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TRANSPORTATION MODE CHOICE AND URBAN ACCESSIBILITY. A CASE STUDY IN GUADALAJARA METROPOLITAN AREA, MEXICO

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1. INTRODUCTION

In the last decades, cities in the developing world have changed considerably. Urban sprawl, the disruption of urban continuity, the dispersion of job, recreational, educational or shopping centers, and the extensive use of automobile have reconfigured how low social classes access the main urban services. Although there have been some valuable exceptions, the greater part of the studies in urban mobility and accessibility has been focused in the developed world. Research reflecting on how households access educational, health or shopping centers have considered cities in countries as USA, United Kingdom, Netherlands, Australia, Germany or Japan. Nevertheless, proposals for the reduction of motorized trips, the recovery of the compact city, or the land use transport integration that are coined in the developed world are difficult to generalized into the context of the developing world where institutions are feeble, urban planning is absent, or households have scant mobility resources.

Based on research conducted in Guadalajara Metropolitan Area (GMA), Mexico, this paper contributes to enlarge the empirical basis from the developing world in studies about urban accessibility. The research is founded on a mobility survey carried on Tlaquepaque, Tlajomulco, El Salto and Tonala, four non central municipalities that integrate GMA, besides Zapopan and Guadalajara. 800 questionnaires were randomly applied, so that we can make inferences for the entire population with a +/- 4'31% error rate. My main objective is to examine how households in peripheral districts in GMA use the different modes of transportation in accessing the most important locations for their reproduction: schools, hospitals, clinics, and shopping and job centers. To do so, I present a first section to review the conceptual discussion on urban accessibility, and to sketch the principal factors that influence on it. Afterwards, I introduce the principal outcomes that show the particular difficulties that households in non central districts of GMA have in accessing the main urban services. Finally, I consider some of these findings to advance preliminary hypothesis to tackle urban accessibility in cities inside the developing world.

2. URBAN ACCESSIBILITY

After considering some contributions, we can identify three dimensions underlying urban accessibility. Firstly, transportation systems influence on how some places are connected to others, allowing people to arrive easier to centers that can be geographically long away (OHNMACHT, *et al*., 2009). In the second hand, it is important to consider how relevant places are distributed along an urban area (ADEEL, *et al*., 2016; NEUTENS, 2015), since jobs, schools, hospital or shopping centers can be far away from some neighborhoods, making it very difficult for residents to fulfill their principal activities. Finally, it has been said (HERNÁNDEZ, 2012; LAU, 2011) that this purview that reflects on the external characteristics of the territory has to be complemented with the considerations on how people manage to actually travel to such spaces counting with different

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resources, domestic organizations and capabilities. Scholars have used many indexes to measure accessibility; putting together the previous three dimensions of the concept, temporal measures to arrive to meaningful places are the most employed (FARBER *et al*., 2011; WIDENER *et al*., 2015), in as much as it comprehends how much time it takes to individuals to overcome certain distances using the diverse transportations modes.

Nowadays some factors bind how accessibility is performed. The dispersion of urban services (SOCIAL EXCLUSION UNIT, 2003) demands that individuals at urban peripheries have to expend long trips to arrive at places such as schools, hospitals, shopping centers and jobs. At the same time, transport is rarely integrated into urban planning, in such a way that at urban fringes, where many low class residential developments are constructed, it is very difficult to count on convenient public transportation (COVENEY *et al.*, 2009; FARBER *et al.,* 2014). Transportation affordability is other problem for peripheral populations; as transportation costs increase, the proportion of the total income allocated to transportation amounts in some cases to 30-35% (ZOLNIK, 2012). Finally, a great deal of regional and local budgets has been diverted to enhance and expand roads and highways for private transportation, and it is more and more difficult to travel throughout urban metropolis in public transportation; this jeopardizes the possibilities to move unrestrainedly, specially for households without a car (SABATINI *et al*., 2008).

The literature reviewed points out to specific hindrances for urban accessibility depending on the type of activity that we consider. The extension of malls and big boxes at urban fringes implies the suppression of local shops where people without a car could otherwise buy convenient goods and food (FARBER *et al.,* 2011; COVENEY *et al.*, 2009; DIAZ OLVERA *et al.*, 2003). Regarding education, households with scant mobility resources have to count on local schools to send their children, and as colleges and universities are usually farther away from peripheral residences, many children have to put an end to their academic trajectories (DIAZ OLVERA *et al.,* 2003; KENYON, 2011). As far as health services, it has been reported that poor households find many difficulties in getting to distant hospitals (AOUN *et al.*, 2015; BLANDFORD *et al.*, 2012), and child care and specialized health care represent the harsh situations in the provision of this kind of services (YANG *et al.*, 2006; HORNER *et al.*, 2015). Considering jobs, the spatial mismatch between residences and job centers is especially troublesome for households at urban peripheries (WANG *et al.,* 2015) and, as these families have limited mobility resources, many individuals give up searching for better opportunities throughout the urban area and resign themselves to work in the surroundings (RODRÍGUEZ VIGNOLI, 2008; PLAUT, 2004).

3. TRAVEL MODE CHOICES AND ACCESIBILITY IN GMA NON CENTRAL DISTRICTS

As the first step in the analysis, we resorted to variables that measured the proportion of households incomes conferred to transportation, to carry on a cluster analysis and to identify three different types of households. The first group is formed by households that expend a low percentage (13.42%) for transportation, especially for mini-buses. This group represents the 49'3% of all the cases. It was supposed that this group depended on non motorized modes of transportation and, in doing so, relied only in urban services located in the surroundings, regardless their convenience or quality. The second group, that comprehends 38'5% of all the cases, is integrated by households that expend a high proportion of their income in transportation (38'5%), mainly in operating cars (22'3% of the total revenue). Finally, the third group include 12'2% of all cases, and is formed by households that confer a great amount of their incomes to transportation (44'04), chiefly to mini-buses (31'39%) and mass transportation (5'69%). Therefore, it can be assumed that populations in non central districts of a metropolis as AMG renounce to explore opportunities across the city, relying in non-motorized transport, or are obliged to squander a great amount of their incomes in motorized modes to take advantage of the entire metropolis.

As well, it was computed how much time households spent in getting into the places to tackle their most basic activities: shopping and jobs centers, schools, hospitals and clinics for primary health care. As expected, those who used non motorized modes, spent less time to get to their different destinations, varying between 10'05 minutes for going to schools, and 14'4 minutes for going to their jobs. For the rest of the households, it is evident the handicap of going in mini-buses compared with going by car. The households that used the first mode of transportation took from 23'28 minutes to go for shopping to 60'01 minutes to get into hospitals. Households using private cars took 15'02 minutes to go for shopping, and 52'07 minutes to go to hospitals.

In the survey we were interested in evaluating the delays in getting to meaningful places depending on the use of the different modes of transportation. In the case of non motorized modes, the simplicity of this kind of trips made that almost all of the households that relied in these modes were on time. The worst case was getting to schools; here the 9'7% of the households going by bicycle or by walking were late in the last month. Considering motorized modes of transportation, it is noteworthy that households using mini-buses incurred in more delays than households using private cars. In the case of going to clinics for primary health care, the 41'9% of the households that went by mini-bus were late, being 25'5% the date for households going by car.

Finally, we asked if in the households they would change the location for performing the main activities in case they had better transportation facilities. Households that used non-motorized modes of transportation, were less prone to change that location. Only 11'8% of households would change the location for working, and 20'9% would change the location to receive primary health care. The handicaps of using mini-buses versus using private cars were very clear in answering to this question, as a great deal of households that counted on this first mode of transportation would search for a better emplacement. It is especially relevant the case of job locations; 63'2% of those relying on mini-buses to get to their jobs would search for a more convenient job in case they had better transportation facilities. This percentage is just a half (31'4%) of the households that use the private car to go to their jobs. Summing up, it can be said that in households where their members go by bicycle or by walking to their activities they would not explore more convenient places in case of better transportation facilities. It can be assumed that propinquity and the option to travel by non motorized modes is one of the factors they value more in deciding the emplacements for their activities. Households that count on motorized modes are more inclined to search for better options throughout the whole metropolis. In these cases, members belonging to households that travel by mini-buses are much more dissatisfied with the present conditions of places and trips to perform their basic activities.

4. CONCLUSIONS

Mobility and transportation studies coined in developed countries usually insist on the need to change motorized by non motorized modes of transportations, and the need to recover the compact city, as a formula to improve urban accessibility. In this way distances would decrease and the majority of population would take advantage of closer services that are accessible by walking or cycling. However, in developing countries we find an insurmountable rift between transport and land planning. In this way, it is difficult to envisage a situation in which a disincentive to use motorized modes of transportation, especially the use of private cars, would be followed by a integrated land use planning that made urban services, jobs and shopping centers closer to populations. In non central districts and peripheries of metropolis in the developing world there is an absence of close and convenient hospitals, schools, clinics, shopping and jobs centers. In these contexts, those who rely on non motorized modes of transport are doomed to be socially excluded because of the poor quality of the urban services in the surroundings. At the same time, those who rely on a deficient web of public transportation waste important sums of money and time to search for better opportunities along the entire city. Counting on the weakness of planning institutions, it is unlikely that this situation would be reverted in a way that peripheral populations could find

convenient urban services in their proximity in the following decades. In this context, motorized modes of transportation, especially cars, are essential to compensate for the deprivation of the habitat. Consequently, we should modify the way we approach urban accessibility in developing countries as the instruments and situations that could make the disincentive of the use of private cars workable are not present.

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