Acceptability of road pricing and revenue use in the Netherlands

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Abstract

This paper presents the empirical results of a questionnaire among Dutch commuters regularly experiencing congestion, asking for their opinion (in terms of acceptance) on road pricing measures and revenue use targets. We find that road pricing is in general not very acceptable and that revenue use is important for the explanation of the level of acceptance. Road pricing is more acceptable when revenues are used to replace existing car taxation or to lower fuel taxes. Moreover, personal characteristics of the respondent have an impact on support levels. Higher educated people, as well as respondents with a higher value of time and with higher perceived effectiveness of the measure, seem to find road pricing measures more acceptable than other people. When we ask directly for the acceptability of different types of revenue use (not part of a road pricing measure), again abolition of existing car (ownership) taxes receives most support whereas the general budget is not acceptable.

Keywords: Road pricing; Revenue use; Public acceptance.

1. Introduction

Road transport is known to generate considerable external costs, in particular in the form of congestion, accidents and noise. Governments may use different types of measures to deal with these problems, pricing being one of them. Most countries use a number of coarse pricing mechanisms, such as fuel duties, registration fees and parking charges. This current charging regime, however, is not very efficient. Economists have advocated the use of more targeted pricing tools for a long time, and have demonstrated the welfare gains. Nevertheless, these more efficient road pricing measures have up till now only seldom been implemented in practice. The low level of implementation is

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nowadays not so much caused by technical or administrative problems. It is generally acknowledged that pricing measures meet public resistance and that acceptability is one of the major barriers to successful implementation of new and more efficient pricing measures (MC-ICAM, 2003).

Transport pricing schemes have the double consequence of discouraging transport use, at least at certain times on certain parts of the network, and of transferring cash from private persons to other (often public) funds. The fact that road pricing – at least before recycling of revenues – involves such a transfer of cash from private travelers to public institutions, is likely to be a major impediment to its public acceptability. Furthermore, the implementation of efficient road pricing policies typically affects equity in a way that policy makers and/or the general population are likely to disapprove of.

The Netherlands has a long experience in developing new road pricing proposals to reduce the increasing levels of congestion. None of these plans has ever been implemented mainly due to low levels of public acceptance. It is therefore interesting to investigate the issue of acceptance of road pricing and use of revenues in this country. This paper reports on the acceptability of new road pricing measures among Dutch commuters experiencing congestion on a regular basis. The aim is to identify explanatory factors for acceptance levels, especially among a group that relatively often uses road space.

This paper is organised as follows. Section 2 discusses the previous literature on the acceptance of road pricing and the role of revenue use in this. Many public concerns can be identified which policy makers should take into account when thinking about implementation of road pricing. Section 3 outlines the empirical survey conducted, and presents the results from our data analysis. Section 4 concludes.

2. Acceptability and revenue use in literature

A regulator may face different types of constraints ranging from practical (and technical) ones to institutional and acceptability constraints (see for an overview on barriers, Ubbels and Verhoef, 2004) that may prevent him designing and implementing the desired pricing scheme. At present the major barriers to the successful implementation of transport pricing strategies relate largely to lack of stakeholder and political acceptability, rather than to technical or administrative problems. Since raising prices is generally disliked by the respective user group, the acceptance of pricing policies is often low. But pricing also generates revenues, which one can use for many purposes, including influencing the public acceptability of pricing. In this section we discuss literature results on the acceptance of road pricing and revenue use.

2.1 Acceptability and road pricing

Public acceptability of transport pricing measures is generally low when compared with other type of transport measures such as an improvement of public transport (e.g. Bartley, 1995; Jones, 1998). Least accepted are generally all kinds of road user fees

(Schade, 2003). The level of acceptance is related to the perception of road pricing. Public concerns often mentioned include (Jones, 1998):

- It is difficult for drivers to accept the notion that they should pay for congestion, it seems irrational and inappropriate;
- Car users feel that urban road pricing is not needed, roads are a publicly provided good that should be free at the point of use;
- Pricing will not lessen congestion, it is an ineffective measure because drivers will be inelastic to road charges;
- The measure will result in unacceptable privacy issues;
- Road pricing will face implementation problems such as unreliable technology and boundary issues;
- Road pricing is considered to be unfair.

This list of concerns suggests that acceptance is not necessarily very negative; it depends on various aspects that can be influenced by policy makers. Verhoef (1996), for instance, asked morning peak road users about their opinion on road pricing. An overwhelming majority (83%) stated that his or her opinion depends on the allocation of revenues. Revenue use will be addressed in the next subsection. The level of acceptance may also be explained by charge levels; higher charges are generally less acceptable. Other factors, not directly linked to the measure itself, may also be important. Steg (2003) identifies several factors that affect the acceptability of transport pricing. People's problem awareness, the attitude towards car driving, mobility-related social norms and the perceived effectiveness of the measure are identified as important in explaining the level of support. In addition, Rienstra et al. (1999) find that the acceptance of policy measures increases if people are more convinced about the effectiveness of such measures.

Acceptability of road pricing also depends on personal features such as age and income. Following economic theory, it is to be expected that high income earners may be less opposed to price measures to reduce congestion than people with lower incomes, because their value of time is higher. Verhoef et al. (1997) do indeed find that income as well as the willingness to pay for time gains has a significant and positive impact on the opinion on road pricing. Other factors, such as the expectation to be compensated, the perception of congestion as a problem and trip length, are also important in explaining the public's opinion. Rienstra et al. (1999) have analysed the support (together with perceived effectiveness and problem perception) for transport policy measures in general (not in particular for road pricing). They find that several personal features and the perceived effectiveness have a significant impact on the respondent's support for policy measures in transport. While gender and type of household do not seem to have an impact on support levels for transport measures, these tend to be higher when the educational level and age becomes higher. Car and driving licence owners support transport measures significantly less. Of all measures, car drivers have the least support for price measures. The authors find no significant impact of the level of income on the support for price measures.

2.2 Acceptability and the use of revenues

The Verhoef (1996) study already indicated the importance of revenue use for the level of acceptance. There are various options how to use the revenues. Revenues may remain in the road sector by highway investment or road maintenance. Funds may also be used for broader objectives such as the improvement of public transport or a reduction of income taxes. Research has addressed the popularity of revenue spending objectives. Verhoef (1996) found that the allocation objectives that are in the direct interest of the road users received most support, as may be expected. Road investments, together with lower fuel and vehicle taxes ('variabilisation') received the highest average score. General purposes, such as general tax reductions and the government budget in general, obtained least support from morning peak road users. In between were transport purposes other than road, notably public transport.

The importance of the use of the funds in gaining or losing public acceptance for a pricing measure has also been shown by a survey in the UK (Jones, 1998). The attitudes of people to a series of measures that would reduce urban traffic problems were asked. When asked independently (road pricing as a stand alone measure), only 30% responded in support of charging road users to enter highly congested urban areas (Jones, 1998). The respondents were then offered a package that includes a charge on entering a zone that was then used to fund better public transport, traffic calming and better facilities for walking and cycling. This resulted in a support of 57% for the package. A similar result was found in particular for London. A single measure was supported by 43% of the public, whereas 63% accepted the scheme when revenues were used for purposes approved by respondents. Hypothecating revenues thus increases public support.

The AFFORD study conducted an empirical survey on the public acceptability of different pricing strategies in four European cities: Athens, Como, Dresden and Oslo (Schade and Schlag, 2000). They investigated the attitudes of the respondents regarding how to use the revenues arising from road pricing. It was found that common purposes of money use like traffic flow and public transport improvements are favoured by the vast majority of respondents. Lowering vehicle taxes is also supported by the people, whereas lower income taxes is not acceptable as a revenue spending target. This is the way revenues should be used according to the public. The expectations concerning how revenues actually will be used are rather different, however. About 70% of the respondents expect that the money will be used for state or municipal purposes, which are not wanted by the public (Schade and Schlag, 2000). This study has also analysed factors that influence the degree of acceptability of pricing measures. In particular, variables such as 'social norm', 'perceived effectiveness' and 'approval of societal important aims' are positively connected with the acceptability of pricing strategies (Schade and Schlag, 2003).

An interesting study by Small (1992) suggests that public and political support can be reached for road pricing, even without using all revenues to compensate travelers since higher user charges are accompanied by reduced travel times. He searched for a strategy that funds programs with such a variety of distributions of impacts that nearly everyone affected will find at least some offsetting benefits, and a majority will perceive the entire package as an improvement. Seven interest groups were distinguished ranging from traveling public and public transport users to low tax advocates. It was suggested to keep money in the transportation sector. Funds should be allocated about equally

between monetary subsidies to travelers, substitutions of general taxes now used to pay for transportation services, and new transportation services. Small illustrates this by designing a politically feasible (in terms of support from the earlier identified interest groups) congestion pricing package for Southern California. His equity analysis indicates that this program makes every class of traveler better off (combination of travel time saved, financial improvements and transportation improvement), with the greatest gains for higher income drivers and public transport users.

However, there is a downside to using revenues solely to improve acceptability. From a broader perspective, it becomes important also to consider explicitly the interaction (or trade off) between public acceptability and efficiency. Clearly, when too easily a scheme were adopted so as to meet public acceptability requirements, its efficient properties may be undermined – even by so much that the efficiency considerations motivating the scheme in the first place would then call for its cancellation.

3. Acceptance and revenue use in the Netherlands: results from a survey among car commuters

3.1 Aims and data collection

This paper analyses the acceptance of road pricing measures (including the use of revenues) by Dutch commuters who experience congestion. It is important to know which factors influence acceptability of road pricing. Our analysis probably comes closest to that of Rienstra et al. (1999) and Verhoef et al. (1997). We also identify factors explaining the level of acceptance of road pricing and revenue use and include the perceived effectiveness and the value of time of respondents into the analysis. This study extends on the previous work by considering multiple variants of pricing measures, systematically varied over dimensions such as price levels, differentiation and revenue use. Moreover, the individual value of time estimates are now based on a choice experiment, while in the Verhoef et al. questionnaire these were based on open-ended WTP questions. We also include the value of schedule delay and uncertainty into the analysis. The work of Rienstra analysed the support for transport measures in general, we focus more specifically on road pricing measures. For that reason, our sample consists only of car drivers who experience congestion on a regular basis.

The data used in this paper have been obtained by conducting an (interactive) internet survey among Dutch commuters. The full questionnaire can roughly be divided into three parts. First, we asked for some socio-economic characteristics of the respondent (such as education and income). In order to analyse the behavioural responses to road pricing we developed a stated choice experiment, which is the second part of the survey. And finally we asked for the opinion of the respondents on several carefully explained road pricing measures. The first and the second part was answered by 1115 respondents, whereas the latter sample (opinion questions) consisted of 564 respondents. This paper will present outcomes of the analysis of this latter part of the survey.

The data collection was executed by a specialised firm (NIPO), which has a panel of over 50.000 respondents. Since the survey was aimed at respondents that use a car for their home to work journey and also face congestion on a regular basis, we selected working respondents, who drive to work by car two or more times per week, and who

experience congestion of 10 or more minutes for at least two times a week. This resulted in a total of about 6800 possible respondents. An initial analysis revealed that a random sample would result in a relatively low number of women and lower income groups. Because income differences are important to analyse, it was decided to 'over sample' the lower income groups and create an equal number of respondents over the various income classes. The data were collected during three weeks in June 2004 (before summer holidays).

3.2 Survey

As previously explained, the survey started with some general questions asking for important explanatory variables of the respondent. These variables may help explain the differences in acceptance levels. Most variables are explained in Appendix 1. Additional variables included in our analysis are not socio-economic in nature. We have information on the perceived effectiveness of the measures, and have an estimate of the value of time (VOT) of the respondent. It is worthwhile to analyse the effects of these variables on acceptance[1].

Appendix 1 shows the profile of our sample. Apparently Dutch commuters experiencing congestion are in most cases men and relatively highly educated. A majority of the respondents are between 26 and 45 years old and do not have children. These characteristics of our data base have been compared with the general profile of the Dutch car driver experiencing congestion, in order to check representativeness. Research by Goudappel Coffeng (1997) suggests that about 75% of all drivers in congestion are men (equal to our sample). Our sample includes more respondents between the age of 26 and 35 (about 10% more), whereas the share of persons older than 45 years is lower than the 1997 profile. Moreover, drivers in congestion tend to be higher educated (our sample consists of 44.1% Bachelor's and Master's, whereas the general profile has 36%) and have a higher income. The effect of the 'over sampling' of lower income is clearly present. About 25% of the drivers in this sample have an income below €28,500 (modal income), whereas the 1997 profile predicts that only 8% of the drivers fall in this category.

The respondent was confronted with three different types of road pricing measures. After a concise description of each measure, the respondents' opinion on various issues was asked. People could indicate the acceptability of a specific measure on a 7-point scale, ranging from 'very unacceptable' to 'very acceptable'. We also asked how effective they thought that the measure would be, both individually (i.e. would you drive less?) and in general terms (would there be less congestion and will there be smaller environmental problems?). The answers to these latter questions (also on a 7-point scale) have been included into the analysis as explanatory variables for the level of acceptance.

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[1] We do not only have an estimate of the VOT of the respondent, also the value of schedule delay (early and late) and the value of uncertainty are available. We refer to Appendix 3 for more information on the derivation of these values.

Table 1: Short description of the transport pricing measures presented to the respondents.

Measure	Variant
1: Bottleneck passage	1A: flat toll throughout the week
	1B: coarse toll (flat within peak hours on working days)
	1C: multi-step toll during peak hours only
	1D: toll depends on actual traffic conditions
2: Kilometre charge differentiated by vehicle type	2A: Revenues to general budget
	2B: Revenues to traffic system
	2C: Lower car taxation and new roads
	2D: Revenues to public transport
	2E: Abolition of car ownership taxes
	2F: Lower fuel taxes
	2G: Revenues to improve and construct new roads
3: Kilometre charge with different charge levels and different revenue use	3A: 2.5 €cents, unclear revenue use
	3B: 5 €cents, unclear revenue use
	3C: 7.5 €cents, unclear revenue use
	3D: 2.5 €cents, improvement of road network
	3E: 5 €cents, improvement of road network
	3F: 7.5 €cents, improvement of road network
	3G: 2.5 €cents, abolish existing car taxation
	3H: 5 €cents, abolish existing car taxation
	3I: 7.5 €cents, abolish existing car taxation

Within each type of measure, we have developed a number of variants differing on: type of charge (measure 1), type of revenue use (measure 2) and level of charge plus revenue use (measure 3) (see Table 1). This resulted in 4 different variants for measure 1, 7 for measure 2, and 9 for measure 3 (a detailed description can be found in Appendix 2).

All variants were randomly distributed over the respondents. This means that we obtained about 140 observations for each variant of measure 1, 80 for each variant of measure 2, and 60 for each variant of measure 3. A short introduction preceded the explanation of the measures. This was to explain that the respondent had to imagine the implementation of the measures in the Netherlands. It was also to be assumed that the privacy of car users is guaranteed, electronic equipment registers the toll and the driver can freely choose the payment method (e.g. credit card, bank transfer, etc.). The introduction to measure 2 and 3 (time-independent charges) also included an estimation of the financial consequences for an average driver (driving 16,000 km in a year), irrespective of type of revenue use.

In addition, we asked the respondents to evaluate the acceptance of different revenue uses separately (without specifying the road pricing measure). Six different revenue use options were presented to the respondent: the treasury of the government (and hence be used for purposes other than transport); new roads; improvement of public transport (e.g. increase of frequencies); a removal of existing car ownership taxes; a decrease in fuel taxation; and a decrease of income taxes. Again, for each option, a 7-point acceptability scale was used.

3.3   Methodology and results

Before investigating the distribution of the levels of acceptance we start with an overview of the average acceptance levels for each single measure. Figure 1 shows the mean acceptance outcomes and its confidence intervals[2].
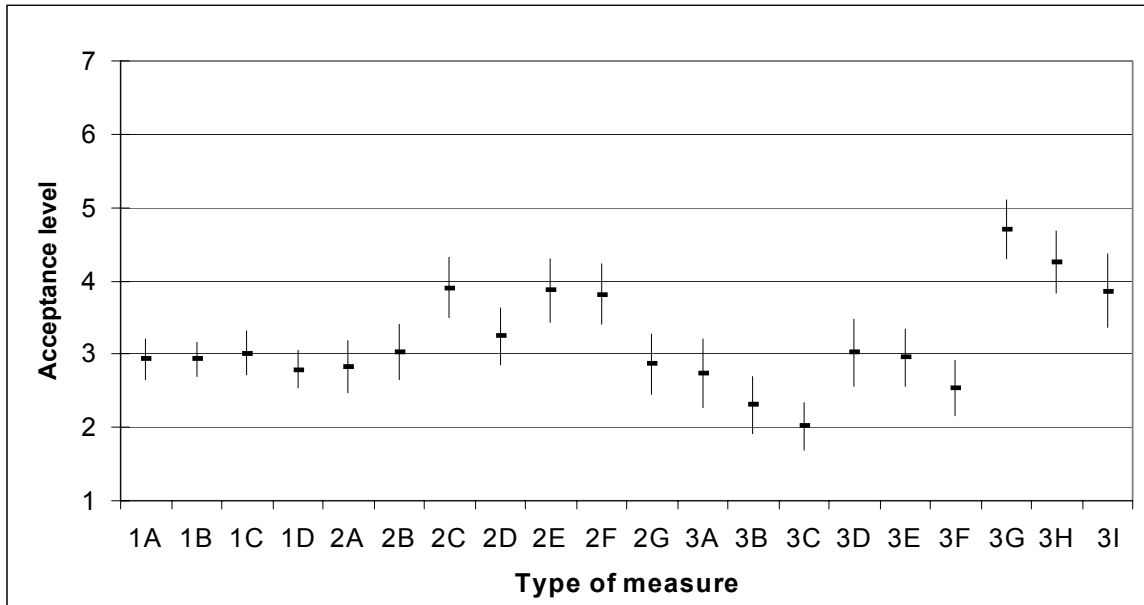

Figure 1: Mean and 95% confidence intervals of acceptance scores on each single measure (level 1 = very unacceptable; level 7 = very acceptable).

The mean level of acceptance differs considerably between the various types of measures. Where all types of measure 1 (bottleneck passage tolls) can be classified as somewhat unacceptable, this is not always the case for the other measures. In particular measures 2C (revenue use: new roads and less car taxation), 2E (abandoning of road taxation) and 2F (lower fuel taxes) have higher acceptance levels. But, a score of 4 still means that the respondents are neutral. The patterns of outcomes for measure 3 can be easily explained by the structure of the measure (a combination of 3 different charge levels with 3 different revenue use options). Apparently the respondents prefer revenues to be used for abolition of car taxation over that of new road and an unclear destination. A charge of 2.5 €cents is more acceptable than higher charges of 5 and 7.5 €cents, as may be expected. Measure 3G has the highest mean (4.7) which comes close to an average score of 5 ('somewhat acceptable').

These findings suggest the following interesting issues. First, given the results for measure 1 it seems that the level of acceptability does not depend on the complexity of the measure. Hence, acceptability is not necessarily a reason for starting simple. Second, measure 3 suggests that revenue use has more effect on the level of acceptance than the charge level (for the chosen range). People prefer a charge of 7.5 €cents with abolishment of car taxation over a charge of 2.5 €cents with revenues hypothecated to the general treasury. This underlines the importance of the allocation of the revenues.

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[2] We present 'unweighted' results. When we correct the outcomes for representativeness (on age, education and income) to obtain a good match with the profile of Goudappel Coffeng and create a 'weighted' sample, we find comparable results.

Appendix 4A shows the percentages of respondents that find the various measures 'unaccaptable' or 'very unacceptable'. These outcomes confirm the previous described 'mean' pattern. For instance, measure 3C is least acceptable, not only on average but also in terms of number of respondents.

Methodology for assessing differences between groups

Various econometric techniques are of course available that can be used to investigate the relation between various variables. The methodology to be applied depends to a large extent on the structure of the data. Here, the aim is first to explain the level of acceptance for the various measures, where the dependent variable consists of a choice out of an ordered set of acceptance alternatives. Given this framework, the ordered probit (OP) technique seems to be most appropriate (see for discussion of OP Maddala (1983)). Ordinary Least Squares (OLS), which assumes an unbounded continuous dependent variable, is less appropriate, although it would have had the advantage of more easily interpretable coefficients.

The underlying response model for an OP estimation is of the following form (see Davidson and MacKinnon, 1993):

$$ACC^* = \beta' X_i + \varepsilon.$$

The underlying continuous response variable ACC* is unobserved, X is the vector of explanatory variables, β gives the vector of coefficients, and ε is the residual. The observed discrete response variable ACC is related to ACC* as follows:

$$ACC = 1 \quad \text{if } ACC^* \leq \mu_1,$$
$$ACC = 2 \quad \text{if } \mu_1 \leq ACC^* < \mu_2,$$
$$ACC = 3 \quad \text{if } \mu_2 \leq ACC^* < \mu_3,$$
$$\vdots$$
$$ACC = 7 \quad \text{if } \mu_6 \leq ACC^*.$$

The μ's (threshold values in the model output) are unknown parameters to be estimated jointly with β, and the model assumes that ε is normally distributed across observations. The constants μ therefore divide the domain of ACC* into 7 segments, which corresponds with observations of the discrete response variable. The model estimates probability intervals for the seven possible answers:

$$\text{Prob}(Z_{ij} = J) = \Phi(\mu_j - \beta' X_i) - \Phi(\mu_{j-1} - \beta' X_i)$$

where Φ is the cumulative standard normal, and Z_{ij}=J represents each acceptability score. The interpretation of the estimated coefficients is not straightforward. The estimated coefficients for the included explanatory variables can be interpreted as indications of shifting the distribution to the left or the right depending on the sign of the β's. Assuming that β is positive, this means that that the probability of the leftmost category (in this case ACC=1) must decline. At the same time we are shifting some

probability into the rightmost cell (ACC=7). But what happens to the middle cells is ambiguous and is dependent on the local densities. Hence, we must be very careful in interpreting the coefficients in this model (see Greene, 1993). The values of the coefficients can more easily be interpreted in a relative sense: a larger value denotes a larger marginal impact.

Various specifications of the model for all measures (by including variables that may be expected to have some explanatory power) have been tried. The following tables present our preferred specifications. The estimations for each type of measure have been done with the same explanatory variables, to maximise comparability between the models.

Measure 1: Electronic toll on daily bottlenecks with fixed revenue use (new roads)

Appendix 6A presents the estimation results for measure 1. The first row presents the estimates for the threshold values (μ's). The second row presents all the explanatory variables that have been included in the estimation. It appears that the individual's value of time, level of education, and compensation of costs by the employer all have a significant and positive impact on acceptance. Most signs of the coefficients are as expected. For example, respondents with higher value of time tend to have higher acceptance levels of an electronic toll on daily bottlenecks. Interestingly, inclusion of the individual's value of schedule delay (early and late) and the value of uncertainty did not lead to significant results. This suggests that people find it hard to predict whether or not uncertainty will reduce under congestion pricing, and whether or not advantages in terms of schedule delay costs can be realized. Alternatively, people may have ignored these matters.

As expected, commuters who have to pay the toll themselves (no compensation) and drive many kilometres tend to find the measure less acceptable than drivers who receive full compensation and use the car less often. Income is not significant; one explanation may be that VOT and education (both correlated with income) take up the expected effect. Income indeed becomes significant (at the 5% level) when VOT and education are not included in the estimation. On the other hand, the type of measure, living in one of the three larger cities (loc1, included to compare the opinions of people located in densely urbanised areas with those in the rest of the Netherlands) and the weight of the car do not seem to have an important impact.

As already apparent from Figure 1, the different types of bottleneck charging measures have no significant effect on the acceptance of the respondent. It makes no difference whether it is a charge at all times (1A), a peak time charge (1B), a differentiated peak charge (1C) or a charge based on actual traffic conditions (1D), although the latter seems somewhat less acceptable than the other three (although not significantly). This suggests that the structure of measure (ranging from a flat and certain charge to a highly uncertain charge depending on traffic density) may not necessarily have an impact on the level of acceptance.

The perceived level of 'general effectiveness' in terms of (less) congestion (i.e. in Appendix 6A general effectiveness (less congestion)) has an important impact on acceptance[3]. The results suggest that respondents who think that the measure will be

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[3] The type of measure that has been proposed has no significant impact on the level of general effectiveness (in terms of less congestion).

effective also tend to find it more acceptable. The effectiveness in terms of less environmental problems is not included in the model as this variable was highly correlated with 'effectiveness (less congestion)'. The 'personal effectiveness' (indicating whether people tend to use their car less when the measure is implemented) shows a somewhat irregular pattern. Compared with people who indicate that they do not change their behaviour (peff=1), respondents who find a personal change more likely have a higher level of acceptance. This may be explained by the 'protest voters' in group 1: "the measure is not acceptable because I will not change behaviour" or "I say I will not change behaviour because I don't want this measure implemented". An explanation of the low score of peff=7 may be that these respondents (who indicate that they will most likely drive less) find the measure not that acceptable because they perceive the consequences of changing behaviour as (very) negative.

The results suggest that acceptance need not depend on the complexity of the road pricing measure. This gives possibilities to policy makers to consider time-differentiated charges that tend to be more effective in reducing congestion. The perception of effectiveness also seems very important for the level of acceptance. Clearly explaining the objectives and expected effects may therefore be an important aspect of the communication strategy of the government.

Measure 2: Kilometre charge dependent on vehicle weight with different revenue use

Appendix 6B shows the estimation results for the second measure. Again, we see the importance of the VOT and compensation of costs by the employer. Education is not as important as for measure 1. One explanation may be that measure 2 (like 3) is more easily accepted on the basis of equity arguments, which require less intellectual effort than effectiveness or efficiency. A striking difference with the previous estimation is the difference between the (sub-) types of measure. Measures C, E and F received significantly more support than measure G, but also than the other 3 variants of this measure. This suggests that when revenues from the charge are used to lower or abandon existing car taxation (2B and 2E) or fuel taxes (2F), more public support is obtained. The weight of the car (and also the number of kilometres driven yearly) does not have a significant impact, despite the fact that this measure differentiates on this characteristic. Again, perceived general effectiveness in terms of congestion and personal effectiveness have a significant impact on the level of acceptance. We have included the effectiveness in terms of less congestion into the estimation and not the effectiveness on the environment despite its possible relevance here. These two variables are again strongly correlated and have equal results in terms of significance. The mean score on environmental effectiveness is only slightly higher than the perceived effectiveness on congestion (it is not "very probable" that congestion will decrease or that the environment will benefit from this measure). Given the nature of this measure, a greater difference might have been expected. Personal effectiveness shows almost the same (irregular) pattern that we found for measure 1, and again the same hypothesis applies here.

The analysis indicates that (as expected) revenue use is an important explanatory variable for the acceptance level. Revenue allocations that are in the direct interest of the individual are more popular. This confirms the findings of other studies such as Verhoef (1996). Characteristics of individual specific (mobility) behaviour tend to be of

less relevance, except for the value of time. The perceived level of effectiveness of the measure by the respondents is important (as also confirmed by the results of Steg (2003).

Measure 3: Kilometre charge with different toll levels and revenue uses

The third measure that we have analysed consists of 9 sub-measures that combine one out of three types of revenue use with one out of three levels of a charge. Two sets of dummy variables thus define the type of measure: one for the type of revenue use and one for the level of the charge. Appendix 6C shows the results for this estimation. It is interesting to see that the level of acceptance very much depends on the way revenues are redistributed, and (but less so, for the values considered) the level of the charge (as may be expected). Higher charges are relatively less acceptable, and the abolition of existing car taxes is far more acceptable than an unclear revenue use (note the high coefficient), and somewhat more acceptable than the construction of new roads. This is consistent with finding that measure 3G (combination of low charge and abandoning of existing car taxes) is relatively most acceptable (confirmed by the results shown in Figure 1). It is remarkable that the weight of the vehicle has an explanatory impact here. This may have something to do with the fact that the previous measure 2 was differentiated according to weight. In indicating acceptance respondents may have compared measure 3 with that measure; and therefore people with smaller cars now find this measure less acceptable. Expected effectiveness again has a very significant impact on the level of acceptance. Commuters who indicate that the measure will be effective are less opposed to this measure. The respondents' value of time, education and personal effectiveness seem to lose importance compared with the other measures. In contrast to the previous measures, personal effectiveness is no longer significant. It is not clear what causes these differences with the previous cases.

The predictability of the charge level and the complexity of the measure may not be important (see measure 1), but the level of the charge and the revenue use is relevant. Individual characteristics are less important in explaining the level of acceptance. The differences between groups are small, which makes it difficult for governments to specify certain groups that may be compensated to increase acceptance.

Revenue use only

Finally, we asked the respondents for their opinion on the allocation categories of the revenues per se, so without defining the road pricing measure. Six different possibilities were evaluated on acceptance by the respondents (general budget, new roads, improve public transport, abandon existing car taxation, lower fuel taxes, and lower income taxes). The findings presented in Figure 2 are largely in line with the previous findings of revenue use as part of a road pricing measure. An abolition of existing car taxes is most preferred (a mean score of 5.85, a 6 is 'acceptable'), whereas the general budget is 'unacceptable'. The construction of new roads is valued rather positively here, while the acceptability of measure 2G (kilometre charge with the same type of revenue use) is considerably lower (see Figure 1). More than 74% of the respondents indicated that the general budget is 'unacceptable' or 'very unacceptable' (see Appendix 4a). The

confidence intervals are smaller than those of the road pricing measures (see Figure 1), indicating less variance in the answers.
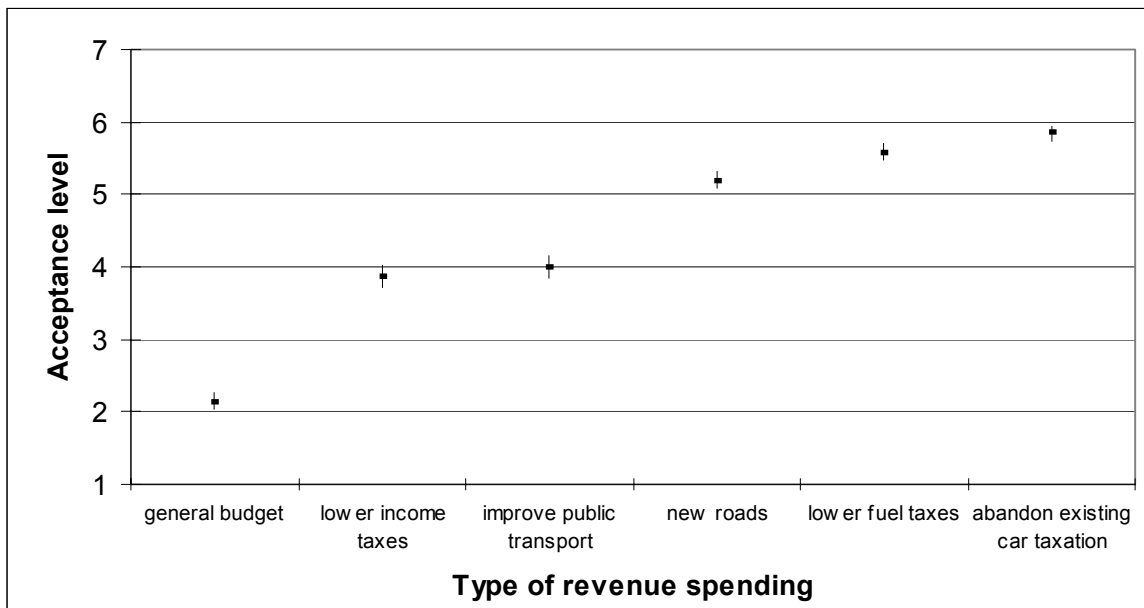

Figure 2: Mean and 95% confidence intervals of acceptance scores on each type of revenue use (level 1 = very unacceptable; level 7 = very acceptable).

We have carried out a similar type of (ordered probit) analysis as we did for the road pricing measures, in order to explain the acceptance levels for these types of revenue use. When policy makers want to compensate certain groups, it is useful for them to know the preferences of these groups. The estimations of the preferred results can be found in Appendix 5. Again, for each type of revenue use the same explanatory variables have been included after having tried various specifications of the model (by including and excluding variables that may be expected to have some explanatory power).

The results differ greatly over the various types of revenue use. Income is only significant when revenues are used to lower income taxes or to construct new roads. Lower income groups dislike revenues to be used for new roads more than people with a higher income, whereas the opposite holds when revenues are used to lower income taxes. The explanation for the first finding could be that lower income people drive less. For the second finding, the higher marginal utility could be an explanation. Hence, when policy makers propose to compensate the lowest income groups by lowering income taxes they obtain most support from this category (although overall support levels for this type of measure are rather modest). Another interesting variable is the compensation of costs by the employer. As may be expected, respondents who are not or only partly compensated have in general more support for abolition of existing car taxation than people who do not have to pay these taxes. This may also explain the disapproval of revenues being used for the general budget by people without full compensation; personal compensation is a better objective for this group. The weight of the vehicle seems important for two targets: lower fuel taxes and improvement of public transport. Owners of smaller vehicles (with lower weights) find lower fuel taxes less acceptable than others, this may be explained by the fact that this group drives relatively more fuel efficiently and consequently benefits less than people with large (and heavy)

cars. The importance of the VOT for certain allocation categories (i.e. general budget and improvement of public transport) seems somewhat strange and inexplicable.

The findings on acceptance for revenue use targets are similar to earlier reported results in the literature. The allocation objectives that are in the direct interest of the road users receive most support. Improvement of public transport is less acceptable in comparison with the findings of Schade and Schlag (2000). Revenues may theoretically ideally be used to reduce distortive income taxes (which is beneficial from a welfare perspective), but support for this option from Dutch commuters is low.

4. Concluding remarks

Despite the fact that politicians and the public regard transport problems as very urgent and important, people do have concerns about road pricing, often resulting in low acceptance levels. The outcomes from a survey among Dutch commuters analysed in this paper confirm this scepticism. The first measure that has been evaluated by the respondents (electronic toll differing according to place and/or time without changing revenue use) is in general (for all alternatives) perceived as somewhat unacceptable, irrespective of the type (or alternative) of measure. The acceptance of second measure (a kilometre charge depending on vehicle weight combined with different allocation of revenues) does depend on the type of measure. This indicates that the respondents' opinions on road pricing are very sensitive to the way tax revenues are allocated. The measure is more acceptable when revenues are used for a decrease in fuel taxes, an abolishment of existing car taxation or to lower existing car ownership taxes together with the construction of new roads; indeed those targets that are in the direct interest of the respondent (car driver). These findings correspond with results from the third measure. It is also found that higher charges are less acceptable.

Most of our findings are in line with results of previous literature. For the first two measures (and to a lesser extent also for measure 3) it was found that education, the VOT of the respondents and financial compensation (partly or full) by the employer are important explanatory variables. Higher educated people, as well as respondents with a higher VOT, seem to find road pricing measures more acceptable than others. The same holds for people that receive financial support for their commuting costs. The perceived effectiveness of the measure (in terms of less congestion) does have an important (positive) impact on the support levels. Finally, we found a weaker relationship, an inverted U, between personal effectiveness and support levels.

The analysis of measure 1 showed that the complexity of a measure does not affect the levels of acceptance. The structure of this measure was varied (with different toll structures when passing a bottleneck), while revenue allocation was kept constant. This may suggest that policy makers can consider more efficient differentiated pricing schemes instead of a rather simple flat fee in dealing with bottleneck congestion, without loosing acceptance. We have also included the value of schedule delay (early and late) and the value of uncertainty of respondents into the analysis of these measures. The results do not confirm that these individual indicators are important in explaining acceptance. Despite the hypothesised impact of variables such as income, the driven number of kilometers and weight of the car (with measure 2), we haven't found

evidence on this. The effect of income seems to be fully captured by education and the value of time.

The above findings on revenue use targets are largely confirmed when we do not present the type of measure, and ask directly for the acceptance of various ways to redistribute the revenues. Dutch car commuters find it almost acceptable when policy makers decide to use the revenues to compensate the car drivers by abandoning current car taxation. This option outperforms all other destinations in terms of acceptance. Lower fuel taxes and new roads are slightly less acceptable. By far the least attractive option is the public treasury. The analysis towards explaining variables of these revenue use targets showed a very diverse pattern. For some allocation categories (lower income taxes and new roads) income was important, whereas for other spending targets compensation of costs by the employer (e.g. abandoning existing car taxation) and the weight of the vehicle (e.g. lower fuel taxes) appeared to have impact on acceptance. Income seems the most relevant variable in this case because equity is often an issue when it comes to implementation of pricing measures and policy makers may want to compensate the lower income groups. It appears that lower income groups have a stronger preference to lower existing income taxes with revenues from road pricing compared with higher income people. The opposite holds when revenues are used to construct new roads.

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