An empirical assessment of Dutch citizens' preferences for spatial equity in the context of a national transport investment plan

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Abstract

This study presents empirical insights into Dutch citizens' preferences for spatial equity in the context of decision-making regarding the composition of a national transport investment plan. To the best of our knowledge, our study is the first study worldwide which scrutinizes citizens' preferences for spatial equity in the context of a transport investment plan empirically. We conducted two Stated Choice experiments: one involving an investment plan for travel time savings, the other involving an investment plan for traffic safety. Our results suggest that in the context of travel time savings, a vast majority of Dutch citizens has a strong preference for spatial equity. When the investment program involves traffic safety improvements, the share of citizens that care about spatial equity is considerably smaller. Specifically, we identified distinct segments. The first segment has a very strong preference for the investment program having the largest total reduction in traffic deaths; the second segment assigns a substantial value to an equal distribution of reductions of traffic deaths across the Netherlands. Highly educated citizens are found to have a relatively strong preference for spatial equity as compared to low educated citizens. Contrary to our expectations, explanatory variables such as political orientation, income and region of residence do not appear to be associated with citizens' preferences for spatial equity.

1. Introduction

The main criteria to evaluate transport policies and transport infrastructure projects concern efficiency and equity (Rietveld et al., 2007). In virtually all western countries Cost-Benefit Analysis (CBA) is used to evaluate the efficiency of large transport projects (e.g. Mackie et al., 2014). CBA is also a popular research topic in transport literature. For instance, there are several contributions that present a CBA of an (innovative) transport project (e.g. Cardell 1980; Nguyen-Hoang and Yeung, 2010; Rotaris et al., 2010; Saelensminde, 2004). Moreover, the literature examines substantive problems and improvements of the CBA (e.g. Grahem, 2007; Mouter et al., 2013) and several researchers have investigated the relation between CBA and political decisions (e.g. Annema et al., 2016; Eliasson et al., 2015; Nellthorp and Mackie, 2000; Mouter, 2016; Nyborg, 1998; Odeck, 1996, 2010; Sager and Ravlum, 2005).

Over the past decades, transport researchers and policy makers have devoted increasing attention to questions about justice and equity (Pereira et al., 2016). For instance, some researchers have explored the question what justice means in the context of transportation planning (e.g. Martens 2016; Pereia et al., 2016). Moreover, several scholars explore ways to include equity in the planning and evaluation of transport policies, for instance, through reviewing how (different) justice principles can be used to integrate equity concerns in the evaluation and planning of transport programs and projects (e.g. Brodie, 2015; Golub and Martens, 2014; Karner and Niemeier, 2013; Khisty, 1996; Martens et al. 2012; Rietveld et al., 2007; Thomopoulos et al., 2009; van Wee and Roeser, 2013). Equity analysis is however complex because there are several types of equity, various ways to categorize people for equity analysis, numerous impacts to consider, and various ways of measuring these impacts (van Wee and Geurs, 2011). For instance, Thomopoulos et al. (2009) provide an overview of eleven equity categories that could matter in ex ante evaluation of transport projects. Hence, the question arises which of these equity categories are the most important ones in the evaluation of transport projects. Several contributions in the existing literature identify 'accessibility' as the focal variable in the analysis of equity of transport systems arguing that a transport system is fair when accessibility levels do not differ too strongly across population groups (distinguished by, for instance, income category, race or mode availability), or when those who are worse of have at least a minimum level of accessibility to key destinations (e.g. Lucas et al., 2016; Martens et al., 2012; Martens 2016; Pereia et al., 2016). For instance, Martens (2016, p. 125) concludes that a transportation system is fair, if persons struck by various forms of accessibility-related brute bad luck (e.g. travel-related impairments) are provided with a sufficient level of accessibility. Since accessibility can be defined and operationalized in many ways and has taken on a variety of meanings, various studies aspire to develop and apply adequate accessibility indicators or explore what type of accessibility indicators are suitable for an equity analysis in the field of transportation (e.g. Brodie, 2015; Martens and Golub, 2012; Lucas et al, 2016; Neutens et al., 2010; van Wee and Geurs, 2011).

Interestingly, despite the emerging consensus among researchers that accessibility is the most promising focal variable of distributive justice (e.g. Brodie, 2015; Martens, 2016; Pereira et al., 2016), studies investigating political decision-making regarding transport projects established that politicians particularly regard 'spatial equity' of transport investments as a key consideration in their decisions involving the allocation of investments in a national transport program for infrastructure investments (e.g. Mouter, 2016; Fridstrøm and Elvik, 1997; Sager, 2016; van der Hoeven, 2015). For instance, Dutch politicians argue that it is fair to balance transport investments across the country to some extent, because all over the country Dutch citizens pay taxes which makes it justifiable to improve citizens' mobility all over the country (Mouter, 2016). Recently, the spatial fairness of the Dutch National Program for Transport Investment (MIRT) was disputed as a result of the conclusion of a Dutch study (BNR, 2016a) that 80% of infrastructure investments in the period 2010-2015 were located in the Randstad (urbanized region in the west of the Netherlands). For instance, Dutch Member of Parliament Martijn van Helvert considered this distribution to be unfair, arguing that 42% of Dutch citizens live outside the Randstad and 47% of the Dutch GDP is earned outside the Randstad (BNR, 2016b). According to van Helvert, the ratio 80%-20% of transport investments versus the ratio 53%-47% GDP earned is clearly out of balance.

Although there are several studies which establish that politicians prefer that transport investments are equally distributed across the country to some extent, to the best of our knowledge, no empirical study exists which elicits citizens' preferences regarding spatial equity of transport investments. The purpose of our study is ameliorating this gap in the scientific literature by generating empirical insights on Dutch citizens' preferences for spatial equity in the context of a national transport infrastructure investment plan. We contend that our study can be a valuable addition to the literature on equity of transport systems which primarily focuses on fair distributions of accessibility levels.

Since reducing travel times and improving safety are two key goals of transport policies (Hauer, 1994) we survey Dutch citizens' preferences for spatial equity in the context of an investment program which decreases travel times (Experiment 1) and an investment program improving safety (Experiment 2). We also analyze whether the proportion of citizens who assign value to spatial equity differs when the investment program involves decreasing travel times or improving safety. Finally, we investigate whether preferences for spatial equity differ between categories of people in the Dutch population. To do so, we employ Latent class discrete choice models. Since in the Netherlands particularly politicians representing political parties with a relatively large voter base in the relatively sparsely populated areas (e.g. the Christian parties) convey the spatial equity argument (Mouter, 2016), we hypothesize that Dutch citizens who vote for these parties and/or live in the relatively sparsely populated areas have a relatively strong preference for spatial equity.

This paper proceeds as follows: section 2 discusses the conceptualization and operationalization of the experiments. Section 3 discusses the data collection. Section 4 presents the results and, finally, section 5 provides conclusions and discussion.

2. Conceptualization and operationalization of the experiments

We selected Stated Choice (SC) as a methodology to infer citizens' preferences concerning spatial equity since SC is currently the dominant empirical approach to derive measures that are used in the evaluation of transport projects, such as the Value of Time and the Value of a Statistical Life (e.g. Börjesson and Eliasson, 2014; Hensher et al., 2009; Kouwenhoven et al., 2014; Ojeda-Cabral et al., 2016). We also used studies in experimental economics which investigate individuals' preferences for equity as inspiration for the design of our SC-experiments. For instance, Andreoni and Miller (2002) employed a modified version of a dictator game and found that respondents follow preferences ranging from perfectly selfish, to utilitarian (maximizing total benefits for participants), to egalitarian (minimizing inequality between pay-offs received by participants in the experiment). Stahl and Haruvy (2009) argue that the results of their extensive-form games – in which participants are enabled to respond to each other's actions – are best reconciled with a behavioral model that incorporates self-interest, efficiency and inequality aversion. Since studies in experimental economics identify 'self-interest' and 'efficiency' as important other motivations in experiments in which individuals' preferences for equity are analyzed, we constructed several SC experiments in which respondents are asked to choose between transport policies/projects which differ in terms of; 1) efficiency: total benefits for Dutch citizens (travel time savings or safety improvements); 2) spatial equity: the extent to which the benefits accruing from the transport policy/project were distributed in an equal way across regions; 3) self-interest: total benefits in the region where the respondent lives/travels most kilometers.

2.1 Pilot surveys

Given that little guidance is available in the literature concerning empirically measuring citizens' preferences for spatial equity of transport policies we performed an extensive pretesting of these SC experiments which involved several rounds of pilot experiments in which respondents were interviewed about their understanding and perception of alternative experiments, and were explicitly asked if particular experiments were realistic, intelligible and meaningful. Below, we address how we translated insights from the pilot surveys into five design objectives for the experiments.

Firstly, we decided to study Dutch citizens' preferences for spatial equity in their evaluation of the spatial distribution of benefits accruing from a (large) transport investment program as a whole instead of their preferences for the spatial distribution of effects accruing from specific transport projects within a transport investment program. The key reason for this decision was that respondents were predominantly concerned about spatial equity in their assessment of the composition of the national transport program as a whole.

Secondly, we decided to design SC experiments in which the extent to which benefits from a transport investment plan are distributed in an equal way between the Randstad and the rest of the Netherlands differs between choice alternatives, since the political discussion in the Netherlands specifically focuses on the question whether transport investments are fairly distributed between the relatively sparsely populated parts of the Netherlands (North, East and South of the country) and the densely populated Randstad (e.g. Mouter, 2016). Moreover, respondents participating in the pilot surveys indicated that the intelligibility of the choice tasks increased when the number of people living in both regions did not vary substantially between the two regions. This was the most important reason to also include the province of Flevoland – which is not a densely populated province – in the urbanized Randstad region.[1] Figure 1 illustrates which areas of the Netherlands are allotted to Region A and Region B.

1 In August 2016 8,119,787 Dutch citizens live in Region A and 9,314,130 Dutch citizens live in Region B, (CBS statline, October 2016). Another argument to classify this province in the urbanized Randstad region is that the two largest cities of Flevoland (Almere and Lelystad) are seen as commuter towns in which many people live who work in Amsterdam.

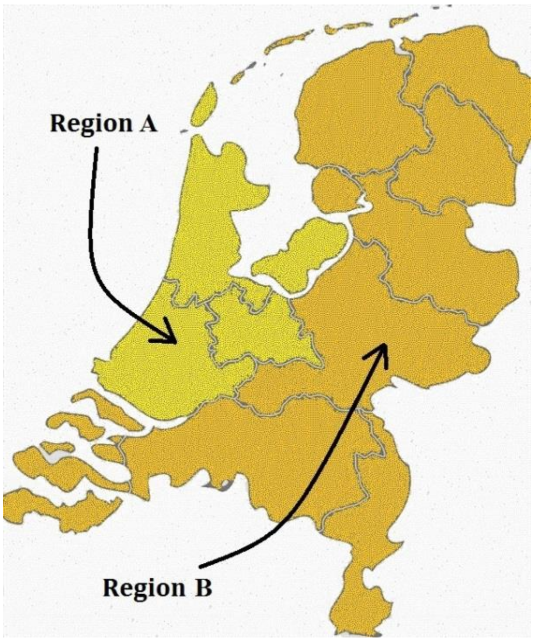


FIGURE 1: Demarcation Region A and Region B

Thirdly, we designed SC experiments in which respondents were presented with three investment alternatives and were asked to recommend one of these alternatives to the government. From the interviews we conducted after the pilot surveys we inferred that many respondents indeed take the 'aggregate benefits for the Netherlands', 'distribution of benefits between regions' and 'benefits in their own region' into account when making their choices. For respondents it was easier to make a trade-off between these three motivations in SC experiments with three alternatives than in the binary SC experiments we tested, since in binary experiments it was unavoidable that one of the two choice alternatives outperformed the other choice alternative on two criteria.[2]

Fourthly, we decided to include choice situations in our experiments in which two choice alternatives score best on one attribute (e.g. 'aggregate benefits for the Netherlands'). An observation from the pilot surveys was that a group of respondents always chose for the alternative with the highest aggregate benefits for the Netherlands and another group of respondents always chose for the alternative with the most equal distribution of benefits between regions in the Netherlands. Including choice situations in our experiment in which two choice alternatives score best on 'aggregate benefits for the Netherlands' allows us to infer whether respondents who consider 'aggregate benefits for the Netherlands' to be the most important criterion prefer an alternative with 'a more equal distribution of benefits across the country' or an alternative with 'the most benefits accruing to the region in which they live/travel most kilometers' provided that alternatives score equally on 'aggregate benefits for the Netherlands'.

Fifthly, we included choice situations in our experiments in which two alternatives scored almost equally well on one attribute (e.g. 'aggregate benefits for the Netherlands'), but

[2] We also considered to present respondents with four alternatives in each choice situation (one performing best on aggregate benefits for the Netherlands, one performing best on spatial equity, one performing best on benefits for Region A and one performing best on benefits for Region B). However, we believed it was too demanding for respondents to choose between four choice alternatives.

the second best alternative on this attribute scored substantially better on another attribute (e.g. 'spatial equity'). In the pilot surveys a relatively large share of respondents was potentially non-trading on one of the attributes. Opting for this relatively complex design objective allowed us to maximize the possibility of observing trading behavior, even when respondents have a very high marginal utility for one particular attribute.

2.2 Experiments

In this study, we survey Dutch citizens' preferences for spatial equity in the context of: 1) an investment program which decreases travel times (Experiment 1); 2) an investment program improving safety (Experiment 2).

In Experiment 1, respondents were asked to choose between investment alternatives that differ in terms of the total travel time savings for Dutch citizens accruing from the investment program, and the extent to which the travel time savings accruing from the investment program are distributed in an equal way across two regions (Region A and Region B). Note that we used 'difference from the mean' to conceptualize 'the extent to which travel time savings are equally distributed'. More specifically, when in choice alternative X the average inhabitant of Region A saves 12 minutes travel time and the average inhabitant of Region B saves 2 minutes the 'difference from the mean' is 5 minutes. When in choice alternative Y this distribution is 7 minutes versus 5 minutes (difference from the mean = 1 minute), alternative Y is superior on 'spatial equity', since the difference from the mean is smaller than in alternative X. Figure 2 (in section 4) shows an example of a choice task in Experiment 1.

Experiment 2 resembles Experiment 1. The only difference is that respondents are asked to choose between three investment programs which differ from one another in terms of the total number of traffic deaths saved (as opposed to travel time savings) and the distribution of reductions in traffic deaths between Region A and Region B. Figure 3 (in section 4) shows an example of a choice task in Experiment 2.

To identify candidate attributes for the choice experiments we carried out a new round of pilot surveys. The attributes were selected based on the model results of the pilot surveys and the feedback received from the participants in the pilot surveys. For instance, based on the comments of the participants in the pilot surveys we decided to use '12 minutes travel time savings for the average inhabitant' as the maximum attribute level in the choice alternatives presented to the respondents in Experiment 1. Respondents negatively assessed the realism of choice alternatives which would result in even larger travel time savings.

To meet the fourth and the fifth design objectives of our experiments (see section 2.1) six choice tasks were incorporated in the experiments. Note that we used heuristics e.g. rather than using an orthogonal or efficient design to construct the choice tasks. We found that it was technically not feasible to construct an experimental design that meets our criteria using standard experimental design software packages. In addition to the six choice situations, we included another four choice tasks to the experiments. These choice tasks were found to be realistic in the pilot survey. Appendix A displays the ten choice tasks of Experiment 1 and Experiment 2.

To increase the probability that respondents reflect their true preferences in the experiments we designed so-called consequential experiments. Consequentiality implies that respondents believe that their choices in a survey might have consequences in real life, for instance, by influencing the agency's final decision (Carson and Groves, 2007). Several studies (e.g. Landra and List, 2007; Vossler and Evans, 2009) find that hypothetical bias disappears in their experiment when the stated preference elicitation method makes participants feel that their answers are more consequential. Zawojska and Czajkowski (2015) recently established in a meta-analysis that if only the consequential studies are considered no significant discrepancy between stated and true values exist. To ensure the consequentiality of our experiment, we emphasized in the text that the government considers to use the results of the experiment in their decisions concerning investments in transport projects.

Finally, note that the experiments which are completed by respondents in this study are designed in a "citizen context" rather than the more conventional "consumer context". Mouter and Chorus (2016) establish that citizen preferences can be derived from experiments in which respondents are asked to choose between policy alternatives of the government and the after tax income of individuals is not directly affected. The experiments in our study would have been 'consumer experiments' if we would have included attributes such as 'additional contribution from your after tax income' or 'one time increase in taxes' to the experiment.

3. Data Collection

The questionnaire consisted out of two major sections. Firstly, after reading through an introductory text, respondents were asked to complete the ten choice situations. To prevent ordering effects, the choice situations were presented in random order across respondents. Since the text preceding the choice tasks is of key importance for our study, we choose to repeat it for every choice task, to enable respondents to re-read it. In the second part of the questionnaire, we asked respondents questions about their political orientation and about the location in the Netherlands where they live and the region in which they travelled most kilometers in the last year. Moreover, we asked the respondents what the most (un)important criterion was by the choices they made in the first part of the questionnaire.

A survey company (TNS NIPO) was asked to draw two random samples of Dutch citizens of 18 years and older. We did not necessarily ask the survey company to draw a representative sample for this group of Dutch citizens, but it was important that all segments in terms of age, education and income were represented and since we aspired to compare the results of Experiment 1 and Experiment 2 it was also important that the socio-demographic characteristics did not differ substantially between the two samples. Finally, we asked the survey company to sample 50% of the respondents in Region A and 50% of the respondents in Region B, since we also aspired to analyze the extent to which citizens living in these regions have different preferences concerning spatial equity.

In the period March 8-March 13 2016 the survey company recruited 174 respondents for Experiment 1 and 165 respondents for Experiment 2. The survey company provided us with additional information about the socio-demographic characteristics of each respondent (e.g. gender, age, income and education). This data and the data gathered in the second part of the questionnaire allows us to investigate whether preferences for spatial equity differ between categories of people in the Dutch population. Table 1 presents the social-demographic characteristics and political orientation of the respondents.

TABLE 1 Socio-demographics and political orientation

Variable	Experiment 1		Experiment 2	
	Reg. A	Reg. B	Reg. A	Reg. B
	88	86	77	88
Gender				
Female	44	43	37	47
Male	44	43	40	41
Age				
18 to 29 yr.	6	3	6	4
30 to 39 yr.	18	6	9	10
40 to 49 yr.	13	23	14	20
50 to 59 yr.	20	27	17	28
60 to 69 yr.	18	20	20	19
70+ yr.	13	7	11	7
Completed education				
Elementary school	3	7	3	9
Lower education	12	16	15	14
Higher education	37	36	35	37
University education	36	27	24	28
Household gross income				
I < 12 900	4	1	5	3
12 900 ≤ I < 27 000	12	17	10	11
27 000 ≤ I < 40 000	14	12	14	24
40 000 ≤ I < 67 000	25	24	22	26
67 000 ≤ I < 79 900	7	11	7	6
I ≥ 79 900	26	21	19	17
For which political party did you vote?				
VVD (Liberal-rightwing)	18	6	15	7
PVDA (Labor)	6	7	8	11
CDA (Christian-Democrats)	5	8	2	8
PVV (Nationalists)	4	10	7	9
GroenLinks (Greenparty)	9	2	6	5
SP (Socialists)	7	14	7	7
D66 (Social-Liberals)	10	11	6	7
Smaller Christian Parties	3	5	6	5
Party for the Animals	1	1	1	2
Other Political Parties	4	2	3	1
I didn't vote	5	8	10	14
I don't want to answer this question	16	12	6	12

4. Results

4.1 Descriptive results

To illustrate the choices respondents made in the experiments in a descriptive way, we present for one choice task of Experiments 1 and 2 respectively the number of respondents choosing for each of the three possible choice alternatives (Figures 2 and 3). The same data for all the ten choice tasks can be found in Appendix A.

Figure 2 presents the number of respondents choosing in one choice task for Alternative 1 (superior on 'spatial equity'), Alternative 2 (superior on 'travel time savings for the average inhabitant of Region A') and Alternative 3 (superior on 'aggregate travel time savings for Dutch inhabitants' and 'travel time savings for the average inhabitant of Region B').

There are multiple locations in the Netherlands where the Government can reduce travel times by investing in transport infrastructure.

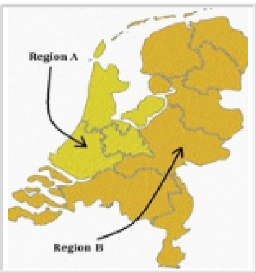
The government has decided to start an investment program which reduces travel times for Dutch citizens.

The government now has to make a decision regarding the composition of the investment program.

You now receive 10 questions in which we present 3 alternatives of the investment program and ask you which alternative you advise to the government.

You can assume the following:

- The alternatives of the investment program consist out of a large package of transport projects (rail and road)
- The alternatives of the investment program only differ in terms of travel time savings accruing to individuals living in **Region A** (provinces of Zuid-Holland, Noord-Holland, Flevoland and Utrecht and **Region B** (Zeeland, Noord-Brabant, Limburg, Gelderland, Overijssel, Drenthe, Groningen, Friesland);
- Costs of the alternatives of the investment program are equal and the alternatives have the same effects on the environment and traffic safety;
- Regions A and B are inhabited by an equal number of Dutch citizens (around 8.5 million);



Below you find the travel time savings for the average inhabitants of Regions A and B accruing from the alternatives of the investment program.

Which alternative of the investment program would you recommend to the government?

	Alternative 1	Alternative 2	Alternative 3
Travel time savings for the average inhabitant of **Region A**	**5 minutes** per day	**8 minutes** per day	**1 minute** per day
Travel time savings for the average inhabitant of **Region B**	**5 minutes** per day	**1 minute** per day	**10 minutes** per day
Number of respondents choosing Alternative	109 (63%)	32 (18%)	33 (19%)

FIGURE 2: Number of respondents choosing Alternatives 1, 2 and 3 in one choice task of Experiment 1.

Firstly, Figure 2 shows that most respondents recommended the investment program which is superior on 'spatial equity' (Alternative 1) indicating that a substantial number of respondents participating in Experiment 1 have a clear preference for spatial equity.

Figure 3 depicts one choice task of Experiment 2. Figure 3 also presents the number of respondents choosing for Alternative 1 (superior on 'traffic deaths saved in Region A'), Alternative 2 (superior on 'aggregate traffic deaths saved in the Netherlands' and 'traffic deaths saved in Region B') and Alternative 3 (superior on 'spatial equity').

There are multiple locations in the Netherlands where the Government can reduce traffics deaths by investing in transport infrastructure.

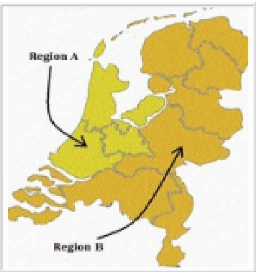
The government has decided to start an investment program which reduces the number of traffic deaths in the Netherlands.

The government now has to make a decision regarding the composition of the investment program.

You now receive 10 questions in which we present 3 alternatives of the investment program and ask you which alternative you advise to the government.

You can assume the following:

- The alternatives of the investment program consist out of a large package of transport projects (rail and road)
- The alternatives of the investment program only differ in terms of traffic deaths saved in **Region A** (provinces of Zuid-Holland, Noord-Holland, Flevoland and Utrecht and **Region B** (Zeeland, Noord-Brabant, Limburg, Gelderland, Overijssel, Drenthe, Groningen, Friesland);
- Costs of the alternatives of the investment program are equal and the alternatives have the same effects on the environment and travel time savings;
- Regions A and B are inhabited by an equal number of Dutch citizens (around 8.5 million);



Below you find the number of traffic deaths saved in Regions A and B as a results of the alternatives of the investment program.

Which alternative of the investment program would you recommend to the government?

	Alternative 1	Alternative 2	Alternative 3
Traffic deaths saved per year in **Region A**	**11 per year**	**5 per year**	**10 per year**
Traffic deaths saved per year in **Region B**	**6 per year**	**15 per year**	**8 per year**
Number of respondents choosing Alternative	9 (5%)	101 (61%)	55 (33%)

FIGURE 3: Number of respondents choosing Alternatives 1, 2 and 3 in one choice task of Experiment 2.

Firstly, Figure 3 shows that most respondents recommended the investment program which is superior on ‘aggregate traffic deaths saved in the Netherlands’ and ‘traffic deaths saved in Region B’ (Alternative 2). One-third of the respondents recommended the Alternative which is superior on ‘spatial equity’ (Alternative 3). Note that this group is considerably smaller than the group of respondents choosing for the ‘equity Alternative’ in the choice task of Experiment 1 presented in Figure 2.

After completing the choice tasks respondents were asked what the most important criterion and least important criterion was when making the choices. Table 2 presents the respondents’ answers to this question. To illustrate, the third row of Table 2 shows that 22% of the respondents participating in Experiment 1 mentioned ‘aggregate travel times saved in the Netherlands’ as the most important criterion in their choices, 30% selected ‘travel time savings in the Region in which they travel most kilometers’ and 48% ‘the distribution of travel time savings between Region A and Region B’.

Since we expected a priori that respondents who live in Region B and respondents voting for political parties which have a relatively large voter base in Region B (e.g. Christian parties) have a relatively strong preference for spatial equity, Table 2 also shows the extent to which respondents with different voting behavior in the previous election and respondents living in Region A and Region B answer the question which criterion was most/least important in their choices differently. Finally, Table 2 shows whether respondents with different levels of education answer the questions differently, since a preliminary analysis of respondents’ answers revealed interesting differences.

TABLE 2 Most important and least important criterion in choices respondents

Experiment 1	Most important criterion			Least important criterion		
	Aggregate	Own Region	Distribution	Aggregate	Own Region	Distribution
Total sample (174)	22%	30%	48%	31%	41%	28%
Region A (88)	30%	28%	42%	28%	40%	16%
Region B (86)	14%	33%	53%	34%	42%	24%
VVD (Liberal-rightwing) (24)	25%	25%	50%	29%	42%	29%
PVDA (Labor) (13)	31%	23%	46%	38%	31%	31%
CDA (Christian-Democrats) (13)	7%	31%	62%	46%	38%	15%
PVV (Nationalists) (14)	21%	43%	36%	29%	36%	36%
GroenLinks (Greenparty) (11)	36%	9%	55%	27%	55%	18%
SP (Socialists) (21)	33%	29%	38%	29%	38%	33%
D66 (Social-Liberals) (21)	19%	29%	52%	29%	52%	19%
Smaller Christian Parties (8)	13%	38%	50%	13%	50%	38%
Party for the Animals (2)	0%	0%	100%	100%	0%	0%
Other political parties (6)	0%	67%	33%	67%	17%	17%
I didn't vote (13)	7%	54%	38%	31%	31%	38%
No answer (28)	25%	25%	50%	21%	46%	32%
Elementary school (10)	10%	70%	20%	50%	20%	30%
Lower education (28)	18%	43%	39%	32%	32%	36%
Higher education (73)	21%	26%	53%	29%	38%	33%
University education (63)	27%	24%	49%	30%	51%	19%

Experiment 2	Most important criterion			Least important criterion		
	Aggregate	Own Region	Distribution	Aggregate	Own Region	Distribution
Total sample (165)	48%	7%	45%	9%	68%	22%
Region A (77)	51%	8%	42%	8%	74%	18%
Region B (88)	46%	7%	48%	10%	64%	26%
VVD (Liberal-rightwing) (22)	59%	5%	36%	5%	77%	18%
PVDA (Labor) (19)	63%	0%	37%	11%	74%	16%
CDA (Christian-Democrats) (10)	30%	10%	60%	10%	60%	30%
PVV (Nationalists) (16)	38%	25%	38%	13%	44%	44%
GroenLinks (Greenparty) (11)	55%	0%	45%	9%	82%	9%
SP (Socialists) (14)	57%	14%	29%	7%	57%	36%
D66 (Social-Liberals) (13)	46%	8%	46%	8%	69%	23%
Smaller Christian Parties (11)	45%	0%	55%	9%	64%	27%
Party for the Animals (3)	33%	0%	67%	0%	100%	0%
Other political parties (4)	50%	0%	50%	0%	75%	25%
I didn't vote (25)	48%	4%	44%	8%	68%	20%
No answer (18)	28%	11%	61%	17%	72%	17%
Elementary school (12)	66%	8%	25%	8%	50%	42%
Lower education (29)	52%	10%	38%	3%	72%	24%
Higher education (72)	42%	10%	49%	13%	65%	22%
University education (52)	38%	2%	60%	8%	75%	17%

The answers of the respondents presented in Table 2 complement the results presented in Figures 2 and 3, in that many respondents participating in Experiment 1 regard the distribution of transport benefits between Region A and Region B to be the most important criterion in their recommendations and that both 'aggregate' and 'distribution' are highly important criteria in the recommendations of respondents participating in Experiment 2. It is interesting to observe that only 7% of the respondents participating in Experiment 2 stated that 'traffic deaths saved in the Region in which they travel the most kilometers' was the most important criterion in their recommendation and 68% of these respondents stated that this was the least important criterion. The importance of 'benefits in own region' seems to be lower for the respondents participating in Experiment 2 than for the respondents participating in Experiment 1. Furthermore, Table 2 indicates that relatively many respondents participating in Experiment 1 who voted for the Christian Democrats and respondents who live in Region B select 'the distribution of travel time savings between Region A and Region B' as the most important criterion in their choices, but the differences with respectively respondents who voted for other political parties and respondents living in Region A do not seem to be substantial. Another interesting observation is that relatively many highly educated respondents participating in Experiment 1 and 2 selected 'distribution' as the most important criterion in their choices. A final interesting observation is that we did not find a segment of respondents participating in Experiment 1 (e.g. respondents voting for a particular political party) for which it holds true that the largest share of respondents regarded 'aggregate travel times saved in the Netherlands' as the most important criterion in their choices.

4.2 Latent class analysis

Next, we use Latent class discrete choice models to investigate heterogeneity with respect to respondents' preferences for spatial equity. To identify the optimal model, subsequent models were estimated with 1 to 10 latent classes, see Table 3. Each class comprises of a linear-additive Multinomial Logit (MNL) model. The BIC index – which weighs both model fit and parsimony of the model (i.e. the number of estimated parameters) – indicates that the 9 class and the 8 class models are optimal for respectively Experiment 1 and 2. However, such high numbers of classes are difficult to interpret and are susceptible to overfitting. Moreover, as shown in Figure 4 for both Experiment 1 and 2 the Log-Likelihood does not improve greatly after the 3-class models. As such, we decided to continue with the 3-class models for both Experiment 1 and 2.

TABLE 3 Performance of Latent Class models

Context	Travel time savings					Traffic deaths saved				
No. classes	LL	BIC(LL)	Npar	R^2	Class. Error	LL	BIC(LL)	Npar	R^2	Class. Error
1-Class	-1588	3192	3	0.1701	0.000	-1456	2928	3	0.225	0.000
2-Class	-1297	2630	7	0.407	0.017	-1265	2566	7	0.394	0.035
3-Class	-1179	2415	11	0.488	0.024	-1127	2310	11	0.501	0.047
4-Class	-1138	2353	15	0.543	0.051	-1096	2270	15	0.545	0.057
5-Class	-1117	2332	19	0.567	0.056	-1063	2224	19	0.574	0.056
6-Class	-1099	2317	23	0.590	0.062	-1041	2199	23	0.584	0.074
7-Class	-1087	2312	27	0.616	0.099	-1013	2164	27	0.614	0.057
8-Class	-1076	2313	31	0.634	0.110	-1001	2160	31	0.629	0.090
9-Class	-1070	2320	35	0.652	0.138	-992	2164	35	0.640	0.077
10-Class	-1059	2320	39	0.664	0.126	-985	2169	39	0.650	0.125

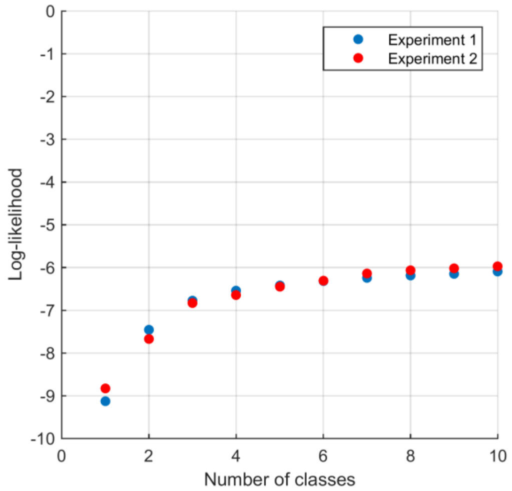


Figure 4: Log-likelihood per observation for 1 to 10 classes

Tables 4 and 5 show the results of the measurement model of respectively Experiment 1 and 2. The Wald statistics and the associated p-values indicate that all 3 marginal utilities are significantly different from zero, in both experiments. Furthermore, the parameter estimates show that there is substantial heterogeneity in respondents' preferences for efficiency, spatial equity and benefits of the transport investment plan in the region where the respondent lives.[3] Furthermore, t-values are reported, indicating whether parameters are statistically significant from zero. As can be seen, most t-values are larger than the critical t-value of t = 1.96. Finally, based on the estimates we derived marginal rates of substitution[4] between equity and efficiency which are presented in the final row of Tables 4 and 5.

Importantly, Table 4 reveals that when the transport benefits involve travel time savings a substantial share of the Dutch citizens (class 1 = 54%) has a strong preference for spatial equity. This group in the Dutch population derives, relatively speaking, a high marginal utility from a relatively more equal distribution of the travel time savings accruing from the investment program across the country. The marginal rate of substitution between equity and aggregate is statistically significantly different from zero for this group of respondents, implying that they are willing to give up aggregate travel time savings for a more equal distribution of travel time savings across Region A and Region B. More specifically, the members of *class 1* are willing to give up 2.3 minutes of aggregate travel time savings for Dutch inhabitants for a 1 minute reduction of the difference between the travel time savings gained in Region A and Region B from the mean travel time savings, but note the relatively large standard error. For members of *class 2*, the marginal utility for aggregate travel time savings is not found to be significantly different from zero. As such, members of this class only make trade-offs between the extent to which travel time savings are distributed between Region A and Region B and the travel time savings accruing to inhabitants of the region in which they live. Since for members of *class 2*

[3] Note that we also analyzed respondents' preferences for efficiency, spatial equity and benefits of the transport investment plan accruing to inhabitants of the region where the respondent *travelled most kilometres last year*. Since, 'the region where the respondent lives' and 'the region where the respondent travelled most kilometres last year' were highly correlated using either one of these two conceptualizations of 'self-interest' did not lead to different results. Hence, we decided to only use one of the conceptualizations in the presentation of our results.

[4] Since we use linear-additive MNL models, the marginal rate of substitution is given by the ratio of the parameters. Standard errors are derived using the Delta method (see Daly et al., 2012)

the marginal utility for travel time savings accruing to inhabitants of the region in which they live is relatively high compared to the members of the other two classes we coin this class as 'Strong Region'. Finally, Members of the smallest class (class 3 = 13%) derive a relatively low marginal utility from the extent to which travel time savings are distributed between Region A and Region B when compared to the members of *class 1* and *class 2*. Since the members of *class 3* derive a comparable marginal utility from the aggregate travel time savings for the Netherlands, distribution of travel time savings across the country and travel time savings for inhabitants of their own region we label members of *class 3* as 'Traders'.

TABLE 4 Results Latent Class analysis Experiment 1

Context	Travel Time savings
Number of observations	1740
Number of respondents	174
Null LL :	-1911.6
Final LL:	-1167.7
ρ^2 :	0.39
Number of parameters	17

	Class 1 Strong Equity			Class 2: Strong Own Region			Class 3: traders Traders			Wald	p-val
Class size	54%			33%			13%				
Estimates	Est	SE	t-stat	Est	SE	t-stat	Est	SE	t-stat		
B_Aggr_1	0.42	0.05	9.39	-0.05	0.05	-1.00	0.25	0.06	4.04	110.1	0.00
B_OwnR_1	0.10	0.03	3.95	0.60	0.05	12.65	-0.16	0.03	-5.81	211.3	0.00
B_Equity _1	-0.99	0.06	-16.97	-0.30	0.06	-5.31	-0.10	0.05	-2.01	304.3	0.00
B_Equity/B_Aggregate	-2.33	1.11	-2.11	6.48	6.11	0.98	-0.41	0.70	-0.56		

B_Aggregate = marginal utility of aggregate Travel time savings in Region A and Region B;
B_OwnRegion = marginal utility of Travel time savings accruing to inhabitants in the respondents' region of residence;
B_Equity = marginal utility of unbalance of the distribution of the Travel time savings between Region A and Region B. In this context, unbalance of the distribution is operationalized as the difference from the mean.

TABLE 5 Results Latent Class analysis Experiment 2

Context	Traffic deaths saved
Number of observations	1650
Number of respondents	165
Null LL :	-1812.7
Final LL:	-1120.3
ρ^2 :	0.38
Number of parameters	17

	Class 1 Traders			Class 2 Strong Aggregate			Class 3 Unclear			Wald	p-val
Class size	44%			37%			19%				
Estimates	Est	SE	t-stat	Est	SE	t-stat	Est	SE	t-stat		
B_Aggr_1	0.43	0.04	10.67	1.51	0.15	9.99	-0.04	0.04	-0.87	256.8	0.00
B_OwnR_1	0.13	0.02	5.61	0.03	0.01	2.72	0.04	0.01	4.18	63.7	0.00
B_Equity _1	-0.48	0.04	-11.65	-0.04	0.02	-2.50	0.03	0.02	1.58	166.7	0.00
B_Equity/B_Aggregate	-1.12	0.65	-1.72	-0.03	0.10	0.89	0.75	3.77	-0.20		

B_Aggregate = marginal utility of aggregate Traffic deaths saved in Region A and Region B;
B_OwnRegion = marginal utility of Traffic deaths saved in the respondents' region of residence;
B_Equity = marginal utility of unbalance of the distribution of the Traffic deaths saved between Region A and Region B. In this context, unbalance of the distribution is operationalized as the difference from the mean.

Table 5 reveals that when the transport benefits involve a reduction of traffic deaths a substantial class of Dutch citizens (class 1 = 44%) has a strong preference for spatial equity in the context of an investment program improving safety. This class also assigns a significant value to a reduction of the total traffic deaths saved in the Netherlands and the number of traffic deaths saved in their own region. Hence, we label this class as 'Traders'. Members of *class 2* have a very strong preference for the investment program with the largest aggregate reduction in traffic deaths and these individuals derive a very low marginal utility from a balanced distribution of traffic deaths saved across the two regions. The smallest (class 3 = 19%) is a relatively noisy class. Therefore, we label this class as 'unclear'. Only the number of traffic deaths saved in the region of residence appears to significantly explain the choices of the respondents belonging to this class.

Finally, results show that respondents' choice behaviour is not similar across the two experiments. For instance, class 2 in Experiment 1 constitutes of decision makers that consider 'Aggregate' not to be a relevant attribute and 'Own Region' and 'Equity' to be relevant attributes, whereas in Experiment 2 no such class is identified.

4.2.1 Explaining heterogeneity

A key feature of Latent Class discrete choice models is the membership model. In the membership model observable characteristics of the decision-makers are used to explain membership of a particular class, potentially providing behaviour insights (Hess et al,. 2011). Tables 6 and 7 show the estimation results for the class membership models. Various socio-demographic variables that might explain class membership were investigated (e.g. Age, Income, Education and Sex) alongside with two variables from which we a priori expected that they would explain class membership: Region of residence (A or B) and Political orientation. However, somewhat surprisingly, only 'Education' was found to explain class membership in both Experiment 1 and 2. The other variables were found highly insignificant in explaining class membership.

Specifically, in both Experiment 1 and 2 high level of education is positively associated with a particular class this being *class 1*. In both experiments respondents belonging to *class 1* are characterized by having a strong and significant preference for a more equal distribution of travel time savings/reduction in traffic deaths across Region A and Region B when compared to respondents belonging to the other two classes. Moreover, in both experiments *class 3* is associated with low levels of education and respondents belonging to this class derive a relatively low (and for Experiment 2 a statistically insignificant) marginal utility from an equal distribution of benefits of the transport investment program. In sum, the class membership model reveals that when Dutch citizens are high (low) educated they have a high (low) probability of belonging in *class 1* which is associated with a relatively strong preference for spatial equity. Likewise, when Dutch citizens are low (high) educated they have a high (low) probability of belonging in *class 3* which is associated with a relatively low preference for spatial equity.

TABLE 6 Class membership model Experiment 1

Context: Travel Time savings	Class1		Class2		Class3		Wald	p-value
	Est	t-stat	Est	t-stat	Est	t-stat		
Intercept	-0.97	-2.28	-0.49	-1.21	1.46	2.84	8.39	0.02
Covariates								
Education	0.32	3.96	0.15	1.87	-0.47	-4.11	18.97	0.00

TABLE 7 Class membership model Experiment 2

Context: Traffic deaths saved	Class1		Class2		Class3		Wald	p-value
	Est	t-stat	Est	t-stat	Est	t-stat		
Intercept	-0.48	-1.29	-0.48	-1.24	0.96	2.31	5.32	0.07
Covariates								
Education	0.16	2.37	0.14	1.89	-0.30	-3.46	12.10	0.00

Based on the parameter estimates the profile of the education level of members of the three classes can be calculated. Table 8 shows the latent class profiles. For example, an individual belonging to the first class has a probability of 44% of having a university education.

TABLE 8 Latent class profiles Experiment 1 and 2

	Experiment 1: Travel Time savings			Experiment 2: Traffic deaths saved		
	Class 1	Class 2	Class 3	Class 1	Class 2	Class 3
Class Size	54%	33%	13%	44%	37%	19%
Covariates						
Education level						
Elementary school	2%	5%	25%	5%	7%	13%
Lower education	13%	16%	30%	7%	20%	38%
Higher education	42%	44%	36%	54%	33%	39%
University education	44%	35%	9%	33%	41%	11%

5. Conclusion and discussion

5.1 Conclusions

This study presents empirical insights into Dutch citizens' preferences for spatial equity in the context of decision-making regarding the composition of a national transport investment plan. To the best of our knowledge, our study is the first study worldwide which scrutinizes citizens' preferences for spatial equity in the context of a transport investment plan empirically. Our results suggest that in the context of travel time savings, a vast majority of Dutch citizens has a strong preference for spatial equity. When the investment program involves traffic safety improvements, the share of citizens that care about spatial equity is considerably smaller. The observation that a larger proportion of Dutch citizens' has a preference for spatial equity when the benefits involve travel time savings than when the benefits involve safety improvements might facilitate a more nuanced discussion regarding the importance of spatial equity in appraisal and decision-making regarding transport policies. Moreover, using Latent class analysis we investigated the presence of heterogeneity in the Dutch population with respect to preferences for spatial equity in the context of a national transport investment plan. Somewhat surprisingly, only 'Education' was found to explain class membership. Highly educated citizens are found to have a relatively strong preference for spatial equity as compared to low educated citizens. Contrary to our expectations, explanatory variables such as political orientation, income and region of residence do not appear to be associated with citizens' preferences for spatial equity.

Section 5.2 discusses results of this study and proposes avenues for further research. Section 5.3 addresses considerations regarding the incorporating of Dutch citizens' preferences for spatial equity in the appraisal of transport projects.

5.2 Discussion and further research

Our study provides convincing evidence that a substantial part of Dutch citizens has a preference for spatial equity. However, we have not been able to infer accurate estimations (as reflected by the relatively large standard errors) of the marginal rate of substitution between the spatial distribution of transport benefits across the Netherlands and the aggregate transport benefits for the Netherlands (i.e. travel time savings and traffic deaths saved). Hence, we regard our study as an important first empirical exploration of citizens' willingness to trade efficiency for spatial equity. We believe a next logical step would be to try to measure the marginal rate of substitution between the spatial distribution of transport benefits across the Netherlands and the aggregate transport benefits for the Netherlands more accurately, e.g. by replicating this study using a more efficient experimental design (Bliemer and Rose, 2006) and, or, a larger sample. When doing so, a considerable challenge is not to jeopardize too much the realism of the stated choice tasks.

Moreover, we recommend further research into underlying explanations of individuals' preferences for spatial equity in the context of decision-making regarding the composition of a national transport investment program. Johansson-Stenman and Konow (2010) outline that individuals' preferences for an equal distribution can emerge for a variety of reasons (e.g. preferences for proportionality, responsibility, need and equality). We hypothesize that 'proportionality' might be an important rule underlying peoples preference for spatial equity, since politicians underpin their argument for a more equal distribution of transport investments across the country by claiming that proportionality should be maintained between agents' inputs (e.g. their contributions in terms of taxes) to the outputs they receive (e.g. benefits accruing from a transport investment program), see the introduction of this paper.

Moreover, it is interesting to scrutinize how our finding that highly educated individuals are found to have a relatively strong preference for spatial equity can be explained. We think that a plausible explanation is that it was difficult for low educated respondents to understand the experiment in which they participated which resulted in the adoption of relatively simple and easy to comprehend decision rules (most benefits for the Netherlands or most benefits in my region) compared to decision rules underlying peoples preference for spatial equity (e.g. proportionality).

Another interesting direction for further empirical research is investigating the extent to which our results are generalizable to other contexts. Firstly, we recommend a replication of this study in other countries/cultures to investigate the extent to which individuals' preferences for spatial equity differs between countries/cultures. Secondly, we recommend a replication of this study for other effects accruing from transport projects than safety and travel time (e.g. comfort, reliability, health and noise pollution) and also to other ethical notions than spatial equity (e.g. mitigating inequality in accessibility levels). Another empirical question is whether we would find the same results if we would design the experiment in a consumer context. That is, a 'willingness to pay attribute' such as 'additional contribution from your after tax income in euros' is added to the experiments. Perhaps, the intensity of respondents' preferences for spatial distribution will be weaker in a consumer context. Finally, we think it is interesting to scrutinize whether the findings of this study are a plausible explanation for the fact that many researchers did not find a significant statistical relation between the final indicator of CBA studies (e.g. net present value or benefit-cost ratio) and political decisions (e.g. Annema et al. 2016; Eliasson et al. 2015; Odeck, 2010). It is conceivable that politicians who want to do justice to the preference of citizens for an equal distribution of transport benefits across regions will assign limited or no value to the results of applied CBA, since the final indicator is insensitive to the distribution of welfare in society.

5.3 Considerations regarding the incorporation of spatial equity in the appraisal of transport projects

Our study primarily contributes to the academic literature by providing empirical insights in peoples preferences for spatial equity. We argue that this is relevant information for policy makers, since the findings enable policy makers to determine the extent to which the distribution of the benefits accruing from a national transport program are in line with citizens' preferences regarding this distribution. To the best of our knowledge, there are currently no countries that include citizens' preferences for spatial equity in the context of decision-making regarding the composition of a national transport investment program in the appraisal of transport projects. In practice, CBA reports at best provide information concerning the spatial distributional consequences of specific transport projects/policies by reporting the net present value of the project/policy under scrutiny for specific regions or by providing a 'winners and losers' table in the report (e.g. Annema et al., 2007; HEATCO, 2006). Hence, a remaining question that we will address below is whether citizens' preferences for spatial equity in the context of an investment program should be incorporated into applied welfare analysis (particularly Cost-Benefit Analysis) and, if so, how? Below, we discuss two possible answers to this question.

Johansson-Stenman and Konow (2010) argue that individuals' utility derived from perceived fairness concerns, such as spatial equity, should count in a welfare analysis, since there are no good arguments why individuals' utility derived from perceived fairness should count less than the same amount of utility derived for any other reason. Various scholars argue that a practicable method for incorporating individuals' fairness concerns in a social welfare analysis involves combining Cost-Benefit Analysis with distributional weights (e.g. Adler, 2012, 2013; Boadway and Bruce, 1984; Dasgupta and Pearce 1972; Dreze and Stern 1987). The implication of incorporating individuals' preferences for spatial equity in applied welfare analysis through distributional weights is that projects from which benefits accrue to regions which receive relatively less benefits from the national investment program in infrastructure projects are likely to be relatively more attractive from a societal point of view when compared to projects from which benefits accrue to regions which receive relatively many benefits from the national investment program in infrastructure projects.

A well-known argument against incorporating individuals' fairness concerns in applied welfare analysis conveyed by Harberger (1978) is that if policy makers want to consider fairness in their decisions, they should always consider to achieve this goal through amending the tax policy instead of using distributional weights in Cost-Benefit Analysis because from a societal point of view amending the tax policy is more efficient than handling this particular distributional goal via government projects such as roads or public parks. More specifically, the preference of Dutch citizens identified in this study should be handled – according to the line of arguing of Harberger – by the tax system and the results should have no implications for the appraisal of transport projects. Following Harberger's argument policy makers might consider to diminish (increase) the taxes paid in the regions of the Netherlands that receive relatively few (many) transport benefits from government projects. Another change in the tax system one can think of is a full decentralization of the taxes (and investments) concerning infrastructure projects. That is, regions are charged with the responsibility of investments in transport projects and also raise local/regional taxes for transport investments.

For the period of time in which it is not clear if and how the empirical insights derived from this study should be integrated into applied welfare analysis, we recommend to inform politicians and civil servants who are charged with composing infrastructure investment programs about the spatial distribution of transport benefits accruing from an investment program to better enable them to consider both the aggregate benefits of the investment program and the distribution of benefits across regions in their decisions.

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Appendix A

Appendix Table 1 presents per choice task: 1) for each choice alternative the travel time savings for inhabitants of Region A and Region B; 2) the characteristic(s) on which the alternative of the investment program was the superior alternative; 3) the percentage of respondents who recommended an alternative of the investment program. To illustrate, for choice task 1 Alternative 1 of the investment program results in 12 minutes time savings and 1 minute of time savings for inhabitants of Region A and Region B respectively. The choice alternative is superior on: 'aggregate time savings for Dutch inhabitants' and 'time savings for inhabitants Region A' and 29% of the respondents recommended this investment program.

Appendix Table 1: choice situations and number of respondents choosing choice alternatives experiment 1

	Alternative 1	Alternative 2	Alternative 3
1	Time Savings Reg. A: 12 min. Time Savings Reg. B: 1 min. Superior on: Aggregate and Reg. A **Resp. choosing Alternative**: 29%	Time Savings Reg. A: 1 min. Time Savings Reg. B: 11 min. Superior on: Reg. B **Resp. choosing Alternative**: 22%	Time Savings Reg. A: 6 min. Time Savings Reg. B: 3 min. Superior on: Equity **Resp. choosing Alternative**: 49%
2	Time Savings Reg. A: 2 min. Time Savings Reg. B: 9 min. Superior on: Reg. B **Resp. choosing Alternative**: 13%	Time Savings Reg. A: 6 min. Time Savings Reg. B: 6 min. Superior on: Equity **Resp. choosing Alternative**: 66%	Time Savings Reg. A: 12 min. Time Savings Reg. B: 1 min. Superior on: Aggregate and Reg. A **Resp. choosing Alternative**: 22%
3	Time Savings Reg. A: 7 min. Time Savings Reg. B: 5 min. Superior on: Aggregate and Equity **Resp. choosing Alternative**: 59%	Time Savings Reg. A: 4 min. Time Savings Reg. B: 8 min. Superior on: Aggregate and Reg. B **Resp. choosing Alternative**: 29%	Time Savings Reg. A: 9 min. Time Savings Reg. B: 1 min. Superior on: Reg. A **Resp. choosing Alternative**: 13%
4	Time Savings Reg. A: 6 min. Time Savings Reg. B: 4 min. Superior on: Equity **Resp. choosing Alternative**: 29%	Time Savings Reg. A: 10 min. Time Savings Reg. B: 1 min. Superior on: Reg. A **Resp. choosing Alternative**: 18%	Time Savings Reg. A: 5 min. Time Savings Reg. B: 7 min. Superior on: Aggregate, Equity and Reg. B **Resp. choosing Alternative**: 53%
5	Time Savings Reg. A: 12 min. Time Savings Reg. B: 1 min. Superior on: Reg. A **Resp. choosing Alternative**: 15%	Time Savings Reg. A: 11 min. Time Savings Reg. B: 3 min. Superior on: Aggregate **Resp. choosing Alternative**: 32%	Time Savings Reg. A: 4 min. Time Savings Reg. B: 4 min. Superior on: Equity and Reg. B **Resp. choosing Alternative**: 53%
6	Time Savings Reg. A: 1 min. Time Savings Reg. B: 9 min. Superior on: Reg. B **Resp. choosing Alternative**: 9%	Time Savings Reg. A: 12 min. Time Savings Reg. B: 2 min. Superior on: Aggregate and Reg. A **Resp. choosing Alternative**: 25%	Time Savings Reg. A: 6 min. Time Savings Reg. B: 8 min. Superior on: Aggregate and Equity **Resp. choosing Alternative**: 66%
7	Time Savings Reg. A: 7 min. Time Savings Reg. B: 9 min. Superior on: Aggregate and Equity **Resp. choosing Alternative**: 45%	Time Savings Reg. A: 2 min. Time Savings Reg. B: 12 min. Superior on: Reg. B **Resp. choosing Alternative**: 17%	Time Savings Reg. A: 8 min. Time Savings Reg. B: 6 min. Superior on: Equity and Reg. A **Resp. choosing Alternative**: 39%
8	Time Savings Reg. A: 9 min. Time Savings Reg. B: 3 min. Superior on: Aggregate **Resp. choosing Alternative**: 50%	Time Savings Reg. A: 10 min. Time Savings Reg. B: 1 min. Superior on: Reg. A **Resp. choosing Alternative**: 11%	Time Savings Reg. A: 3 min. Time Savings Reg. B: 5 min. Superior on: Equity and Reg. B **Resp. choosing Alternative**: 39%
9	Time Savings Reg. A: 5 min. Time Savings Reg. B: 5 min. Superior on: Equity **Resp. choosing Alternative**: 63%	Time Savings Reg. A: 1 min. Time Savings Reg. B: 10 min. Superior on: Aggregate and Reg. B **Resp. choosing Alternative**: 18%	Time Savings Reg. A: 8 min. Time Savings Reg. B: 1 min. Superior on: Reg. A **Resp. choosing Alternative**: 19%
10	Time Savings Reg. A: 1 min. Time Savings Reg. B: 12 min. Superior on: Aggregate and Reg. B **Resp. choosing Alternative**: 18%	Time Savings Reg. A: 4 min. Time Savings Reg. B: 5 min. Superior on: Equity **Resp. choosing Alternative**: 51%	Time Savings Reg. A: 10 min. Time Savings Reg. B: 2 min. Superior on: Reg. A **Resp. choosing Alternative**: 32%

Appendix Table 2 presents per choice task: 1) for each choice alternative the reduction of traffic deaths per year in Region A and Region B; 2) the characteristic(s) on which the alternative of the investment program was the superior alternative; 3) the percentage of respondents who recommended an alternative of the investment program. To illustrate, for choice task 1 Alternative 1 of the investment program results in 23 traffic deaths saved in Region A and 2 traffic deaths saved in Region B respectively. The choice alternative is superior on: 'aggregate traffic deaths saved in the Netherlands' and 'traffic deaths saved in Region A' and 36% of the respondents recommended this investment program.

Appendix Table 2: choice situations and number of respondents choosing choice alternatives experiment 2

	Alternative 1	Alternative 2	Alternative 3
1	Traffic deaths saved Reg. A: 23 Traffic deaths saved Reg. B: 2 Superior on: Aggregate and Reg. A **Resp. choosing Alternative**: 36%	Traffic deaths saved Reg. A: 4 Traffic deaths saved Reg. B: 18 Superior on: Reg. B **Resp. choosing Alternative**: 9%	Traffic deaths saved Reg. A: 12 Traffic deaths saved Reg. B: 12 Superior on: Equity **Resp. choosing Alternative**: 55%
2	Traffic deaths saved Reg. A: 7 Traffic deaths saved Reg. B: 31 Superior on: Reg. B **Resp. choosing Alternative**: 9%	Traffic deaths saved Reg. A: 20 Traffic deaths saved Reg. B: 20 Superior on: Equity **Resp. choosing Alternative**: 56%	Traffic deaths saved Reg. A: 40 Traffic deaths saved Reg. B: 1 Superior on: Aggregate and Reg. A **Resp. choosing Alternative**: 35%
3	Traffic deaths saved Reg. A: 15 Traffic deaths saved Reg. B: 13 Superior on: Aggregate and Equity **Resp. choosing Alternative**: 60%	Traffic deaths saved Reg. A: 10 Traffic deaths saved Reg. B: 18 Superior on: Aggregate and Reg. B **Resp. choosing Alternative**: 32%	Traffic deaths saved Reg. A: 22 Traffic deaths saved Reg. B: 3 Superior on: Reg. A **Resp. choosing Alternative**: 8%
4	Traffic deaths saved Reg. A: 13 Traffic deaths saved Reg. B: 10 Superior on: Aggregate and Equity **Resp. choosing Alternative**: 9%	Traffic deaths saved Reg. A: 20 Traffic deaths saved Reg. B: 2 Superior on: Reg. A **Resp. choosing Alternative**: 10%	Traffic deaths saved Reg. A: 11 Traffic deaths saved Reg. B: 14 Superior on: Aggregate, Equity and Reg. B **Resp. choosing Alternative**: 81%
5	Traffic deaths saved Reg. A: 30 Traffic deaths saved Reg. B: 6 Superior on: Reg. A **Resp. choosing Alternative**: 5%	Traffic deaths saved Reg. A: 26 Traffic deaths saved Reg. B: 13 Superior on: Aggregate **Resp. choosing Alternative**: 71%	Traffic deaths saved Reg. A: 15 Traffic deaths saved Reg. B: 15 Superior on: Equity and Reg. B **Resp. choosing Alternative**: 24%
6	Traffic deaths saved Reg. A: 2 Traffic deaths saved Reg. B: 16 Superior on: Reg. B **Resp. choosing Alternative**: 5%	Traffic deaths saved Reg. A: 18 Traffic deaths saved Reg. B: 3 Superior on: Aggregate and Reg. A **Resp. choosing Alternative**: 21%	Traffic deaths saved Reg. A: 10 Traffic deaths saved Reg. B: 11 Superior on: Aggregate and Equity **Resp. choosing Alternative**: 73%
7	Traffic deaths saved Reg. A: 11 Traffic deaths saved Reg. B: 6 Superior on: Equity and Reg. A **Resp. choosing Alternative**: 15%	Traffic deaths saved Reg. A: 7 Traffic deaths saved Reg. B: 12 Superior on: Aggregate and Equity **Resp. choosing Alternative**: 75%	Traffic deaths saved Reg. A: 1 Traffic deaths saved Reg. B: 14 Superior on: Reg. B **Resp. choosing Alternative**: 10%
8	Traffic deaths saved Reg. A: 9 Traffic deaths saved Reg. B: 11 Superior on: Equity **Resp. choosing Alternative**: 45%	Traffic deaths saved Reg. A: 20 Traffic deaths saved Reg. B: 1 Superior on: Reg. A **Resp. choosing Alternative**: 11%	Traffic deaths saved Reg. A: 2 Traffic deaths saved Reg. B: 20 Superior on: Aggregate and Reg. B **Resp. choosing Alternative**: 45%
9	Traffic deaths saved Reg. A: 11 Traffic deaths saved Reg. B: 6 Superior on: Reg. A **Resp. choosing Alternative**: 5%	Traffic deaths saved Reg. A: 5 Traffic deaths saved Reg. B: 15 Superior on: Aggregate and Reg. B **Resp. choosing Alternative**: 61%	Traffic deaths saved Reg. A: 10 Traffic deaths saved Reg. B: 8 Superior on: Equity **Resp. choosing Alternative**: 33%
10	Traffic deaths saved Reg. A: 6 Traffic deaths saved Reg. B: 10 Superior on: Aggregate and Reg. B **Resp. choosing Alternative**: 59%	Traffic deaths saved Reg. A: 8 Traffic deaths saved Reg. B: 7 Superior on: Equity **Resp. choosing Alternative**: 31%	Traffic deaths saved Reg. A: 12 Traffic deaths saved Reg. B: 2 Superior on: Reg. A **Resp. choosing Alternative**: 10%