Road pricing and (re)location decisions households

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Taede Tillema
Urban and Regional research centre Utrecht (URU)
Utrecht University
t.tillema@geog.uu.nl

Dick Ettema
Urban and Regional research centre Utrecht (URU)
Utrecht University
d.ettema@geog.uu.nl

Bert van Wee
Section of Transport Policy and Logistics Organisation
Faculty of Technology, Policy and Management
Delft University of Technology,
g.p.vanwee@tbm.tudelft.nl

Abstract

This paper focuses on possible influences of road pricing policies on residential and work location choices of households. Road pricing may play a role in both stages of the relocation process: the decision whether or not to relocate and the choice of the new residential location. On average roughly 5 percent of the respondents indicated a remarkably high probability of moving to another residential location if a road pricing measure would be implemented. The probability of searching for another job on the other hand was found to be significantly higher for all price measures: on average 13.5 percent. The majority of these respondents also answered that the chance of changing house or work within 2 years (for whatever reason) is considerable. Therefore, the actual relocation specifically due to road pricing may be considerably lower than the observed percentages. Important explanatory variables for changing the residential or work location due to the introduction of a kilometre charge are: the level of travel cost compensation, the size of the municipality, the type of region (i.e. living in a region suffering from congestion problems or not), and the number of working hours per week. Specifically in the case of work change, the commuting distance is an important explanatory factor too. Finally, beside the more personal, work and trip related characteristics, several perceptions and short term behavioural changes also seem to have a relation with the relocation probability. Furthermore, looking at the influence of different variables in the actual residential location choice, travel cost (including road pricing) seems to be an important factor. First of all respondents are more sensitive to travel costs than to housing costs. In the second place respondents value travel time less negatively than travel costs. Next to travel cost, location related factors such the type of location and the number of bedrooms seem to be important factors in a residential location choice too.

1. Introduction

Road pricing policies are increasingly implemented in urbanised areas around the world. The most important reason for implementing road pricing is to alleviate congestion and to increase accessibility of urban regions. Additional motivations are the reduction of negative effects of car traffic, such as noise nuisance, local air pollution, acidification and climate change, and the generation of revenues, that can be used to build and maintain infrastructure.

Road-pricing policies are seen as a potentially promising measure to alleviate congestion problems in several countries (Bovy, 2001; Bovy and Salomon, 1999). By means of road pricing, travel costs are more directly linked to the use of the road. In the short run, implementation of road pricing could lead to changes in route choice, departure time, the choice of the mode of transport and in the frequency of travelling (May and Milne, 2000; TfL, 2003). In the longer term, relocation decisions, such as changes in residential or work locations, may also occur (Banister, 2002). To properly assess the effects of road pricing, it is important that relocation decisions are included. Relocations imply changes in car trip patterns and car trip distances, which in turn have an effect on congestion levels and the results of road pricing. On the other hand, relocations may imply that alternative modes become more or less attractive, leading to mode changes, which also affect congestion. Additionally changes in residential and work locations may also have an impact on the housing market, such as for example the need for more or less houses at particular places and/or changing housing prices.

In contrast to the more extensive (economic) literature on short term responses to road pricing, the influence of road pricing on (re)location choices has received only limited attention to date. Sometimes more long term elasticities implicitly take these location effects into account, but then only partly because empirical data is often available for only a few years after a price change. However, there are relevant studies in adjacent areas. A substantial body of literature (e.g. Wingo, 1961; Alonso, 1964; Muth, 1969) describes the influence of the traffic and transport system on residential and work locations. Some of this literature, especially the older work, is based on the classical spatial micro-economic model developed by Von Thünen in the nineteenth century, later (especially in the 1960's) extended and refined by other researchers such as Wingo, Alonso and Muth. A general criticism raised against these micro-economic models is that the influence of transport costs in location decisions is

overestimated. This overestimation is due to the neglect of non-monetary travel costs, such as travel time. In addition, while studying the effect of travel impedances on residential and work location choices in general, they do not focus on possible relocation effects initiated by a road pricing measure. This is a shortcoming since road pricing may lead to a different perception of travel impedance, possibly affecting the influence of travel costs in location decisions.

Other studies have investigated the importance of accessibility and travel related variables on one hand and location and house related factors on the other hand in location decisions, by using discrete choice models (e.g. Timmermans *et al.*, 1996; Rouwendal and Meijer (2001); Molin and Timmermans, 2002). However, these studies do not include road pricing as a variable determining locations choice. In addition, these models describe the choice between location alternatives, and do not address the decision whether or not to relocate.

Finally, some studies have started to address the spatial effects of road pricing. These studies can roughly be subdivided into theoretical studies on the one hand and modelling studies on the other hand. However, empirical studies specifically based at relocation effects due to road pricing have not been found. In the theoretical studies expectations of spatial effects of road pricing are often based on research in related areas, such as for example location behaviour studies (e.g. Banister, 2002; MuConsult, 2000; Blok *et al.*, 1989). In the category of modelling studies, impacts of pricing policies on location choices are usually modelled based on utility theory (e.g. Eliasson, 2002; Anas and Xu, 1999; Arnott, 1998). However, these theories and models have not been validated against empirical data.

Thus, while relocation decisions are likely to impact the outcomes and success of road pricing strategies, the literature on this topic is limited. This paper aims at providing additional insight into the effect of road pricing on relocation decisions of households. The paper will address two main topics, which have received only minor attention to date. First, the decision whether or not to relocate in response to pricing policies will be investigated. Second, the paper will focus on the relative importance of road pricing as compared to other factors that affect relocation decisions (e.g. travel time, characteristics of the dwelling and its surroundings). In this second case, the study specifically aims at assessing the importance in location decisions of travel costs versus travel time on one hand and of travel cost versus monthly housing costs on the other hand.

The paper will be structured as follows. The next section provides the theoretical framework. Section 3 focuses on the used data and on the study design. Section 4 discusses the probability of households changing their residential or work location due to a road pricing measure and furthermore presents the explanatory variables for the probability to change location. The importance of trip and location related variables in a location decision is described in section 5. The conclusions finally follow in section 6.

2. Theoretical framework

Figure 1 presents a conceptual model for the relation between road pricing and (re)location choice. Central to our approach is the observation that relocation decisions consist of several stages (Devisch *et al.*, 2005). The first stage can be termed awakening. This implies that a household realises that it can improve its housing conditions by moving to another dwelling at another location. Awakening can be caused by various triggers. These may relate to changes in the household, such as changes in household composition, changes in income or changes in preferences but also to external factors, such as changes in the environment (e.g. socio-economic status of the neighbourhood). These factors are summarized as 'other factors' within figure 1. Besides that, generalized transport costs clearly can also be an external trigger for awakening (figure 1). Relocation decisions may also be quite dependent on the type of road pricing measure (not presented in figure 1). More general forms of road pricing, such as a flat kilometre charge, may especially have an effect on the distribution of people over locations. The effect of such a pricing measure on the demand where houses or business parks should be built seems to be lower, as was computed with so-called land-use transport interaction models (e.g. Eradus *et al*., 2002). The strongest spatial effects are expected to occur when spatial dependent forms of road pricing are implemented, such as for example a spatial differentiated kilometre charge or a cordon charge.

Once the decision to relocate is made a household will evaluate available dwellings on a set of criteria, including characteristics of the dwelling and the environment. One of the factors in this respect can be the expected (generalized) travel costs implied by the residential location, which are affected by road pricing policies (see figure 1). Especially in the spatial economic theories from the 1960's (e.g. Alonso, 1964; Muth, 1969) the trade-off between travel costs for commuting and the housing cost are determining for the residential location in relation to the work location. Since the 1970's several authors criticised these classical spatial-economic

theories. The most important criticism in general being that the classical spatial-economic theories from the sixties overestimate the influence of transport costs in location decisions (for example O'Farrell en Markham, 1975; Weisbrod *et al.*, 1980). Nevertheless, although these theories from the sixties are regarded to overestimate the influence of travel costs, transport costs seem to influence location decisions to a certain extent. Besides that, road-pricing costs make travel costs more variable, possibly leading to an even stronger connection between generalized travel costs and location choices (figure 1) than when travel costs only consist of fixed costs (such as for example road taxations). It follows that road pricing may play a role in both stages of the relocation process: the decision whether or not to relocate and the choice of the new residential location. If road pricing plays a role in the decision to relocate, it will logically also affect the residential location choice. However, if a household chooses to relocate for another reason, road pricing might still influence the choice of a new residential or work location.

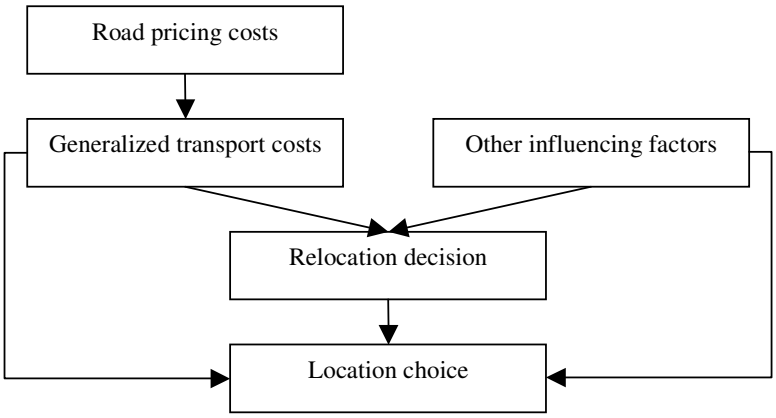

Figure 1: road pricing and (re)location choice

Due to relocations, spatial changes in the demand of locations may occur. These demand shifts can also lead to changing housing prices. However, these changing prices will first of all quite likely depend on the type of pricing measure. For example, spatial differentiated forms of pricing may lead to higher spatial price differences than more general types of measures. Secondly, the influence of a specific price measure on housing prices will be dependent on the spatial characteristics of a certain region. For example, are jobs and houses evenly spread over a region or do clear nodes exist where work and housing activities come together? Although effects of measures on housing prices might occur, this paper will not focus on studying these price effects.

3. Data and study design

As discussed in section 2, road pricing might influence the relocation decision itself, but might also affect the final location choice of people. Therefore, this paper focuses on the following two goals:

- To get insight into the probability of households to change to a residential location (in most cases: closer to work), or to search for another job (in most cases: closer to home) under influence of a road pricing measure and furthermore to get insight into explanatory variables for the relocation choices;
- To get insight into the relative importance of trip and location related variables in the actual residential location choice with the final goal of getting more insight into location decisions under road pricing conditions.

The second goal especially focuses on the importance of travel costs versus travel time and on the influence of travel costs versus monthly housing costs in location decisions. Staying in line with the mainstream in the field of transport theory and modelling, both goals are studied by taking the micro-economic consumer theory as point of departure. The first goal, the probability of location change of households (including explanatory variables), is studied by using stated preference data. In a questionnaire people were asked to indicate the probability of moving to another house closer to work, or to search for a job closer to home[1], after a road pricing measure was shown to them. Several road-pricing measures were presented to each respondent. Furthermore, the second goal is studied on basis of a stated choice experiment in which respondents had to choose between alternatives consisting of trip and location related variables.

The total data collection took place in two questionnaire rounds, partly held amongst the same respondents. To get insight into the probability of relocation due to road pricing measures and into explanatory variables for those relocation choices specifically due to the introduction of a road pricing measure, a questionnaire survey was conducted amongst 512 respondents. This questionnaire especially focussed on the behavioural effects (short and long term) due to

[1] This research only focused on shortening the commuting distance due to a pricing measure. In reality people may also decide to increase the distance (by changing house or work location). This can for example be the case when a price measure leads to substantial decreases in traffic congestion. However, it is expected that the large majority of people (especially with respect to a kilometer charge) will reduce the commute distance when they are going to relocate due to a pricing measure. Therefore this paper only studies relocations aimed at shortening the commute distance.

introducing different forms of road pricing. Five different measures were shown to each respondent. After reading each measure, the respondent had to answer several questions regarding behavioural changes and acceptability related issues. Although each respondent only answered questions for five measures, each measure consisted of different variants, which were randomly assigned to the respondents. The five pricing measures, including the different variants within each measure, are shown in table 1. The first measure is a flat kilometre charge. The revenues of the charge are either used for abolishment of fixed car taxes or for lowering income taxes. Measure 2 consists of two different types of measures. The first measure resembles a low fixed kilometre charge with an additional time dependent toll on congested bottlenecks. The second variant is a kilometre charge based on the weight of the car. Furthermore, measure 3 consists of a time dependent kilometre charge. The usage of revenues is comparable to measure 1. Finally, measure 5 and 6 resemble cordon charges with a price level of respectively 5 and 8 euro. Only when entering a medium/large city by car, the fixed toll has to be paid.

Table 1: different pricing measures and variants within the questionnaire

Measure	Alternative
1. km charge	A: 3 € cent, abolishment of car ownership taxes B: 6 € cent, abolishment existing car taxation (purchase and ownership) C: 12 € cent, abolishment existing car taxation and building new roads D: 3 € cent, revenues used for lowering income taxes E: 6 € cent, revenues used for lowering income taxes F: 12 € cent, revenues used for lowering income taxes
2. km charge	A: 2 € cent with a morning and evening peak time charge (time dependent and stepwise) B: differentiated according to weight of the car, revenues used to abolish existing car taxation (4, 6, 8 € cent for respectively light, medium weight and heavy cars)
3. km charge	A: 2 € cent outside and 6 € cent within peak periods, abolishment of car ownership taxes B: 4 € cent outside and 12 € cent within peak periods, abolishment existing car taxation C: 8 € cent outside and 24 € cent within peak periods, abolishment existing car taxation and building new roads D: 2 € cent outside and 6 € cent within peak periods, revenues used for lowering income taxes E: 4 € cent outside and 12 € cent within peak periods, revenues used for lowering income taxes F: 8 € cent outside and 24 € cent within peak periods, revenues used for lowering income taxes
4. cordon charge	A: 5 euro for entering city of min. 40.000 inhabitants, revenues used for lowering income taxes B: 5 euro for entering city of min. 40.000 inhabitants, revenues used for improving quality of public transport in region C: 5 euro for entering city of min. 40.000 inhabitants, revenues used for improving quality of public transport in whole country
5. cordon charge	8 euro for entering city of min. 40.000 inhabitants, revenues used for lowering income taxes

Roughly half of the group of respondents (263) were selected from earlier questionnaire rounds, which only focussed on commuters. These 263 respondents are workers, who

commute by car two times or more per week and face congestion of 10 or more minutes per trip for at least two times a week. Car commuters have been selected for the sample since they are likely to be confronted with road pricing once implemented. The only selection criterion for the other half (249 respondents) of the sample is that respondents had to possess a car. Taking this other group into account makes it also possible to compare effects of a road pricing measure between different user classes. After a pricing measure was shown respondents who had a job (i.e. 422 of the 512 respondents) were asked to indicate the probability that they would change to another residential location closer to work. A second question aimed at the probability of searching for another job closer to the residential location. The response scale for both questions consisted of 7 categories (Likert-scale) ranging from 'highly unlikely' to 'highly likely'.

To investigate the relative influence of trip and more location related variables in the actual residential location choice (second goal), data from a stated choice experiment among 564 respondents is used. Again the respondents were commuters, who drive to work by car two times or more per week and face congestion of 10 or more minutes per trip for at least two times a week. To every respondent 9 hypothetical choice situations were shown, consisting of two alternatives. The total design of the experiment consisted of 27 choice situations. Therefore, three blocks of 9 screens were randomly assigned to the respondents. The experiment was generic (i.e. non-alternative specific). This means that both alternatives consisted of the same attributes and that alternatives were not labelled (for example not one alternative always having higher toll costs). The alternatives within the experiment were: number of bedrooms, the monthly rent or mortgage costs of the house, the location ((large) city, medium sized city, small village/rural area), the travel time (free flow and time in congestion) and travel costs (road pricing and fuel costs). Every attribute systematically varied at 3 levels. The actual values shown were tailored to the specific situation of the respondents such as the actual commuting distance. The number of bedrooms presented in the choice screens was made dependent on the type of housing. The monthly housing cost in the experiment furthermore, was varied around the actual housing cost. Additionally, a distinction was made between rent and mortgage costs. Fuel costs for respondents who get fuel cost compensation in the current situation were set to zero within the experiment. Finally, the set-up of the experiment aimed at making differentiations in monthly cost on average comparable to travel cost variations (including monetarized travel time, toll and fuel costs).

4. Relocation due to road pricing

This section is split-up into two parts. The probabilities of changing the residential or work location due to various types of road pricing measures are described in section 4.1. Furthermore, section 4.2 focuses on explanatory variables for relocation chances due to a kilometre charge.

4.1 Relocation probability (descriptive)

Two types of relocation probabilities have been studied: on one hand moving house to a location closer to work and on the other hand searching for another job closer to the residential location. Table 2 shows the probability of changing the residential location due to different price measures. In total 5 measures are distinguished (see table 1 for a further explanation). The probability of moving is measured by means of 7 categories. For each price measure, the percentage of respondents that chose a certain probability category is reported. For example in case of price measure 1, almost 72 percent of the respondents indicated that the probability of moving house due to the measure is extremely low. Furthermore, the sums of different categories (5 to 7 and 6 to 7) are shown at the bottom of the table. 'Sum 5 to 7' indicates per price measure the summation of the categories 5, 6 and 7; in the same line 'Sum 6 to 7' resembles the summation over the categories 6 and 7.

Table 2: probability of moving house (distinction in measurement type)

Probability of moving house (%)	M1	M2	M3	M4	M5
1: Extr low	71.8	69.9	64.7	61.8	62.6
2: Low	19.4	20.1	25.4	23.1	23.5
3: Quite low	2.1	2.6	2.8	4.6	2.5
4: Not low/high	2.4	3.6	3.6	3.4	4.6
5: Quite high	1.9	1.9	0.9	3.4	2.5
6: High	1.2	1.2	2.1	2.9	1.7
7: Extr high	1.2	0.7	0.5	0.8	2.5
Sum 5 to 7: quite to extr. high	4.3	3.8	3.5	7.1	6.7
Sum 6 to 7: (extr) high	2.4	1.9	2.6	3.7	4.2

Table 3: probability of searching for another job (distinction in measurement type)

Probability of searching another job (%)	M1	M2	M3	M4	M5
1: Extr low	56.6	60.2	57.8	49.2	52.1
2: Low	22.7	21.6	22.3	22.7	17.6
3: Quite low	3.6	3.1	3.1	5.0	5.0
4: Not low/high	6.2	5.2	5.0	6.3	7.6
5: Quite high	6.4	5.5	5.5	7.1	6.3
6: High	3.1	3.8	5.0	7.6	7.6
7: Extr high	1.4	0.7	1.4	2.1	3.8
Sum 5 to 7: quite to extr. high	10.9	10	11.9	16.8	17.7
Sum 6 to 7: (extr) high	4.5	4.5	6.4	9.7	11.4

The average percentage of respondents (seen over all measures) that indicated the probability of moving house to be quite high, high or extremely high, amounts to 5.1 percent (i.e. the average value of the numbers in the row 'Sum 5 to 7'). Looking only at a high or extremely high probability, this value decreases to 3.0 percent (average value over price measures for row 'Sum 6 to 7'). The cordon charge (i.e. M4 and M5) shows the highest probability of moving. This seems in line with the expectation that a more spatially differentiated charge (in this case the cordon charge) leads to higher relocation probabilities (see also section 2). However, only respondents that were expected to cross a cordon during their commuting trip answered the cordon related relocation questions. In total 238 respondents answered the relocation questions in relation to the cordon charge. For the kilometre charge all 422 working respondents in the sample responded to the relocation questions. Now, the probability of moving house due to a cordon charge may be somewhat overestimated in relation to the kilometre charge, because only car commuters (at least one time per week) that are expected to pass a cordon were asked to indicate the probability of relocation. In the case of the kilometre charge all car commuters, even with shorter distances had to answer the relocation questions. The expectation is that commuters who are not expected to pass a cordon for their commute trip will have a lower probability of changing locations.

The probability results of searching another job are described in table 3. This probability is significantly (statistical) higher than the probability of moving to another residential location (for all measures). 13.5 percent of the respondents indicated that the probability is quite high, high or extremely high and 7.3 percent reported a high to extremely high probability. The results presented in table 2 and 3 are valid for the sample which consists partly of car commuters who are facing delays due to traffic congestion on a regular basis (at least two times a week with a minimum of 10 minutes) and partly of commuters possessing a car. However, dataset characteristics in this phase have not been compared with average

characteristics of commuters in for example the Netherlands. Therefore, the probabilities found are not directly transferable to commuters in general.

Furthermore, it is good to put the observed probabilities specifically due to a road pricing measure in the light of the probability that the respondents are going to relocate anyway. Therefore, the questionnaire contained two questions regarding the chance of changing house or job within a certain period (i.e. 2 years). Table 4 shows the relation between the probability of moving the residential location specifically due to road pricing and the probability of moving house within 2 years for whatever reason. There seems to be a clear positive and significant relation (i.e. Kendall's tau-b is positive and significant) between a high probability of moving the residential location due to road pricing and between a high probability of moving house within 2 years for whatever reason. Furthermore, the same kind of positive significant relation is found between a high probability of searching for another job due to road pricing and the probability of changing job within 2 years. Thus, in general the majority of respondents that reported a high probability of changing location due to a road pricing measure also seem to consider relocation anyway. On one hand one may conclude therefore that the actual probability of relocation specifically due to road pricing is lower than presented in the tables 2 and 3. On the other hand however, road pricing can still be the initiating factor leading to relocation when people already consider relocation (for whatever reason).

Table 4: relation between prob. Of moving house due to pricing and of moving house within 2 years anyway for all pricing measures combined

Cross tabulation	*Prob. move house within 2 years* (very low, low=0; moderately, high, very high =1)			
Prob. move house due to road pricing (very low, low, quite low, nor low/nor high=0; quite high, high very high =1)		0	1	Total
	0	1176	139	1315
	1	346	81	427
	Total	1522	220	
			Value	P-value
	Pearson X^2		139.4	0.000
	Kendall's tau-b		0.283	0.000

Table 5: relation between prob. of searching for another job due to pricing and of moving house within 2 years anyway for all pricing measures combined

Cross tabulation	*Prob. change job within 2 years* (very low, low=0; moderately, high, very high =1)			
Prob. search another job due to pricing (very low, low, quite low, nor low/nor high=0; quite high, high very high =1)		0	1	Total
	0	1150	57	1207
	1	372	163	535
	Total	1522	220	
			Value	P-value
	Pearson X^2		222.7	0.000
	Kendall's tau-b		0.358	0.000

4.2 Explanatory characteristics for relocation choice

4.2.1 Residential relocation

Table 6 gives the results of an ordered probit analysis aimed at getting insight into explanatory variables for the probability of moving to a residential location closer to work due to the introduction of a kilometre charge. For the analyses the relocation probabilities observed for the first three pricing measures (see table 1) were combined. Explanatory variables for the cordon charge are not presented in this paper (i.e. measures 4 and 5). Furthermore, to be able to study the explanatory characteristics of changing locations specifically initiated by a road pricing measure, respondents that indicated to have a moderately high, high or extremely high possibility of changing their residential location within 2 years (for whatever reason) were removed from the dataset. In total a range of about 30 variables were tested on significance. The variables consisted of various socio-economic characteristics (e.g. income, household size, age, education level) and furthermore of other household related and various trip and price measure related characteristics. Finally also attitudes and perception characteristics were tested. Only variables significant with a reliability of at least 90 percent are presented in the table.

Table 6: results analysis of probability of moving house closer to work (ordered probit) due to a km charge

	Coefficient	T-value	P-value
Constant	0.0114	0.056	0.9555
Personal, work and trip related characteristics			
dummy yearly gross household income high (>68000 euro =1)	0.4052	2.799	0.0051
dummy living alone (yes=1)	-0.2472	-1.794	0.0728
dummy owned house (yes=1)	-0.4060	-3.343	0.0008
dummy living in a region with congestion problems (yes=1)	-0.2582	-2.379	0.0173
dummy size municipality (≥50.000 inhab.=1)	-0.2440	-2.352	0.0187
dummy travel cost compensation employer (completely compens.=1)	-0.4784	-3.748	0.0002
dummy working hours/week (≥35 hours/week=1)	0.4537	3.479	0.0005
dummy car medium weight (yes=1)	0.2610	2.540	0.0111
dummy gasoline car (yes=1)	-0.3491	-2.875	0.0040
Perceptions and behavioural changes			
dummy perception of being better of due to measure (better of =1)	-0.4859	-2.454	0.0141
dummy adjusting short term trip behaviour due to rp measure (yes=1)	0.2914	2.178	0.0294
dummy prob. changing job due to rp measure (quite to high prob=1)	0.3384	2.283	0.0224
μ_1	1.173		
μ_2	1.769		
Log likelihood (constants)	-540.6		
Log likelihood (convergence)	-488.5		
X^2	104.2		

The μ-values in table 6 are the threshold parameters. Since the equation does include a constant term, one of the threshold parameters is not identified. We normalize the first to 0. The reason for having only 2 μ values is that some of the 7 response categories (see section 3) had to be combined to reach an acceptable data fill in each class. A further general characteristic is that the table makes a distinction between personal, work and trip related factors on the one hand and variables related to perceptions or behavioural changes on the other hand.

First of all looking at the personal, work and trip related characteristics, the result that people with a high household income seem to have a higher chance of changing the residential location is somewhat strange. This is in contrast to some other estimation results, not presented here. Therefore this result must be handled with care. Respondents that live alone, own a house, work more than 35 hours per week and who get a travel cost compensation by their employer seem to have a lower probability of changing due to the road pricing measure. Furthermore, respondents living in a region (of Holland) suffering from traffic congestion problems are found to have a relatively lower probability of changing house due to road pricing. This can partly be explained by the substantial lower commuting distances in the sample for people living within these 'congested regions'. And toll costs off course are in case of a kilometre charge linearly linked to distance. Respondents living in a bigger city have a lower probability of changing due to the pricing measures. The same goes up for respondents driving in a gasoline car. Gasoline car drivers driving fewer kilometres on a yearly basis than diesel car drivers can partly explain this last result.

As expected, respondents that indicated they would (in general) be better of due to the introduction of the different charges have a lower probability of changing house due to the measure. Furthermore, a positive relation is found between the extent to which people indicated to adapt their (short term) trip behaviour (e.g. route, departure time, mode choice etcetera) and the probability that they are going to relocate due to a pricing measure. Next to that, the sign of the probability of changing job due to the road pricing and the probability of changing house is positive. This indicates that people, who have a higher probability of changing their job due to the pricing measure, are also more willing to move house. Finally, somewhat remarkably no significant effect of the type of price measure (i.e. type of kilometre charge) or price level on the relocation probability has been found.

4.2.2 Searching for another job

The same kind of ordered probit analysis has been conducted for the probability of searching another job due to road pricing. In this case respondents that indicated to have a moderately high, high or extremely high possibility of changing job within 2 years (for whatever reason) were removed from the dataset. The results of the analysis are presented in table 7.

Table 7: results analysis of probability of searching a job closer to home due to a km charge

	Coefficient	T-value	P-value
Constant	0.5710	1.798	0.0722
Personal, work and trip related characteristics			
dummy living alone (yes=1)	-0.5968	-1.832	0.0670
dummy living in a region with congestion problems (yes=1)	-0.2771	3.943	0.0001
dummy commute trip length single trip (≥25 km =1)	0.4069	3.175	0.0015
dummy working partner	0.5612	3.943	0.0001
dummy size municipality (≥50.000 inhab.=1)	-0.3182	-2.703	0.0069
dummy travel cost compensation employer (completely compens.=1)	-0.3356	-2.447	0.0144
dummy working hours/week (≥35 hours/week=1)	0.2608	1.868	0.0617
dummy heavy car (yes=1)	-0.7086	-3.779	0.0002
dummy car medium weight (yes=1)	-0.3220	-2.033	0.0421
dummy gasoline car (yes=1)	-0.4425	-3.035	0.0024
dummy number of cars in household (≥2 cars=1)	-0.4378	-3.619	0.0003
Perceptions and behavioural changes			
dummy house satisfaction (satisfied=1)	-0.3663	-2.094	0.0363
dummy acceptability of rp measues (quite to high prob=1)	-0.3444	-2.257	0.0240
dummy prob. moving house due to rp measure (quite to high prob=1)	0.7677	2.698	0.0070
μ_1			
μ_2	1.010		
	1.637		
Log likelihood (constants)	-484.0		
Log likelihood (convergence)	-431.9		
X^2	104.2		

Various significant explanatory factors in table 6 can also be found in table 7: living alone, living in a bigger city, getting a travel cost compensation, working 35 hours or more per week, driving a car on gasoline. The sign of the coefficients in this case is in line with table 6. A difference between table 6 and 7 is the sign for the car with a medium weight. Another significant characteristic in table 7 is commuting distance; respondents with a higher distance show a higher probability of changing job location. This can be explained by the higher toll costs commuters have to pay when having a higher commute distance.

Looking at perceptions, we find a negative relation between house satisfaction and the relocation probability. This means that respondents having a higher house satisfaction seem to have a lower probability of searching for another job. Furthermore, as could be expected a

higher level of acceptability of the road pricing measure leads to a lower chance of searching for another job. Finally, again a significant relation is found between the probability of moving residential and work location; respondents with a higher probability of moving their residential location due to the price measures also indicated a higher chance of searching for another job.

5. Location preferences households

This section focuses on studying the influence of different trip and location related variables on the residential location choices of people. For the analyses data from a stated choice experiment has been used (see section 3). The outline of this section is as follows. In section 5.1 the importance of trip versus location related variables in a residential location decision is assessed. Special emphasis will be put on the comparison of the importance of travel cost (especially due to road pricing) versus housing cost and travel time in location decisions. Furthermore section 5.2 extends the analysis presented in section 5.1 by explicitly taking into account explanatory trip and household related characteristics.

5.1 Comparison influence trip and location related variables

Table 8 presents the multinomial logit (MNL) results in which only basic location and trip related variables are taken into account; no distinction was made into explanatory socio-economic or other characteristics. First of all, the sign of the coefficients in table 8 seems to be logical. An increase in the number of bedrooms is valued positively. Furthermore, cost components, such as the monthly housing and travelling costs, and travel time are valued negatively. The type of location finally is a qualitative variable consisting of three levels: (big) city (more than 100.000 inhabitants), medium sized town/city (10.000 to 100.000 inhabitants), rural area or small town (less than 10.000 inhabitants). The preference for location has been estimated by using effect codes. Table 6 shows that respondents in general dislike living in a big city and prefer to live in a small town/rural area. The parameter value for a medium sized city amounts to 0.21, meaning that the respondents on average like to reside in such a medium sized city. Note that these results are only representative for respondents who drive to work by car two or more times per week and face congestion of 10 or more minutes per trip for at least two times a week.

Table 8: analysis of the importance of variables taken into account in the stated choice experiment (MNL-estimation without considering possible heterogeneity effects)

MNL			
Attributes	Coefficient	T-value	P-value
bedrooms	0.2641	10.863	0.0000
monthly cost	-0.0027	-6.416	0.0000
big city	-0.4939	-14.599	0.0000
small town	0.2842	9.229	0.0000
medium sized city (= - big city - small town)	0.2097	-	-
travel costs	-0.2914	-18.562	0.0000
travel time	-0.0122	-4.961	0.0000
adjusted ρ^2	0.1490		
-2LogLikelihood	-2990.6		

By comparing the coefficients, the importance of the different variables in residential location decisions can be assessed. From the viewpoint of studying the importance of a road pricing policy on location choices, the comparison of trip related factors (i.e. travel time and travel costs) on one hand and location based variables on the other hand is especially interesting. These comparisons are presented in table 9. The table indicates how much extra travel time or travel costs respondents seem to accept in order to attain a certain location benefit, overall without being off better or worse (no disutility).

Table 9: location benefits compensated by trip costs and travel time (no disutility)

		Compensation trip components	
		Travel cost per day (euro) (2 trips)	Travel time per day (min) (2 trips)
Location benefit	Save 1 euro on housing cost/day	0.4	9
	1 bedroom extra	1.8	43
	Not living in a big city	3.4	81
	Living in a small town	2.0	47

To be able to compare the influence of monthly housing costs on one hand and daily travel cost and travel time on the other hand, the coefficient of monthly housing costs in table 6 has been converted into costs per day. This makes comparison between the housing cost component and trip related factors easier. Table 9 shows that respondents on average want to pay 0.4 euro of travel cost per day extra (or accept an extra travel time of 9 minutes per day)

in order to save 1 euro/day on housing costs. This result seems to point into the direction of people being more sensitive to travel costs than to housing costs[2].

Beside the monthly cost component, the benefit of having one extra bedroom, of not living in a big city (on average negative valuation) and/or living in a small town are compared to the influence of travel time and travel costs. Travel costs seem to be quite important. This may implicate that people do not want to pay much on commuting. They do not want to spend (extremely) high costs in order to be able to live at a certain location or to extend the number of bedrooms. Furthermore, results in general indicate that (at least for the respondents) travel times are relatively unimportant compared to the location related variables but also in comparison to travel cost. The relative importance of travel time versus travel cost can be observed into more detail by computing a value of time (VOT). Values of travel time saved (VOT) indicate the amount of money people want to pay in order to save a certain amount of travel time. Therefore, the VOT gives an indication of the importance of travel time in relation to travel costs. Low values of time for example, indicate that people are relatively more cost than travel time sensitive. In case of location decisions such a low value of time could mean that people would prefer a relatively longer commuting time (and maybe distance) with lower travel costs above a shorter commuting time with higher travel costs. The VOT is computed as follows:

$$VOT = \frac{coeff.traveltime}{coeff.travel\cos t} * 60 \qquad \text{[euro/hour]}$$

In fact two different concepts of the value of time exist: the marginal and the non-marginal value of time. Most studies focus on the marginal value of time, indicating as formulated before the amount of money people want to pay in order to save a certain amount of travel time. This marginal VOT is often indicated by the term 'value of travel time saved' (see also

[2] These results must be handled with some care. First of all, in order to convert monthly housing cost to cost per day, one has to know the (average) number of commute trips that are made on a monthly basis. In this case a multiplication with 20 (5 day working day, 4 weeks/month) has been used, but this choice remains somewhat arbitrary. In the second place, the set-up of the experiment aimed at making differentiations in monthly cost on average comparable to travel cost variations. This 'comparability' could not be guaranteed before the experiment started. After the data had been derived for example, the mean trip length was found to be substantial higher than expected. But, in the same way also monthly housing costs were somewhat underestimated in advance. However, it is expected that this uncertainty (i.e. attached to these two mentioned aspects) alone cannot lead to the observed large difference in valuation between housing cost and travel cost.

Gunn, 2001; Wardman, 2001; Hensher, 2001; Hensher, 2004). The non-marginal value of time furthermore gives a valuation for the 'actual' travel time, for example the value for 20 minutes of travel time. However in general, literature focuses on the marginal value of time. One important reason being that it is easier to derive a marginal than a non-marginal value of time (i.e. via stated choice experiments). In this paper the focus also lies on the marginal value of time, because (the valuation of) travel time 'changes' can be seen as an important cost or benefit component caused by a road pricing measure.

The average VOT estimated for the entire sample (on basis of table 8) amounts to 2.5 euro/hour. This value is low compared to other VOT's found in literature (Gunn, 2001; Wardman, 2001; Hensher, 2001). However, these other VOT's were in most cases derived from stated choice experiments, focusing on short-term choices (route choice, mode choice etcetera), whereas the choice experiment used in this experiment aims at long-term (i.e. location) choices. Thus travel time does not seem to be a very important factor in a location decision. In combination with a high dislike for travel costs (amongst which are toll costs) the resulting value of time is low. Thus, focusing on location choices, respondents seem to prefer relatively low (direct) monetary trip costs, whereas the travel time itself is of less importance.

In conclusion, travel cost seems an important component in location decisions. First of all respondents are more sensitive to travel costs than to housing costs. In the second place the low VOT indicates that respondents value travel time less negatively than travel costs. Overall this may lead to the conclusion that respondents in general prefer to pay somewhat higher housing costs and accept longer travel times in order to avoid (high) travel costs.

5.2 Location preferences and explanatory variables

Additional to section 5.1, this section describes logit estimation results in which explanatory variables, such as socio-economic, demographic, trip and house related characteristics have also been taken into account. This analysis therefore gives a more differentiated insight into the importance of the trip and location related variables for different types of respondents.

The model results used in the analysis in this section are based on logit estimation and are presented in table 11. An explanation for the acronyms used in table 11 is given in table 10. Two types of models have been estimated. The left part of table 11 shows the estimation based on using a multinomial logit (MNL) model. Only coefficients that are significant with a

reliability of at least 90 percent are described. The parameters shown in the left part (i.e. MNL model) are used as basis for mixed logit (ML) estimation. Mixed logit models are examples of discrete choice models that can test for the possibility that pairs of alternatives in the choice set are correlated to varying degrees. For example, a bus and train may have a common unobserved attribute (e.g. comfort), which makes them more similar (i.e. more correlated) than either is to the car. These choice models can also allow for differences in variances of the unobserved effects (Louvière *et al*., 2000). The ML model does not suffer from the IIA (i.e. independence from irrelevant alternatives) en IID (i.e. independently and identically distributed) restrictions with which the MNL model is confronted (Louvière *et al*., 2000; Train, 2003). The model is therefore seen as a better and more advanced estimation model than the MNL model (see also Louvière *et al*., 2000; Train, 2003). Results based on ML estimation are also presented in table 11. The same parameters were taken into account as in the MNL-case. Additionally, the variables 'number of bedrooms', 'monthly cost', 'big city and small town' and the 'travel time and cost' variables were tested on randomness. For each of these variables, triangular and normal distributions (representing amongst other things unobserved heterogeneity in preferences) were applied. The best fitting model, looking at significance of coefficients, is presented in table 11, in which a triangular distribution was used for the monthly housing cost, travel cost and travel time coefficients and a normal distribution was applied for the 'big city' variable. Because of the superiority of the mixed logit estimation procedure, the description of results in this section is mainly based on the mixed logit outcomes.

Each respondent within the experiment made 9 choices. The presence of multiple observations (i.e. 9 choices per individual) on stated choice responses for each sampled individual means that a potential for correlated responses across observations exist. This is a violation of the independence of observations assumption in the classical choice model estimation (Hensher and Greene, 2003). The possibly existing correlation can be the product of many sources including the commonality of socio-economic descriptors that do not vary across the choice situations for a given sampled individual and the sequencing of offered choice situations that results in mixtures of learning and inertia effects, amongst other possible influences on choice response. Through the applied estimation procedure, these possibly existing correlation effects were accounted for.

Table 10: explanation of acronyms used in table 11

Variables	Explanation
bedrooms (bedr)	number of bedrooms
monthly cost (mnth cost)	monthly cost housing
big city	effect code 1 location (big city)
small town	effect code 2 location (small town/rural area)
travel costs	travel cost (fuel and rp) single trip (euro)
travel time	travel time total single trip (min)
college/university	dummy college/university (yes=1)
working partner	dummy working partner (yes=1)
child	dummy children (yes=1)
large municip.	dummy size municipality (≥ 50.000 inhab. =1)
apartment	dummy apartment (yes=1)
owned house	dummy owned house (yes=1)
detached house	dummy (semi) detached house (yes=1)
no fuel cost	dummy fuel cost compensation (yes=1)
work home	dummy possibility work at home (always, sometimes=1)
partner	dummy partner (yes=1)
dep. time constr.	dummy departure time constraint (yes=1)
gasoline car	dummy car on benzene (yes=1)
region congest.	dummy congestion sensitive regions in Holland (yes=1)
tta5175	dummy actual travel time (including congestion) between 51 and 75 min (yes=1)
tta76m	dummy actual travel time (including congestion) > 75 min (yes=1)
tte030	dummy travel time shown in experiment between 0 and 30 minutes (yes=1)
income class 1	dummy household income 0-28000 euro/year =1
income class 2	dummy household income 28500-56000 euro/year =1
income class 3	dummy household income >56000 euro/year =1

Looking at the ML results in table 11 four significant random parameters can be observed. The fit of the ML model is higher than of the MNL-model. Also, the parameter values in general are more extreme in the ML-case, which might partly be explained by the higher model fit. Furthermore, some significant parameters in the MNL-case are not significant on a 90 percent level in the ML-estimation, namely: the relatively lower dislike of living in a big city for people receiving a fuel cost compensation, the relation between the province and travel costs and the fact that people with departure time constraints value travel time less negatively. Besides these effects, some relations with income are not significant in the ML-estimation (e.g. big city*i2 and tc*i2). However, in general the picture between the two model estimations is comparable.

Table 11: MNL and ML estimation results

	MNL			MIX. LOGIT		
Attributes	Coefficient	T-value	P-value	Coefficient	T-value	P-value
bedrooms	-0.1268	-2.137	0.0326	-0.1556	-2.498	0.0125
monthly cost	-0.0065	-5.632	0.0000	-0.0093	-6.382	0.0000
big city	-0.9992	-8.311	0.0000	-1.516	-5.983	0.0000
small town	0.2280	4.241	0.0000	0.2894	4.500	0.0000
travel costs	-0.7359	-12.459	0.0000	-0.9794	-11.908	0.0000
travel time	-0.0338	-4.652	0.0000	-0.0547	-5.424	0.0000
Heterogeneity:						
bedr*college/university	0.1450	2.780	0.0054	0.2030	3.789	0.0002
bedr*working partner	0.1530	2.980	0.0029	0.1807	3.579	0.0003
bedr*child	0.2114	3.845	0.0001	0.2970	5.206	0.0000
bedr*large municip.	0.2253	4.255	0.0000	0.2575	4.600	0.0000
bedr*apartment	0.2981	4.360	0.0000	0.3971	6.149	0.0000
mnth cost*college/university	0.0020	2.423	0.0154	0.0025	2.166	0.0303
mnth cost*child	-0.0019	-2.271	0.0232	-0.0028	-2.398	0.0165
mnth cost*owned house	0.0043	3.961	0.0001	0.0059	4.343	0.0000
big city*partner	-0.2661	-3.478	0.0005	-0.3509	-2.242	0.0250
big city*child	0.1713	2.524	0.0116	0.2426	1.808	0.0705
big city* large municip.	0.6929	8.917	0.0000	1.0027	6.897	0.0000
big city*owned house	0.2001	2.815	0.0049	0.3788	2.287	0.0222
big city*detached house	-0.3844	-4.543	0.0000	-0.6838	-4.101	0.0000
big city*apartment	0.6339	7.911	0.0000	1.0393	5.610	0.0000
big city*no fuel cost	0.1795	2.795	0.0052	0.1797	1.400	0.1615
big city*income class 1	-0.2089	-2.208	0.0273	-0.3317	-1.765	0.0775
big city*income class 2	-0.1898	-2.706	0.0068	-0.2219	-1.599	0.1099
small town*large municip.	0.1489	2.317	0.0205	0.1763	2.268	0.0233
small town*gasoline car	0.1455	2.423	0.0154	0.2245	3.001	0.0027
small town*income class 1	-0.2281	-3.071	0.0021	-0.2744	-3.168	0.0015
travel costs*region congest.	-0.0653	-1.989	0.0467	-0.0746	-1.454	0.1460
travel costs*apartment	0.1609	4.187	0.0000	0.1767	2.398	0.0165
travel costs*work home	0.0653	1.989	0.0467	0.0980	1.867	0.0619
travel costs*tta5175	0.1278	2.396	0.0166	0.1573	2.399	0.0164
travel costs*tta76m	0.3667	7.534	0.0000	0.4285	6.778	0.0000
travel costs*income class 2	0.1388	3.347	0.0008	0.0935	1.389	0.1650
travel costs*income class 3	0.1620	3.424	0.0006	0.1615	2.266	0.0234
travel time*dep. time constr.	0.0122	2.292	0.0219	0.0129	1.496	0.1347
travel time*tta5175	0.0143	1.823	0.0683	0.0223	2.087	0.0369
travel time*tta76m	0.0215	2.927	0.0034	0.0388	3.702	0.0002
travel time*tte030	-0.0092	-2.466	0.0137	-0.0110	-2.180	0.0293
st. dev. random parameters:						
monthly cost	-			0.0076	2.424	0.0153
big city	-			1.5617	11.094	0.0000
travel costs	-			0.7416	8.801	0.0000
travel time	-			0.0348	2.079	0.0376
Halton simul.	-			150 (number)		
adjusted ρ^2	0.2447			0.3096		
-2LogLikelihood	-2638.1			-2406.6		

Table 11 shows preferences for five aspects in detail: the number of bedrooms, the location, the monthly cost of housing and travel cost and time. First of all looking at 'bedrooms', the

mixed logit estimation in table 11 shows a negative sign, meaning a dislike for bedrooms. However, all heterogeneity aspects are positive, leading to a positive bedroom valuation in general (see table 8). Table 11 indicates that commuters with a higher education level, value an extra bedroom relatively higher than respondents with a lower education level. As expected commuters with a working partner or with children next to that have a positive valuation for an extra bedroom. Furthermore, respondents living in a municipality with 50.000 or more inhabitants value an extra bedroom more positively than respondents living in smaller municipalities. Finally, table 11 shows that people living in an apartment value an extra bedroom higher than people living in another type of house. This might be due to a sort of selection effect of having relatively (too) little space in an apartment.

Monthly housing costs are valued negatively. However, people having a higher level of education dislike monthly housing cost relatively less than people with a lower education. The same goes up for respondents living in a house they own. Respondents having children on the other hand dislike housing costs even more than people without children. This might be explained by the on average higher expenditures households with children have to make.

Looking at the location variable, table 11 shows a strongly negative coefficient for living in a big city. This dislike is even stronger for respondents having a partner, living in a (semi-) detached house and/or having a lower gross household income than 56000 euro/year. First of all, respondents with a partner might often need more space. This space can in general better be found outside the big cities. Secondly, the extra dislike of living in a big city for people living in a larger house might partly be seen as a sort of self-selection effect: larger houses occur more often in smaller towns/cities (at least in this dataset). And people living outside a big city might quite likely have a reason for living outside a big city. Thirdly, respondents with a higher income, in general quite often live in nicer neighbourhoods in a big city, whereas relatively lower income households are forced (by housing prices) to live in less preferred neighbourhoods. This last group then might prefer to live (for the same price) in a smaller city or more rural region.

Furthermore, the dislike of living in a big city is relatively lower for people having children, living in a municipality with more than 50.000 inhabitants, owning a house, living in an apartment and/or for people not having to pay fuel costs. The fact that households with children have a relatively lower dislike of living in a big city is somewhat opposite to the

expectation. One might expect that those households look for space and a relatively quiet area to raise children. On the other hand a lot of opportunities (e.g. schools, sports) are available in a big city, possibly leading to a relatively lower dislike of living in such a big city. Some other effects, namely the positive signs of the coefficients for a larger municipality and for living in an apartment can be seen as self-selection effects.

In contrast to a big city, the coefficient for living in a small town (less than 10.000 inhabitants) is positive. The sign becomes even more positive for people currently living in a bigger municipality. Thus, respondents living currently in a larger municipality on one hand have a lower dislike for living in a big city compared to those living in smaller municipalities but also relatively like living in a small town to a higher extent. This means however, that people currently living in a municipality with more than 50.000 inhabitants relatively dislike living in a medium sized city more than people currently living in a smaller municipality. This again can be regarded as a self-selection effect. As for larger municipalities, respondents driving a car on gasoline also value living in a small town relatively higher. Finally, respondents within the lowest income class seem to value living in a small town lower. In combination with the earlier described effect of respondents with lower incomes dislike living in a big city to a higher extent, points to the direction that respondents within the lowest income class seem to prefer to live in a medium sized city.

Looking at the trip related factors (i.e. travel cost and travel time) several heterogeneity effects can be observed. Respondents living in a region in Holland suffering from traffic congestion problems seem to value travel cost more negatively than people living outside these regions. Besides that, respondents living in an apartment value travel cost less negatively as is the case for people who have the possibility to work at home. As expected, people with a higher income value travel costs less negatively, leading to a higher VOT for higher income classes. Furthermore, respondents with departure time constraints seem to value travel time less negatively.

A special situation occurs for respondents with longer actual travel times. These respondents have a significant other coefficient for both travel time and cost. As can be seen in table 11, the travel time and travel cost coefficients are less negative for higher actual travel times. However on basis of this result the conclusion of respondents with a higher actual travel time (above 50 minutes) being less sensitive for travel costs or travel time cannot be drawn.

Because these people have higher actual travel times, the value of the coefficients is lower in absolute size. However, the quotient of travel time and travel cost, i.e. the VOT, can give more insight into the relative importance of travel time and travel cost for respondents having a higher actual travel time. Looking at the VOT, respondents with a longer travel time in reality (longer than 50 minutes) have a lower value of time. Thus, respondents who in the current situation live relatively far from their work want to pay less to save a certain amount of travel time than people who live closer to their work. This might be explained by self-selection: people who prefer low travel times already live closer to their work. This finding seems to be in contrast to the finding of Gunn (2001), who expects a higher VOT with increasing travel time. However both results do not have to be in conflict. The travel times shown within the choice experiment used were tailored on basis of the actual travel distance. Thus, respondents with lower travel times observed relatively lower travel times within the experiment than those with higher commute distances. In the end the self-selection effect might well overshadow a possibly increasing VOT with travel time for individual persons. Closer inspection of the travel time and travel cost coefficients finally seems to lead to the conclusion that the lower VOT for higher actual travel time classes is particularly caused by the relatively higher travel cost (discounted for travel time) disutility for these higher travel time classes.

6. Conclusions

Road pricing may play a role in both stages of the relocation process: the decision whether or not to relocate and the choice of the new residential location. This paper focused on getting more insight into the probability to relocate on the one hand and on studying the relative influence of trip and location related variables in the actual residential location choice on the other hand. With respect to this last point special emphasis has been put on the comparison of the importance of travel cost (especially due to road pricing) versus housing cost and travel time in location decisions.

The probabilities of moving to a residential location closer to work and/or searching for another job closer to home under influence of different types of road pricing measures have been studied. Roughly half of the sample consisted of car commuters confronted with traffic congestion on a regular basis. The other part of the sample was selected on basis of the criterion that people had to possess a car. Therefore, results may not be directly transferable to commuters in general. On average roughly 5 percent of the respondents indicated a quite high,

high or extremely high probability of moving to another residential location when a road pricing measure would be implemented. The probability of searching for another job on the other hand was found to be significantly higher for all price measures. On average 13.5 percent of the respondents responded that the probability of searching for another job would be quite high, high or extremely high. However, these results must be put into perspective. The majority of respondents that indicated that the probability of moving house or changing job due to a road pricing measure is quite high, high or extremely high, also answered that the chance of changing house or work within 2 years (for whatever reason) is considerable. Therefore, the actual relocation specifically due to road pricing may be lower than the observed percentages.

Several significant explanatory variables were found for the probability of changing the residential location or searching for another job specifically due to a road pricing measure. Respondents getting a travel cost compensation by their employers, respondents living in a bigger city and those who live in a region with higher congestion problems seem to have a lower probability of relocating due to a price measure. Respondents working more hours per week on the other hand have a higher chance of moving. In the case of changing job, the commuting distance is an important explanatory factor. Respondents with a higher commuting distance seem to have a higher probability of changing job due to a road pricing measure. Finally, perceptions and behavioural characteristics seem to form important explanatory variables. Respondents, which have the feeling that they are better of or those that regard the road pricing measure to be acceptable, indicate a lower probability of relocating. Furthermore a positive relation is found between short term trip behaviour changes and longer term location changes on one hand and between residential and work location change on the other hand. This means that for respondents that indicated to change their trip behaviour due to a road pricing measure also a higher relocation probability was found. And that people having a higher probability of changing their work location also have a higher probability of changing the residential location and vice versa.

Looking at the influence of different variables in the actual residential location choice of car commuters confronted with traffic congestion on a regular basis (i.e. the sample), travel cost seems to be an important factor. First of all respondents are more sensitive to travel costs than to housing costs. In the second place respondents value travel time less negatively than travel costs. Overall this may lead to the conclusion that respondents in general prefer to pay

somewhat higher housing costs and accept longer travel times in order to avoid (high) travel costs. Furthermore, location related factors such the type of location and the number of bedrooms seem to be important factors in a residential location choice too.

The dislike for travel costs seems to be even higher for respondents having a higher travel time in reality. This finding on itself is somewhat in line with the observed result of respondents with longer commute distances having a higher relocation probability under influence of a kilometre charge. However, this comparison between datasets currently cannot be made in a good way. To make the comparison, it is important to study the influence of the differences in sample construction (i.e. dataset for relocation probability and the stated choice experiment for location preferences) on the outcomes into more detail. Finally, respondents with a higher household income were found to be less cost sensitive and therefore may be less willing to move due to a road pricing measure. This result was not confirmed by results from the relocation probability study.

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