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# Transportation Research Part A

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## Do individuals have different preferences as consumer and citizen? The trade-off between travel time and safety



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### A B S T R A C T

Transport policy decisions often involve a trade-off between travel time and safety. Transport economists generally evaluate the societal value of transport policy options involving travel time versus safety trade-offs in a Cost-Benefit Analysis (CBA) through multiplying the expected change in traffic casualties with the value of a statistical life (VOSL) and multiplying the changes in travel time with the (marginal) value of time (VOT). The dominant empirical approach to infer the VOSL and the VOT is based on stated preference experiments in which respondents are asked to make choices between (hypothetical) routes which differ in terms of various characteristics (e.g. travel time and number of fatal accidents per year). This approach towards inferring the VOT and the VOSL has been criticized by scholars who argue that individuals' preferences as consumer of mobility inferred through (hypothetical) route choices may be a poor proxy for how the same individuals in their role of citizen believe that government should trade-off safety and travel time. This study investigates the extent to which individuals indeed do have different preferences as consumer and citizen when trading off travel time and safety, by conducting five stated choice experiments in which respondents are asked to choose between hypothetical routes as consumer or hypothetical routes/policy options as citizen. Our results suggest that individuals in their role as citizen assign substantially more value to safety than travel time when compared to their consumer choices. We believe that this paper could fuel a debate about whether or not the VOT and VOSL inferred from choices individuals make as a car driver are the single most relevant metrics for the valuation of expected changes in traffic casualties and travel time in the appraisal of transport-related government policy options.

### 1. Introduction

Transport policy decisions often involve a trade-off between travel time and safety. For instance, the principal benefit of replacing “stop” signs by “yield” signs is that it saves motorists time; the main draw-back is that it degrades safety (Hauer, 1994). Transport economists evaluate the societal value of transport policy options involving travel time versus safety trade-offs in a Cost-Benefit Analysis (CBA) through multiplying the expected change in traffic casualties with the amount of money that individuals are willing to pay for reducing the risk of their premature death (the so-called value of a statistical life, VOSL) and multiplying the changes in travel time with the amount of money individuals are willing to pay for travel time savings (the so-called value of time, VOT). In case a transport policy solely results in travel time savings and an increase in the number of fatal accidents per year, transport economists postulate that the policy enhances societal welfare when the aggregated monetary travel time benefits accruing from the policy (i.e.

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the travel time savings multiplied by the VOT) are larger than the policy's aggregated monetary safety losses (i.e. the additional fatal accidents multiplied by the VOSL).

Inferring the VOT and the VOSL from the amount of money individuals are willing to pay from their after tax income – and establishing the societal welfare effect of government policy options through aggregating changes in travel time and safety with these money metrics – has been heavily criticized by numerous scholars (e.g. Ackerman and Heinzerling, 2004; Hauer, 1994; Kelman, 1981; Sagoff, 1988). These scholars acknowledge that the amount of money individuals are willing to pay from their after tax income in (hypothetical) markets provides crucial information for the evaluation of consumer goods. However, the scholars contest that 'willingness to pay-based metrics' should guide public priorities. For instance, Alphonse et al. (2014) state that individuals' willingness to pay for consumer goods provides valuable decision support for marketers and producers, but studies investigating willingness to pay through observing people's behavior in real (or hypothetical) markets are unlikely to reflect how people want public policies to change. Moreover, Sergio Jara-Díaz and co-workers contend that there can be a stark difference between the values for use in public sector appraisal and the values which a commercial operator would wish to use in an analysis of the same project (Gálvez and Jara-Díaz, 1998; Jara-Díaz, 2007; Jara-Díaz et al., 2000; Mackie et al., 2001). When a project is financed by users directly, their willingness to pay will determine whether or not a commercial operator builds a project (Jara-Díaz, 2007). However, Mackie et al. (2001) argue that there is no good reason for the value that the individual is willing to pay to reduce travel time to be equal to the value that society as a whole attaches to the reassignment of time of that individual to other activities. Jara-Díaz (2007) establishes that tax money will go proportionally more to high income groups when social appraisal is based on willingness to pay and he argues that this is one important reason for not using willingness to pay values for prioritizing public projects.

Moreover, Ackerman and Heinzerling (2004) contest the decision of the US Government against banning cellphone use in the car based on calculations that people who are talking while driving are willing to pay a lot to talk on the phone more than many people who face deadly risks are willing to pay to avoid the risk of being killed. In their view, the consumer values for talking while driving cannot legitimize that some US citizens will end up in the morgue because they are hit by other US citizens distracted by their cellphone while driving a car: "using private market behavior as a standard for public policy overlooks the possibility that people will have different preferences when they take on different roles" (Ackerman and Heinzerling, 2004, p. 191). Ackerman and Heinzerling (2004) criticize the current practice in which respondents participating in experiments for inferring the VOT and the VOSL are asked to trade-off after tax income, travel time and safety in their role as *consumer of mobility*, whilst preferences of individuals in their role as consumers may be a poor proxy for how the same individuals in their role as citizens believe that Government should trade-off tax money, safety and travel time.

Although the literature does not offer waterproof evidence, contributions in the literature indicate that, all else being equal, the consumer value of reducing mortality risk does not differ between young and old people, whereas the citizen value of reducing mortality risk for younger people is substantially higher than the citizen value for reducing mortality risk for older people. Various studies conclude that there is weak support for the notion that the amount of money consumers are willing to pay for reducing the risk of their premature death declines with age, all else being equal (e.g. Alberini et al., 2004; Krupnick, 2007). Krupnick (2007) found in his meta-analysis fourteen studies that did, and twelve that did not report evidence of a so-called senior discount effect. In contrast, various studies (e.g. Cropper et al., 1994; Dolan et al., 2004; Johannesson and Johannson, 1997; Johannesson-Stenman and Martinsson, 2008; Richardson et al., 2017) conclude that individuals in their role as citizen attach less importance to government projects saving older citizens than to saving younger citizens. For instance, Cropper et al. (1994) found that for the median respondent in their study, saving one 20-year-old is equivalent to saving seven 60-year-olds. Johannesson and Johannson (1997) concluded that Swedish citizens judge saving five 50-year-old citizens equivalent to saving one 30-year-old citizen and saving 34 70-year-old citizens. Interestingly, in both studies it turns out that the age of the respondent has no effect on the observed choices. Both young and old individuals give priority to saving the lives of the younger individuals. Tsuchiya (1999) distinguishes three explanations for why, *ceteris paribus*, the young are favored over the old: (1) the young are expected to gain more benefit due to their longer life expectancy; (2) the young are more productive (e.g. economic productivity; taking care for others); (3) the young have lived shorter lives and therefore 'deserve' the health improvement because everyone is entitled to some 'normal' span of life years. This is also known as the 'fair innings argument' (e.g. Harris, 1985; Williams, 1997). Harris (1985) refers to the 'greater injustice' experienced in case a younger individual dies 'too soon' versus the person who has lived a reasonable amount of years.

Moreover, Mouter and Chorus (2016) concluded that individuals value travel time savings higher in their role as citizen than in their role as consumer. More specifically, they inferred that individuals' willingness to pay from previously collected tax money for travel time gains created by a government policy, is significantly higher than their willingness to pay, from their after tax income, for time gains obtained by choosing a different route.

Despite the indications in the literature that people evaluate travel time savings and reductions in mortality risk differently as consumer and citizen, to the best of the authors' knowledge, no research has been conducted that empirically tests the claim that individuals have different preferences as consumer and citizen when *trading off* travel time and safety. Hence, the key aim of our study is to ameliorate this gap in the scientific literature. Therefore, our research question is: *to which extent do individuals have different preferences when trading off travel time and safety as consumer and citizen?* We answer the research question by designing a stated choice (SC) experiment including three experiments in which respondents are asked to choose between two hypothetical routes in their role as consumer and two experiments in which respondents are asked to recommend a route/road project to the government in their role as citizen. A comparison of the results of the five experiments allows us to answer the research question.

The remainder of this paper is organized as follows: Section 2 provides a brief discussion of the literature regarding valuation methods used to transfer travel time savings and improved traffic safety into monetary terms. Section 3 defines the concepts 'consumer' and 'citizen' adopted in this study. Section 4 discusses our methodology and Section 5 the data collection. Subsequently, we present the results in Section 6. In Section 7, we draw conclusions and discuss the results.

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