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Modeling politicians' preferences for road pricing policies: A regret-based and utilitarian perspective

Caspar G. Chorus *, Jan Anne Annema, Niek Mouter, Bert van Wee

Delft University of Technology, Jaffalaan 5, 2628 BX, Delft, The Netherlands

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ABSTRACT

This paper presents the results of a stated choice-study among Dutch local politicians in the context of road pricing policies. Politicians were asked to express their preferences for policy-options that differed in terms of (i) emissions reduction, (ii) congestion reduction, (iii) operational costs, (iv) acceptability among the general public and (v) acceptability among retailers. Utility-maximization-based and regret-minimization-based discrete choice models were estimated, and their results compared, on 238 stated choices made by members of Dutch city-councils. The estimated models allow for the evaluation of the popularity of different road pricing scenarios among Dutch local politicians, as a function of their performance in terms of the above-mentioned criteria.

1. Introduction

In highly urbanised regions worldwide congestion is a severe and increasing problem. Road capacity increases do not keep up with increases in car ownership and car use levels because of space limitations, environmental concerns or a lack of financial resources. As early as 1920 it was recognized that if demand for infrastructure capacity exceeds supply (and increasing capacity is not a feasible option) road pricing increases the general welfare (Pigou, 1920): congestion levels will reduce and so will travel times, and those who value road use during peak hours most, will travel (and pay) during those hours.[1] Furthermore, it is well-known that besides travel time-related benefits, additional environmental and safety benefits can result from road pricing measures (e.g., Verhoef et al., 2008).

For decades and in many countries, road pricing has been the subject of ample academic research efforts and policy debates. However, despite the benefits repeatedly shown in academic literature, only a few examples of real world implementation of any form of road pricing exist. These include private companies that own roads, which impose tolls, for example in France and Portugal, and specific types of road pricing in some urban regions, such as London City, Stockholm, a few Norwegian cities and Singapore (Ieromonachou et al., 2007; Mckinnon, 2006). In addition, Germany has introduced a national system of road charges for lorries using motorways.

Triggered by this discrepancy between the potential of road pricing as a policy-tool and policy-makers' limited inclination to actually implement road pricing-based initiatives, the academic literature on implementation barriers has predominantly focused on barriers related to acceptability among car users or the public in general (e.g., Jakobsson et al., 2000; Viegas, 2001; Schuitema and Steg, 2008; Ison et al., 2008; Schuitema et al., 2010; Vonk Noordegraaf et al., forthcoming). However, intuition and scholarly research suggest that in order to successfully implement complex policies in which many actors play a role – such as pricing policies – not only public (or: social) acceptability counts, but also political acceptability (Feitelson and Salomon, 2004). Political acceptability is related to the politician's behavior in the political market place. According to public choice theory (e.g., Buchanan and Tullock, 1962) politicians in the political market – where they interact with other actors, such as voters, interest groups and bureaucrats – pursue their own goals. In public choice theory politicians are hypothesized to have an interest in implementing specific policies, which are in line with their personal ideology or with notions such as altruism, or which may help increase the chance of obtaining a 'spot in history books'. Other reasons for politicians to support policies may vary from the wish to increase discretionary power, their personal income or their chances of re-election (e.g., Rienstra and Nijkamp, 1996). When aiming for an increase in the chance of re-election, politicians have to take into account voters' interests in general, and the trade-off between gains and losses in votes when evaluating alternative policy measures in specific (Weck-Hannemann, 2003).

These theoretical notions can be applied to understand why politicians have been reluctant to introduce road pricing. Firstly, based on the assumption that politicians' actions are strongly motivated by re-election concerns, Frey (2003) states that a major disadvantage of pricing policies is that these are not directly attributed to a politicians' action since the problems addressed by the pricing policies (e.g., congestion and harmful emissions) are

* Corresponding author. Tel.: +31152788546; fax: +31152782719.
E-mail address: c.g.chorus@tudelft.nl (C.G. Chorus).

[1] See Rouwendal and Verhoef (2006) for a review of the economic principles underlying road pricing.

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solved by the actors in the market with an invisible or anonymous role for the price incentive. Another disadvantage of pricing from the viewpoint of politicians is that while the costs remain highly visible, the benefits of the policy – reduced road congestion and better environmental quality – are much less salient (Oberholzer-Gee and Weck-Hannemann, 2002; Schneider and Weck-Hannemann, 2005). Therefore, it makes sense to hypothesize that most politicians have an almost instinctive preference for clearly visible policy interventions in which their voters are not directly faced with the bill of the policy – e.g., road building – over pricing instruments. What has not been studied so far, is how different aspects of road pricing policies (such as their operational costs, or their impact on congestion and emissions) may influence politicians' preferences for these policies.

This paper contributes to the literature on the acceptability of road pricing-related policies, by considering political acceptability of road pricing policies and by focusing on how a number of potentially relevant aspects of these pricing-options influence politicians' preferences. We focus on five such dimensions: (i) emissions reduction, (ii) congestion reduction, (iii) operational costs, (iv) acceptability among the general public and (v) acceptability among retailers. We build on the premises underlying public choice theory by assuming that political preferences and choices are driven by a more or less rational trade-off involving these different criteria. Specifically, we postulate that politicians' preferences for policy-options may be estimable from observed choice-behavior, using a discrete choice-modeling approach (e.g., Ben-Akiva and Lerman, 1985). Choices are observed in the context of a websurvey-based Stated Choice-experiment that explores the opinions of politicians with respect to the implementation of pricing policies. Because the majority of real world implementations of road pricing are local projects (as are not successfully implemented proposals) we focus on local municipalities.

As a secondary contribution, we specify and estimate both utility-maximization-based and regret-minimization-based choice models. While the overwhelming majority of work in the field of public choice theory is founded on utilitarian principles, results from the field of social-psychology suggest that the type of choices politicians make may be driven to an important extent by the wish to minimize regret. More specifically, there is much empirical evidence (see Zeelenberg and Pieters (2007) for a review) that regret-minimization is a particularly important determinant of choice-behavior when choices are perceived by decision-makers as difficult and important, and when decision-makers believe that they will be held accountable for their choices. It goes without saying that these conditions readily apply to many of the choices politicians make. Recently, the notion of regret-minimization has been translated in a Random Regret Minimization (RRM) counterpart (Chorus, 2010) of the classical Random Utility Maximization (RUM-) paradigm (McFadden, 1974). RRM-models can be easily estimated using readily available discrete choice-software-packages, and have been found to perform well empirically in the context of modeling various types of travel choice-behavior (Chorus, 2010; Chorus and de Jong, in press; Hensher et al., accepted for publication). This paper presents the first application of RRM in the context of modeling choices made by politicians.

Section 2 presents the utility-based and regret-based choice-models. Section 3 presents the set-up of the experiment and the data collection effort. Section 4 presents and discusses estimation results. Conclusions and directions for further research are presented in Section 5.

2. A utility-based and regret-based multinomial logit model

This section presents the classical linear-additive RUM-based MNL-model, followed by an introduction of its regret-based counterparts. For a more elaborate introduction of the utility-based model, the reader is referred to Ben-Akiva and Lerman (1985) and Train (2003). A more in-depth treatment of the RRM-paradigm, including an elaborate theoretical and empirical comparison with the RUM-paradigm, can be found in Chorus (2010).

Assume the following choice situation: a politician faces a set of J policy-options or alternatives, each being described in terms of M attributes x_m that are comparable across alternatives. The focus is on predicting the choice probability for an alternative i from this set. A conventional, linear-additive utilitarian specification would assign the following deterministic utility to alternative i: $V_i = \sum_{m=1\ldots M}\beta_m x_{im}$. Adopting the classical Random Utility-Maximization (RUM) paradigm (that is: adding i.i.d. Extreme Value Type I-distributed errors to the deterministic utilities of all alternatives to represent heterogeneity in unobserved utility) implies the following well-known MNL-formulation of the resulting choice probability (McFadden, 1974): $P_i = \exp(V_i)/\sum_{j=1\ldots J}\exp(V_j)$.

The RRM-model postulates that when choosing between alternatives, politicians aim to minimize anticipated random regret, and that the level of anticipated random regret, which is associated with the considered policy-option or alternative i is composed out of an i.i.d. random error ε_i, which represents unobserved heterogeneity in regret and whose negative is Extreme Value Type I-distributed, and a systematic regret R_i. Systematic regret is in turn conceived to be the sum of all so-called binary regrets that are associated with bilaterally comparing the considered alternative with each of the other alternatives in the choice set: $R_i = \sum_{j\neq i} R_{i\leftrightarrow j}$. The level of binary regret associated with comparing the considered alternative with another alternative j is conceived to be the sum of the regrets that are associated with comparing the two alternatives in terms of each of their M attributes: $R_{i\leftrightarrow j} = \sum_{m=1\ldots M} R^m_{i\leftrightarrow j}$. This attribute-level-regret in turn is formulated as follows: $R^m_{i\leftrightarrow j} = \ln(1+\exp[\beta_m(x_{jm}-x_{im})])$. This formulation implies that regret is close to zero when alternative j performs (much) worse than i in terms of attribute m, and that it grows as an approximately linear function of the difference in attribute-values in case i performs worse than j in terms of attribute m. In that case, the estimable parameter β_m (for which also the sign is estimated) gives the approximation of the slope of the regret-function for attribute m. See Fig. 1 for a visualization of this formulation of attribute-level-regret (for the situations where $\beta_m = 1$, 2 and 3, respectively).

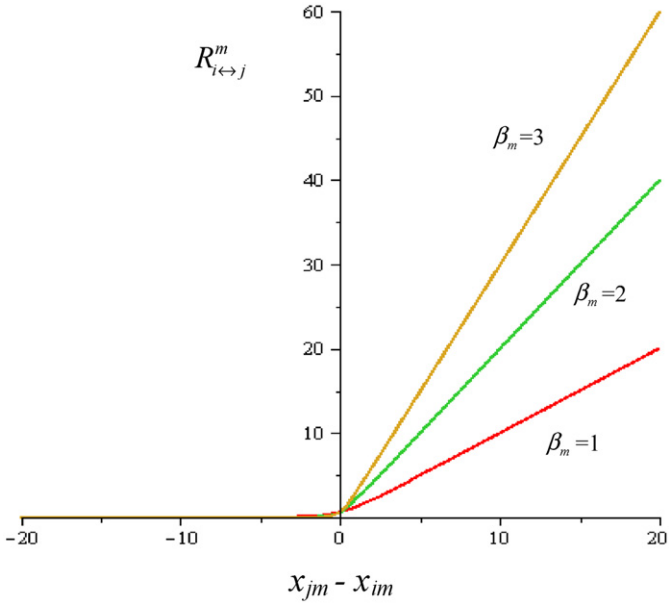

Fig. 1. A visualization of attribute-level-regret $R^m_{i\leftrightarrow j} = \ln(1+\exp[\beta_m(x_{jm}-x_{im})])$.