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Reprint of Measuring trends in household expenditures for daily mobility. The case in Lyon, France, between 1995 and 2015☆

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ABSTRACT

There are very few suitable databases for an in-depth analysis of changes in the expenditures of households for their daily mobility, despite the fact that the increase in fuel costs in the years following 2000 raised questions concerning the vulnerability of certain households in light of their dependence on cars. This article uses three consecutive surveys on household transportation carried out in the Lyon urban area in France in 1995, 2006 and 2015. We propose a technique to extract consistent data on household expenses from the three surveys. Changes are then analysed, taking care to distinguish between changes in prices, population structure and mobility behaviour. The results reveal trends that diverge widely during the two periods between the surveys. In addition, significant differences appear in the changes in expenditure levels and structure depending on the location of households. Finally, a transition to reduced car use has become very clear, however significant generational effects produce contrasting results in young and retired households.

1. Introduction

Over the decade following the year 2000, the strong increase in oil prices raised concerns for households dependent on their car(s) for non-discretionary daily travel over long distances (Dodson and Sipe, 2007; Fishman and Brennan, 2009). However, the problems arising from the energy transition represent only one facet in the overall economic vulnerability of households. For example, in the French case discussed in this paper, fuel costs represented 2.6% of household budgets, but outlays for the purchase of a vehicle and for its maintenance/repairs represented 2.6% and 2.8% respectively. Between 1990 and 2010, these expenses trended very differently (up 27% for fuel and 54% for maintenance/repairs, but down 9% for vehicle purchase), resulting in a 22% increase in overall vehicle costs. However, due to economic growth over the same period, the percentage of vehicle costs in household budgets in France dropped from 11.1% to 9.4% (Visse, 2013). That being said, general price trends, the technical characteristics of the cars on the road and decisions made by households combined in a complex mix to produce a situation where, in spite of the overall drop in the percentage of vehicle costs in household budgets, some households were nonetheless adversely impacted even to the point of economic vulnerability. What were the characteristics of these households? Were they simply households living in periurban areas and highly dependent on their car? What trends in the general context, what specific situations (socio-economic or spatial) exposed the households in question to factors other than the rise in fuel costs?

These issues are not often discussed in the scientific literature unless the topic is energy poverty, but they certainly merit further research in the current context where the topic of mobility inequality has come increasingly to the fore (Lucas, 2012). It is therefore worthwhile to break down the data on the mobility expenditures of households in order to expand the questions on vulnerability beyond the narrow focus on energy that resulted in the wake of the increase in oil prices. Unfortunately, databases specifically suited to this type of study do not exist and that is why this paper adopted a dual objective. The first was to clarify the study method, i.e. the decision to use the mobility surveys and the procedure designed to fill out their results. The second was to analyse the data from the Lyon urban area in order to track the evolution of household transportation expenditures and to throw light on the various factors behind the changes in household expenditures.

To meet those two objectives, this paper first reviews the literature on the mobility expenses of households, which serves to establish the

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general context of the work and to clarify the issues at hand. It then presents the method used to estimate daily mobility expenditures in the Lyon urban area and discusses the analysis results.

2. Review of the literature

Research on mobility expenditures generally adopts a fairly wide point of view, ranging beyond an overly restrictive focus on the transportation sector. Two main approaches should be mentioned here in order to position this paper.

First of all, in the years following the turn of the century, debates on sustainable cities and on the links between urban forms and mobility took up the subject of expenditures. The initial work by Newman and Kenworthy (1989) established a strong correlation between a diffuse urban form and the energy consumed for mobility. A large number of studies fleshed out these results, confirming the links between urban form, car dependence and mobility, and stressing the environmental issues involved (e.g. see Hall, 1997; Ewing et al., 2007; see also the reviews by Ewing and Cervero, 2001, 2010; Boarnet, 2011; in France, a number of similar studies were carried out, e.g. Aguilera and Mignot, 2004; Pouyanne, 2006; Dupuy, 2011). However, the debates also took into account the argument that a diffuse urban form offers access to peripheral areas where land is less expensive (Brueckner, 2001; Nechyba and Walsh, 2004). Pursuing the idea of an affordable city, researchers then integrated the costs of the daily mobility of households (Haas et al., 2013; Mattingly and Morrissey, 2014) in order to establish the true budget, taking into account all "residential costs" (Maresca, 2013) including both transportation and housing (CTOD & CNT, 2006; Haas et al., 2008). However, these studies often focussed exclusively on mobility between the home and the workplace (see Ewing and Cervero, op. cit.). This approach is justified if the objective is to use a proxy for the distances covered, the environmental impacts and the costs for local mobility incurred by households. But in this case, only households with an active member are analysed. It is the work on poverty and social exclusion that revealed the difficulties caused by certain types of areas for fragile populations such as elderly people and the unemployed (e.g. see Lucas, op. cit., and in France, Orfeuil, 2004; Paulo, 2006; Motte-Baumvol et al., 2012; Jouffe et al., 2015). The research in this field has reinforced the idea that access to transportation is a critical factor in obtaining employment and gaining access to services spread widely over an area (daily purchases, health care, local-government offices, etc.) and that, conversely, lack of access to transportation is a cause of social exclusion, particularly in areas with diffuse habitat or in highly specialised areas where households depend on their car. Exclusion traps, where negative factors are mutually reinforcing (e.g. high mobility costs, due to a distant residence, make it more difficult to find work and a source of revenue that could be used to cover the mobility costs), mean particular attention must be paid to the most fragile households when studying trends in the overall mobility expenditures of households, taking into account factors such as transportation costs and the constraints weighing on households.

Another way to study the mobility costs of households is to use the Household budget surveys. These surveys can be used to compare mobility expenditures with the other expenses of households. Mobility is a consumer good requiring a differentiated assessment. Certain types of travel, e.g. for vacation, may be seen as final consumer goods, whereas most daily mobility (e.g. to work, for groceries or various errands) serves as an intermediate good to achieve a more important, often unavoidable activity, which means it is necessary to take into account the overall context in which the mobility is required (Anas, 2007; Ferdous et al., 2010). This wider focus, taking into account all household expenses, is of course a major advantage of this work. A further strong point is that these studies often analyse the time factor in expenditures and the factors determining the decisions made by households (Thakuriah and Mallon-Keita, 2014; Anowar et al., 2016; Smart and Klein, 2017). On the other hand, these surveys on consumer expenditures do not provide any detailed information on mobility behaviours and consequently cannot be used to pursue an analysis on the links between the place of residence, life styles, mobility and expenditures. They are also incapable of separating non-discretionary daily mobility and recreational mobility, even though the capacity of households to adjust to the two differs considerably.

3. Measuring trends in household expenditures for daily mobility

The purpose of this paper is clearly to contribute to the debates on the interaction between transportation and urbanism. Consequently, it focusses on daily mobility that, on the one hand, shapes and is shaped by the urban landscape, and on the other, corresponds to a very large degree to the derived demand for mobility resulting from the manner in which the patterns of activity of households and their members are organised. This analysis of expenditures thus focusses on the consequences arising from the place of residence, in addition to the specific social and economic characteristics of households. But paradoxically, relatively little work has been put into analysing over time the expenditures of households in the framework of research on sustainable cities. Information on adaptations in mobility behaviour as a function of trends in the socio-economic constraints weighing on households over time complements the analysis on the various types of area and it is certainly necessary to include it in the debates on the subject.

This section on the method employed presents the data used and the manner in which they were combined and processed in order to answer the questions at hand.

3.1. Piecing together expenditures using three different household surveys

The first step is to present the procedure used to reconstitute the expenditure data on local mobility. An in-depth presentation of the method may be found in Nicolas et al. (2001, 2003), with updates in Vanco (2011) and Pelé (2014).

3.1.1. Expenditure items for daily mobility

Household expenditures for local mobility comprise different elements obeying divergent rationales, notably concerning the type of transportation and depending on whether the costs are fixed or variable.

The costs incurred by a car should be split between use and ownership costs. The ***cost of using a car*** depends on the distance driven locally and the average cost per kilometre (fuel consumption and price). The ***cost of owning a car*** includes the yearly depreciation, insurance, vehicle maintenance and any taxes. In the framework of our intra-annual approach, these expenses may be seen as fixed and assigned proportionally to the distances covered locally with respect to the total annual distance (coefficients have been set for each type of household, see Pelé, 2014). In addition, concerning ***parking fees***, a distinction was made between overnight parking, an element in the cost of owning a car, and daytime parking, which depends on the cost of parking at the destination and is an element in the cost of using a car.

The costs for urban public transportation (transit) depend on the number of trips and the price per trip. These costs combine a number of factors (one-trip tickets, monthly tickets, various social reductions). On the whole, they are fairly low and are not discussed in detail here.

The costs incurred for **non-motorised transportation** (walking, cycling) were considered negligible and were not included in the estimates. However, information on this type of transport can be used to analyse, if necessary, differences in the uses of transportation among different types of households and trends in decisions concerning the type of transportation selected.

Finally, **other types of transportation**, such as regional public transportation (inter-city buses, trains, bus scolaire to school) and all types of motorbikes were marginal. They increased over the study period, but remained negligible in 2015, in terms of both their use and the expenses incurred by households in the study area (together less than 1% of the modal share and 2% of trip expenditure by households in Lyon). In