Historical perspective of the willingness to commute: the example of the Lyon metropolitan area since the 70's

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Abstract

This proposal fits with the disciplinary field of transportation science and economics. It refers specially on individual travel costs sensitivity and aims to measure its evolution over time following the socioeconomic individual characteristics.
The individual willingness to commute varies according to facilities is aware of to meet needs, their spatial location and the level of service by transport networks. It also depends on the willingness to pay travel monetary and time costs (Da Cunha and al, 2005). *Ceteris paribus*, commuters may perceive travel cost differently. Some individuals are fairly insensitive to travel costs and are willing to pay for high travel costs. The less sensitive individual are, the more they are ready to support high travel time costs (resp. monetary costs). Others, for whom travel time and costs budgets are constraint, seek to limit daily trips.

The travel cost sensitivity parameter estimates price elasticity of travel time demand. It defines the decay rate of facilities interest according to distance and travel time cost (SETRA, 2013). The gravity model developed by Wilson (1967), is used to determine trip distribution between zones i and j as function of an attractive parameter (number of facilities in zone j) and an impedance parameter (travel generalized cost between i and j). The resistance function is a negative exponential function. The generalized cost (sum of travel time and monetary cost) between I and j, is weightet by a β parameter reflecting the sensitivity to the generalized cost of travel. This parameter corresponds to the more or less travel cost resistance, a kind of willingness to commute.

The value of the impedance factor is obtained during the model calibration stage. In a "four-step model" procedure, the calibration consists in "estimating the values of various constants and parameters in the model structure" (Edwards, 1992). More precisely, it consists in the model parameter adjustment "until the predicted travel matches the observed travel within the region for the base year" (Wegmann and *al.*, 2011). The impedance factor can be estimated for different trips according transport mode or purposes but also for various categories of population or spatial divisions (Johansson and *al.*, 2002).

In a previous study, such a model calibration at the Lyon metropolitan area level has been made according to different trip purposes and social status. Time sensitivity is lower for

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travelling to the work place than to other places, whatever the period of the day. Indeed, in the Lyon metropolitan area, people in employment are less likely to make a long daily trip for a non-constraint purpose or to find an opportunity that can have close to their home like shops or leisure places. Then, managers are ready to support the highest travel time costs while farmers are the most sensitive to travel time.

In this proposal, we consider sensitivity parameter evolution at the Lyon metropolitan area level since the 70's. Travel behaviors are obtained from the households surveys (called EMD) made at 10-year intervals since 1975. EMD provides socio-economic data like household size, automobile ownership, profession or income group. The evolution will be considered using first all population. Then a disagreed analysis by socio-professional category, age or gender will be proposed.

The objective is to identify, using a single indicator, trend lines on the willingness to commute since the 70'S for different groups. It aims to understand complexity mobility trends following urban structure evolution with sub-urbanization and spatial evolution of urban functions and activities.