



Understanding the effects of economic crisis on public transport users' satisfaction and demand



Dimitrios Efthymiou*, Constantinos Antoniou

Laboratory of Transportation Engineering, School of Rural and Surveying Engineering, National Technical University of Athens, 9. Iroon Polytechniou St. Zografou Campus, 15780, Greece

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ABSTRACT

This paper extends the research that begun in 2008 by the authors, on users' perception of public transport quality. The objective of the current paper is to investigate the impact of crisis on public transport users' satisfaction, and demand. Data from two user satisfaction surveys that took place in Athens in 2008 and 2013 are used for the analysis. A hybrid choice and latent variable model is developed, to model the increase of public transport demand within the last five years. As exploratory variables are used demographic characteristics and travel attributes. The satisfaction of the users about the quality of public transport service is included as latent variable into the model.

The results show that overall people use public transport in 2013 more than in 2008. More specifically, the improved satisfaction about the quality of service has led to increase of public transport demand. Environmental consciousness, public transport service improvement, and high car use and maintenance costs have turned people towards public transport; on the other hand, increased ticket prices, as well as increased preference to use other modes (car, bike and walk) have turned others to use it less. The demonstrated increase of public transport market share comes in contrast with studies that support the opposite, not taking into consideration the general decrease of commuting activities due to the increase of unemployment.

1. Introduction

The current economic crisis that Greece is experiencing has two opposing effects on the use of public transportation. On the one hand, the level of service is likely to have decreased as a result of the decreasing investments and increasing unemployment. Increased unemployment rates have led to decrease of travel activities in general, and public transport (PT) demand in particular. A reduction in demand for the service can be expected accordingly. On the other hand, changes in personal circumstances have driven people to use public transport, since they can no longer afford the always-increasing cost of private transportation. As a result, public transport is expected to increase its market share since it constitutes an economic alternative of car. Moreover, some people are expected not even to be able to pay for the use of public transport anymore.

The provision of qualitative public transportation services should form a primary consideration of PT operators. In times of crisis, this objective becomes more important than ever. Crisis creates the opportunity to attract new customers/users, with whom to create long-term relations to be maintained after the end of the crisis. In

order to increase satisfaction of the users and maintain their number in the long-run, public transport operators should emphasize on the constant improvement of the services. As a result of the crisis in Greece, public transport operators in Athens have been merged, ticket sale locations have shut down, ticket prices and types have changed and, most importantly, the income of users and drivers has decreased severely. These are just indicative results of the crisis that could have possibly affected satisfaction of users and demand for PT.

The research studies around the factors that affect quality of service and demand are numerous. However, only few of them attempt to investigate the relation between the two. Understanding how quantitative factors, such as quality of service, information provision and comfort, affect public transport demand could be valuable during transport planning and policy evaluation. The exploration of the impact of crisis on public transport demand, taking into consideration such factors as latent perceptions/variables, could give us a first valuable insight. The objective of this paper is to measure the impact of crisis on public transport users' satisfaction and demand, taking into consideration qualitative factors, such as the quality of service provision, which are included as latent variables in a hybrid discrete and latent variable

* Corresponding author.

E-mail addresses: deftym@mail.ntua.gr (D. Efthymiou), antoniou@central.ntua.gr (C. Antoniou).

model.

The remainder of the paper is structured as follows: Following the introduction, the literature review of public transport quality of service on users' satisfaction and demand are presented. The next section presents the study area and data collection methodology. Then, the analysis of the results are demonstrated in Section 4. The paper ends with the conclusions and recommendations for future research in Section 5.

2. Literature review

2.1. Quality of service, users' perception and demand

The quality of public transport systems has been investigated by a large number of studies within the last decades. Moreover, US and European agencies have published manuals in an attempt to build a framework to set the indices of quality measuring (e.g. TRB, 1999, 2004; CEN, 2002). In Sweden, Friman et al. (2001) found that the factors that affect public transport user satisfaction are behavior of the employees, reliability, information simplicity and design. Srinivasan et al. (2007) applied multivariate models to examine the impact of quality changes in public transport of the developing countries, to before and after mode choices. Taylor et al. (2008) analyzed data from public transport operators of 265 urban areas in the US and found that the quality depends on the regional geography, economy, the characteristics of the population and the road network. They concluded that increasing the frequency of service leads to increase of the passengers' number, while higher price leads to decrease. Felleson and Friman (2008) compared the users' satisfaction of public transit in eight European cities. They identified that satisfaction is affected by four factors: comfort, staff, system and safety. They concluded that there are differences in the perception of public transport by the population of the examined cities.

Dell'Olio et al. (2010a) investigated the bus transit factors that affect the perceptions of users using a two-stage survey. At first, they asked bus transit users in Santander, Spain, to rate the overall quality of service and, second, to rate specific characteristics of the system. They found that about 35% of the respondents changed their score after being asked about specific variables. The authors suggest that service punctuality and headways should be priorities for service providers, since "reliability" and "waiting time" are perceived as the most important factors by the respondents. Later, Dell'Olio et al. (2010b) explored how important a number of public transport service characteristics are for the citizens of Santander, Spain. They found that waiting time, cleanliness and comfort are valued higher by the users, while driver kindness, bus occupancy and journey time are less important. The results vary depending on the socio-economic characteristics of the users.

Eboli and Mazzulla (2011) proposed a methodology to measure transit service quality based both on passenger perceptions and agency performance measures (e.g. comfort, punctuality and price). Cirillo et al. (2011) concluded that probably the most important characteristic of a public transport service is punctuality, since about one third of the respondents that participated in a survey answered that they could pay more in order to use an on-time service. Román et al. (2014) modeled the choice of public transport users comparing the current and a hypothetical future public transport system, examining quality factors. They found different behavior between urban and interurban users, because of the differences in perception of attributes such as service frequency, and the willingness to pay.

Carrel et al. (2012) explored the impact of unreliability of public transport services on transit usage. Their results show that reliability affects the users' trip planning. They prefer to use small, more frequent vehicles over larger, low-frequent, even if they are more crowded, which shows that it would be a strategic policy for the operators to follow. Moreover, they speculate that the provision of real-time

information in case of infrequent services could intensify the unattractiveness of it. Redman et al. (2013) reviewed a number of studies that deal with the public transport attributes that attract car users and found that, while reliability and frequency are considered as important public transport characteristics in general, the shift from car depends mainly on individual perceptions and motivations (e.g. fare promotions). De Oña and de Oña (2015) provide a very detailed literature review in quality of service in public transport based on customer satisfaction surveys.

Taylor and Camille (2003) found that the factors that primarily affect transit ridership are primarily those that measure car access and utility, and secondary economic factors (e.g. unemployment, income). Moreover, spatial factors (e.g. population density, parking availability), which are usually collinear with socio-economic factors, also have an impact. Paulley et al. (2006) found that the bus income elasticity in Great Britain is negative, although it is somewhat smaller in the short run (−0.9 to −1) compared to the long run. Moreover, they found that the elasticity of quality of service is −0.4. Holmgren (2007) performed a meta-analysis of public transport demand, integrating the findings of studies that have computed the elasticity of price, Vehicle Kilometers per Hour (VKH), income and price of petrol. However, he did not take into consideration quantitative parameters, such as user satisfaction about the quality of service provision.

Buehler and Pucker (2012) analyzed the factors that affect public transport demand in Germany and the US and found dependency on demographic, socio-economic and land use characteristics. They found that Germans are five times more likely to use public transport compared to the Americas, while the services attract broader cross-sections of the society. The higher demand in Germany is the result of a package of policies, such as more and better service, attractive fares, high taxes to car-use, integrated services and land-use policies. Germans use public transport for a wider range of trip purposes. Van Oort et al. (2014) investigated the impact of unreliability of public transit in transport demand. They applied a three-step approach and found that service reliability increased public transit demand by 18%.

Employment is a main determinant of the public transport demand, according to the Report of Transport for London (2010). During the recession of 2008 and 2009, the growth of public transport demand did not follow the increasing trend of the previous years, but was around 0%. Cordera et al. (2015) investigated the impact of unemployment rates and income on demand for public transport in Spain. They found that unemployment affects public transport demand with elasticity from 0.133 to 0.210 and income with elasticity between −0.505 and −0.861 depending on the model used (static equilibrium and long-run dynamic respectively).

2.2. Existing research in Greece

This paper builds upon and extends the research on public transit user satisfaction and service demand that begun in 2008 by the authors. Tyrinopoulos and Antoniou (2008) investigated the factors that affect public transit user satisfaction. They performed comparative analysis to all the major Greek public transport service providers in Athens [Athens Metro, ETHEL (thermal buses), ILPAP (trolley-buses), ISAP (electric railway)] and Thessaloniki (OASTH thermal buses), using factor analysis and ordered logit models, to model the characteristics that affect users' satisfaction. The results of the factor analysis showed that quality of service (i.e. related to characteristics such as information provision, behavior of the personnel and vehicle conditions) is the most important factor for OASTH and ILPAP users, while transfer quality and service production (the operating hours of the service provision on a given day) follow. Concerning ISAP, quality of service was again first, with service production coming second. Service and transfer quality are almost equally important for ETHEL users, while service production follows. In all cases, quality of service is considered as the most important factor by the respondents. Moreover,

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