



What shapes local public transportation in Europe? Economics, mobility, institutions, and geography

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ARTICLE INFO

Article history:

Received 2 January 2009

Received in revised form 5 October 2009

Accepted 8 December 2009

Keywords:

Urban transportation

Local government

Mobility

Institutions and geography

ABSTRACT

This paper analyzes factors explaining supply and demand of local public transportation. Together with variables related to traditional economic factors and mobility, we consider variables reflecting institutional characteristics and geographical patterns. Being a political capital increases supply and demand of local public transportation, inequality is associated with higher supply, and contracting out reduces supply. Furthermore, our regional analysis allows us capturing the effect of geographical characteristics and different traditions of government intervention. In all, we provide first evidence on the role played by institutional and regional characteristics useful to achieve a better understanding of local public transportation supply and demand.

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1. Introduction

Mobility is becoming increasingly essential in large cities as a consequence of its impact on social, economic and geographic development. In fact, transportation potentially affects the nature of the urban area itself (Small, 1997), and for this reason the literature on the relationship between travel behavior and urban form has grown at a fast pace during recent decades (Rodríguez et al., 2006).²

Indeed, citizens in developed economies understand mobility as a right, especially in large cities where congestion and pollution make private transportation more inconvenient and expensive. In such urban environments, transport effectiveness and efficiency not only affect local and regional productivity rates, they also have an impact on citizens' quality of life.

The aim of this paper is to identify factors explaining local public transportation of large European cities from both supply and demand sides. In this effort, we characterize aggregate supply and demand equations, which are separately (OLS) and jointly estimated (SUR), and we test the impact of well-known determinants by the transportation literature, as well as new explanatory variables that suggest interesting relationships between urban transport development, institutions and regional heterogeneity within Europe.

The contributions of the present paper are twofold. The first one relies on the fact that, to our knowledge, this is the first study attempting to explain urban transportation – both supply and demand – by using an international sample of large

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² Some relevant works are Sasaki (1990), Banister (1995), Banister et al. (1997), and Giuliano and Narayan (2003).

cities.³ Taking into account supply and demand together, and enjoying a world-wide database of large cities, produces results of interest to both scholars and policy makers. The second contribution is the analysis of institutional and geographical factors as determinants of transport supply and demand, which have also been largely neglected by previous transportation and geographic literature, and which might play an important role on local public transportation determination. Therefore, this paper tries to further connect institutional and geographic fields to transportation at a local level.

As expected, our results confirm that socioeconomic variables and factors related to the generalized cost of transportation play the most important role on local public transportation. However, we also find interesting significant and insignificant relationships between supply and demand and institutional variables such as being a political capital, having an elected or appointed mayor, the choice between in house and contracting out production to private firms, among others. Also, we show the existence of regional heterogeneity behind the design of urban public transportation supply that seems to have a significant explanatory power. Some of these results highlight the lower use of public transport in southern countries and the relatively higher provision of public transport in eastern cities as heritage of their communist past.

The rest of the study is organized as follows. The next section is a brief review of the related literature on urban public transportation. Section 3 describes the empirical strategy pursued to determine transport supply and demand equations. Here we offer detailed information on the data and variables used, and the methodology applied. The fourth section presents the main results, and the last section (Section 5) concludes with some final remarks on our findings and its main contribution to the literature.

2. Related literature

The literature on public transport demand and supply enjoys a long tradition in the field of transport economics. Nonetheless, given the local dimension of the service, most studies have considered only single metropolitan areas, regions or countries for their analysis. As a consequence, few studies use international samples, and within this group, most studies are constructed as meta-analyses derived from different national or local studies.

Price and time elasticities, modal choice and externalities internalization have been the leading topics in the recent literature on urban public transport demand. The work by [Dargay and Hanly \(2002\)](#) uses data on English countries to estimate a dynamic relationship between per capita bus patronage and bus fares. Their work distinguishes between the short and long-term impact of fare changes on bus patronage – as do most studies on this issue – and provides an indication of the time required for the total response to occur.

[Matas \(2004\)](#) also estimates an aggregate demand function for bus and underground trips in the metropolitan area of Madrid, Spain in order to obtain the demand elasticities of the main attributes of public transport services. The study's second objective is to evaluate the impact on revenue of the introduction of the travel card scheme by estimating a matrix of own and cross-price elasticities for different ticket types. For the same metropolitan area we have the recent study by [García-Ferrer et al. \(2006\)](#), which studies the incidence of alternative types of public transport modes.

[Hensher \(1998\)](#) also distinguishes between fare classes across train and bus modes of public transportation and the car for commuting travel in the Sydney, Australia metropolitan area, while [Marchese \(2006\)](#) uses her theoretical model to show that integrated tariffs can be used to extract the consumer's surplus if there are a lot of connections supplied.

The meta-analyses by [Nijkamp and Pepping \(1998\)](#), [Kremers et al. \(2002\)](#) and by [Holmgren \(2007\)](#) review the wide variation in demand elasticities found in the literature. The first focuses on price elasticity, while the latter also considers other elements. In fact, it sheds light on the importance of including car ownership, own price, income and some measures of service in demand models. Moreover, it supports the position that explanatory variables should be in per capita terms if population is not included in the model. A recent paper by [Graham et al. \(2009\)](#) also estimates the effect of fares, quality and income for a sample of 22 international urban metros.

Close to these studies but more focused on the determinants of demand of public transport, we find [Paulley et al. \(2006\)](#), which concentrates on the influence of fares in the UK, though it also studies the roles played by quality of service, income and car ownership. Related to this last element, [Bresson et al. \(2004\)](#) present a panel data analysis for French urban areas, finding a clear downward trend in public transport patronage that is mainly due to increasing car ownership. In addition, the use of public transport appears to be quite sensitive to the volume supplied and its price, which makes the financial equilibrium of this industry problematic.

Regarding mode choice we can mention the recent study by [Sungyop and Ulfarsson \(2008\)](#), which analyzes transportation mode choice for short home-based trips using a survey from a part of Washington State, or the paper by [Asensio \(2002\)](#), which reveals elasticities for commuters using different modes in Barcelona, Spain.

Finally, a large group of recent theoretical and empirical studies have worked on pricing schemes to internalize the external costs of transport by linking subsidies, price of public transport and road charges. [De Borger et al. \(1996\)](#) develop a simple theoretical model that determines optimal prices for private and public urban transport services, taking into account all

³ [Gordon and Willson \(1984\)](#) also used an international data set (data for 1978) of metropolitan cities but they only focused on light rail transport and estimated a semilog model of its demand (ridership per km of lane) with only four exogenous variables. Moreover, they did not carry any analysis on supply determinants.

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