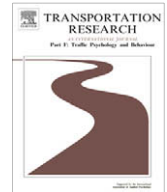




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## Factors influencing car use for commuting and the intention to reduce it: A question of self-interest or morality?

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### ABSTRACT

Car use for commuting contributes to various environmental and traffic problems, such as pollution and congestion. Policies aimed at reducing commuter car use will be more effective when they target important determinants of car use and willingness to reduce it. This study examined whether variables reflecting self-interest (from the theory of planned behavior [Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11–39). Berlin: Springer]) and variables reflecting moral considerations (from the norm-activation model [Schwartz, S. H. (1977). Normative influences on altruism. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 221–279). New York: Academic Press]) were able to explain self-reported car use for commuting and intentions to reduce it in a sample of Canadian office workers. Car use for commuting was mostly explained by variables related to individual outcomes (perceived behavioral control and attitudes) whereas the intention to reduce car use was mostly explained by variables related to morality (personal norms). The study also found that perceived behavioral control moderated the relation between personal norms and behavioral intentions: stronger personal norms were associated with stronger behavioral intentions, but only when perceived behavioral control was low. Some issues evoked by these results are discussed.

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### 1. Introduction

Vehicle transport, although it serves many societal functions as well, also contributes to various problems, such as environmental pollution and traffic congestion. Of all modes of transportation, cars account for the largest proportion of emissions of polluting substances, such as CO<sub>2</sub>, thereby contributing to global warming (OECD, 2002). For example, greenhouse gas emissions for urban travel in Canada in 1997 were 215 g per passenger-kilometer for a car or a light truck, 77 g for urban transit, 26 g for intercity bus travel, and, of course, 0 g for walking or cycling (Transport Canada, 2008). In OECD countries, commuting accounts for an estimated 25% of household travel (OECD, 2002). Despite efforts at reducing the environmental impact of cars by means of technological innovations (e.g. more efficient engines, hybrid fuel systems, and fuel cell technology), various trends tend to nullify this positive effect, such as increased car ownership, and increased frequency of car use. Therefore, apart from technological innovations, travel demand management policies are needed as well. This implies that factors related to car use behavior and intentions to reduce it are important to consider.

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Commuting to work is one such behavior. Because it occurs on a regular basis, and within a fixed time frame, viable alternatives are more likely to exist than for other types of car trips. For instance, car pooling and more frequent public transport during rush hours can facilitate the use of alternative modes of transport to get to work. Attempts to encourage commuters to reduce car use will be more effective when they address its behavioral antecedents.

This study examines which variables underlie self-reported car use for commuting and the intention to reduce it. More specifically, variables reflecting self-interest (i.e. from the theory of planned behavior (Ajzen, 1991)) and variables reflecting moral considerations (stemming from the norm-activation model; Schwartz, 1977) are compared as explanations for car use for commuting and the intention to reduce it. Also, interaction effects are explored between 'self-interest' variables and moral considerations. This study builds on previous work in the field with student samples (e.g. Bamberg & Schmidt, 2003) by studying a sample of government employees (i.e. working for several Canadian Ministries).

### 1.1. Theoretical background

To understand why commuters drive to work instead of using more environmentally friendly modes of transport, it is necessary to consider the behavioral antecedents of car use for commuting and the intention to reduce it. Two approaches to explaining pro-environmental behavior are often used (Bonnes & Bonaiuto, 2002). On the one hand, rational choice theories (e.g. Ajzen's (1985) theory of planned behavior; TPB) consider (pro-environmental) behavior to be a result of individual cost-benefit analyses. Other frameworks assume that moral considerations are at the basis of pro-environmental behavior (e.g. Schwartz' (1977) norm-activation model of altruism; NAM).

The theory of planned behavior (Ajzen, 1985; Ajzen & Fishbein, 1980) assumes that behavior is determined by the intention to perform it. In turn, behavioral intentions are assumed to be determined by attitudes, subjective norms and perceived behavioral control. Attitudes in this case refer to the degree to which a person holds a favorable or an unfavorable evaluation of the idea of commuting by car. Subjective norms refer to perceived social pressure to perform or not to perform a behavior, and an individual's motivations to comply to such social pressures. In other words, it refers to an individual's perception of the extent to which important others would approve or disapprove of a given behavior, in this case, using a car for commuting. Finally, perceived behavioral control is the perceived ease or difficulty of engaging in a behavior, for example driving to work or using alternative modes of getting to work.

The TPB has been used to explain a wide array of behaviors, such as weight loss and smoking cessation (see Armitage & Conner, 2001; Conner & Armitage, 1998; Ajzen, 1991, for reviews). It has also been applied in the transport and environmental psychology field (e.g. Bamberg & Schmidt, 2003; Gardner & Abraham, 2008; Heath & Gifford, 2002). For instance, Heath and Gifford (2002) found that among university students, attitudes, subjective norm and perceived behavioral control were significantly (positively) related to the intention to use the bus. In turn, intentions to use the bus was significantly positively related to reported bus use (which was measured retrospectively). Harland, Staats, and Wilke (1999) also used a retrospective measure of car use and they found that attitude and perceived behavioral control were positively related to car use in a sample of households. In addition, the power of TPB in explaining car use for short trips could be improved significantly by adding the concept of personal norms. Bamberg and Schmidt (2003) found that TPB variables significantly predicted the intention to use a car in a sample of university students, and that these intentions significantly predicted future car use.

The norm-activation model (NAM) takes a somewhat different perspective by focusing on altruistic behavior, that is to say, behavior that implies giving up personal interests for the benefit of others (Schwartz, 1977; Schwartz & Howard, 1981). Pro-environmental behavior may be considered as a form of altruistic behavior, because it entails giving up personal benefits for the sake of the environment. For instance, deciding to commute to work by bus instead of by car out of environmental concerns probably involves less convenience (more walking, to the bus stop) and freedom (less choice about when to leave home and work, to fit the bus schedule), and may entail longer travel times.

Moral considerations play an important role here, as engagement in pro-environmental behavior (and pro-environmental intentions) is assumed to be determined by the extent to which people feel a personal obligation to do so (reflected in personal norms). Behavior in accordance with these personal norms may lead to a sense of pride, whilst feelings of guilt may arise when one's behavior is not in accordance with one's personal norms. Two additional factors are involved in this norm-activation process. First, individuals must realize the consequences of their behavior for the environment (referred to as awareness of consequences). Those who believe that car use has negative environmental consequences are assumed to feel a stronger moral obligation to reduce their car use than those who do not recognize these negative consequences. Second, individuals must feel personally responsible for the behavioral consequences (ascription of responsibility) before they will engage in pro-environmental behavior. Those who assume responsibility for the problems resulting from car use will feel more obliged to help solve these problems by reducing their car use than those who do not assume this responsibility.

Furthermore, one of the assumptions in the NAM is that activated personal norms result in altruistic behavior when no barriers are perceived and no high costs are involved: "Once potentially helpful actions are recognized, internalized values become relevant only for those actions a person feels able to execute" (Schwartz & Howard, 1981, p. 197). Thus, following from this, perceived behavioral control may moderate the relationship between personal norms and behavior (and intentions). The norm-activation model has been successfully applied to a wide array of pro-environmental behaviors; including recycling (Guagnano, Stern, & Dietz, 1995; Hopper & Nielsen, 1991), political action to support the environment (Stern, Dietz, & Kalof, 1993), and car use (Bamberg & Schmidt, 2003). However, studies testing the NAM have not included perceived behavioral control, nor examined its possible moderating effect.

## 1.2. Hypotheses

The present study examines which set of variables (related to self-interest or moral considerations) has the greatest explanatory power in relation to car use for commuting and the intention to reduce it. Because the theory of planned behavior is expected to be especially relevant for explaining behavior when high personal costs (in terms of time, effort, convenience, etc.) are involved (such as car use and intention to reduce it, see Lindenberg & Steg, 2007), it is expected that self-interest variables will be better suited for this purpose. In particular, we hypothesize that more positive attitudes towards car use and stronger subjective norms in favor of car use will be positively related to commuter car use and negatively related to the intention to reduce it, and that higher levels of perceived behavioral control to reduce car use are negatively related to commuter car use, and positively to behavioral intentions. We expect that variables reflecting moral considerations will be less suitable for explaining car use for commuting and intention to reduce it (cf. Bamberg & Schmidt, 2003). Finally, we expect that extending the NAM with perceived behavioral control will add significantly to the explanation of car use and intention to reduce it, and that it will moderate the relationship between personal norms and behavior and personal norms and behavioral intention, as suggested by Schwartz and Howard (1981) in such a way that the relationships between personal norms and behavior and behavioral intention will be stronger when levels of perceived behavioral control are high.

## 2. Method

### 2.1. Respondents and procedure

The questionnaire study took place at the Ministry of Education, the Ministry of Higher Education and the Ministry of Labor, all located in downtown Victoria, British Columbia, Canada. First, a small pilot study was conducted among a sample of ten Ministry employees to investigate whether participants encountered any difficulty in answering the questions. One finding was that the original version of the questionnaire was perceived by some to be biased against car users. Therefore, the wording of some of the items was changed to create a more neutral impression of car use, and additional questions about the advantages of car use were added. The revised questionnaires were then distributed in the three different Ministries, accompanied by an informed-consent form, and by information about the purpose of the study. Participation was completely voluntary. Each floor in each Ministry building was provided with a box in which respondents could return the completed questionnaires. These boxes were located in visible and frequently used places, such as near the photocopy machine or in the coffee room. Moreover, an email was sent to all employees informing them of the study and encouraging them to participate.

Of the 500 distributed questionnaires, 244 were returned (47%). Three incomplete questionnaires were omitted from the analyses. The sample consisted of 161 females (66.5%) and 78 males (32.2%); two respondents did not answer this question. Of these respondents, 4.1% were 18–25 years of age, 24.4% were 26–35 years of age, 36.8% were 36–45 years of age, 29.3% were 46–55 years of age and 4.5% were 56–65 years of age (two respondents did not answer this question). The sample consisted of single-person households (20.7%), single-parent households with children living at home (11.2%), couples without children (30.6%), couples with children (33.6%), and other types of households (2.9%); and three respondents did not answer this question. On average, respondents lived at a distance of 10.4 km from work (ranging from 0.10 to 60), and worked an average of 4.8 days a week. A total of 52.5% ( $N = 127$ ) had a managerial position (e.g. directors, managers, supervisors), 21.9% ( $N = 53$ ) held a clerical position (e.g. secretaries, clerks) and 14.9% ( $N = 36$ ) were classified as research and development (e.g. researchers, analysts, programmers), whilst 10% ( $N = 26$ ) did not answer this question.

### 2.2. Measures

All constructs were measured on five-point Likert scales, ranging from 1 “strongly disagree” to 5 “strongly agree,” unless otherwise indicated below. When necessary, items were recoded so that higher scores reflected higher levels of that construct.

*Car use for commuting.* Respondents indicated what percentage of commuting trips they normally traveled by car, by bus, walking, cycling or other modes of transport, respectively. The self-reported percentage of car trips was used as the measure of car use for commuting. Most employees drove to work (41.4%), followed by bus (22.9%), walking (19.5%), cycling (13.0%) and other modes (e.g. motorcycling) (3.2%). About 25% always drove to work, 32% never drove to work and 43.5% drove to work, but also used other transportation modes, such as bus (40%), walking (18.1%), and cycling (14.3%). Eight percent always commuted by bus, 10% always walked and 2.9% always cycled. There was a tendency for employees with managerial positions to drive to work more often (46.6%) than those with clerical (41.5%) or research and development positions (29.4%); however the difference was not significant ( $F(2, 212) = 2.23, ns$ ).

*Intention to reduce car use for commuting.* Intention was measured by the statement ‘I intend to drive less often for commuting’, on a four-point scale on which 1 indicated “definitely not,” 2 “probably not,” 3 “probably yes,” and 4 “definitely yes.” The option “I don’t drive to work” was also included, and was coded as a missing value (in this case, 32% of the respon-

dents never drove to work). A total of 130 car users responded to this question, and on average, they did intend to reduce car use for commuting:  $M = 2.9$ ,  $SD = .78$ .

*Attitude toward car use.* Seven items were used to measure respondents' attitude toward car use. The items all measured individual consequences of car use, such as "I like the idea of driving to work" and "Driving to work allows me to have a flexible schedule". Respondents who normally did not drive to work were asked to indicate whether they liked the *idea* of driving to work. The seven items combined comprise a reliable scale ( $\alpha = .85$ ). On average, respondents had a neutral attitude towards car use:  $M = 3.4$ ,  $SD = .80$ .

*Subjective norm (SN).* Respondents indicated whether they believed that other people (viz., relatives and friends, colleagues, and the Ministry management) expected them to drive to work. The three items combined formed a reliable scale ( $\alpha = .84$ ). The mean score was computed; higher scores indicated greater acceptance of a social norm in favor of driving to work. On average, respondents thought that the social norm was to not drive to work:  $M = 2.0$ ,  $SD = .78$ .

*Perceived behavioral control (PBC).* Four items were used to measure respondents' perceived possibilities and difficulties for reducing car use. First, respondents indicated whether it would be possible for them to reduce their car use for commuting. The options were 1 "definitely not", 2 "probably not", 3 "probably yes", 4 "definitely yes", or "I don't drive to work". Second, they indicated how difficult it would be for them to reduce their car use, how difficult it would be for them to go to work by bus, and how difficult it would be for them to go to work by bike. These items were measured on a scale ranging from 1 "very difficult" to 4 "very easy". Again, the option "I don't drive to work" was added. To minimize unnecessary loss of respondents, it was assumed that people who did not drive to work would not have any difficulty reducing their car use, that is, not driving to work was considered easy for them. Therefore, the option "I don't drive to work" was recoded into "very easy." For people who already commuted to work by bus or by bike, the option "I (almost) always take the bus/bike to work" was added. Again, it was assumed that respondents who already used these modes of transportation would not have any difficulty using them to go to work. Therefore, the option "I (almost) always take the bus/bike to work" was recoded to "very easy." The four items combined formed a reliable scale ( $\alpha = .76$ ), with higher scores indicating greater perceived behavioral control for not commuting to work by car. On average, perceived behavioral control among respondents was relatively high ( $M = 2.7$ ,  $SD = .85$ ).

*Personal norm (PN)* was measured with the following items: "I (would) feel good about driving to work," "I (would) feel guilty about driving to work," and "I feel (or would feel) a moral obligation to reduce my car use for commuting." Relevant items were recoded. Cronbach's  $\alpha$  of this scale was .65. On average, respondents felt a moderate moral obligation to not drive to work:  $M = 3.3$ ,  $SD = .75$ .

*Awareness of consequences (AC).* Respondents indicated to what extent they evaluated ten different consequences of car use as a problem (e.g. "Car use causes serious air pollution in the world," "Air pollution caused by cars is not as serious as some people claim."). These ten items were recoded when applicable and combined to form a reliable indicator of problem awareness ( $\alpha = .76$ ), with higher scores reflecting greater problem awareness ( $M = 3.8$ ,  $SD = .51$ ).

*Ascription of responsibility (AR).* To measure the extent to which respondents felt personally responsible for the problems resulting from car use, the following three items were used: "I feel personally responsible for the problems resulting from car use," "My car use contributes to environmental problems," and "My car use constitutes a problem to society." A reliable measure of responsibility was constructed ( $\alpha = .70$ ). The mean score for this ascription of responsibility scale was 3.2 ( $SD = .64$ ).

### 3. Results

In order to examine which 'type' of variables (i.e. self-interest or morality) would have a higher explanatory power to explain Ministry employees' self-reported car use for commuting and their intention to reduce it, several correlation and regression analyses were performed. First, the correlations between the dependent variables and car use for commuting and intention to reduce it are reported. Second, the explanatory power of the variables reflecting self-interest (related to TPB) and those reflecting moral considerations (related to NAM) is examined, both for reported car use for commuting and the intention to reduce it. Finally, the moderating role of perceived behavioral control on the relation between personal norms and car use and intention to reduce it is examined.

#### 3.1. Correlations between independent and dependent variables

Table 1 lists the correlations between self-reported car use for commuting and intention to reduce it, and attitudes, subjective norm, perceived behavioral control, awareness of consequences, ascription of responsibility, and personal norm. The more often respondents drove to work, the lower were their perceived possibilities for reducing their car use ( $r = -.69$ ) and the more positive were their attitudes towards car use ( $r = .52$ ). Stronger intention to reduce car use for commuting was associated with stronger moral obligation to reduce car use ( $r = .43$ ) and higher levels of awareness of consequences ( $r = .37$ ). As assumed by NAM, its predictor variables were considerably correlated with one another. Notably, higher levels of awareness of consequences were associated with higher levels of responsibility for problems related to car use ( $r = .57$ ). Also, the more respondents felt responsible for these problems, the more they felt morally obliged to reduce their car use ( $r = .54$ ) and the more they were aware of the problems resulting from car use ( $r = .47$ ).

**Table 1**

Means, standard deviations and correlations of the explanatory variables, car use for commuting and intention to reduce it.

	M	SD	N	1	2	3	4	5	6	7
1. Car use	41.4	43.71	241							
2. Intention to reduce car use	2.9	.78	131	-.30**						
3. Perceived behavioral control	2.7	.85	224	-.69**	.32**					
4. Attitude	3.4	.79	239	.52**	-.30**	-.45**				
5. Subjective norm	2.0	.76	240	-.06	.13	-.02	-.15*			
6. Personal norm	3.3	.75	238	-.25**	.43**	.34**	-.45**	.10		
7. Awareness of consequences	3.8	.51	237	-.25**	.37**	.29**	-.37**	.11	.47**	
8. Ascription of responsibility	3.2	.76	239	-.05	.32**	.06	-.21**	.11	.54**	.57**

Note: Car use was measured as a percentage of car trips to work. Intention to reduce car use was measured on a four-point scale, ranging from 1 'definitely not' to 4 'definitely yes.' Perceived behavioral control was measured on a four-point scale, ranging from 1 'very difficult' to 4 'very easy.' All other variables were measured on a five-point scale, ranging from 1 'low' to 5 'high'.

\*  $p < .05$ .\*\*  $p < .001$ .

### 3.2. Explaining car use and intention to reduce It

Hierarchical regression analyses were performed using percentage of car use for commuting and intention to reduce it as the dependent variables and the variables related to TPB and to NAM as the independent variables. For both models, all independent variables were entered simultaneously. Assumptions of the regression models were checked, and did not appear to be violated.

First, car use and intention to reduce car use were regressed on attitude, PBC and subjective norm. Taken together, these variables explained 52% of the variance in car use:  $F(3, 213) = 78.14, p < .001$ . Table 2 shows that the more difficult respondents thought it would be to not drive to work ( $\beta = -.56, t = -10.60, p < .001$ ), and the more positive their attitude towards car use ( $\beta = .27, t = 5.04, p < .001$ ), the more often they would drive to work. Subjective norm did not significantly contribute to the explanation of car use when the other variables were controlled for.

Attitude, subjective norm and PBC explained 18% of the variance in respondents' intention to reduce car use:  $F(3, 124) = 9.17, p < .001$ . As Table 2 indicates, the more respondents felt able to reduce car use for commuting ( $\beta = .30, t = 3.57, p < .01$ ), and the more negative their attitude towards car use ( $\beta = -.22, t = -2.66, p < .01$ ), the stronger their intention to reduce car use for commuting. Subjective norm in favor of car use did not significantly explain behavioral intention when the other variables were controlled for.

Personal norm, awareness of consequences and ascription of responsibility explained 12% of the variance in car use,  $F(3, 209) = 9.34, p < .001$ . As shown in Table 3, respondents who felt a stronger moral obligation to reduce car use ( $\beta = -.21, t = -2.57, p < .05$ ) and a higher awareness of the negative consequences of their own car use ( $\beta = -.30, t = -3.60, p < .001$ ) tended to drive to work less often. Interestingly, the more respondents felt personally responsible for the problems resulting from car use, the more often they drove to work ( $\beta = .23, t = 2.75, p < .01$ ).

About 24% of the variance in intentions to reduce car use was explained by the NAM variables,  $R = .49, R^2 = .24, F(3, 121) = 12.71, p < .001$ . Table 3 reveals that stronger feelings of moral obligation to not drive to work ( $\beta = .34, t = 3.41, p < .01$ ) were associated with stronger intentions to reduce car use for commuting. Awareness of consequences and ascription of responsibility did not significantly contribute to the explanation of behavioral intention when personal norm was controlled for.

To explore the nature of the relation between the variables reflecting moral considerations and PBC, a moderator analysis was performed. Following Cohen, Cohen, West, and Aiken (2003), all variables were standardized. First, personal norm, awareness of consequences and ascription of responsibility were entered in the regression model, followed by perceived behavioral control. As a third step, the interactions between PBC and PN, PBC and AR, and PBC and AC were entered. The interactions did not significantly add to the explanation of car use. As may be seen in Table 4, the interaction between personal norm and perceived behavioral control did, however, significantly contribute to the explanation of intentions to reduce

**Table 2**

Multiple regression results with car use for commuting and intention to reduce car use as dependent variables and TPB variables as independent variables.

	Car use for commuting (N = 241)			Intention to reduce car use for commuting (N = 130)		
	R <sup>2</sup>	$\beta$	t	R <sup>2</sup>	$\beta$	t
Perceived behavioral control	.52	-.56	-10.60***	.18	.30	3.57**
Attitude towards car use		.27	5.04***		-.22	-2.66**
Subjective norm		-.04	-.72		.16	1.87

Note: \*  $p < .05$ .\*\*  $p < .01$ .\*\*\*  $p < .001$ .

**Table 3**

Multiple regression results with commuter car use and intention to reduce car use as dependent variables and the NAM variables as independent variables.

	Car use for commuting (N = 241)			Intention to reduce car use for commuting (N = 130)		
	R <sup>2</sup>	$\beta$	t	R <sup>2</sup>	$\beta$	t
Personal norm	.12	-.21	-2.57*	.24	.34	3.41**
Awareness of consequences		-.30	-3.60***		.16	1.69
Ascription of responsibility		.23	2.75		.06	.58

\*  $p < .05$ .\*\*  $p < .01$ .\*\*\*  $p < .001$ .**Table 4**

Regression results with intention to reduce car use as dependent variable.

		R <sup>2</sup>	R <sup>2</sup> <sub>change</sub>	B	t
Model 1	PN	.24	.24***	.34	3.41**
	AR			.06	.58
	AC			.17	1.69
Model 2	PN	.28	.04*	.30	2.96**
	AR			.10	.92
	AC			.21	1.25
	PBC			.21	2.60*
Model 3	PN	.31	.03	1.02	2.87**
	AR			-.25	-.68
	AC			-.02	-.06
	PBC			.37	.59
	PBC $\times$ PN			-1.34	-2.12*
	PBC $\times$ AR			.55	.89
	PBC $\times$ AC			.45	.50

Note: All variables are standardized, following Cohen et al. (2003). PN is personal norm, AR is ascription of responsibility, AC is awareness of consequences, and PBC is perceived behavioral control.

\*  $p < .05$ .\*\*  $p < .01$ .\*\*\*  $p < .001$ .

car use for commuting ( $B = -1.34$ ,  $t = -2.12$ ,  $p < .05$ ). To probe its nature, simple slope analysis was conducted. For respondents low in PBC (1 standard deviation below the mean), stronger personal norms were associated with stronger intentions to reduce car use ( $B = .43$ ,  $t = 4.84$ ,  $p < .001$ ). In contrast, for respondents high in PBC (1 standard deviation above the mean), stronger personal norms were less strongly associated with intentions to reduce car use ( $B = .18$ ,  $t = 1.81$ ,  $p = .072$ ).

#### 4. Discussion

This study examined (i) whether environmentally relevant behaviors (commuter car use and intention to reduce it) would be better explained by variables reflecting self-interest or by moral considerations and (ii) whether perceived behavioral control (i.e. a self-interest variable) would moderate the relation between personal norms (i.e. morality) and car use and the intention to reduce car use.

About 52% of the variance in car use for commuting was explained by the variables reflecting self-interests. The more respondents felt able to reduce car use for commuting and the less favorable their attitude toward car use, the less often they tended to drive to work. The variables reflecting morality were much less successful as an explanatory framework (12% of variance explained). This confirms earlier findings by Bamberg and Schmidt (2003), who found the TPB to have a higher explanatory power than the NAM in explaining car use to university in a student sample. In the present study it appeared that the more respondents felt morally obliged to reduce car use, and the more they were aware of the problems related to car use, the less often they drove to work. Interestingly, the more often respondents drove to work, the more responsible they felt for problems related to car use. This points to a possible suppressor effect, as responsibility was not significantly related to car use. When awareness of consequences and personal norm were controlled for, feelings of responsibility were positively related to car use. Another possibility is that these respondents simply felt guilty about driving, and that emerged as accepting responsibility for problems caused by car use.

A different picture emerged when intention to reduce car use was considered. The variables reflecting moral considerations explained a larger amount (24%) of variance in behavioral intentions than the self-interest variables (18%). Intentions

were mainly explained by feelings of moral obligation to reduce car use for commuting. Stronger feelings of moral obligation to reduce car use were associated with stronger intentions to actually do so. This concurs with findings from Harland et al. (1999) and Heath and Gifford (2002), who also found personal norms to be significant predictors of intention to use the car for short trips and intention to use the bus, respectively. These results lend tentative support for the observation that variables reflecting self-interest and those reflecting moral concerns may be related to behaviors in different ways. Car use and the intention to reduce it may be considered as conceptually different, and as a result, they may be related to different antecedents (cf. Letirand & Delhomme, 2005).

Lastly, there is tentative support that perceived behavioral control moderates the relation between personal norms and behavioral intentions. Among commuters with relatively low levels of PBC, those with stronger personal norms displayed stronger behavioral intentions to reduce car use, whereas among commuters with relatively high levels of PBC, the positive relation between personal norms and intentions was less strong. This contradicts the assumption of Schwartz and Howard (1981) that led to our hypothesis. These results seem to suggest that when commuters do not perceive many possibilities for reducing their car use, they feel all the more morally obliged to reduce their car use. When levels of perceived behavioral control are high, people may already use alternatives to get to work, while when levels of perceived behavioral control are lower, they only intend to reduce their car use when they feel a strong moral obligation to do so. Perceived behavioral control did not moderate the relation between personal norms and self-reported car use. Future studies could explore the moderating role of perceived behavioral control in the relation between moral considerations and behavioral intentions and behavior in more detail.

As a limitation to this study, it should be noted that we used a retrospective measure of car use behavior. This did not allow us to fully test the theory of planned behavior as outlined by Ajzen (1991), that is, we could not test whether intentions predict future behavior. For this reason, and in line with other studies (cf. Harland et al., 1999; Heath and Gifford, 2002), we have measured car use for commuting and intention to reduce it concurrently and related the TPB constructs (attitude, subjective norm and PBC) to present car use and intention to reduce car use separately.

Overall, one reasonable conclusion, based on these findings, is that different 'types' of variables (related to self-interest and morality) may be applicable to different behavioral domains, or different stages of behavioral choices. The variables reflecting self-interests were especially successful in explaining self-reported car use, whereas intentions to change car use were better explained by variables reflecting moral considerations. Relatively high-cost behavior, such as car use for commuting, seems to be explained better by individual considerations (i.e. perceived possibilities, attitudes), whereas willingness to change behavior in a more pro-environmental direction may depend largely on moral considerations – in particular when people do not perceive many possibilities to change their behavior.

From a policy perspective, in order to encourage commuters to use alternative modes of transportation, it seems especially important to enhance perceived possibilities for reducing car use. Also, policies aimed at reducing car use for commuting should focus on feelings of moral obligation (e.g. personal norms) to make a difference.

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