

Residential Self-Selection and Its Effects on Urban Commute Travels in Iranian Cities Compared to US, UK, and Germany

Houshmand E. Masoumi

Abstract—Residential self-selection has gained increasing attention in the Western travel behavior research during the past decade. Many studies in the US, UK, and Germany conclude that the role of individuals' residential location choice on commute travel behavior is more important than that of the built environment or at least it has considerable effects. However the effectiveness of location choice in many countries and cultures like Iran is unclear. This study examines the self-selections in two neighborhoods in Tehran. As a part of a research about the influences of land use on travel behavior information about people's location preferences was collected by direct questioning. The findings show that the main reasons for selecting the location of residential units are related to socio-economic factors such as rise of house price and affordability of house prices. Transportation has little impacts on location decisions. Moreover, residential self-selection accounts for only 3 to 7.5 percent of the pedestrian, PT, and car trips.

Keywords—Residential self-selection, Tehran, travel behavior, urban transportation.

I. INTRODUCTION

THE recent publications about the connections of land use and transportation have increasingly targeted the role of residential self-selection in travel behavior. Most of these studies are done in North America and Western Europe. Since the culture and economic conditions are very different in many countries located in Asia, Africa and The Middle East, it seems necessary to have a precise, local understanding of the ways location choice influences transportation.

The number of the Western literature with the subject of residential choice has jumped after the late 1990s and beginning of 2000s. The concept deals with the decisions of people about their living place according to their travel preferences and abilities. The general impression of the new publications is that "People who for any reason cannot drive or prefer using alternative modes tend to choose more compact, urban, multi-modal communities if possible" [1]. The recent researches suggest using the notion of self-selection to strengthen the causality side rather than only defining associations. Such studies present methods leading to better definition of causality relationships so that more in-depth solutions are offered [2].

Dr. Houshmand E. Masoumi is with the Center for Technology and Society, Technical University of Berlin, Hardenbergstr. 16-18, Berlin 10623, Germany (phone: +49-030-31424616; fax: +49-030-26917; e-mail: masoumi@ztg.tu-berlin.de).

The related literature show that people choose living places that suit their transportation needs. Low-income people choose higher-density neighborhoods to fit their transport needs and let them have less car travels and more on-foot or public transport travels. However the per capita average annual vehicle use of city dwellers from any economic class reduces when they live in such high density areas [2]-[4].

The recent studies indicate strong connections between residential self-selection and individual travel attitudes/habits. There are several examples of such findings; there is evidence that families that have more bicycles are more interested in outdoor physical activities. Such households are located in neighborhoods that have more bicycling facilities [5]. The effect of car/bicycle ownership or mode choice is seen in self-selecting the residential neighborhoods. In other words, the residents of San Francisco Bay Area choose their living place according to the transportation vehicle/mode that they own or access [6]. In 2009, using the San Francisco Bay Area Travel Survey (BATS), Bhat and Eluru showed that the urban travel distance, namely Vehicle Miles Traveled (VMT) is under the influence of self-selections as well as the built environment [7]. The residential choice is found to be the most important factor in defining the frequency of walking trips, including strolling trips and pedestrian shopping trips, in Austin, TX [8]. The abovementioned examples show the recent findings about the importance of self-selections in western countries. However these studies can hardly be a representation of the facts in countries with different cultural and societal specifications and problems.

The objective of this paper is to investigate the effects of location choice on commute travels in Iranian cities. It is important to know more about the differences of such influences in the Western cultures with that of the Iranian cities.

II. METHODOLOGY

The study applies direct questioning method to define the main reason for selecting the residential location of two neighborhoods in Western Tehran. In autumn 2012 face-to-face interviews were arranged with the residents as a part of a study about the land use impact on travel behavior. As a side activity, individuals were asked about the reason why their family chose their current neighborhood to live in. The results are qualitatively described. This study tests the following hypothesis:

“Due to cultural and economic differences, there are differences in the effectiveness of residential self-selection of Iranian urban residents on commute travels, compared to that of US, UK, and Germany. The location decisions in Iranian cities are less oriented to transportation and more under the effect of economy”.

A. Case-Study Areas

Two areas were selected in the Region 5 of Tehran. The Region is located in the western part of the city and accommodates 677085 residents in 5287.1 hectares [9]. Two small areas are selected as the case-study neighborhoods, first of which is “Keyhan” and the second one is “Bahar”. Located in a distance of about 500 meters, the two neighborhoods have almost similar socio-economic conditions. The neighborhoods have areas equal to about 35 hectares each. Since the neighborhoods are smaller than the administrative neighborhoods determined by the Municipality of Tehran, the populations of the case-study areas is calculated based on the number of the residential units. There are 600 buildings in Keyhan and 400 in Bahar. Taking 3.37 for the household size of Region 5 [9], the population of Keyhan would be approximately 18000 and that of Bahar would be about 9500 people.

B. Surveying and Sampling

96 adults with the average age of 34.86 (between 18 and 64 years old) were interviewed in Keyhan. The 96 respondents in Bahar had an average age of 35.8 (between 20 and 58 years old). Each individual was representative of a household and answered the question “what has been the main reason for your family to choose this neighborhood to live in?” Each respondent had to choose only one option. Five options were presented to be chosen from; a) because my family could afford buying/renting the house/apartment, b) because commuting to my workplace was easier from this neighborhood, c) because the surrounding is attractive and beautiful, d) because of rise of the house/apartment price in the future, and e) personal reasons like proximity to relatives. In the meantime, the respondents were asked about their transportation mode for their commute trips. They chose from among “personal car”, “motorbike”, “taxi” (including “line taxi”, “passenger taxi”, and “telephone taxi”), “bus/minibus”, “metro”, “bicycle”, and “pedestrian”. The aim is to find out what percentage of urban trips including pedestrian trips, travels by public transit and also car trips are made by the residents as a result of residential self-selection.

Whereas the average household size of Region 5 is 3.37 persons, the population of Keyhan includes 5341 families. In the same way, 2819 families are estimated for Bahar. Each respondent answered the questions on behalf of his/her family. In other words, each questionnaire is related to one household. 96 persons were interviewed in Keyhan and 96 in Bahar. Therefore the sample size is 1.8% for Keyhan and 3.4% for Bahar. According to Cochran (1963) this sampling size is significant based on the number of households living in the two selected neighborhoods [10].

III. FINDINGS

The question about the main reason for selecting the neighborhood to live produced interesting results about the importance of economic trends when Iranian urban dwellers decide about their living places. Table I indicates the responses to the first question about the reason for residential location choice. As seen in this table, options (a) and (c) which are related to economic trends of housing have gained most of the selections. In general 68.7 percent of the responses in Keyhan and 69.8 percent in Bahar are related to economics. The percentages are very similar to each other and seem reliable. Only 17.7 percent of people in Keyhan and 13.5 percent in Bahar have announced that they have selected their current living place to enable them to have easy access to their work.

TABLE I
 THE MAIN REASON FOR RESIDENTIAL LOCATION CHOICE IN KEYHAN AND BAHAR

Why have you chosen this neighborhood to live in?	Keyhan	Bahar	Average
a)because my family could afford buying/renting the house/apartment	53 (55.2%)	50 (52.1%)	53.7%
b)because commuting to my workplace was easier from this neighborhood	17 (17.7%)	13 (13.5%)	15.6%
c)because the surrounding is attractive and beautiful	11 (11.5%)	14 (14.6%)	13%
d)because of rise of the house/apartment price in the future	13 (13.5%)	17 (17.7%)	15.6%
e)personal reasons like proximity to relatives	2 (2.1%)	2 (2.1%)	2.1%
Sum	96 (100%)	96 (100%)	100%

The respondents were also asked about the transportation mode they use for commuting to their workplace. Table II shows the results of the second question about the modes of work trips. About 12 to 14 percent of the respondents walk to their workplace and as expected no one bikes to work. 50.1 and 57 percent of people use public transportation including metro, bus/minibus and all types of taxi to reach workplace in the two neighborhoods.

As one of the purposes of this study, the number of commute trips that is made on-foot, by public transportation, and by car are calculated for those people who declared they have chosen their living place because of proximity to workplace. It is important to have an understanding of the proportion of the trips done by people who have chosen their living place according to transportation needs to trips done by all the people.

TABLE II
 COMMUTE TRANSPORTATION MODE IN THE SELECTED NEIGHBORHOODS

By which transportation mode do you commute?	Keyhan	Bahar	Average
Pedestrian	10 (11.9%)	11 (13.9%)	12.9%
Bicycle	0 (0%)	0 (0%)	0%
Motorbike	4 (4.7%)	5 (6.3%)	5.5%
Metro	15 (17.9%)	18 (22.8%)	20.4%
Bus or Minibus	9 (10.7%)	4 (5.1)	7.9%
Taxi			
Line Taxi	13 (15.5%)	18 (22.8%)	19.1%
Passenger Taxi	4 (4.8%)	5 (6.3%)	5.6%
Telephone Taxi	1 (1.2%)	0 (0%)	0.6%
Personal car	28 (33.3%)	18 (22.8%)	28%

According to Table III, pedestrian trips are under the influence of self-selection as much as about 5%. This is slightly more for public transit. 0 to 6 percent of car commute trips are under the effect of residential location choices.

TABLE III
 PROPORTION OF SELF-SELECTION INFLUENCE ON URBAN TRIPS

By which transportation mode do you commute?	Keyhan	Bahar	Average
Pedestrian trips	4.76%	5%	4.88%
Trips by public transportation	5.95%	8.86%	7.4%
Trips by personal car	5.95%	0	2.98%

IV. DISCUSSION

To connect the findings of this paper to the existing literature, the studies with the subject of the effect of residential self-selection on commute trips are examined. In the context of the United States, one of the oldest studies done using the 1976 data Washington DC shows that mode choice and location choice can affect on each other. The causality directions are directed toward both sides and the choices are interdependent [11]. In a very important finding using two-level nested logit model, it was concluded that about 40% of rail commute decisions are under the influence of residential self-selection [4], [12]. Despite some methodological critics (for instance: [2]), this article remains a crucial evidence of the American cities for the comparison purposes. This percentage has previously been resulted in another study back in 1994; 40 percent of people who moved their house near to rail stations in Santa Clara County, California declared that the presence of the light rail station has been the motive to choose the home locations [13].

In the UK, Hammond asked the residents of Century Warf, Cardiff about the sequence of their decision about residential location choice and commute mode. 90 persons were interviewed, 18 percent of whom selected commute mode before living location. 39 percent decided on location and commute mode simultaneously. For more than half of the interviewees, residential location is conditional on commute mode or interacts with it [14]. The conditions of the UK neighborhoods are slightly different from that of the US. The British neighborhoods are not so separated from the other parts of the metropolitan areas as the US neighborhoods. Therefore the British residents have more transportation mode

options than the US citizens. Thus self-selection is less important in travel behavior research of the UK [15]. However there are similarities between the role of selections in the two countries that puts UK between mainland Europe and the US. According to Aditjandra et al., the structure and facilities of the neighborhoods of Britain gives more mobility options to people, so the role of land use planning and neighborhood facilities becomes more important. Regarding the similarities, it is possible to generalize the American travel behavior studies including self-selection and travel preferences to the UK. Nonetheless there are still differences with the effective factors in the multimodal transportation of Europe [16]. This similarity is mainly caused by high motorization rate in the two countries [17].

Regarding relatively better condition of public transportation systems and smaller size of the cities in Germany, it is expected to find, to some extent, differences in the patterns of location choice. Scheiner has done continuous observations about travel behavior in German cities. Scheiner together with Holz-Rau have studied the metropolitan area of Cologne using Structural Equation Modeling (SEM) and showed that household relocations influence the car ownership rates. This is seen particularly when the family relocates in different neighborhood types. Families moving to suburbs have higher car ownerships [18]. On the other hand, owning a car can influence the location choice. Households that do not own a car decide about the location of their home based on availability of public transportation and local infrastructure. In contrary, families that have a car have broader range in selecting the home location [19].

Apart from the impacts of location choice on car dependency, the recent German studies have found evidences on the preconditions of choosing the residential location. 69 percent of the respondents of a study in Munich have declared that they have selected their home location because it has been near to a rapid transit station [20]. The dominant role of transportation in location choice is again seen in the study of Bauer and colleagues who examined five criteria (price of land, car accessibility, quietness and safety, central infrastructure, and family infrastructure) affecting selections (Fig. 1). The importance factors that were measured by a scale of 1 to 4 (unimportant to very important) indicate that quietness and car accessibility have the most importance for home location selection in the region of Dresden [21].

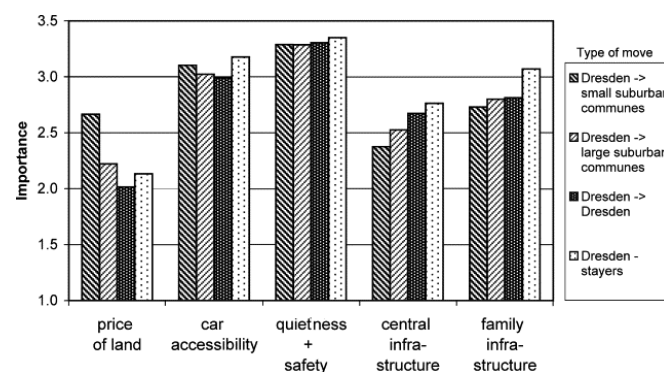


Fig. 1 Importance of locational factors in selection of home location in the region of Dresden [21]

Considering the above, there is an obvious mutual causality relationship between residential self-selection and transportation including commute mode choice and car ownership in the US, UK, and Germany. The findings of this study show that this causation is extremely weaker in the Iranian cities. Table III indicates that self-selections account for only about 5 percent of the pedestrian trips, about 7.5 percent of PT trips, and 3 percent of car trips. These figures are considerably less than that of the western countries, for example 40 percent in the US. The main motives of location choice are related to economy including affordability of the residential units and rise of housing price in the future. The results of this paper indicate that the economic trends are more important than the attractiveness of neighborhood environment and adequacy of neighborhood facilities as well as transportation trends. The point that must be emphasized among these findings is that in contrast to the urban residents of North America and Western Europe, the Iranian urban populations choose their living place in a way their wealth is increased or at least it is not decreased because of rapid rise of home prices. The urban housing mechanisms including its price are very different from the western countries. Therefore the reaction of people is different in turn. People prefer to have long-time daily commute journeys while they have bought/rented a house in a region which has a predictable rise of price or it is located in prestigious part of the city. Such circumstances are more severe in the metropolitan areas because of the inverse relationship between the metropolitan land per capita and housing price [22].

The above result about privilege of socio-economic factors in determination of travel behavior specification is in line with the previous findings by different researchers about travel behavior. Already it has been shown that the socio-economic and demographic trends, rather than the built environment, define the travel attributes like transportation mode choice and travel generation. This significance has been shown in the inter-city context in the Tehran-Karaj region [23] and also in the scale of Transportation Traffic Zones (TAZs) [24]. The latter shows that the effects of socio-economic factors on generation of the inter-zonal travel are more than that of land use. Also Masoumi showed that preferences in relation with social and economic conditions outweigh the specifications of urban form in micro scale [25].

Although the socio-economic and demographic conditions can be somehow considered as self-selection, but its nature is different with the residential self-selection. Here the definitions of the recent literature about the observed and unobserved self-selections are helpful. In this concept, the socio-economic trends are considered as observed self-selections. People prefer a sort of travel or living in a neighborhood type according to their affluence, social class, education, age, etc. Such phenomena are observed but they are indirectly affecting people's travel preferences and habits. On the other hand, unobserved self-selections are those that are the result of individuals' direct choice according to their attitudes and personality.

V. CONCLUSION

This paper shows how residential self-selection in Iranian

cities has less effectiveness on commute travels in comparison with the cities in the US, UK, and Germany. Such effects are separately considered about pedestrian travels, PT travels, and trips by personal cars. The idea that is behind this weak causality is that people do not choose their living place according to their travel preferences, so two main factors remains for the travel behavior researchers; the socio-economic/demographic specifications and the urban form/land use characteristics. Although a great part of the causation comes from socio-economic traits, but the urban form characteristics can also have some limited effects. Such influences can be more considerable in the micro scale. Promotion of "local accessibility" can be an outcome of centeredness of neighborhood facilities and walkable local spaces.

This paper suggests researchers working on the context of Iranian cities to focus their efforts on observed self-selections (socio-economic factors) and built environment characteristics as the center of travel behavior research. This is in contrary to the current approach of the recent North American and Western European studies that argue about the dominant or very important role of unobserved residential self-selection.

ACKNOWLEDGMENT

This study has been done in the Center for Technology and Society, Technical University of Berlin within the framework of "Young Cities" project funded by German Academic Exchange Service (DAAD) and German Federal Ministry of Education and Research (BMBF).

REFERENCES

- [1] T. A. Litman, *Land Use Impacts on Transport: How Land Use Factors Affect Travel Behavior*, Victoria Transport Policy Institute, 2007, Available at: <http://www.vtpi.org/landtravel.pdf>, Accessed: 10.05.2013.
- [2] X. Cao, P. L. Mokhtarian, and S. L. Handy, *Examining the Impacts of Residential Self-Selection on Travel Behavior: Methodologies and Empirical Findings*, Research Report No. UCD-ITS-RR-08-25 (Davis, CA: University of California – Davis), 2008.
- [3] J. Holtzclaw, *Using Residential Patterns and Transit to Decrease Auto Dependence and Costs*, National Resources Defense Council, 1994.
- [4] R. Cervero, "Transit-Oriented Development's Ridership Bonus: A Product of Self-Selection and Public Policies", *Environment and Planning A*, 2007, **39**: pp. 2068-2085.
- [5] A. R. Pinjari, C. R. Bhat, and D. A. Hensher, "Residential Self-Selection Effects in an Activity Time-Use Behavior Models", *Transportation Research Part B*, 2009, **43**(7): pp. 729-748.
- [6] A. R. Pinjari, R. M. Pendyala, C. R. Bhat, and P. A. Waddell, "Modeling the Choice Continuum: An Integrated Model of Residential Location, Auto Ownership, Bicycle Ownership, and Commute Tour Mode Choice Decisions", *Transportation*, 2011, **38**(6): pp. 933-958.
- [7] C. R. Bhat, and N. Eluru, "A Copula-Based Approach to Accommodate Residential Self-Selection Effects in Travel Behavior Modeling", *Transportation Research Part B*, 2009, **43**(7): pp. 749-765.
- [8] X. Cao, S. L. Handy, and P. L. Mokhtarian, "The Influence of the Built Environment and Residential Self-Selection on Pedestrian Behavior: Evidence from Austin, TX", *Transportation*, 2006, **33**(1): pp. 1-20.
- [9] Tehran Master Plan, Urban Development Planning Foundation of Tehran, Municipality of Tehran, 2006.
- [10] W. G. Cochran, *Sampling Techniques*, 2nd Edition, New York: John Wiley & Sons, 1963.
- [11] J. Horowitz, "Modeling Choices of Residential Location and Mode of Travel to Work", Chapter 9 in *The Geography of Urban Transportation*, Hanson, Susan, ed. New York: The Guilford Press, 1986: pp. 207-226.

- [12] R. Cervero, M. Duncan, *Residential Self Selection and Rail Commuting: A Nested Logit Analysis*, Working paper, University of California Transportation Center, Berkley, California, Available at: <http://www.uctc.net/papers/604.pdf>, Accessed: 10.05.2013.
- [13] Gerston & Associates, *Transit-Based Housing*, San Jose, Santa Clara County Transportation Agency and the Santa Clara Valley Manufacturing Association, 1995.
- [14] D. Hammond, *Residential Location and Commute Mode Choice*. Doctoral dissertation, University of Wales, Cardiff, 2005.
- [15] T. Schwanen, P.L. Mokhtarian, "What if you live in the wrong neighbourhood? The impact of residential neighbourhood type dissonance on distance travelled", *Transportation Research Part D*, 2005, **10**: pp. 127-151..
- [16] P. T. Aditjandra, C. A. Mulley, and J. D. Nelson, "Neighborhood Design Impact on Travel Behavior: A Comparison of US and UK Experience", *Projections*, 2009, **9**: pp. 28-52.
- [17] J. A. Cram, *Sustainable Suburbs: Neighbourhood Characteristics and Travel Behaviour*, School of Architecture, Planning and Landscape, University of Newcastle upon Tyne, Unpublished PhD Thesis, 2006.
- [18] J. Scheiner and C. Holz-Rau, "Changes in Travel Mode Use After Residential Relocaion: a Contribution to Mobility Biographies", *Transportation*, 2013, **40**(2): pp. 431-458.
- [19] J. Scheiner and B. Kasper, "Lifestyles, choice of housing location and daily mobility: The lifestyle approach in the context of spatial mobility and planning", *International Social Science Journal*, 2003, **55**(2): pp. 319-332.
- [20] IMU-Institut für Medienforschung und Urbanistik, *Raus aus der Stadt? Untersuchung der Motive von Fortzügen aus München in das Umland 1998–2000*, IMU-Institut, München, 2002.
- [21] U. Bauer, C. Holz-Rau, and J. Scheiner, *Entscheidungsprozesse regionaler Wohnstandortmobilität*. Report AP 131 of Project titled Intermobil Region Dresden, Büro für Integrierte Planung, Berlin, Herdecke, 2003.
- [22] S. Samadi and S. Moeeni, The Analysis of Metropolitan Housing Price and UGB in Iran: Application of Panel Data Technique in Selected Metropolises (Tehran, Isfahan, Shiraz), *Urban-Regional Studies and Research Journal*, 2012, **14**: pp. 21-24.
- [23] M. Mirmoghtadaee, "The Relationship between Land Use, Socio-Economic Characteristics of Inhabitants, and Travel Demand in New Towns- A Case Study of Hashtgerd New Town (Iran)", *International Journal of Urban Sustainable Development*, 2012, **4**(1): pp. 39-62.
- [24] A. Soltani and Y. Esmaeili-Ivaki, "The Influence of Urban Physical Form on Trip Generation, Evidence from Metropolitan Shiraz, Iran", *Indian Journal of Science and Technology*, 2011, **4**(9): pp. 1168-1174.
- [25] H. E. Masoumi, "Modeling the Travel Behavior Impacts of Micro-Scale Land Use and Socio-Economic Factors", Accepted subject to revisions, *Tema. Journal of Land Use, Mobility and Environment*, 2013.