Getting from A to B: Operant Approaches to Travel Decision Making

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Introduction

The study of transport economics exists very much in an R world, with strongly held beliefs in rational choice, survey analysis, modeling, and forecasting. The models transport economists create border on caricature in assuming that travelers are highly motivated and involved in searching for optimal travel solution for each trip and base their decisions on complete and well-defined preferences about all aspects of travel. Travelers are thought to have immutable preferences between points in time and space as well as between socio-economic contexts, to have access to all available travel alternatives, and to consider all of these each time as they use all relevant information for each travel decision. Furthermore, this high quality decision making process is presumed to be undisturbed by repetition, and possibly uninfluenced by habituation. Large surveys are conducted to feed models that translate expectations about travel behavior into fairly aggregate price and substitution elasticities. Track records of these models, however, are poor. Predictions have often been inaccurate and, consequently, the transport policies based on them have seldom been effective in reducing the need for travel and achieving a modal shift from car to public transport. In most EU member states car ownership and usage have increased dramatically since the 1960s, making the following decades the "era of the car" (Banister 1994).

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The design and preliminary results of this study were presented at the ISSSS Q Conference in Canton, Ohio, October 2-4, 2003.

Operant Subjectivity, 2004 (July), 27(4), 194-216.

Every second person in the EU now owns a car, and over 80% of all passenger kilometers are traveled by car. The figures are even higher in the US, where car ownership is around the assumed saturation level of 650 cars per 1,000 inhabitants; and automobiles account for over 95% of all passenger kilometers in land transportation (Banister 1994).

Travel demand management has recently become the focus of transport policy, as policy makers seem to have abandoned attempts at reducing the need for travel and increasing use of public transport. The primary aim of policies like using toll roads and pricing premiums for travel at times of peak congestion is to optimize demand around infrastructure bottlenecks. Yet, the design of a pricing scheme that will convince people to change their travel plans (e.g., route, departure time, car sharing) creates an even greater need for understanding determinants of individual travel behavior. The question remains whether the use of ever larger surveys has increased understanding about individual travel behavior.

Travel behavior is sometimes the result of reasoned choice; other times, though, it resembles *inert* continuance of a habitual satisfactory behavioral pattern, often best characterized by both low involvement and little cognitive effort.[1] Perhaps more often, it is something in between. We are interested in the contribution of *inert* behavior to apparent insensitivity to a range of factors expected to influence travel behavior from the *rational actor* perspective usually adopted in transport economics. Many ideas have been advanced to explain deviations in observed travel behavior from theoretical expectations:

1) need or desire (i.e., direct demand) for travel itself;
2) interdependence of travel and activity patterns;
3) absolute, non-compensatory preferences for modes, routes, destinations, or departure and arrival times, with high involvement in a single option leading to low motivation for change;
4) objectively or subjectively restricted choice sets resulting from (perceived) availability and suitability of alternative travel modes;
5) impact of repetition (e.g., commuting behavior) on learning, experience, familiarity, and habituation; and
6) relationship of experience (including critical incidents), familiarity, and habituation in the availability, perception, and use of information about use of potential travel alternatives.

Though this list is far from complete, it adequately demonstrates the difficulty faced by researchers who try to identify all relevant influences upon individual travel behavior and then incorporate each one in sufficient detail as part of a concise travel survey.

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[1] We refer to such behavior as *inert* to distinguish it clearly from *irrational* or *non-rational* behavior.

We used Q methodology to allow travelers themselves to help us identify the most relevant subjective influences on their travel behavior. To clarify focus and scope, our research was limited to medium-distance travel (30-100 kilometers, or about 20-60 miles). Such trips are common for most people, but are impractical for a number of private travel alternatives (e.g., walking, cycling, roller skating). Our research question was: *What are the approaches to and determinants of medium-distance travel decisions*? We wanted to know how the role of standard economic cost/benefit motives used in transport research compares to that of motives that are not economic, quantifiable, or compensatory, (such as freedom, culture, status, and personal and social norms). Another concern was how robust the assumptions of stable preferences, perfect control, and independence are in operant approaches to medium-distance travel decisions.

Previous Q studies in transport

We could locate only two previous applications of Q methodology in transport research. Steg, Vlek, and Slotegraaf (2001) investigated the relative importance of *instrumental-reasoned*[2] and *symbolic-affective*[3] motives, by asking car users to sort 32 car-use episodes according to their attractiveness. Comparing their results with those from conventional self-report measures, they argue that conventional studies tend to emphasize instrumental-reasoned motives for car use, because respondents tend to rationalize and justify their behavior and to give socially desirable answers. Their Q study demonstrated that this behavior can be avoided to some extent by limiting the explicit information participants receive about the purpose of the evaluation. Symbolic-affective motives then play a much more significant role in evaluating the attractiveness of car use. Q-Research (2001) investigated the acceptance and anticipated behavioral response to the introduction of charging tolls for road use in the Netherlands. Seven stakeholder groups[4] ranked 43 statements. They report the dominant attitude-profiles for each of the participating groups.

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[2] *Instrumental-reasoned* motives play an important role in cognitive-reasoned models that assume travel decision behaviors are the result of a trade-off between costs and benefits of travel alternatives. Central motives relate to individual preferences and attitudes; e.g., travel time, reliability, safety, and comfort.

[3] *Symbolic-affective* motives stem from psychological analyses of travel behaviors; e.g., status, self-expression, self-esteem, and control. Wall, Devine-Wright and Mill (2004) studied car driver motivations for reducing or maintaining their car use for commuting and found more than 60 psychological and contextual factors that may influence travel behavior.

[4] Stake holder groups included road users and non-users; organizations representing employers, employees, and road users; environmental groups; and fee-for-use experts. Topics of the Q statements included a new kilometer charging policy, alternative charging schemes, infrastructure and road congestion, mode choice, travel purpose, alternative travel modes, privacy concerns, and fraud.

Methods used in the present Q study: Operant approaches to travel decision making

Concourse

Because this study is part of an ongoing research program, traditional theories about travel decision making were used to develop and structure the concourse (Van Exel, De Graaf, and Rietveld 2003). Based on an unpublished literature review, we identified four main categories of variables that may influence whether travel behavior complies with or deviates from that predicted by an R-type rational consideration of medium-distance travel costs and benefits: (1) motivation for travel or mode choice; (2) stability of travel preferences; (3) control over alternatives; and (4) repetition of journeys. We searched for statements to fit these four categories, especially if they included the approach to travel decision making, motivation and criteria for travel choice, and personal opinions regarding travel and travel alternatives. Statements were collected from newspapers, periodicals, public transport advertisements, a survey by the Dutch public transport travelers association (ROVER 2001), popular literature (Van Kleef 1997), scientific literature (Rooijers 1992; Desmet, Hekkert and Jacobs 2000; Steg, Vlek and Slotegraaf 2001; Hiscock et al. 2002; Petit 2002; Hagman 2003; Staal 2003) and during two previous studies.

In a conjoint analysis, the first of two previous studies, we asked respondents to rank sets of three or four car and public transport alternatives on twenty different commutes from their office location. Respondents were asked to elaborate on their choices during follow-up interviews (Van Exel and Rietveld 2003). In the second study, a participating observation of 338 trips by public transport, a large sample of personal observations and statements from other travelers and transport employees regarding subjective reliability of public transportation was collected (Van Exel 2003).

Q sample

All statements from the concourse were allocated to one of the four theoretical categories identified in the literature review and a balanced set of 42 statements addressing instrumental-reasoned and symbolic-affective characteristics of travel modes and the travel decision making process was selected for the Q sample in Table 1.*

P set

Since we were interested in travel choice, our focus was on non-captive travelers. One selection criterion for participants, was possession of a driving license. Ability to use a travel mode, however, also depends on accessibility.

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* Note: Because of length and complexity, all numbered tables appear together for clarity in the Appendix, beginning on page 211.

Thus, the two-dimensional structure of the P set consists of 6 (3×2) logical combinations: car ownership: (a) no car; (b) private car, or (c) leased/company car; and living in a city with an intercity rail station: yes or no. In addition, we differentiated, though not systematically, according to age, gender, and level of education, across all combinations within the P set.

Car ownership is an important determinant of travel behavior, because it can be viewed as proxy for access, commitment, and habituation to car use. As distinct from privately-owned cars, leased or company-owned vehicles are generally newer and better and can be driven at negligible marginal costs, which may affect travel decision making and views of public transport as an alternative. Living in a city with an intercity rail station was selected as proxy for availability of a competitive public transport alternative for medium-distance trips. Travel time by intercity rail is often acceptable for trips having origins and destinations close to rail stations. Easy access to an intercity rail station limits the number of transfers, which is associated with waiting and travel time uncertainty.

A first wave of participants was recruited within the authors' circles of family, friends, colleagues, and acquaintances.[5] Some people in this group were approached because of their personal reputation for being car- or public transport-minded or involved (uninvolved) with travel and its spatial and environmental aspects. Further respondents were acquired through *snowballing*, where these friends recruit more friends from their circles. There were 39 people participating in the study: 9 with no car, 18 with a private car, and 12 with a leased or company car. Of these, 23 lived in a city with an intercity rail station and 16 did not. We recruited at least five participants in every combination, but excluding one respondent with an incomplete Q sort left only four participants with the less common combination of no car and no access to an intercity rail station.

Q sorting

To limit time and costs, all respondents were first approached by telephone or email to determine eligibility and willingness to participate. The Q sort materials were sent by mail to the home address of people who fulfilled the selection criteria and agreed to participate with a request to return it by mail within ten days.

The condition of instruction for Q sorting was: "To what extent do you agree with the following statements concerning car and public transport as travel alternatives for middle-distance trips (30-100 kilometers)?" Participants were asked to read through all of the statements carefully, and to begin with a

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[5] "If you merely want to know the existence of factors, any person or persons will do. Simply entice, bribe, wheedle, or exercise dominance over loved ones, students or others in a delicate situation, and they will perform a Q sort. That factors will emerge from appropriate analysis is left in no doubt by 50 years of published work since *The Study of Behavior"* (Barchak 2003).

rough sorting while reading, by dividing the statements into three piles: 1) generally agree, 2) disagree, and 3) neutral, doubtful, or undecided, and to record the number of statements in each pile. Next, they were asked to rank order the statements according to the condition of instruction and the following range (*most disagree* to *most agree*) and distribution:

-4	-3	-2	-1	0	+1	+2	+3	+4
2	3	5	7	8	7	5	3	2

After sorting, participants were asked to explain why they selected the statements they placed under "-4" and "+4."[6]

Analysis

Data were entered and analyzed using PQMethod 2.11 (Schmolck and Atkinson 2002). The overall balance in the Q sample was fair: the mean number of statements pre-sorted under *agree* was 15, under *neutral* 9, and under *disagree* 18. Seven factors were extracted originally using centroid factor analysis. Two factors had more than two defining variables (at significance level $p<0.001$; Respondents 27 and 11, respectively), and five factors had eigenvalues in excess of 1.00 (from 1.30 to 12.96). A four factor solution was finally chosen for this study, based on varimax rotation with two additional hand rotations to move two co-loading variables each to a single factor. For the Q analysis reported here, we retained Q sorts as defining variables when their factor loading was 0.51 or higher (representing statistical significance at $p<0.001$ level).

Results

Four operant approaches to medium-distance travel decisions were found: (1) choice travelers who use the car as a dominant alternative; (2) choice travelers with a car preference; (3) choice travelers with a public transport preference; and (4) conscious car-dependent travelers.[7] Table 2 presents the factor loadings of all subjects in this study together with some participant characteristics; 34 Q sorts loaded on a single factor and five did not load significantly on any factor. Factor 1 had seven defining variables, Factor 2 had three, Factor 3 had 13, and Factor 4 had 11. The four factors account for 57% of the variation in the Q sorts. Table 3 presents the factor arrays.

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[6] The complete instruction used in this study can be found in Van Exel and De Graaf (2005)." Complete reference: Van Exel, N.J.A., De Graaf, G. 2005. Q methodology: A sneak preview. Downloadable from www.jobvanexel.nl. [This document is a brief introduction to Q methodology for students and researchers, which Paul Summit has mirrored on the Qmethod page (www.qmethod.org), at the request of Steven Brown.]

[7] Based on comments received after presentation at the 2003 ISSSS conference and from anonymous *OS* reviewers, our Q sort matrix was re-analyzed yielding a slightly different set of factors. Our conclusions remain largely unchanged, however.

Factor 1. Choice travelers with a car as dominant alternative

The travel behavior of people pertaining to factor 1 is dominated by car use. They are neither car dependent nor car lovers (23, -4 [statement 23 ranked -4]; 20, -3; 35, -3; 41, -3; 30, +1; 1, -1). They find the car to be a convenient mode of transport (22, +4). Though they do not disapprove of public transport use (6, -4), they clearly feel the car is a superior choice in their circumstances (7, +2), and the main reasons for its selection appear to be: high value placed on reliability of travel time (40, +4; 18, +3) and on travel costs (34, +3). Also, a car is less expensive for them than would be public transport (13, +3), probably because almost half of the people loading on this factor drive a leased or company car (Table 4), usually making the marginal travel costs of the automobile negligible.

Factor 1. Choice travelers with a car as dominant alternative

No.	*Statement*	*Factor*			
		1	*2*	*3*	*4*
22	A car is not a necessity, but it does make life a whole lot easier.	**4**	3	2	1
40	Door to door travel time plays an important role in my mode choice.	**4**	3	1	4
13	For me, travelling by public transport is more expensive than travelling by car.	**3**	0	-1	1
18	I find the reliability of travel time important.	**3**	3	2	2
34	Travel costs play an important role in my mode choice.	**3**	0	0	-1
7	All things considered, to me the car is superior to public transport.	**2**	-1	-2	3
30	For an active social life I need a car. Without a car I would visit my family and friends less often and would make fewer leisure trips.	**1**	4	-1	3
1	For private use I do not need a car.	**-1**	-3	2	-4
20	On a day when I do not have my car at my disposal for a day, I am greatly inconvenienced.	**-3**	-2	-1	2
35	I am a dedicated follower of the four-wheel-credo. The car can maybe do without me for a day, but I can not do without my car.	**-3**	-4	-4	-1
41	The Netherlands is a car country. We could just as well pave all railroads and transform all stations into parking garages.	**-3**	-4	-4	-3
6	Public transport is for people who can not afford a car.	**-4**	-3	-3	-3
23	For me the car is more than a mode of transport, it is a part of my identity, a way to distinguish myself from others.	**-4**	-3	-3	-2

Factor 2. Choice travelers with a car preference

The travel behavior of people loading on Factor 2 is fairly reasoned. They are informed about car and public transport (17, +2), see advantages in both travel modes (42, +4; 22, +3), have no strong likes or dislikes for either modes (6, -3; 23, -3; 35, -4; 41, -4), and usually give their travel choices at least some thought (25, +2). Nonetheless, they prefer the car (22, +3) and even indicate that for some of their travel — especially private and social — they regard the car as a necessity (30, +4; 1, -3). Perhaps this is associated with the fact that all the people loading on Factor 2 are female (Table 4). For private and social trips they may find traveling by car safer, especially in the evenings (even though they do not regard traveling by public transport as unsafe; 39, -2 [Table 3]). Another reason may be that, much like the people in Factor 1, they place

Factor 2. Choice travelers with a car preference

No.	*Statement*	*Factor*			
		1	*2*	*3*	*4*
42	A big advantage of travelling by train is that you can do something useful en route: do some reading or take a nap.	2	**4**	4	2
30	For an active social life I need a car. Without a car I would visit my family and friends less often and would make fewer leisure trips.	1	**4**	-1	3
22	A car is not a necessity, but it does make life a whole lot easier.	4	**3**	2	1
40	Door to door travel time plays an important role in my mode choice.	4	**3**	1	4
18	I find the reliability of travel time important.	3	**3**	2	2
17	I am well aware of the costs of a trip, by car as well as by public transport.	0	**2**	1	-1
25	Before every trip, I draw a comparison between car and public transport regarding travel costs, time and so forth, and select the best alternative.	-2	**2**	-1	-2
1	For private use I do not need a car.	-1	**-3**	+2	-4
6	Public transport is for people who can not afford a car.	-4	**-3**	-3	-3
23	For me the car is more than a mode of transport, it is a part of my identity, a way to distinguish myself from others.	-4	**-3**	-3	-2
35	I am a dedicated follower of the four-wheel-credo. The car can maybe do without me for a day, but I can not do without my car.	-3	**-4**	-4	-1
41	The Netherlands is a car country. We could just as well pave all railroads and transform all stations into parking garages.	-3	**-4**	-4	-3

high value on reliability of travel time (40, +3; 18, +3). All people loading on Factor 2 have a private car, i.e. no one with this viewpoint used a leased or company car (Table 4).

Factor 3. Choice travelers with a public transport preference

No.	Statement	Factor 1	2	3	4
42	A big advantage of travelling by train is that you can do something useful en route: do some reading or take a nap.	2	4	**4**	2
28	A better environment starts with yourself. Therefore, everyone should use public transport more often.	0	1	**4**	0
5	I'd rather look out of the compartment window to the passing Dutch landscape than to the bumper of the car before me.	0	0	**3**	0
8	I know the public transport system pretty well because I make use of it frequently.	0	2	**3**	1
14	I know very well where in my neighborhood I can get on public transport to the rail station and I have a fairly good notion of the timetable.	-1	1	**3**	1
11	I'd rather not drive in big cities... lots of traffic, lots of traffic lights, problems with parking.	-1	0	**2**	-3
32	A lovely view, a pleasant encounter, a surprising book, a brain wave. A train journey often is an experience.	1	1	**2**	0
1	For private use I do not need a car.	-1	-3	**2**	-4
4	I am not really price- or time-sensitive, environmental aspects are most important to me.	-2	-1	**1**	-4
30	For an active social life I need a car. Without a car I would visit my family and friends less often and would make fewer leisure trips.	1	4	**-1**	3
36	Only the car takes me where I want, when I want it.	0	1	**-2**	3
29	Driving a car is a great pleasure. The sound of the engine, accelerating sportily at traffic lights, cruising on the highway, listen to music.	1	0	**-3**	1
6	Public transport is for people who can not afford a car.	-4	-3	**-3**	-3
23	For me the car is more than a mode of transport, it is a part of my identity, a way to distinguish myself from others.	-4	-3	**-3**	-2
35	I am a dedicated follower of the four-wheel-credo. The car can maybe do without me for a day, but I can not do without my car.	-3	-4	**-4**	-1
41	The Netherlands is a car country. We could just as well pave all railroads and transform all stations into parking garages.	-3	-4	**-4**	-3

Factor 3. Choice travelers with a public transport preference

People aligning with Factor 3 have a clear preference for traveling by public transport. They see a lot of advantages (42, +4; 5, +3; 32, +2), are very familiar with the system (8, +3; 14, +3) and value highly its supposed environmental friendliness (28, +4; 4, +1). They indicate dislike for driving (29, -3; 23, -3; 35, -4; 41, -4). About half of the people loading on Factor 3 belong to a household without a car, while most others share the car with household members having a driving license. Most have good public transport accessibility; they either live in a city with an intercity rail station (Table 4) or — as became clear from comments they made — in a suburb with good access/egress connections to an intercity rail station in a nearby town (which in the Netherlands would typically be within a few kilometers). People on Factor 3 appear to be somewhat older (Table 4) and to have less time pressure (40, +1 [Table 3]).

Factor 4. Conscious car dependent travelers

No.	*Statement*	*Factor* 1	2	3	4
40	Door to door travel time plays an important role in my mode choice.	4	3	1	**4**
15	It is important to me to have control over my journey.	2	1	1	**4**
7	All things considered, to me the car is superior to public transport.	2	-1	-2	**3**
30	For an active social life I need a car. Without a car I would visit my family and friends less often and would make fewer leisure trips.	1	4	-1	**3**
36	Only the car takes me where I want, when I want it.	0	1	-2	**3**
20	On a day when I do not have my car at my disposal for a day, I am greatly inconvenienced.	-3	-2	-1	**2**
37	I always travel in the same way and find it satisfactory.	0	-1	0	**2**
19	I find it pleasant to plan my trips in advance and to have everything well organized before I leave.	2	2	1	**-1**
11	I'd rather not drive in big cities... lots of traffic, lots of traffic lights, problems with parking.	-1	0	2	**-3**
41	The Netherlands is a car country. We could just as well pave all railroads and transform all stations into parking garages.	-3	-4	-4	**-3**
6	Public transport is for people who can not afford a car.	-4	-3	-3	**-3**
1	For private use I do not need a car.	-1	-3	2	**-4**
4	I am not really price- or time-sensitive, environmental aspects are most important to me.	-2	-1	1	**-4**

Factor 4. Conscious car dependent travelers

The travel behavior of people on Factor 4 is consciously car dependent. They find the car superior (7, +3) and probably the only suitable or acceptable mode of transport (30, +3; 36, +3; 1, -4). They feel comfortable (11, -3) and satisfied (37, +2) driving their car, and may experience mobility problems when it breaks down (20, +2). Travel time (40, +4; 4, -4), control (15, +4), and flexible spontaneity (19, -1) are important to them. A large majority of people loading on Factor 4 drive a leased or company car and are young males (Table 4).

Comparing the factors

Consensus Statements

We found agreement on several items. The basic purpose of travel — getting from Point A to Point B (3) — did not emerge as important or distinguishing in any factor. People find reliability of travel time important (18), are a bit undecided about the relative importance of instrumental-reasoned and symbolic-affective characteristics of travel modes (10), and do not see the car as status symbol or means of self-expression (26, 23 [Table 3]). They see room for public transport, either in their own choice-set or as part of the total transport system: public transport is not just for people of low socio-economic status (6), the system is not too complex (2) or too dirty and unsafe (39) to use, their last experience was not a critical incident that will keep them away for good (9), and we should not get rid of the system as a whole (41).

No.	*Statement*	*Factor*			
		1	*2*	*3*	*4*
2	As a result of all those different timetables and lines, travelling by public transport is too complicated.	-2	-1	-1	0
18	I find the reliability of travel time important.	3	3	2	2
6	Public transport is for people who can not afford a car.	-4	-3	-3	-3
9	The last time I travelled by public transport was a complete disaster.	-1	-2	-2	-2
39	Public transport is much too dirty and unsafe to be an alternative for the car.	-2	-1	-2	-1
3	What really matters is reaching my destination and getting back, the mode of travel does not matter much.	1	0	0	0
26	You are what you drive.	-1	-2	-2	-2
10	Things like comfort, privacy and safety are more important to me than travel costs and travel time.	-1	0	0	0
41	The Netherlands is a car country. We could just as well pave all railroads and transform all stations into parking garages.	-3	-4	-4	-3

Disagreement and Distinguishing Statements

The most controversial issue appears to be the car itself, on issues like need, convenience, dependence, habituation, and superiority (1, 11, 7, 20, 27, 30, 36). Environmental issues (4, 28) are relatively important to people on Factor 3, while people on Factors 1, 2, and 4 attach more importance to door-to-door travel time and people on Factors 1 and 4 — mostly driving leased or company cars — have a travel cost structure that favors the car. People on Factor 2 put the most effort into their travel decision making compared to all others (25).

No.	*Statement*	*Factor*			
		1	*2*	*3*	*4*
27	Once you own a car, you'll use it for all your travel.	2	-2	0	2
40	Door to door travel time plays an important role in my mode choice.	4	3	1	4
28	A better environment starts with yourself. Therefore, everyone should use public transport more often.	0	1	4	0
13	For me, travelling by public transport is more expensive than travelling by car.	3	0	-1	1
4	I am not really price- or time-sensitive, environmental aspects are most important to me.	-2	-1	1	-4
36	Only the car takes me where I want, when I want it.	0	1	-2	3
25	Before every trip, I draw a comparison between car and public transport regarding travel costs, time and so forth, and select the best alternative.	-2	2	-1	-2
11	I'd rather not drive in big cities... lots of traffic, lots of traffic lights, problems with parking.	-1	0	2	-3
30	For an active social life I need a car. Without a car I would visit my family and friends less often and would make fewer leisure trips.	1	4	-1	3
1	For private use I do not need a car.	-1	-3	2	-4
7	All things considered, to me the car is superior to public transport.	2	-1	-2	3
20	On a day when I do not have my car at my disposal for a day, I am greatly inconvenienced.	-3	-2	-1	2

Discussion

The aim of our study was to investigate how people approach medium-distance travel decisions. The underlying objectives were to distinguish between reasoned and *inert* travel decision making and to use the aspects that are of importance to travelers who exercise choice in order to identify policies likely to succeed in reducing the need for travel or promoting modal shift from car to public transport.

The study uncovered four operant approaches to medium-distance travel decision making. The ranking of statements that address the decision making process[7] indicates that relative to the others, people on Factor 2 have the most reasoned travel behavior; they give travel choice some consideration (16, -2; 25, +2), and are least dependent on only one single mode (1, +2; 36, -2). Travel decisions made by people on Factor 4 appear most *inert*, with a choice-set consisting of a single mode (1, -4; 36, +3), low cognitive effort devoted to travel choice (25, -2) and the strongest indication of habituation (16, +1; 27, +2; 37, +2).

No.	*Statement*	*Factor*			
		1	*2*	*3*	*4*
1	For private use I do not need a car	-1	-3	2	-4
3	What really matters is reaching my destination and getting back, the mode of travel does not matter much	1	0	0	0
16	For the greater part my travel behaviour is routine, I do not really give it much thought	0	-2	-1	1
25	Before every trip, I draw a comparison between car and public transport regarding travel costs, time and so forth, and select the best alternative	-2	2	-1	-2
27	Once you own a car, you'll use it for all your travel	2	-2	0	2
36	Only the car takes me where I want, when I want it	0	1	-2	3
37	I always travel in the same way and find it satisfactory	0	-1	0	2

What kind of policies could we suggest based on the results of this exploratory study, keeping in mind that we specifically asked about opinions concerning medium-distance travel? Regarding the policy objective of reducing the need for travel, our study suggests that none of the participants regularly made medium-distance trips without reason. All participants saw their trips as necessary to engage in professional or social activities allowing them to maintain their current lifestyle and activity pattern. To create a modal shift from car to public transport, we must focus on Factors 1 and 2, because Factor 3 adherents already prefer to use public transport whenever possible, and those on Factor 4 may require disproportionate policy effort, as public transport is not part of their choice set.

Regarding Factors 1 and 2, our results point at improving relative public transport quality in terms of reliability of travel time. These people are not unfamiliar with public transport (8), are not unwilling to use it (33), already value it for the ability of doing something useful *en route* (42), and do not seem too concerned with environmental norms (28). Both groups, however,

[7] For instance, in terms of basic travel needs (1, 3), the cognitive effort devoted to travel choice (16, 25, 37), the choice-set that is considered (1, 36) or habituation (16, 27, 37).

attach great weight to door-to-door travel time (40) and reliability of travel time (18). Their current circumstances require a car to maintain their busy lifestyle, perhaps because they shaped their professional and social activity patterns around car availability. If relative qualities of travel modes change substantially to favor public transport, their latent interest may surface. Furthermore, only the people on Factor 1 indicate that travel costs play an important role in their mode choice (34). A second-best policy aimed at these people may concern changing the travel cost structure. The importance of travel costs may be associated with their claim that traveling by public transport is more expensive for them than traveling by car (13). Although almost half the individuals on Factor 1 drives a leased or company car, this claim does not appear to be based on information (17) and might be a misperception (sunk-cost fallacy). In any case, changing the relative costs of travel will probably only contribute to a modal shift if service reliability of public transport is improved first.

Little can be said about the relative importance and the potential impact of these policy recommendations, as a Q methodological study does not reveal the relative distribution of factors in the general population. Nonetheless, knowledge of the operant factors is instructive and may also be useful in structuring questionnaires for administration to large samples. Brown (2002) explained how likely Q factor membership could be assessed, providing an indication of the prevalence of the identified typologies in the overall population and of the associations between the factors, travel behavior, and a wide range of related individual and contextual variables. Triandis (1977) stated that if we "find that there are certain types of people, certain types of settings, and certain types of behaviors, we will certainly want to take this information into account when we construct our theory about people's behavior in different settings, provided this information improves our predictions." The latter remains to be investigated. Still, such a combination of Q and R is legitimate and intriguing, though rare (Brouwer 2000).

The factors we found appear reasonable and comprehensive for the Dutch setting, but some interesting aspects stand out. First, it is remarkable that travel costs were found to be practically irrelevant for travel behavior (34). We find some evidence for the expected difference in importance of travel costs between people with a private car and a leased or company car, and from the link between the factors and the P set structure we can hypothesize that people with a leased/company car tend to adopt a more *inert* approach to travel decision making than others. However, we cannot be certain that this was instigated by the structure of travel costs. This is an important topic that should be investigated further, especially because the share of company and leased cars has been steadily increasing (CBS 1999; 2003). There may be other reasons for apparent insensitivity to travel costs, e.g., when traveling alone the

cost differential between car and public transport is too small to compensate for the inconvenience; commuting and business travel expenses sometimes are reimbursed; many people are wealthy enough that other criteria prevail.

Second, contrary to what we expected, statements relating to emotions, status, or self-expression associated with driving a car were found to be largely irrelevant and non-distinguishing (12, 23, 24, 26). Either such attitudes do not play a very important role in day-to-day travel behavior (instead being more relevant in car acquisition or ownership of second cars for leisure use), or chance failed to include among the P set some of those people holding them.

An issue of slight concern is the level of consensus between some factors, as reflected in the correlations (Table 2). Correlations are considerable between the car Factors 1, 2, and 4, as well as between the choice Factors 2 and 3. To some extent this seems to be because most respondents strongly disagreed with the same small set of statements that refer to personal and social norms regarding travel behavior (6, 23, 35, 41). Perhaps people generally are more reactive to normative statements, or perhaps, in this Q set, the normative statements were perceived as more pronounced than other statements. Any follow-up study should take this into account and perhaps drop, replace, or reformulate one or more of these statements. A number of alternative two to five factor solutions were considered, as well as various judgmental rotations, but such a level of agreement between all respondents on a considerable number of statements obviously affects any solution. We felt that the remaining level of consensus and disagreement on other statements in the four factor solution presented was sufficient and relevant in content — and more straightforward than any other solution.

At the outset, we argued that transport policies in the last decades failed to convince more people to reduce their travel or to use public transport more often. We argued that the policy most likely to succeed in achieving travel behavior change is investment in public transport quality, while not too much should be expected from relatively modest changes in pricing policies. Quite the contrary, current policy in the Netherlands appears to focus on privatization of public transport companies, with a detrimental effect on service quality (ROVER 2001, Van Exel 2003), on investment in road infrastructure, and on road and congestion pricing policies. This underlines the potential contribution of Q methodological studies to transport policy making. It would be essential to sensible policy making to know something about the relative proportions of *choice travelers with a car as dominant alternative*, *choice travelers with a preference for car*, *choice travelers with a preference for public transport,* and *conscious car dependent travelers* in the Dutch population.

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Appendix

Table 1. Structured Q sample (statements numbered randomly)

Category	*Statement*	*No.*
	MOTIVATION	
Instrumental/reasoned		
costs	♦For me, travelling by public transport is more expensive than travelling by car.	13
	♦Travel costs play an important role in my mode choice.	34
travel time/speed	♦Door to door travel time plays an important role in my mode choice.	40
reliability	♦I find the reliability of travel time important.	18
comfort	♦Things like comfort, privacy and safety are more important to me than travel costs and travel time.	10
environment friendly	♦I am not really price- or time-sensitive, environmental aspects are most important to me.	4
protection: social safety	♦I often feel unsafe when using public transport and on stations, especially at night.	21
	♦Public transport is much too dirty and unsafe to be an alternative for the car.	39
autonomy: availability	♦I know very well where in my neighborhood I can get on public transport to the rail station and I have a fairly good notion of the timetable.	14
autonomy: flexibility, independence	♦For an active social life I need a car. Without a car I would visit my family and friends less often and would make fewer leisure trips.	30
	♦A car is not a necessity, but it does make life a whole lot easier.	22
	♦On a day when I do not have my car at my disposal for a day, I am greatly inconvenienced.	20
productivity en route	♦A big advantage of travelling by train is that you can do something useful en route: do some reading or take a nap.	42
overall assessment	♦Before every trip, I draw a comparison between car and public transport regarding travel costs, time and so forth, and select the best alternative.	25
	♦All things considered, to me the car is superior to public transport.	7
Symbolic/affective		
freedom	♦Only the car takes me where I want, when I want it.	36
prestige, social	♦You are what you drive.	26
privacy	♦In the train you sometimes meet nice people. I enjoy that. The car is much duller and more lonesome.	31
self-expression	♦For me the car is more than a mode of transport, it is a part of my identity, a way to distinguish myself from others.	23
social contacts	♦A lovely view, a pleasant encounter, a surprising book, a brain wave. A train journey often is an experience.	32

Category	*Statement*	*No.*
Norms		
personal	♦I am a dedicated follower of the four-wheel-credo. The car can maybe do without me for a day, but I can not do without my car.	35
	♦Public transport is for people who can not afford a car.	6
social	♦A better environment starts with yourself. Therefore, everyone should use public transport more often.	28
	♦The Netherlands is a car country. We could just as well pave all railroads and transform all stations into parking garages.	41
	♦My family and friends appreciate it when I travel by public transport.	38
	STABILITY	
process	♦What really matters is reaching my destination and getting back, the mode of travel does not matter much.	3
	♦Driving a car is a great pleasure. The sound of the engine, accelerating sportily at traffic lights, cruising on the highway, listen to music.	29
role/context dependent	♦For private use I do not need a car.	1
	♦For my work I need a representative mode of transport.	12
emotion	♦I had rather look out of the compartment window to the passing Dutch landscape than to the bumper of the car before me.	5
	♦I recall the day I got my first car very well, I had been looking forward to that day for quite a while.	24
	CONTROL	
control	♦I find it pleasant to plan my trips in advance and to have everything well organized before I leave.	19
	♦It is important to me to have control over my journey.	15
incomplete: costs	♦I am well aware of the costs of a trip, by car as well as by public transport.	17
incomplete: route	♦I had rather not drive in big cities... lots of traffic, lots of traffic lights, problems with parking.	11
incomplete: schedule	♦As a result of all those different timetables and lines, travelling by public transport is too complicated.	2
incidents	♦The last time I traveled by public transport was a complete disaster.	9
	REPETITION	
familiarity, experience	♦I know the public transport system pretty well because I make use of it frequently.	8
choice set	♦As far as I am concerned, car and public transport both are good transport alternatives.	33
habit	♦I always travel in the same way and find it satisfactory.	37
interdependency	♦Once you own a car, you'll use it for all your travel.	27
routine	♦For the greater part my travel behavior is routine, I do not really give it much thought.	16

Table 2. Rotated Four Factor Solution with Participant Characteristics

Q sort	Characteristic		Factor[c]			
	Car[a]	Pub Trans[b]	1	2	3	4
Anita	N	N	**0.62**	0.01	0.17	0.05
Anke	P	Y	**0.64**	0.13	0.32	0.25
Anna	P	N	0.09	0.42	**0.65**	0.16
Arjan	P	N	0.17	0.44	0.28	0.20
Benedikt	P	N	0.37	-0.01	0.29	**0.60**
Bob	P	N	0.37	0.34	**0.54**	0.40
Dani	L	N	-0.08	0.27	-0.18	**0.63**
Dirk-Jan K.	L	Y	0.08	0.35	0.13	**0.64**
Dirk-Jan M.	P	Y	0.29	0.14	0.28	**0.70**
Elly	P	Y	0.26	**0.62**	0.46	0.11
Elsbeth	L	N	**0.52**	0.23	0.24	0.36
Esther	P	Y	**0.61**	0.08	0.38	0.33
Geert	L	N	0.29	0.23	-0.03	**0.78**
Henri	P	N	**0.57**	0.24	0.26	-0.01
Huib	N	Y	0.43	-0.02	-0.40	-0.11
Ines	N	Y	0.34	0.22	0.12	0.33
Irene	P	N	0.45	**0.52**	0.32	0.13
Johan	N	Y	0.20	-0.18	**0.79**	-0.03
Johanna	P	Y	0.11	**0.54**	0.46	0.38
Kees	P	Y	0.48	-0.08	0.21	**0.64**
KJ	P	Y	0.21	0.07	-0.20	**0.72**
Klaas	N	N	0.13	-0.06	**0.66**	-0.01
Marc K.	P	Y	0.31	0.44	**0.68**	0.02
Maria	L	Y	**0.53**	0.47	0.06	0.45
Marije	N	N	0.09	-0.15	**0.78**	0.01
Marlene	L	Y	0.17	-0.16	-0.44	0.49
Michiel	L	N	0.39	0.18	0.09	**0.56**
Mike	P	Y	0.26	-0.19	**0.60**	0.01
Nientje	P	N	0.43	0.14	**0.52**	0.28
Oever	P	Y	-0.05	0.29	0.34	0.32
Pai	P	Y	0.04	0.32	**0.83**	-0.07
Petra	N	N	-0.05	-0.02	**0.79**	-0.18
Rik	N	Y	-0.04	0.19	**0.79**	0.12
Rob	L	Y	**0.55**	0.25	0.29	0.44
Ruurd	N	Y	0.09	0.12	**0.79**	-0.03
Teun	P	Y	0.32	0.29	**0.54**	-0.03
Ulf	L	Y	-0.29	-0.03	-0.29	**0.57**
Wag	L	N	0.32	0.27	-0.02	**0.60**
Ytzen	L	Y	0.32	0.03	0.15	**0.67**
% Explained variance			12	8	21	16
% Cumulative explained variance			–	20	41	57
Number of defining variables			7	3	13	11
Composite reliability			0.97	0.92	0.98	0.98
Standard error of factor scores			0.19	0.28	0.14	0.15
Factor correlations			1	0.64	0.50	0.60
			2	–	0.62	0.46
			3	–	–	0.14

[a] N = no car; P = private car; L = leased/company car.
[b] Y = lives in city with intercity rail connection;
N = lives in city without intercity rail connection.
[c] Very highly significant loadings ($p<0.001$) of factor definers appear in bold.

Table 3. Factor Arrays

No.	*Statement*	*Factor*			
		1	*2*	*3*	*4*
1	For private use I do not need a car.	-1	-3	2	-4
2	As a result of all those different timetables and lines, travelling by public transport is too complicated.	-2	-1	-1	0
3	What really matters is reaching my destination and getting back, the mode of travel does not matter much.	1	0	0	0
4	I am not really price- or time-sensitive, environmental aspects are most important to me.	-2	-1	1	-4
5	I had rather look out of the compartment window to the passing Dutch landscape than to the bumper of the car before me.	0	0	3	0
6	Public transport is for people who can not afford a car.	-4	-3	-3	-3
7	All things considered, to me the car is superior to public transport.	2	-1	-2	3
8	I know the public transport system pretty well because I make use of it frequently.	0	2	3	1
9	The last time I traveled by public transport was a complete disaster.	-1	-2	-2	-2
10	Things like comfort, privacy and safety are more important to me than travel costs and travel time.	-1	0	0	0
11	I had rather not drive in big cities... lots of traffic, lots of traffic lights, problems with parking.	-1	0	2	-3
12	For my work I need a representative mode of transport.	-1	-1	-1	1
13	For me, travelling by public transport is more expensive than travelling by car.	3	0	-1	1
14	I know very well where in my neighborhood I can get on public transport to the rail station and I have a fairly good notion of the timetable.	-1	1	3	1
15	It is important to me to have control over my journey.	2	1	1	4
16	For the greater part my travel behavior is routine, I do not really give it much thought.	0	-2	-1	1
17	I am well aware of the costs of a trip, by car as well as by public transport.	0	2	1	-1
18	I find the reliability of travel time important.	3	3	2	2
19	I find it pleasant to plan my trips in advance and to have everything well organized before I leave.	2	2	1	-1
20	On a day when I do not have my car at my disposal for a day, I am greatly inconvenienced.	-3	-2	-1	2
21	I often feel unsafe when using public transport and on stations, especially at night.	1	0	0	-1

Table 3. Factor Arrays (continued)

No.	Statement	Factor 1	2	3	4
22	A car is not a necessity, but it does make life a whole lot easier.	4	3	2	1
23	For me the car is more than a mode of transport, it is a part of my identity, a way to distinguish myself from others.	-4	-3	-3	-2
24	I recall the day I got my first car very well, I had been looking forward to that day for quite a while.	0	1	0	0
25	Before every trip, I draw a comparison between car and public transport regarding travel costs, time and so forth, and select the best alternative.	-2	2	-1	-2
26	You are what you drive.	-1	-2	-2	-2
27	Once you own a car, you'll use it for all your travel.	2	-2	0	2
28	A better environment starts with yourself. Therefore, everyone should use public transport more often.	0	1	4	0
29	Driving a car is a great pleasure. The sound of the engine, accelerating sportily at traffic lights, cruising on the highway, listen to music.	1	0	-3	1
30	For an active social life I need a car. Without a car I would visit my family and friends less often and would make fewer leisure trips.	1	4	-1	3
31	In the train you sometimes meet nice people. I enjoy that. The car is much duller and more lonesome.	1	-1	1	-1
32	A lovely view, a pleasant encounter, a surprising book, a brain wave. A train journey often is an experience.	1	1	2	0
33	As far as I am concerned, car and public transport both are good transport alternatives.	1	2	1	0
34	Travel costs play an important role in my mode choice.	3	0	0	-1
35	I am a dedicated follower of the four-wheel-credo. The car can maybe do without me for a day, but I can not do without my car.	-3	-4	-4	-1
36	Only the car takes me where I want, when I want it.	0	1	-2	3
37	I always travel in the same way and find it satisfactory.	0	-1	0	2
38	My family and friends appreciate it when I travel by public transport.	-2	0	0	-2
39	Public transport is much too dirty and unsafe to be an alternative for the car.	-2	-1	-2	-1
40	Door to door travel time plays an important role in my mode choice.	4	3	1	4
41	The Netherlands is a car country. We could just as well pave all railroads and transform all stations into parking garages.	-3	-4	-4	-3
42	A big advantage of travelling by train is that you can do something useful en route: do some reading or take a nap.	2	4	4	2

Table 4. Demographic data of interest

Factor	All	1	2	3	4
n (definers)	39	7	3	13	11
Car ownership					
% none	23	14	0	46	0
% private	49	43	100	54	36
% leased/company	28	43	0	0	64
City has intercity rail station					
% yes	59	57	67	54	55
% no	41	43	33	46	45
Gender					
% female	41	71	100	31	18
Age					
mean	38	30	38	44	35
range	24-70	24-34	26-61	26-70	32-40