” when the destination is located within the Koyo New Town’s buffer which extends 200 meters from the Koyo New Town’s administrative boundary (Figure 1). In the same way, when the destination is outside of the boundary, the destination is labeled as “outside new town”. Another important classification in this study is that, to represent respondents’ social network status in a simple manner, respondents are divided into two groups: those who have more friends inside the new town compared with the outside are grouped into the “inside-network” group, and those who have more outside friends are classed as being in the “outside-network” group.

2.2. Aggregate Analysis

Based on the available samples from both waves, destinations of mandatory trips (working, going to school, seeking medical treatment and picking-up/dropping-off) and discretionary trips (shopping, volunteering, meeting with friends/acquaintance, attending club activities, eating out, walking around, pursuing leisure activities, and so on) are shown in Table 1. First, it is confirmed that discretionary activities are the dominant activities in the current samples. This is because most respondents are already retired, and thus, in this study, the discretionary activities have been examined. Second, discretionary activities tend to be done inside new town compared to mandatory activities, implying that their activity locations tend to be inside the new town after retirement. Since self-containment status has been measured based on residents’ actual behavior (i.e., finding how many residents do activities inside/outside the neighborhood)
in most existing studies, these results indicate that the progress in aging could result in the pursuit by residents of more self-contained neighborhood activities. Meanwhile, self-containment is examined as an aggregation of destination choice analysis.

In the case of discretionary activities, the status of the social network may influence destination choice. Table 2 shows destinations of discretionary activities by the status of the social network. The results indicate that the respondents who belong to the inside-network group did 71.1% of activities inside the new town, while those in the outside-network group tend to do activities outside the new town. These results indicate that their activity spaces would be formed based on their social network distributions.

<table>
<thead>
<tr>
<th>Destination</th>
<th>Inside new town</th>
<th>Outside new town</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mandatory activities</td>
<td>93</td>
<td>87</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>51.7%</td>
<td>48.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Discretionary activities</td>
<td>477</td>
<td>228</td>
<td>705</td>
</tr>
<tr>
<td></td>
<td>67.7%</td>
<td>32.3%</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Destination</th>
<th>Inside new town</th>
<th>Outside new town</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside-network group</td>
<td>315</td>
<td>128</td>
</tr>
<tr>
<td></td>
<td>71.1%</td>
<td>28.9%</td>
</tr>
<tr>
<td>Outside-network group</td>
<td>162</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>61.8%</td>
<td>38.2%</td>
</tr>
</tbody>
</table>

3. MODELING DESTINATION CHOICE WITH SOCIAL NETWORK EFFECTS
To examine the impacts of social networks on destination choice under the control of other influential factors, a destination choice model is developed based on a panel binary mixed logit model (also called random-parameters or error-components logit) to account for unobserved heterogeneity among respondents and the correlations in unobserved utility over repeated choices by each individual. In fact, a variety of studies have developed mixed logit model for modeling location choice. Bhat and Gossen (2004) use a mixed logit model to analyze in-home, out-of-home, and pure recreational activities, while the trips-making propensity of residents to visit urban parks has been estimated using a mixed logit model (Kemperman et al., 2005). The model was also applied to location-related choice (Bhat & Guo, 2004), and migration to urban and rural areas (Détang-Dessendre et al., 2008).

In this study, a destination choice model is developed based on a simple panel mixed logit model specification with respect to discretionary activities, and the dependent variable is destination choice (1: inside new town; 0: outside new town), since the sample size may not be large enough to develop the full random-coefficients model. Concretely, we only deal with the constant term as a random term, which varies over respondents but is constant over choice situations for each respondent. In the empirical analysis, 705 trips obtained from 37 individuals are used. Because this is a typical repeated measurement data analysis, the model estimation results can be biased when we do not control the possible correlation among samples obtained.
from the same individual. One conventional way to handle this issue is to employ a multilevel modeling approach, where the correlation among samples is controlled by adding the corresponding individual-level random term. This approach is exactly the same as the random effects model in panel analysis. Snijders and Bosker (1993) note that the multilevel model could be useful when the number of groups (in the current context, this is the number of individuals) is greater than 10, while Maas and Hox (2005) propose that the number of groups should be greater than 30. Since the number of individuals in the current empirical analysis is 37, the multilevel model may be able to properly handle the issue for repeated measurement data.

In this case, the utility $U_{njt}$ that an individual $n$ ($n = 1, 2, \ldots, N$) associates with a destination $j$ ($j = 1, 2$) in trip $t$ may be written as

$$U_{njt} = \alpha_j + \beta_1 x_{nj} + \beta_2 x_{njt} + \eta_{nj} + \varepsilon_{njt}$$

(1)

where $\alpha_j$ is a constant term for destination $j$, $\beta_1$ is a vector of parameters associated with a vector of explanatory variables $x_{nj}$ that are invariant across trips made by the same respondent (such as personal attributes), $\beta_2$ is a vector of parameters associated with a vector of explanatory variables $x_{njt}$ (i.e., trip attributes), $\eta_{nj}$ is a random term that is normally distributed with mean 0 and variance $\sigma^2_{\eta}$ capturing unobserved heterogeneity among respondents, and $\varepsilon_{njt}$ is an error term that is Gumbel distributed. The random term $\eta_{nj}$ is particularly important in adequately identifying the impacts of personal attributes with the data repeatedly observed from the same respondents, as is analogous to random-effects/multilevel models.

Conditional on $\eta_{nj}$, the probability that individual $n$ chooses destination $i$ on day $t$ follows the standard logit formulation:

$$L_{i,j}(\beta_1, \beta_2 \mid \eta_{nj}) = \prod_{t=1}^{T} \left[ \frac{e^{\beta_1 x_{nit} + \beta_2 x_{njt}}}{\sum_j e^{\beta_1 x_{nit} + \beta_2 x_{njt}}} \right]$$

(2)

The unconditional probability is the integral of the conditional probability over all possible values of $\eta_{nj}$:

$$P_{i,j} = \int L_{i,j}(\beta_1, \beta_2 \mid \eta_{nj}) f(\eta_{nj}) d\eta_{nj}$$

(3)

The model estimation is done by using R software with a package named “lme4” (Bates, 2010). It is hypothesized that a greater number of friends within the new town leads to increasing the number of discretionary activities in the new town, and vice versa. It should be noted that, in this paper, facility variables are not used for the modeling. This is because accessibility to facilities does not really vary across residents, since almost all facilities are located in the neighborhood center, including the community hall, shopping center, bank, post office, hospital, sports club, and so on. To explore the impacts of facilities, two or more new towns should be examined simultaneously.

4. ESTIMATION RESULTS

The estimation results are shown in Table 3. The impacts of the status of social networks are captured by the number of friend variables. It is confirmed that the more friends a resident has
inside [outside] increases the number of activities inside [outside], indicating that the status of social networks statistically influences the self-containment status of the new town. It is also found that the nonmotorized variable is indeed significant at the 1% level with a positive sign, indicating that owning a nonmotorized vehicle would result in an increase of inside activities. This finding is consistent with that of Fujiwara (2012) that the introduction of personal mobility vehicles is positively associated with an increase in activities inside a new town. The motorized vehicle ownership variable is not statistically significant, but it has a negative sign as expected: those who have a car tend to do activities outside the new town. The age variables are significant at the 1% level. The negative sign of the age-squared variable indicates that age impacts follow a quadratic function (upwardly convex) with a maximum at around 70 years of age. Job and gender variables are not significant, but the signs are as expected: those males who work tend to do activities outside the new town. In addition, as can be seen in the result of a Chi-squared test, the differences between results with and those without the random term $\sigma^2_\eta$ are statistically significant at the 0.1% level, illustrating that there is heterogeneity among respondents.

### 5. THE RELATIONS AMONG DESTINATION CHOICE, SOCIAL NETWORK, AND SUBJECTIVE WELL-BEING

In the previous sections, it has been confirmed that the social network has a significant impact on destination choice decisions. We found that, when residents have more friends inside a given area, they tend to conduct activities inside, and vice versa. According to Gagliardi et al. (2007) and Spinney et al. (2009), the ability to travel and participate in mobility and social interactions is positively associated with a person’s cognitive subjective well-being. However, what will happen when people have more friends outside the neighborhood, but actually cannot engage in activities outside it because of mobility constraints? Answering this question would be crucial for implementing compact city policies, where residential relocation from suburban areas to the central areas would be involved. Thus, after relocation, social network distribution and activity space could be mismatched, implying that social contacts would become more difficult. This could cause negative impacts on people’s quality of life, especially for those with more severe mobility constraints. As mentioned in Subsection 2.1, in 2011, respondents were asked to report on their level of happiness. This section attempts to provide some additional insights into the impacts of the mismatch on quality of life by comparing the subjective well-being among different groups: (1) those who belong to the inside-network group with more activities inside, (2) those who belong to the outside-network group with more activities inside, (3) those who belong to the inside-network group with more activities outside, and (4) those who belong to the outside-network group with more activities outside. Our particular interest is in group (2): if their subjective well-being is significantly lower than the that of the other groups, then the mismatch between social network distribution and activity space would be an important aspect of compact city policy debates.

Table 4 presents the level of subjective well-being across the four groups. It is confirmed that the respondents belonging to the inside-network group (groups (1) and (3)) have higher subjective well-being than those in the outside-network group. Although activity locations seem not to be really influential on subjective well-being, it is found that group (2) shows the smallest subjective well-being, indicating that residential relocation policies should be designed with due consideration for maintaining social relationships.

As can be seen from Table 5, there is statistical significance for friend networks, with representatives of the inside-network category ($M = 8.00$) ranking higher in happiness than members of the outside-network one ($M = 7.29$), $t = -3.629, p < 0.001$. This result proves that
the level of well-being is significantly influenced by social networks existing in close proximity to a person’s residential location. It is also shows significant differences between group (1) and group (2), demonstrating that members of group (1) have higher subjective well-being than do those of group (2). In this context, for the elderly, the existence of friend networks far away from their daily activity location leads to a decrease in subjective well-being. In contrast, no statistically significant difference is found in the destination choices between visits to inside and outside locations, indicating that there are no significant impacts of self-containment on subjective well-being. This finding could be because of the limited sample size, and we may have to reconfirm it with a larger-scale dataset.

Table 3. Binary mixed logit model for destination choice

<table>
<thead>
<tr>
<th>Variable</th>
<th>Logit model</th>
<th></th>
<th>Mixed logit model</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parameter</td>
<td>t-value</td>
<td>Parameter</td>
<td>t-value</td>
</tr>
<tr>
<td>Constant</td>
<td>-56.016</td>
<td>-4.132**</td>
<td>-64.343</td>
<td>-2.931**</td>
</tr>
<tr>
<td>Year (1: 2011, 0: 2010)</td>
<td>-0.115</td>
<td>-0.506</td>
<td>-0.247</td>
<td>-0.878</td>
</tr>
<tr>
<td>Log(number of friends inside + 1)</td>
<td>0.312</td>
<td>2.777**</td>
<td>0.327</td>
<td>1.902*</td>
</tr>
<tr>
<td>Log(number of friends outside + 1)</td>
<td>-0.484</td>
<td>-3.821**</td>
<td>-0.420</td>
<td>-1.992**</td>
</tr>
<tr>
<td>Motorized vehicle ownership (1: own; 0: otherwise)</td>
<td>-0.998</td>
<td>-3.199**</td>
<td>-0.444</td>
<td>-0.976</td>
</tr>
<tr>
<td>Non-Motorized vehicle ownership (1: own; 0: otherwise)</td>
<td>1.374</td>
<td>5.026**</td>
<td>1.395</td>
<td>3.090**</td>
</tr>
<tr>
<td>Age</td>
<td>1.662</td>
<td>4.408**</td>
<td>1.857</td>
<td>3.051**</td>
</tr>
<tr>
<td>Age*Age (divided by 100)</td>
<td>-1.194</td>
<td>-4.614**</td>
<td>-1.309</td>
<td>-3.130**</td>
</tr>
<tr>
<td>Job (1: having job; 0: otherwise)</td>
<td>0.602</td>
<td>1.939</td>
<td>-0.690</td>
<td>-1.273</td>
</tr>
<tr>
<td>Gender (1: male; 0: female)</td>
<td>0.199</td>
<td>0.664</td>
<td>-0.174</td>
<td>-0.329</td>
</tr>
<tr>
<td>Random term $\sigma^2_{\eta}$</td>
<td>-</td>
<td>-</td>
<td>0.694</td>
<td>[26.28]**</td>
</tr>
</tbody>
</table>

Sample size | 705
Initial log-likelihood | -488.7
Final log-likelihood | -383.6

Table 4. Level of subjective well-being across four groups

<table>
<thead>
<tr>
<th>group</th>
<th>Those who did more activities inside</th>
<th>Those who did more activities outside</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside-network group</td>
<td>7.98 [group (1)]</td>
<td>8.08 [group (3)]</td>
</tr>
<tr>
<td>Outside-network group</td>
<td>7.20 [group (2)]</td>
<td>7.37 [group (4)]</td>
</tr>
</tbody>
</table>

Table 5. The results of t tests for two groups of social networks based on level of subjective well-being

<table>
<thead>
<tr>
<th>Group</th>
<th>n</th>
<th>Mean value of reported subjective well-being</th>
<th>t-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Those who did more activities inside</td>
<td>179</td>
<td>7.87</td>
<td>-0.459</td>
</tr>
<tr>
<td>Those who did more activities outside</td>
<td>64</td>
<td>7.78</td>
<td></td>
</tr>
<tr>
<td>Inside-network group</td>
<td>191</td>
<td>8.00</td>
<td>-3.629**</td>
</tr>
<tr>
<td>Outside-network group</td>
<td>52</td>
<td>7.29</td>
<td></td>
</tr>
<tr>
<td>Inside-network group with more activities inside [group (1)]</td>
<td>154</td>
<td>7.98</td>
<td>-3.537**</td>
</tr>
<tr>
<td>Outside-network group with more activities inside [group (2)]</td>
<td>25</td>
<td>7.20</td>
<td></td>
</tr>
</tbody>
</table>
The findings are consistent with the findings of the reviewed literature and the hypothesis given earlier in this paper. Friend networks affect the self-containment of discretionary trips (choosing destinations inside or outside the new town) as well as residents’ happiness. In other words, it is thanks to friends in the new town that the respondents have a higher number of trips within the new town and report a higher level of happiness. Policy makers in urban and transportation planning should, therefore, carefully consider policies that prompt residents to move out from the aging new towns.

6. CONCLUSIONS

Because of population decline and aging in Japan, it has become an urgent task to reorganize residential neighborhoods, particularly new towns, which were built around 40 years ago during a period of rapid population growth. Since aging would increase the demand for activities inside new towns, having a more self-contained neighborhood would be preferable for elderly residents. This paper has examined the self-containment status of discretionary activities in an aging new town. Many research studies have assessed self-contained neighborhoods based on working trips, while recent studies have examined the effects of self-containment on nonworking or discretionary trips. By following the latter stream, in this paper, the self-containment status has been explored by developing a destination choice model. Since social bonds are considered as important factors of life, the effects of social relationships on destination choices have also been examined in this paper. We conducted a series of empirical analyses using multiperiod (two waves) and multiday (two weeks) panel survey data collected in Koyo New Town (Hiroshima, Japan) in 2010 and 2011. The primarily aggregate analysis shows that having a greater number of friends who live within the new town leads to the pursuance of an increasing number of discretionary activities in the new town. The model estimation results of destination choice behavior also support this finding. These results imply that the status of a person’s social network significantly influences destination choice sets, and hence, it is an influential factor of the self-containment status of the new town. We also confirm that owning nonmotorized vehicles would further enhance the self-containment of the neighborhood. Finally, the relationships among destination choice, social network and subjective well-being have been examined to find the possible consequences of residential relocation policies, which often appear on the agenda of compact city policy debates. The results show that, the more friends the respondents have in the neighborhood, the more subjective well-being they would obtain. This finding indicates that residential relocation policies should be designed with due consideration of the mismatch between social network distribution and activity space.

There are a number of remaining issues that need to be addressed in future studies. First, although we believe that the current study has provided some useful insights for future urban and neighborhood planning, more empirical evidence is certainly needed, since the number samples used in the empirical analysis is quite limited. Empirical analysis of a large-scale data set and/or in different neighborhoods would be necessary before giving a general conclusion. Second, mainly because of the limited sample size, this analysis had to be simplified considerably: only two destinations and two social network groups were considered. The model could be generalized more with larger-scale data.
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