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# Optimizing the implementation of policy measures through social acceptance segmentation

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## Abstract

This paper proposes Q-methodology as a technique for the identification of more homogeneous subgroups or 'segments' within a rather heterogeneous overall population when it comes to social acceptance of demand restricting policy measures. Identification of such segments would allow policy makers to better tailor their future actions and thereby increase the chance for a successful implementation of the measures they propose. A set of 33 persons, selected in function of age, gender and car ownership evaluated the acceptability of a total number of 42 demand restricting policy measures. Special care was taken that the final set of statements covered the four classically distinguished demand restricting strategies, i.e., improved transport options, incentives for the use of alternative transport modes, parking and land-use management, and institutional policy revision. In addition, a balance between both 'hard' and 'soft' and 'push' and 'pull' measures was strived for. The results indicate that four different segments in terms of social acceptance of demand restricting policy measures, can be distinguished, i.e., travelers in favor of traffic calming, travelers against hard push measures, travelers in favor of demand restriction, and travelers against policy innovations. Besides the differences and similarities between these segments, the practical implications for policy makers are discussed, together with a series of specific recommendations and suggestions for future research.

*Keywords:* sustainable transport, demand-restricting policy measures,

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## 1 1. Background

The previous century was characterized by an extraordinary growth in 2 car use that has continued in the current century as can be seen from Figure 3 1 (Haustein and Hunecke, 2007). As a result, today's society is confronted 4 with various car-related problems causing serious environmental, economic 5 and societal repercussions (Schuitema et al., 2010). Despite technological 6 innovations and policy interventions, the externalities remain an ecological and social threat that cannot be discarded. Therefore, policy makers should 8 switch their strategy from a demand-following policy to a demand-restricting 9 policy. Notwithstanding, pursuing a demand-restricting policy is a complex 10 task as there are various aspects and interests that need to be taken into 11 account. It is essential for a present day administration, that aspires to a 12 sustainable and highly qualitative mobility policy, to focus on users' and 13 residents' needs (Stringham, 2004). 14



Figure 1: Evolution of car possession in Flanders (Belgium)

<sup>15</sup> To pursue efficiency, policy makers should focus on creating a solid social

basis for the policy measures considered, as measures that are perceived un-16 acceptable by the general public often miss their target. Therefore, in this 17 research it will be explored how people evaluate different demand-restricting 18 policy measures. In particular, it will be investigated to what extent people 19 perceive the proposed policy measures in the same way, and whether differ-20 ent sub-groups or segments can be identified according to their assessments. 21 Possible similarities between different segments indicate general agreement 22 and pin-point for which policy measures an overall solid social basis exists, 23 or in contrast, for which policy measures public acceptance is completely 24 absent. Furthermore, any eventual differences between segments provide es-25 sential information for policy makers, as they allow to tailor policy actions to 26 specific subgroups in order to create the required public support. After all, 27 policy measures will be more efficient and effective if they are fine-tuned on 28 specific target groups, as they can be assumed to better match backgrounds, 29 desires and possibilities of these groups (Anable, 2005). 30

In general, policy measures can be subdivided into four categories: on 31 the one hand, one could distinguish 'hard' from 'soft' policy measures (Eriks-32 son et al., 2006). Policy measures considered as 'hard' are the provision of 33 transport infrastructure and other physical and/or technical facilities, strict 34 regulation and significant pricing policies (Cools et al., 2009). These pol-35 icy measures primarily focus on changing behavioral opportunities. 'Soft' 36 policy measures include information provision, education and persuasive ad-37 vertising, aimed at changing norms, motivations and perceptions. On the 38 other hand a distinction can be made between 'push' and 'pull' measures 30 (Stradling et al., 2000; Thorpe et al., 2000). 'Push' measures focus on reduc-40 ing the attractiveness of car use, whereas 'pull' measures aim at increasing 41 the attractiveness of alternative transport modes. 42

In addition, policy measures can be categorized according to the policy domain: engineering [eng], law, economics [eco] and education [edu]. Table 1 gives an overview of commonly referred categorizations of policy measures corresponding to these policy domains.

Finally, policy measures can be typified according to their policy strategy. The Victoria Transport Policy Institute (2010) distinguishes four demandrestricting policy strategies: (*i*) improved transport options, (*ii*) incentives to use alternative transport modes, (*iii*) parking and land-use management, and (*iv*) institutional policy revision (policies and programs).

In the following Section, the methodology to explore the evaluation of various demand-restricting policy measures, which is a qualitative yet sta-

	Marshall and Banister (2000)	May et al. (2003)	Gärling and Schuitema (2007)	
Eng	Physical measures	Infrastructure provision	Physical change measures	
	Capacity management			
	Restrictions on access and parking	Management and regulation	Legal policies Economic policies	
Law	Deliveries of goods and services	management and regulation		
	City and company travel policies			
	Land-use planning	Land-use policies		
Fco	Pricing, charging and taxation	Pricing		
LCO	Subsidies and spending	Theme		
Edu	Public awareness	Attitude and behavior	Information and education	
Lau	Communications and technology	Information provision		

Table 1: Categorization of policy measures according to their policy domain

tistical technique, will be discussed. Afterwards, in Sections 3 and 4, the
results will be presented and discussed more in detail. Finally, Section 5
will recapitulate the most important findings and pin-point some worthwhile
avenues for future research.

## <sup>58</sup> 2. Q-methodology

To explore the evaluation of various demand-restricting policy measures 59 and define specific target groups, different methodological approaches can be 60 followed including cluster analysis (Kaufmann, 2000), factor analysis (Kauf-61 mann, 2000), discourse analysis (Guiver, 2007), Q-methodology (Rajé, 2007; 62 Cools et al., 2009) and correspondence analysis (Diana and Pronello, 2010). 63 In this study, Q-methodology is adopted as the technique to segment people 64 according to their evaluation of different policy measures. The technique is 65 chosen because it does not require a large number of participants in order 66 to generate a diversity of subgroups (Rajé, 2007), and because it provides a 67 responsive but statistically rigorous approach to study perceptions on sus-68 tainable transport policy making (Barry and Proops, 1999). 69

Q-methodology is a qualitative yet statistical approach that aims at the 70 systematic and rigorous study of subjectivity, an individual's personal view-71 point, opinion, attitude, and the like. It provides a methodological framework 72 to define discourses (subgroups or segments) which frame people's views on a 73 particular subject, for instance transport policy measures (Rajé, 2007). Al-74 though it is primarily an exploratory technique (the methodology cannot be 75 adopted to formally test hypotheses), it brings coherence to research ques-76 tions that have many, potentially complex and socially contested answers 77 (Watts and Stenner, 2005). The added value of the technique lies in the 78 identification of the different typologies (sub-groups or segments) that are 79

relevant to the population. However, the technique does not allow making
 inferences on the people belonging to these different typologies based on the
 sample.

In a Q-methodological study respondents (P-set) are presented with a set 83 of statements about a particular topic, called the 'Q-sample'. They are asked 84 to rank-order the statements (usually from 'agree' to 'disagree'), a process 85 often referred to as 'Q-sorting' (Brown, 1993). By performing this Q-sorting, 86 respondents give their subjective meaning to the statements, and so reveal 87 their personal viewpoints. These viewpoints are then subject to factor anal-88 ysis (McKeown and Thomas, 1988). By correlating respondents, Q-factor 89 analysis gives information about similarities and differences in viewpoints on 90 a particular subject (Barry and Proops, 1999). If significant clusters of cor-91 relation exist, they could be factorized, and described as common viewpoints 92 (or preferences, typologies). 93

Summarized, Q-methodology encompasses five phases (McKeown and Thomas, 1988): (*i*) identification of the areas which one wishes to explore (concourse), (*ii*) development of the statements (Q-sample), (*iii*) selection of the respondents (P-set), (*iv*) rank-ordering by the respondents (Q-sorting), and (*v*) analysis and interpretation. For the basic reference on Q-methodology, the reader is referred to Stephenson (1953). A good tutorial reference to Qmethodology is written by McKeown and Thomas (1988).

#### 101 2.1. Concourse

The first stage in Q-methodology concerns the delineation of the flow 102 of communicability surrounding the areas of interest, often referred to as a 103 'concourse' (Brown (1993) as cited by van Exel et al. (2004)). The concourse 104 is a technical concept for the collection of all the possible statements people 105 can make about the subject at hand. The concourse is thus supposed to 106 contain all the relevant aspects of all the discourses (Brown, 1993). In this 107 study, the concourse involves statements about the acceptability of various 108 demand-restricting policy measures. Although 'acceptability' can refer to 109 underlying indicators such as 'effectiveness', 'fairness' and infringement on 110 someone's 'freedom' (Eriksson et al., 2006), in this study the focus is laid on 111 the overall concept 'acceptability' to ensure that the respondents give their 112 overall subjective meaning to the statements. 113

## 114 2.2. Q-sample

The second stage implies defining the 'Q-sample', i.e., the set of state-115 ments that is presented to the respondents. Watts and Stenner (2005) indi-116 cate that, in general, the use of 40 to 80 statements yields satisfactory results. 117 For this study, the Q-sample contains 42 statements (Table 2). The Q-sample 118 is a structured sample covering the four demand-restricting policy strategies 119 identified by Litman (2003) and Victoria Transport Policy Institute (2010). 120 In addition, it ensured that the distinction between 'hard' and 'soft' policy 121 measures on the one hand, and 'push' and 'pull' on the other is weaved into 122 the Q-sample. The advantage of using a structured sample, is that struc-123 tured samples are composed systematically, minimizing the risk that some 124 issue components are over- or under-sampled (McKeown and Thomas, 1988). 125

## 126 2.3. P-set

A Q-methodological study does not require a large number of participants 127 (P-set) in order to find meaningful, discernable groups. Barry and Proops 128 (1999) illustrated that a larger P-set would not be beneficial in a Q-study. 129 The reliability of the methodology in terms of replication of schematically 130 reliable discourses across different respondents, is assured by the fact that the 131 Q-sample is well-structured and by the finding that only a limited number 132 of distinct viewpoints exist on any topic (McKeown and Thomas, 1988). 133 Reliability, in terms of the ability to generalize sample results to the general 134 population is of less concern here, as the main focus of the methodology is to 135 identify a topology, not to test the typology's proportion distribution within 136 the larger population (Rajé, 2007). 137

Since the focus of this research lies on the acceptability of demand-138 restricting policy measures that often involve car-use, participants had to 139 be at least 18 years old, the age-level for legally obtaining a driving license in 140 Belgium. Besides age, car possession and gender were also used to balance 141 the P-set. Correspondingly, a three-dimensional structure of the P-set was 142 obtained, consisting of 12  $(3 \times 2 \times 2)$  logical combinations: three age cate-143 gories (18-25, 26-65, >65), gender, and car ownership (yes/no). For each of 144 the 12 combinations, three persons were sought. For the category older males 145 without a car, no participants were recruited, resulting in a study population 146 of 33 persons. 147

		Table 2. Q-sample statements				
Policy measure	No.	Statement	Hard	Soft	Push	Pull
Improved transpo	ort opt	ions				
Ridesharing	1	It is acceptable to spread travel costs by carpooling	0	•	0	•
0	29	It is unacceptable to ride along with people you got	0	•	0	•
		to know trough a carpool-related website.				
Telework	34	It is acceptable that people are allowed to telework	0	•	0	•
		from home.				
	5	It is acceptable to shop online in order to avoid	0	•	0	•
		making a trip to the shop				
Traffic calming	31	It is acceptable that physical speed reduction mea-	•	0	•	0
frame canning	01	sures such as speed humps are installed.				
	9	It is unacceptable that some roads are closed to	•	o	•	o
		avoid through traffic.				
Transit im-	35	It is acceptable that trams have separate lanes to	•	0	0	•
provements		prevent from getting stuck in traffic jams.				
P	13	It is acceptable that trams always have right of way	•	0	0	•
		over other transport modes such that higher travel				
		speeds can be attained.				
Alternative	18	It is acceptable to determine your own working	0	•	0	•
work schedules		times to a certain degree.				
	39	It is acceptable that not all employees have to work	0	•	0	•
		at the same moment.				
Car sharing	21	It is acceptable to reserve special parking lots for	•	0	0	•
0.000 000000000		car sharing				
	40	It is acceptable that people who participate in car	•	0	0	•
	10	sharing do not need to pay all the costs.				
Cycling im-	14	It is acceptable that improved bicycle tracks are	•	0	0	•
provements		constructed	-	-	-	-
provenience	41	It is unacceptable that parking lots nearby train	•	0	0	•
		stations are converted into covered bicycle-racks.				
Park and ride	25	It is acceptable that under-occupied park lots	0	•	0	•
i anii ana mao	-0	nearby public transit stops are promoted as P&B-				
		parking facilities.				
Incentives to use	alterr	partime transport modes				
HOV priority	30	It is acceptable that it is prohibited to drive on a	•	0	•	0
nov priority	00	separate bus lane with a private car	•	0	•	0
	2	It is acceptable that public transport has priority	•	0	0	•
	-	at traffic signals	-	-	-	-
Distance-based	6	It is unacceptable that variable pricing is applied	•	0	•	0
taxes	0	when you drive a car.	•	0	•	0
Con too	19	It is acceptable that you have to pay road taxes	•	0	•	0
	10	according to the distance you travel by car	•	0	•	0
Fuel Taxes	10	It is unaccentable that fuel prices increase	•	0	•	0
Speed Boduc	38	It is acceptable that the speed limit in school zones			-	
tions	00	is 30km/h	•	Ŭ	•	Ŭ
00115	26	It is acceptable that more speed cameras are in	•	0	•	0
	20	stalled at dangerous locations	•	0	•	0
Walking and	15	It is accortable that walking and evaluations	0	-		-
Cycling En	10	motod as an alternative to car use for short distance	0	•	0	•
Cyching Ell-		tripa				
couragement	<u> </u>	unps. It is accontable that an employer news bioycle sub-	-	0	0	-
	44	sidios	•	0	U	•
M14: M1-1	20	Sittes.				
Mariantina	20	it is acceptable that you can plan your own (multi-	0	•	0	•
Taal		modal route by means of route planning software				
1001		made available by public transport companies.				

Table 2: Q-sample statements

Policy measure	No.	Statement	Hard	Soft	Push	Pull
Parking and land	l-use 1	nanagement				
Strong com-	3	It is unacceptable that many local shops are re-	•	0	0	•
mercial centra		placed by huge commercial centra.				
New Urbanism	7	It is acceptable that shops are within a 10 minute	•	0	0	•
		walking distance from home.				
Location Effi-	11	It is acceptable that shopping malls are constructed	•	0	0	•
cient Develop-		at highly accessible locations.				
ment						
Parking Man-	23	It is acceptable that parking is prohibited at certain	•	0	٠	0
agement		locations.				
	16	It is unacceptable that underground parking in	0	•	•	0
		cities is promoted.				
Parking Pric-	27	It is acceptable that fringe parking is free-of-charge.	•	0	0	•
ing						
	32	It is acceptable that parking in the city center is	•	0	•	0
		expensive.				
Transit Ori-	17	It is acceptable that the use of public transport is	•	0	0	٠
ented Develop-		stimulated by building offices nearby train stations.				
ment						
	42	It is acceptable that commercial areas in the prox-	•	0	٠	0
		imity of train stations are not accessible by car.				
Smart Growth	24	It is acceptable that higher density development is	•	0	0	•
		encouraged.				
	36	It is unacceptable that areas are developed explic-	•	0	0	•
		itly oriented at public transport.				
Connectivity	28	It is acceptable that small alleys are provided such	•	0	0	٠
		that people using slow modes do not have to make				
		detours.				
Institutional poli	cy rev	ision				
Car-free Plan-	4	It is acceptable that city centers are highly accessi-	•	0	0	•
ning		ble by alternative transport modes.				
	33	It is acceptable that car use is prohibited in certain	•	0	•	0
		parts of the city center.				
Operations and	37	It is acceptable that public transport is put into	•	0	0	•
Management		service for special events.				
Programs						
	8	It is unacceptable that a scheduled service bus can	•	0	0	٠
		make use of the hard shoulders on highways.				
Least-Cost	12	It is acceptable that no investments are made in	•	0	•	0
Transportation		new road infrastructure.				
Planning						

## 148 2.4. Q-sorting

After the formulation of the statements (Q-sample) and selection of the 149 respondents (P-set), the respondents need to rank-order the different 150 statements according to their points of view, a process that is referred to as 151 'Q-sorting' (McKeown and Thomas, 1988). To lower complexity, participants 152 are not required to carry out a complete rank ordering of the different state-153 ments. Instead, they have to assign each statement to a ranking position in a 154 fixed quasi-normal distribution. An important element in this rank-ordering 155 process is that each respondent can use his or her own subjective criteria to 156 evaluate the different statements (Watts and Stenner, 2005). 157

The 42 statements in this study were all printed on randomly numbered 158 cards. Respondents were instructed to attentively read through all of the 159 statements and asked to what extent they agreed with the statements. First, 160 they had to order them into three piles: general agree, general disagree, and 161 neutral/undecided. Next, the respondents had to rank-order the statements 162 further according to the quasi-normal distribution illustrated by Table 3. A 163 value of +4 indicates the largest agreement with the statement, a value of 164 -4 the largest disagreement. This distribution restriction may alarm some 165 researchers, vet such concerns are largely misplaced, as an array of statisti-166 cal comparisons demonstrate that distribution effects are virtually inexistent 167 and thus, the chosen distribution makes no noticeable contribution to the dis-168 courses (segments) that emerge from the analysis (Watts and Stenner, 2005). 169 After sorting, participants were asked to clarify why they most agreed and 170 most disagreed on the statements they placed under "-4 (most disagree)" 171 and "+4 (most agree)". 172

Table	e 3:	Q-sa	mple	e sta	tem	ents			
Values	-4	-3	-2	-1	0	+1	+2	+3	+4
Number of statements	<b>2</b>	3	5	7	8	7	5	3	2

#### 173 2.5. Analysis

To analyze the Q-sorts and extract the underlying segments, the software 174 package PQMethod (Schmolck, 2002) was used. After entering all 33 Q-175 sorts in the program, the intercorrelation matrix of the Q-sorts is factor-176 analyzed by the centroid procedure. In contrast to traditional factor analysis, 177 the psychometrics of Q-methodology call for the correlation and factoring 178 of persons, as opposed to tests, traits, etc (McKeown and Thomas, 1988). 170 A selection of the resultant factors is then rotated using varimax rotation. 180 Varimax rotation fits perfectly with the primary objective of Q-methodology, 181 namely the disclosure of the range of segments in the participant group. 182 Given this objective, it makes theoretical sense to pursue a rotated solution 183 which maximizes the amount of variance explained by the extracted factors 184 (Watts and Stenner, 2005). 185

Different criteria are used to determine the number of factors that have to be rotated. A first criterion is that only factors with eigenvalues exceeding one should be considered for extraction (Rajé, 2007). Eigenvalues are a measure of the relative contribution of a factor to the explanation of the

total variance in the correlation matrix. Factors with an eigenvalue greater 190 than one explain more variance than a single Q-sort would (McKeown and 191 Thomas, 1988). Nine factors met this first criterion. A second criterion is 192 that an interpretable Q-methodological factor must have at least two Q-sorts 193 (the ranked statements of two respondents) that load significantly upon it 194 alone (Watts and Stenner, 2005). A Q-sort was considered to significantly 195 load upon a single factor when the correlation between the factor and the 196 Q-sort exceeded 0.50 and cross-loadings of the Q-sort with other factors were 197 smaller than 0.40. This second criterion was met with a four factor solution. 198 Note that a four-factor solution appears to be common in the paradigm of sus-199 tainable transport planning as Barry and Proops (1999), Kaufmann (2000), 200 van Exel et al. (2004), Rajé (2007) and Cools et al. (2009) all suggested that 201 four segments preponderate the paradigm. 202

#### 203 3. Results

Four different segments to acceptance of demand-restricting policy mea-204 sures were found: (i) travelers who are in favor of traffic calming policy 205 measures (segment A), (*ii*) travelers who are against hard push measures 206 (segment B), (*iii*) travelers who are in favor of demand-restricting policy 207 measures (segment C), and (iv) travelers who are against innovative policy 208 measures (segment D). These four subgroups account for 56% of the varia-209 tion in the Q-sorts. Recall that both similarities and differences between the 210 different subgroups provide essential information for policy makers. These 211 similarities and differences can be derived from the factor Q-values and nor-212 malized factor scores (Z-scores) displayed in Table 4. The factor Q-values for 213 each statement indicate how each group ranked the items (Donner, 2001). 214 The Z-scores denote how far each item is from the overall group mean. A 215 summary profile for each of the segments is obtained by combining the infor-216 mation from the Q-sort values and the distinguishing characteristics derived 217 from the Z-scores (Donner, 2001). 218

		Factor Q-	sort values		Normalized factor scores				
No.	Segment A	Segment B	Segment C	Segment D	Segment A	Segment B	Segment C	Segment D	
1	2	1	2	1	0.809	0.714	0.995	0.347	
2	0	0	0	0	-0.111	-0.074	0.259	0.166	
3	0	-1	-1	-1	0.326	-0.565	-0.461	-0.115	
4	0	2	2	2	0.285	1.045	0.998	0.812	
5	-1	0	0	-2	-0.394	0.100	0.071	-0.831	
6	-2	3	-3	-2	-0.751	1.740	-1.610	-0.867	
7	-1	1	-2	1	-0.622	0.317	-0.754	0.402	
8	-2	-3	-4	-3	-1.223	-1.188	-1.838	-1.294	
9	-3	0	-4	-2	-1.411	0.041	-1.872	-1.061	
10	-1	4	-1	1	-0.464	1.882	-0.562	0.226	
11	0	2	0	-1	0.156	0.734	0.143	-0.120	
12	-3	-3	-1	0	-1.474	-1.404	-0.587	0.189	
13	1	-2	1	1	0.368	-0.845	0.844	0.346	
14	4	4	2	4	1.962	1.991	1.028	2.051	
15	3	2	0	3	1.073	1.067	0.210	1.103	
16	-2	-4	-3	-1	-1.175	-1.660	-1.378	-0.577	
17	2	3	1	0	0.781	1.093	0.781	-0.046	
18	2	1	3	0	0.997	0.426	1.088	0.072	
19	-2	-2	4	-4	-1.213	-1.137	1.493	-1.689	
20	1	1	0	-2	0.500	0.506	0.000	-1.110	
21	0	-1	-1	-1	0.212	-0.406	-0.501	-0.526	
22	3	3	2	0	1.456	1.579	0.859	0.060	
23	2	-1	1	2	0.631	-0.539	0.442	0.997	
24	-1	0	0	-1	-0.504	-0.075	0.018	-0.648	
25	1	1	1	0	0.401	0.628	0.664	0.065	
26	2	-2	0	1	1.047	-1.062	-0.322	0.193	
27	0	3	4	2	0.070	1.209	1.925	0.817	
28	-1	0	2	3	-0.605	0.141	0.871	1.283	
29	-3	-2	-3	1	-1.360	-0.838	-1.468	0.346	
30	0	1	3	3	-0.057	0.194	1.298	1.391	
31	4	-3	-3	-4	2.032	-1.257	-1.227	-1.580	
32	-2	-4	1	-2	-0.911	-1.841	0.507	-1.114	
33	3	-1	3	-1	1.084	-0.411	1.493	-0.697	
34	1	0	1	4	0.562	0.006	0.735	2.100	
35	1	2	-1	0	0.430	0.762	-0.559	0.002	
36	-4	-2	-2	-3	-1.666	-0.838	-0.874	-1.281	
37	0	2	3	2	0.284	0.815	1.103	0.828	
38	3	-1	-2	3	1.581	-0.191	-0.859	2.045	
39	1	0	0	0	0.328	-0.136	-0.225	-0.007	
40	-1	0	-1	2	-0.339	-0.061	-0.630	0.577	
41	-3	-2	-2	-3	-1.499	-1.035	-1.168	-1.279	
42	-4	-3	-2	-3	-1.594	-1.432	-0.930	-1.578	

Table 4: Factor Q-sort values and normalized factor scores

## 219 3.1. Similarities between the different subgroups

Similarities between the different subgroups indicate general agreement 220 and pin-point for which policy measures an overall solid social basis exists, 221 or in contrast, for which policy measures such social basis is completely 222 absent. Table 5 shows the consensus statements for which a clear agreement 223 or disagreement (average Q-sort values (aqv.) strictly smaller than -1 or 224 strictly greater than +1) exists. In the remainder of the text square brackets 225 refer to the Q-sort values; the first number between the square brackets 226 corresponds to the statement number, the second number corresponds to the 227 (average) Q-sort value. 228

Table 5: Conse	ensus s	tatemen	ts			
Policy measure		Aqv.	Hard	Soft	Push	$\operatorname{Pull}$
Improved transport options						
Ridesharing	1	1.50	0	•	0	•
Cycling improvements	41	-2.50	•	0	0	•
Parking and land-use management						
Transit Oriented Development	42	-3.00	•	0	•	0
Smart Growth	36	-2.75	•	0	0	٠
Institutional policy revision						
Car-free Planning	4	1.50	•	0	0	٠
Operations and Management Programs		1.75	٠	0	0	•
Operations and Management Programs	8	-3.00	•	0	0	•

 Table 5: Consensus statements

There is a general agreement that public transport has to play an im-229 portant role in a demand-restricting policy. Important destinations such as 230 city centers [4, +1.50] or locations where huge events are organized [37, +1.75]231 should be easily accessible by public transport (values are displayed in Ta-232 ble 5). Moreover, accessibility by public transport should be a key issue in 233 future urban development [36,-2.75]: "King car should not always have the 234 final word, various public transport modes should be preferred" (quote from 235 the additional questioning of the respondents). 236

The key role that everyone attributes to public transport can be accounted for by the fact that all travelers, including the ones that have fewer transport options, should be able to reach important city locations [42,-3.00]. The attractiveness of public transport should be stimulated by prioritizing public transport by allowing a scheduled service bus to make use of the hard shoulders on highways [8,-3.00].

Next to the clear preference for a more dominant role for public transport, there is a general consensus for improved transport options of alternative transport modes. It is generally accepted that by carpooling, travel costs are spread [1,+1.50] and that sufficient bicycle shelter should bee provided nearby train stations [41,-2.50].

#### 248 3.2. Differences between the different subgroups

Differences between segments also provide essential information for policy makers, as they allow to tailor policy actions to specific subgroups in order to create the required public support. The contention statements that subgroup (concourse) members have ranked significantly differently from other subgroups are displayed in Table 6. From this Table it is clear that the different policy strategies matter in explaining differences in acceptance of policy measures.

0	0	(1	)				
Policy strategy	Distinguishing statements (statement numbers)						
Toney strategy	Segment A	Segment B	Segment C	Segment D			
Improved transport options	31	9,13	14	29,34			
Incentives to use alternative modes	26	6,10,26	$6,\!15,\!19$	$10,\!20,\!22$			
Parking and land-use management	27,28	23,28,32	27,32	17			
Institutional policy revision	-	-	12	12			

Table 6: Distinguishing statements (p-value < 0.05)

Next to indicating those elements that differentiate segments, it is important to get deeper insight into the rationale of each of the identified subgroups. By combining the information from the Q-sort values (Table 4) and the distinguishing characteristics (Table 6) a summary profile for each of the segments is obtained.

#### <sup>261</sup> 3.2.1. Segment A: travelers in favor of traffic calming policy measures

The first segment is characterized by a noticeably higher acceptance 262 of traffic calming and speed reducing policies. Members of this group fa-263 vor installation of physical speed reduction measures such as speed humps 264 [31,+4.00], support the introduction of a speed limit of 30 km/h in school 265 zones [38, +3.00], and whet the installation of more speed cameras [26, +2.00]. 266 In addition, this subgroup is typified by a general acceptance of hard 267 policy measures to stimulate bicycle use. Members of this subgroup favor 268 the construction of improved bicycle tracks [14, +4.00] and support the fact 269 that employers pay bicycle subsidies to their employees [22,+3.00]. Poor 270 conditions of the bicycle tracks in Flanders (Dutch speaking part of Belgium) 271 are indicated as a barrier to shift to this mode. 272

This subgroup also endures that car use is prohibited in city centers [33,+3.00] and that certain roads are closed to avoid through traffic [9,-3.00]. Members of this subgroup indicate that these policy measures are the only solution to ensure the livability of the city centers. When cars are prohibited, children can play outside and social contacts within the neighborhood are enhanced.

Finally, this subgroup has a clear objection to least-cost transport planning [12,-3.00]. The members belonging to this segment stress the importance of investment in new road infrastructure to support economic development.

#### 282 3.2.2. Segment B: travelers against hard push measures

The second subgroup is marked by an extremely low acceptance of hard push measures. Soft and pull measures on the other hand are more favored by this subgroup. Increases in fuel prices [10,+4.00], variable pricing for car use [6,+3.00] and higher parking prices nearby city centers [32,-4.00] are unacceptable for members of this subgroup. Nonetheless, the simulation of car use, by investing in improved bicycle tracks [14,+4.00] and by providing financial benefits for cycling [22,+3.00], is perceived as acceptable.

Although this subgroup opposes to push measures concerning parking management, the subgroup is in favor of parking-related pull measures such as the promotion of underground parking [16,-4.00] and free fringe parking [27,+3.00]. The creation of a more beautiful cityscape by letting historical places stand out well is quoted as the underlying motivation for the acceptance of these measures.

In comparison to the other subgroups, this segment perceives prioritizing trams [13,-2.00], introducing parking restrictions [23,-1.00] and closing particular roads to avoid through traffic, to be less acceptable.

## 299 3.2.3. Segment C: travelers in favor of demand-restricting policy measures

The third segment is typified by a clearly higher acceptance of demandrestricting policy measures as the other segments. Broader public support for parking pricing and distance-based taxes characterizes this segment. This segment favors the parking pricing principle that fringe parking is free-ofcharge [27,+4.00], whereas parking in the inner-city is financially penalized [32,+1.00]. In addition, kilometer charging, which encourages car use reductions, is perceived acceptable [19,+4.00; 6,+3.00].

Besides, members of this subgroup agree with different policy measures that enhance the livability of the city. Making parts of the city center car-free <sup>309</sup> [33,+3.00], stimulating underground parking [16,-3.00] and closing roads to <sup>310</sup> tackle through traffic are perceived as acceptable policy measures pursuing <sup>311</sup> this goal.

#### 312 3.2.4. Segment D: travelers against innovative policy measures

The final subgroup that can be distinguished opposes to innovative pol-313 icy measures. The necessity of multi-modal navigation tools [20,-2.00] and 314 promotion of ridesharing [29,+1.00] is seriously questioned by this subgroup, 315 indicating the dislike for innovative policy measures. Notwithstanding, tele-316 work is perceived as highly acceptable [34, +4.00]. Although no generaliza-317 tions of personal characteristics concerning the members of this segment can 318 be made, it still is apparent that all members belonging to this segments 319 were either professionally inactive women or elderly women. 320

#### 321 4. Discussion and policy advice

The findings indicate that push measures are likely to be the most so-322 cially acceptable policy interventions. This implies that policy makers should 323 primarily focus on this type of policy measures when planning and imple-324 menting an integrated transport policy. The similarities between the different 325 subgroups highlighted three important issues that policy makers should take 326 into account when formulating their transport policy: (i) the important role 327 everyone attributes to public transport, (ii) the need to improve bicycle in-328 frastructure, and *(iii)* the acknowledgement of the potential of ridesharing. 329

Concerning public transport, policy makers might gain from explicitly 330 tailoring future urban developments on public transport systems. On a local 331 level, it is important that these systems are reliable, fast and comfortable. 332 Thus, the influence of congestion on public transport systems should be min-333 imized. A possible way forward is the introduction of separate bus lanes. 334 On a more regional level, a high inter-exchangeability between different pub-335 lic transport systems should be guaranteed. The location of multi-modal 336 transport nodes should optimize transfer times and accessibility of different 337 types of travelers. An essential element is that the timetables of the dif-338 ferent services are matched. In addition to maximizing the accessibility of 339 destination zones by public transport, the accessibility of the origin zones by 340 public transport should also be enhanced. Herein lies the rub for Flemish 341 policy makers as the urban environment is shattered by ribbon development 342 (Boussauw and Witlox, 2009). Consequently, a close collaboration between 343

transport and urban planners is essential to focus future urban development
on accessibility by public transport systems.

Secondly, improving current bicycle infrastructure should be a key pri-346 ority for policy makers. The current network of bicycle tracks needs to be 347 upgraded and extended, taking into account a multitude of aspects including 348 safety, comfort, attractiveness, directness and coherence. Moreover, bicycles 349 are often used as a secondary transport mode before and after the leading 350 transport mode. Therefore, improved and additional bicycle shelter could 351 further enhance bicycle use. Besides, a close cooperation with specific target 352 groups (e.g. schools and companies) could be beneficial. 353

The third issue which should not be disregarded is the potential of ridesharing. Policy makers should facilitate travelers to carpool. On the one hand, investments concerning the infrastructure should be made. On the other, travelers need to be informed about the advantages of ridesharing, in particular cost savings, and about the various possibilities to find carpooling partners.

Concerning other policy measures there is no overall consensus. Nonethe-360 less, the differences between the various subgroups are very useful, since they 361 serve as tailoring cues for future policy actions. Table 7 provides an overview 362 of alternative approaches to implement certain policy measures. For each 363 policy measure, it is indicated whether social acceptance is present in the 364 different subgroups:  $\checkmark$  indicates the presence of public support for the policy 365 measure,  $\mathbf{x}$  refers to the absence of a social basis, and  $\circ$  indicates that the 366 segment is neutral concerning the acceptability of the policy measure. 367

Comment							
Policy measure	Jegment				Possible alternative approach		
		В	C	D			
Traffic calming (31)	$\checkmark$	×	×	×	Only install speed humps where absolutely neces-		
					sary, as there are more subtle ways to achieve a		
					traffic calming affect including a smaller camber		
					traine canning effect including a smaller camber,		
					and the implantation of trees to create a sense of		
					enclosure.		
Fuel taxes (10)	$\checkmark$	×	$\checkmark$	×	( <i>i</i> ) Compensate increased fuel prices by lowering		
					fixed costs (purchase price, insurance, etc) and in-		
					form people of this compensation. ( <i>ii</i> ) Promotion		
					compaigns to stimulate people to reduce their car		
					campaigns to stimulate people to reduce their car		
					use.		
Distance-based taxes $(6,19)$	0	×	$\checkmark$	×	Some target groups, for instance people working		
					in the home health care sector, do not have fully		
					fledged alternatives to their car. For these target		
					groups special arrangements can be made, increas-		
					ing the social basis for the policy measure		
$\mathbf{D}$ 1: : (22)	~	~			D li l l l l l l l l l l l l l l l l l l		
Parking pricing (32)	×	×	~	×	Policy makers should try to optimize parking be-		
					havior by (i) providing free fringe parking, (ii) in-		
					troducing maximum parking times next to higher		
				parking prices in the city centers, and (iii) provid-			
				ing parking permits for local residents and disabled			
		neonle					
		1			people.		

Table 7: Policy measures to conduct a differentiated policy

The numbers between brackets correspond to the statement numbers

## 368 5. Conclusion

In this research it was explored how people evaluate the acceptability of 369 divergent demand-restricting policy measures. It was shown that four dif-370 ferent segments to acceptance of demand-restricting policy measures were 371 found. Similarities between the different subgroups underlined that pub-372 lic transport has to play an important role in a demand-restricting policy. 373 Next to improving public transportation, the resemblances also illustrated 374 that there exists a solid social acceptance concerning policy measures that 375 stimulate ridesharing and bicycle use. 376

The policy measures for which no overall acceptance existed, did provide essential information for policy makers to tailor policy actions to specific subgroups. An overview of alternative approaches to implement contested policy measures was provided in Table 7.

The distinguishing statements in this research can be adopted by future 381 research attempts to analytically investigate the identified segments. Us-382 ing the distinguishing statements in a large-scale survey enables the formal 383 testing of hypotheses about the relationships between the segments and dif-384 ferent socio-economic and other relevant variables, which would enable tai-385 loring based on these variables. Further research may be carried out to test 386 whether a wider range of source materials to provide the concourse (extend-387 ing the policy measures listed by Victoria Transport Policy Institute (2010)) 388 yields different clusters of subjectivity. Furthermore, the transferability of 389 the findings to different socio-geographical and cultural contexts needs to be 390 assessed. In addition, future research could focus on the underlying indica-391 tors (fairness, effectiveness, infringement of freedom) of the acceptability of 392 policy measures. 393

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