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Why live far? — Insights from modeling residential location choice in Bangladesh

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ABSTRACT

Increasing commute distances often lead to increased auto-dependency and is a major problem in many developed as well as developing countries. While in developed countries, the propensity to commute long distances generally originates from the preference to work in the core of the city and live in the suburb or periphery, in developing countries, the trend is often quite the opposite. For example, in Bangladesh, people generally have a strong preference to live at the heart of the major cities even if they work at the peripheral areas of the city, in another city or in a rural area. Further, it is also not uncommon to maintain split-families where the earning member of the family lives near the workplace while the rest of the family is based in a big city (subject to affordability). These phenomena lead to substantial increase in Vehicle Miles Traveled (VMT) and add burden to the transport infrastructure.

The focus of the research is to explore the key factors that induce middle and upper-middle class commuters in Bangladesh to live away from their workplace and/or maintain split-families. A case study is conducted using Stated Preference (SP) surveys conducted among the faculty members of two universities: one located at the periphery of the capital city and the other quite far away. Discrete Choice Models are developed using the collected data. Results reveal that albeit some differences, for both cases, the choices are strongly driven by quality of the education institutes and the house rent. Factors like gender, income and car-ownership, which traditionally play a strong role in the context of developed countries, are found to be of less significance.

The models, though estimated with limited data, provide useful insights about the factors that drive residential location choices in the context of a developing country and can help in formulating policies for encouraging people to live closer to their workplaces and thereby reduce commuter VMT.

1. Background

Commuter vehicle miles traveled (VMT) constitute a major share of the total VMT, both in developed and developing countries. For instance, in 2009, the contribution of commute trips to total VMT in the USA was 27.8% with more than one out of twelve workers spending an hour or more traveling one-way to work each day (Federal Highway Administration, 2011). In the absence of a well-developed public transport network, the commute trips can have a significant contribution in increasing congestion and can lead to increased environmental pollution. Moreover, increase in commuting distances very often leads to increased auto-dependency (Cao et al., 2009; Litman and Laube, 2002; Næss, 2009; Newman and Kenworthy, 1989; Vasconcellos, 1997). Several studies have been conducted in recent years that focus on the choice of residential location and its impact on VMT which reveal that individuals who live farther away from the city center tend to drive more than those living closer (Cao et al., 2009; Næss, 2009; Sun et al., 1998).

In developed countries, the propensity to commute long distances generally originates from the preference to work in the city and live in a suburb (Bill et al., 2006; Cervero, 1998; Forster, 1999; Giuliano and Small, 1993; Rivera and Tiglao, 2005; Watts, 2009). However, in developing countries, the resources are scarce and the major cities offer much better economic opportunities as well as educational, healthcare, recreational and overall quality of life. This very often leads to huge influx of people migrating to large cities in developing countries. For example, Asia's urban population has increased by 38 million per year on an average in 2005–2010, and is still projected to grow by an annual 35 million a year or more till 2050 (United Nations, 2011). Similarly, Africa has gained 13 million additional urban dwellers per year on an average in 2005–2010, and is expected to gain 25 million a year or more till 2050 (United Nations, 2011). Further, in developing countries, it is also not uncommon to maintain split-families where one earning member of the family (generally a male member) lives near the workplace while the other family members (generally the female members and the children), subject to affordability, live in the capital or other major cities

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which have better education, healthcare and other facilities. These families are generally reunited only during weekends. This phenomenon also leads to substantial increase in VMT and adds burden to the transport infrastructure.

There are many studies that explore the factors affecting choice of residential location. Previous studies conducted in the context of the developed countries reveal that cost (de Palma et al., 2005; Pagliara et al., 2003; Sermons and Koppelman, 1998), dwelling quality (Molin and Timmermans, 2003; Ozturk and Irwin, 2003; Zondag and Pieters, 2005), neighborhood attributes (Gayda, 1998; Guo and Bhat, 2007; Molin and Timmermans, 2003; Ozturk and Irwin, 2003; Weisbrod et al., 1980; Zondag and Pieters, 2005), safety, demographic factors (Cassel et al., 2013; Gayda, 1998; Molin and Timmermans, 2003; Ozturk and Irwin, 2003; Prashker et al., 2008; Sermons and Koppelman, 2001; Weisbrod et al., 1980; Zondag and Pieters, 2005), immigration background (Axisa et al., 2012) etc. have significant impacts on the choice of residential location. Some studies revealed auto-ownership (Cervero, 1998), transport connectivity and traffic conditions (Molin and Timmermans, 2003; Ozturk and Irwin, 2003; Pagliara et al., 2003; Zondag and Pieters, 2005) and travel time (Guo and Bhat, 2007; Rivera and Tiglao, 2005; Sermons and Koppelman, 1998) play a significant role in residential location choices. Research also revealed significant interdependence of home location, workplace location and transport mode choice of the household members (Abraham and Hunt, 1997; Guo and Bhat, 2007; Waddell, 1993; Waddell et al., 2007). A critical element of residential mobility decisions: relationships between home type choice and residential location choice (which are normally evaluated in isolation) have also been investigated and it has been suggested that location choice decisions can best be nested within the choice of home type (Habib and Kockelman, 2008). However, all of these advanced models have been developed in the context of developed countries and may not be directly applicable to developing countries.

In the context of developing countries, there have been few research works that focused on residential location choice most of which are qualitative (Limbumba, 2010), semi-empirical (Kumarage, 2007; Shirgaokar, 2014) or basic discrete choice modeling studies (Molugaram and Rao, 2005; Tiglao and Tsutsumi, 2005; Manoj et al., 2015). Findings of all these studies indicate significant deviations from developed countries. For example, it has been revealed that the residential location choices are often strictly dictated by affordability (Kumarage, 2007; Sharma and Chandrasekhar, 2014) and the travel time frontiers (i.e. the maximum time people are willing to spend on their commute) is quite high (Banerjee et al., 2007). Moreover, due to the limited housing availability and dominance of informal housing arrangements, social factors such as networks and informal channels prevail in the decision making process (Limbumba, 2010). Also, in terms of potentially significant variables, factors like water availability, power availability, fire/police station availability have been considered in the choice models (Molugaram and Rao, 2005). In the context of Bangladesh, residential location choice has been explored in a less comprehensive manner (Habib, 2004; Nahrin, 2009) and the previous researches did not involve any rigorous mathematical modeling.

This motivates the current research, where we explore the factors affecting residential location choice in further detail through a discrete choice framework using data from Stated Preference (SP) survey. The survey design allows us to quantify effects of individual attributes and test how people will respond to potential policy interventions. The models, though estimated with limited data, provide useful insights about the factors that drive residential location choices in the context of a developing country. The findings of the research are likely to be useful for planners and policy makers in other developing countries (as well as Bangladesh) that are experiencing similar residential location and commuting patterns.

The rest of the paper is organized as follows: we first present the scope of the study and then present the details of the survey. This is followed by exploratory analysis of the data. The model structure and the estimation results are presented next. We conclude with the policy implications and directions for future research.

2. Scope and objective

Dhaka, the capital of Bangladesh, is the economic, political, cultural and higher educational hub of the country and is the preferred residential location of the majority of the population. Over the years, the influx of people moving to Dhaka from other areas has turned it to one the most densely populated cities in the world with one of the highest population growth rates: the average density being 23,000 per sq. km and the population growth rate being 5.1% (Bangladesh Bureau of Statistics, 2011). The city has a polycentric mixed land-use pattern (Fig. 1). It may be noted that despite the fact that the living costs in Dhaka are more than double compared to the other major cities in Bangladesh and more than triple compared to the smaller cities of the country (Bangladesh Bureau of Statistics, 2009), the city has a large residential population. The major reason for this is the concentration of resources in this city which strongly encourages people to live here, even if this involves commuting to surrounding areas and often to other cities and rural areas for work. The longer commutes are often more common in dual-career households which are in sharp rise in the country in the recent years (Bangladesh Bureau of Statistics, 2010).

In terms of trip generation and attraction, the city is estimated to generate 610, 000 trips/day and attract 570,000 trips/day from other areas in the morning peak period alone (DHUTS, 2010) resulting a very different pattern compared to the developed countries. The focus of this research is investigating the reason for this large influx of outgoing trips from Dhaka and more specifically, why people in the city are opting to live in the expensive inner city and traveling outwards for work rather than living closer to their workplace.

The detailed data used in this study is collected from faculty members of two universities in Bangladesh, Shahjalal University of Science and Technology (SUST) and Dhaka University of Engineering and Technology (DUET). SUST is located around 6 km (around 40 min) from the city center of Sylhet, the 5th largest city in Bangladesh and about 300 km (around 6 h) from the capital city Dhaka. DUET is located in Gazipur, a small town around 40 km (around 2 h) from Dhaka (Fig. 2).

SUST and DUET have 282 and 95 faculty members respectively.[1] In both cases, on-campus residential facilities are available for the faculty members of the universities, but both universities have high proportions of faculty members who are either commuting long-distances on a daily basis (around 67% and 33% respectively[2]) or maintaining split-families (around 32% and 30% respectively). It may be noted that such residential location patterns (long commutes from the major cities and maintenance of split families) are quite typical among the middle class and upper middle class residents of other sub-urban universities and other white-collar workers[3] of other offices as well.

The current research focuses only on the middle and upper-middle class segments of the population who have wider affordability in terms of residential location choice and can afford to own private vehicles (e.g. cars or motorcycles). People from lower income groups, who also very often maintain split families (where the earning member is based on the capital city and the rest of the family members are based on rural areas), are not included in the study as their choices are constrained by affordability and also because they are unlikely to have access to private vehicles and tend to use public transport for their weekly/monthly/occasional visits to the family homes.

In terms of transport access, both universities provide shuttle services to the nearby large cities, but private cars are popular choices of many of these long-distance commuters, particularly those traveling between DUET and Dhaka.

[1] Excluding faculty members currently on study or research leave.

[2] These numbers are based on the survey results presented in Section 3 since no actual statistics was available.

[3] White collar workers constitute of 13.1% of the total population and 19.4% of the urban population of the country (DHUTS, 2010).