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Crowding-in or crowding out: An empirical analysis on the effect of subsidies on individual willingness-to-pay for public transportation

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ABSTRACT

Public transportation throughout the world is highly subsidized. User knowledge about public subsidies may affect their willingness to pay for public transport services and alter demand and related passenger fare revenues. This is especially relevant in view of the increasing availability of information about public subsidies. An empirical study reveals a crowding-in effect, on average, on WTP (willingness to pay) as a result of access to information about public subsidies that generates concerns of fairness. Crowding-out effects also occur, caused by considerations of double financing and free-riding, although they are minor. Study results show that public transportation companies as well as financing institutions should highlight the existence of subsidies to produce crowding-in effects in the WTP for public transportation, to maximize public valuation (WTP) of public transportation. This should increase self-generated revenues of public transportation services.

1. Introduction

Worldwide public transport is highly subsidized by public authorities to cover the difference between passenger fare revenues and operating costs (Tscharaktschiew and Hirte, 2012). In the US (Parry and Small, 2009), subsidies range from 57 to 89 percent of the operating costs for buses and from 29 to 89 percent for rail transport. Studies calculate that public subsidies range from 23 to 50 percent of operating costs of European public transportation systems. In the European Union, transport subsidies amounted to about 270 billion € in 2005 (EEA, 2007). In Germany, the site of our study, there is a trend toward passenger fares comprising an increasing share of operating costs. From 2001 to 2012 the passenger share increased by approximately six percent and amounted to 48 percent by 2012 (VDV, 2012). At the same time, subsidies per passenger were significantly reduced by organizational restructuring and outsourcing that improved productivity and financial efficiency of German public transport (Buehler and Pucher, 2011a,b).

Operating subsidies for public transport compensate for the gap between operating costs and revenues generated by fares and advertising (Bly et al., 1980). Subsidies tend to reduce fares and increase the frequency of service (Bly and Oldfield, 1986; Pucher and Markstedt, 1983) to achieve redistributive objectives (Asensio et al., 2003; Tscharaktschiew and Hirte, 2012).

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Lower fares make public transport affordable and usable for low-income people and passenger segments with special needs such as the handicapped and older people (Bly et al., 1980; Serebrisky et al., 2009; Tisato, 1998). Increased patronage also allows systems to use larger vehicles and increase frequency of service, which affects the density of the route structure (Proost and Dender, 2008). Concurrently, the risk of congestion on roads is reduced by fewer private cars (Asensio et al., 2003).

The pictured demand-side effects of public subsidies depend heavily on the fare elasticities of demand. Studies on elasticities show a large variance in their results, but overall small negative fare elasticities can be found (see meta-analyses by Holmgren, 2007; Kremers et al., 2002; Nijkamp and Pepping, 1998). This means that subsidies are not very effective in increasing patronage of public transportation.

The ongoing research on effects of subsidies for fares on patronage of public transportation does not so far indicate whether funding public transportation services through fares and subsidies affects passengers' evaluation and related willingness to pay for public transport. In light of market-oriented approaches to managing public transportation services, a deeper understanding of the consumer perspective in this context is essential (Molander et al., 2011). The discussion about greater transparency of public expenditures, in line with open government initiatives worldwide, makes the research on effects of public subsidies on passengers' WTP even more relevant (Hilgers, 2012; Hilgers and Ihl, 2010). In the future, information about public subsidies for public transport will be more available and receive more attention than in the past.

The possible direct effect of subsidization on the evaluation of public transportation services and passengers' willingness-to-pay has not been studied, although research in cultural economics shows that public subsidies can crowd in as well as crowd out private donations to cultural institutions (Bekkers and Wiepking, 2011; Borgonovi, 2006; Maddison, 2004). Applied to transportation research, public subsidies as operating subsidies may raise incentive effects and fairness considerations when passengers read information about subsidies as an additional funding source besides passenger fare revenues.

Knowledge about public subsidies may result in decreasing passenger willingness-to-pay for public transportation (called crowding-out) but it may also result in an increased willingness to contribute to funding public transportation (called crowding-in). Shifts in the WTP in turn may result in demand reactions to a given fare that affect the level of usage and passenger fare revenues. A lower WTP resulting from knowledge about public subsidies, for example, will increase the likelihood of people evaluating the actual fare as too expensive and could motivate an individual to use a car instead of public transport. This study fills the research gap by addressing three questions about crowding effects of public operating subsidies on passengers' willingness-to-pay:

1. *Does information about public operating subsidies result in crowding effects of individuals' WTP for public transportation services?*
2. *Which behavioral measures explain crowding effects in WTP caused by information about public operating subsidies?*
3. *Which characteristics differentiate crowding-in, crowding-out and no crowding subgroups?*

Within the context of transportation research this paper contributes to the research on determinants that affect the public valuation of and demand for public transportation (Souche et al., 2012). The study expands our knowledge about the economic consequences of public subsidizations in the context of public transportation (Tscharaktschiew and Hirte, 2012) by examining passengers' related attitudinal and behavioral outcomes.

In the next section, we introduce a conceptual model of the effect of subsidies on WTP of public transport passengers, followed by the results of a survey among citizens of a medium-sized city in Germany which validates our conceptual model. In the concluding section, we provide a summary, discuss the study's limitations, managerial implications, and avenues for further research on transportation.

2. Conceptual considerations

Besides the effects of subsidies for fares on patronage, public transport operating subsidies may affect passengers' evaluation and related willingness-to-pay for public transport, which we define as crowding effects. Willingness-to-pay is a value that can be classified as stated preference data and is used in the context of the total economic values for goods and services, especially those that entail not only use values but also non-use and option values such as public transportation (Chang, 2010). As a reservation price, WTP measures the maximum amount of money a customer is willing to spend for a usage experience in monetary units (Homburg et al., 2005). In research on transportation, benefits are estimated in the form of willingness-to-pay (WTP) values (Phanikumar and Maitra, 2006), which comprise not only use values but also non-use values and option values to capture the total economic value of public transportation. The total economic value is defined as the sum of passengers' WTP for non-use, use, and option values due to a service or policy (Geurs et al., 2006).

To investigate crowding effects on WTP we rely on the attitude concept, which says that behavior intentions such as WTP can be predicted by attitudes (Kahneman et al., 1993). This rationale was applied to the evaluation of public goods in contingent valuation studies by Cooper et al. (2004), Kotchen and Reiling (2000) and Liebe et al. (2011). Information about public subsidies may affect attitudes toward public transportation services and the WTP, provided that individuals are aware of public subsidies (Horne et al., 2005).