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For whom the tunnel be tolled: A four-factor model for explaining willingness-to-pay tolls

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ABSTRACT

This research examines citizen acceptance of tolls and road pricing, and specifically focuses on determinants of the individual's expressed willingness-to-pay tolls to use a tunnel express lane that would be free of traffic delays. We answer the research question "What factors influence citizens' willingness-to-pay tolls" by empirically estimating a four factor model of willingness-to-pay: (a) direct benefit to the respondent; (b) relative cost over time; (c) community concern; and (d) political and environmental liberalism. We use data about citizen perceptions from the Life in Hampton Roads Survey, a survey of residents of Hampton Roads, Virginia. We find that willingness-to-pay is primarily driven and motivated by self-interest, through a balancing of benefit to cost relative to individual income and frequency of use. In addition, concern for the community also contributes to willingness-to-pay tolls. The individual's perception of government's trustworthiness, a reflection of political and environmental beliefs, also influences the extent to which an individual is willing to pay tolls.

1. Introduction

For most urban areas in the US, traffic congestion and subsequent travel delays have become significant problems. For example, statistics from the Texas Transportation Institute indicate that congestion, measured as delay per commuter (in hours), has increased from 16 h in 1982 to 38.0 h in 2011 (Shrank et al., 2012). In recent years, there has been a significant and wide-spread interest in the use of tolls and other forms of road pricing as a source of funding, a means of managing congestion, and a way of providing additional traveler options. Tolls have become increasingly attractive to state and local governments in the current fiscal environment in which they face significant demands for services, but possess limited (even decreasing) resources to meet these demands. Many states in the US are experiencing shortfalls in transportation funding, along with growing needs for surface transportation system improvements to manage congestion. "Tolling and road pricing have become part of contemporary transportation planning and policy making vernacular out of the need to address traffic congestion and infrastructure funding short-falls" (Zmud and Arce, 2008, p. 49).

Despite the potential advantages of tolling, much of the existing empirical research in transportation indicates that public acceptance of tolls has been low. Yet there are reasons to believe that latent support for tolls may exist among the general public, as tolling can confer benefits desired by many voters, including the many who rarely drive or infrequently use the tolled facility. Among the potential benefits are revenue for needed infrastructure and public transportation projects, less congestion for drivers, less pollution and reduced auto dependence for environmentalists and smart growth advocates, just

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to mention a few. Thus, the benefits are many and only those who pay the toll will bear the cost. The latter, of course, gain the benefit of reduced congestion and faster travel.

This research examines the willingness of residents in a community (Hampton Roads, Virginia) to pay a $3.00 toll to access a tunnel express lane that would be free of traffic delays the majority of the time. We answer the research question "what factors influence citizens' expressed willingness-to-pay a toll" by empirically estimating a four-factor model of willingness-to-pay. Our approach is similar to that of Hamilton (2012), who studied the factors predicting support for congestion pricing in three European cities. He looked at the impact of five factors on support: self-interest, fairness, political ideology, trust in government, and previous experience with congestion pricing. Our model includes measures of three of these factors. Our model also includes measures of community concern along with measures of the direct benefit to the respondent (e.g., congestion relief and commute time), trust in government, and political and environmental liberalism. We use data about citizen perceptions from the Life in Hampton Roads Survey, which is a survey of 700 residents of the Hampton Roads region in Southeastern Virginia.

Our study uses a textbook static model of congestion pricing with homogeneous values of time, thus assuming a single value of time and a single road link. We do not include a direct measure of the value of time in our model, as we assume that drivers will use the tunnel at different times for a variety of reasons and the value of time will in all likelihood vary with the reasons for travel. Moreover, some supporters of a toll may not use it very often, if at all (Gaunt et al., 2007; Jaensirisak et al., 2005). We do however have a measure of individual income; and, as research on the value of time suggests, residents with more income are more likely to be willing to pay the toll. But many other factors can influence support for a toll. It is well-documented that the value of time varies by trip purpose, day of week, and type of traffic encountered, which is to say that the value of time is more than a function of income and chronological time saved (Hamilton, 2012; Wardman and Nicolás Ibáñez, 2012). And, of course, many low income residents of a city, such as those who rely on transit, may support a toll because they are not likely to pay the toll or pay it infrequently and the toll, itself, can serve as an alternative to a possible tax increase for infrastructure that they would have to pay. Others with a low value of time may support the toll for political or environmental reasons (Eliasson and Jonsson, 2011; Jaensirisak et al., 2005). Thus, this study is designed to capture the factors beyond income and time saved that lead to support for a toll. A city seeking to impose a toll can design its campaign for support so that it clearly informs each subgroup of residents of their specific benefits. Given the increasing reliance on user fees and user charges by governments in the US, this study has implications for the research on citizen acceptance of (and willingness to pay) similar fees or charges.

After providing some background information on the issue of tolling, we discuss the importance of public support. We then present our four-factor model of support for tolling followed by our study methods and results. The conclusion offers implications for future efforts to gain public support for tolls, road pricing and similar user fees.

1.1. Some background on tolling and road pricing

According to the US Department of Transportation's Federal Highway Administration, as of January 1, 2011, toll facilities in the US totaled 5365 miles (Federal Highway Administration, 2011). These toll facilities, which range from congested urban facilities to toll roads linking rural areas, include not only highways, but also tunnels, bridges, and ferries. The tolling structures vary widely, from multi-tiered price structures with discounts according to frequency of use, carpooling, and time of day discounts, to flat rate structures in which the only differentiation is made on the basis of the number of axles per vehicle.

Tolls are a direct user fee charged for use of road capacity and services to the motorist. Toll financing has a long tradition in the US as a supplemental source of revenue to meet transportation needs. In the late nineteenth century, toll road development tapered off as toll evasion as well as rail travel increased. However, by the 1930s, some states began developing public toll road programs to respond to growth in automobile ownership, the rising needs of commerce, and the absence of significant Federal-aid for highways. While private tollway companies dominated the "turnpike" industry in the earlier centuries, the toll facilities of the twentieth century have largely been authorized, constructed, and managed by quasi-public authorities established by state and local governments. The pursuit of toll roads declined after 1956, when the Federal Highway Act established a Federal gasoline tax to support the interstate highway system and prohibited tolling on new, federally-funded highways.

In recent decades, increased transportation needs and public funding constraints have fueled new interest in tolls as a revenue source to support transportation investment. The interest in toll roads today is an outgrowth of federal legislation giving states greater flexibility to implement tolling and road pricing. But it also reflects the multiple benefits derived from tolling, of which three are prominent: (a) creation of adequate funds for urgently needed projects; (b) a shift in the burden of capital, operating, and maintenance costs to specific users; and (c) the generation of an immediate and direct source of revenue to discharge bond and other financing obligations (Rusch, 1984). There is also an environmental argument for road pricing in that it may reduce driving and its related externalities. While not commonly acknowledged as a key driver for imposing tolls, these environmental benefits have sometimes been included as part of the case for a toll project.

The three prominent financial goals of tolling do not always coincide with the goals of reducing congestion. However, as Santos and Fraser (2006, p. 266) note, it is common "to confuse schemes that were designed to finance infrastructure with schemes designed to reduce congestion." The economic case for road pricing argues that absent pricing at the point of use, the demand for road use will exceed its capacity, resulting in congestion (Vickrey, 1969). This is true for most tolling cases where road pricing and imposition of tolls do not automatically lead to expanded capacity. As such, tolling that was