Explaining Pro-environment Consumer Behavior in Air Travel

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ABSTRACT
Some airlines and airports have begun offering a voluntary carbon offsetting service. This article examines the behavior of passengers with respect to their preparedness to compensate for CO_2 emissions. Responses from an on-line-survey of air travelers suggest severity, self-perception, and importance are positively related to willingness-to-compensate. How passengers perceive their self-effectiveness in reducing CO_2 emissions does not affect willingness-to-compensate, but influences likelihood of compensating directly.

KEYWORDS: Pro-environment consumer behavior, voluntary carbon offsetting, theory of planned behavior

1.   INTRODUCTION
Air travel is widely acknowledged to significantly impact global climate through the emissions of greenhouse gases (GHG), including carbon dioxide (CO_2). With the inclusion of aviation in the European Union Emissions Trading Scheme (EU ETS) planned for 2012, the air transportation sector "is about to feel the full blast of regulatory heat" (Turner, 2009). Steps have already been taken to improve aircraft technological but measures to modify air travel behavior remains limited still. Airlines and airports have started offering voluntary carbon offsetting schemes to air travelers.

Little is known, however, about the acceptance of voluntary carbon offsetting schemes (Hooper et al., 2008). When it comes to pro-environment behavior the theory of planned behavior (TPB) may offer useful insights[1]. Here we use it to look at the factors

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[1] It has been used for example for examining pro-environment food consumption (Vermeir and Verbeke, 2006) and consumer behavior pertaining to beverage packaging (Van Birgelen et al., 2009).

that affect an air traveler's willingness to compensate for CO_2 emissions and whether the willingness-to-compensate affect likelihood of compensating.

2. HYPOTHESES

First, four constructs (perception of severity, perceived consumer effectiveness, self-perception, and importance) are examined for their predictive ability regarding a consumer's intention to behave pro-environmentally when flying. This intention is represented as the consumer's willingness-to-compensate for CO_2 emissions. Then, the consumer's willingness to pay is examined with regard to consumers' likelihood to compensate for CO_2 emissions.

A consumer's attitude towards certain behavior relates to the extent to which a consumer evaluates that behavior either favorably or unfavorably. Previous studies have found that attitudes are valid predictors of pro-environment behavioral intentions (e.g., Minton and Rose, 1997). For example, a person who demonstrates a positive attitude towards organic food products is more likely to purchase in organic supermarkets. Laroche et al. (2001) has also found that consumers who perceive ecological problems as having severe consequences for the security of the world, are willing to pay more for the consumption of ecological products. Hence,

H1: Consumers who perceive that CO_2 emissions from air travel create a severe ecological problem are more willing to compensate for these emissions.

Closely related to TPB is the concept of perceived consumer effectiveness (PCE), defined as "the extent to which the consumer believes that his personal efforts can contribute to the solution of a problem" (Vermeir and Verbeke, 2006): With high PCE a consumer will likely translate a positive attitude toward a specific issue into actual behavior. Here it is expected that a consumer who is convinced of the positive effect on the environment of the individual contribution is more willing-to-compensate for CO_2 emissions from air travel. Thus,

H2: Consumers who perceive that their individual efforts to prevent or reduce CO_2 emissions from air travel have a positive effect on the environment as a whole are more willing to compensate for these emissions.

Consumers who behave pro-environmentally in one area are likely to do the same in others. Hence,

H3: Consumers who behave pro-environmentally in areas other than air travel are more willing to compensate for CO_2 emissions from air travel.

McCarty and Shrum (2001) investigated the behavioral context of recycling. When consumers are more aware of the importance of recycling they are more likely to recycle waste. Laroche et al. (2001) investigated the demographic, psychological and behavioral profiles of consumers who are willing to pay more for environmentally friendly products. These consumers think that it is important to behave in an ecologically sound way and we

therefore expect consumers who find it important to behave pro-environmentally to be more willing to compensate for CO_2 emissions from air travel. Thus,

H4: Consumers who view pro-environment behavior as important to themselves or society as a whole are more willing to compensate for CO_2 emissions from air travel.

Behavioral intentions are generally thought offer good predictions of actual behavior (Ajzen, 1991). We expect a consumer's willingness to compensate for CO_2 emissions from air travel to positively influence the likelihood of compensating. Consumer volitional control is required for the transfer of intention into actual behavior. Because voluntary carbon offsetting schemes allow for such control, we posit,

H5: A consumer's willingness to compensate for CO_2 emissions from air travel is positively related to his or her likelihood of compensating.

3. EMPIRICAL ANALYSIS

Cross-sectional data were gathered through an online survey, using NetQuestionnaires software provided by Maastricht University. Invitations to participate were sent out by e-mail, containing a link to the questionnaire. First, the e-mail was addressed to family and friends, who were kindly requested to forward the invitation to as many people as possible; basically a 'snowball-sampling' (Schmidt and Hollensen, 2006). Second, the invitation was sent to the online research panel of Maastricht University. Third, the invitation was published on online community websites, such as Facebook. To limit the social desirability bias, which is associated with environmental issues (MacKerron et al., 2009), anonymous participation was guaranteed. About 250 responses were received. Of these, 128 questionnaires were fully completed. The sample consisted of 46% male and 54% female respondents with about 16% of respondents being frequent business travelers. Most respondents were aged 25-34 years and resided in the Netherlands.

The questionnaire was first pretested and consisted of items that were adapted from previous studies (Table 1). Respondents were asked to indicate their level of agreement/disagreement with these items, which were all scored on a 7-point Likert-item scale ranging from 1 = totally disagree to 7 = totally agree. Willingness-to-compensate was measured using Likert-type items as well as an open question asking for the maximum amount respondents would be willing-to-pay to compensate for CO_2 emissions from flying. Here, a distinction was made between short- and long-haul flights. To assess the likelihood of compensating, respondents were instructed to reflect on several hypothetical offers by an airline to compensate for CO_2 emissions, similar to MacKerron et al. (2009). The questionnaire ended with demographic questions about gender, age, place of residence, and purpose for air travel.

Please Insert Table 1 Here

The data were analyzed using structured equation modeling involving partial least squares (PLS) estimations and making use of SmartPLS (Ringle et al., 2005). PLS is an analysis technique that enables the simultaneous estimation of both the measurement and the structural models (Haenlein and Kaplan, 2004) providing estimations that are very

robust against skewed data distributions and multicollinearity (Cassel et al., 2000) and is suitable for smaller sample sizes.

The interpretation of a PLS model involves the assessment of the measurement model and the structural model (Tenenhaus et al., 2005). First, the unidimensionality, reliability, and validity of the scale are assessed. All but one factor loading resulting from confirmatory factor analysis exceeded the threshold value of 0.50 proposed by Dunn et al. (1994), supporting the unidimensionality of the scales. Furthermore, the scales are reliable; all composite reliability values in Table 2 exceed the threshold value of 0.70 (Nunnally, 1978). Construct correlations, also displayed, provide evidence for construct validity; the average variance extracted, with the exception of the score for self perception, exceed 0.5 and the square root of the average variance of an individual construct exceeds the correlation of that construct with the remaining constructs.

Please Insert Table 2 Here

4.   RESULTS

A bootstrapping procedure with 500 runs of construct-level changes was performed to obtain the t-values of the path coefficients. Figure 1 shows the structural model including the results of the hypotheses testing procedure. The model explains nearly 53% of the variation in willingness-to-compensate and the willingness-to-compensate explains approximately 36% of likelihood of compensating.

Please Insert Figure 1 Here

Four out of the five hypothesized relationships are statistically significant at the 1% level. The extent to which a person views CO_2 emissions from air travel as damaging to the environment seems to have a positive influence on willingness to compensate for those emissions. This result supports H1. The influence of a person's perceived consumer effectiveness on his or her willingness to compensate does not appear to be significant, which fails to support H2. The third relationship, that between self-perception and willingness to compensate, is shown to be positive and significant; therefore, H3 is supported. Consumers who consider pro-environment behavior as important to themselves or society seem significantly more willing to compensate for CO_2 emissions from air travel. This result shows support for H4. Hence, only perceived consumer effectiveness does not appear to have an influence on a person's willingness to compensate. A strong and positive relationship was found between the willingness to compensate and the likelihood of compensating which is in line with the hypothesized relationship and H5 is thus supported.

Mediation Analysis

Mediation occurs when a direct causal relationship between an independent variable and a dependent variable is affected by another variable (Baron and Kenny, 1986). In our model, the construct of willingness-to-compensate could be a mediator of direct relationships between the four independent constructs and the dependent construct of likelihood of compensating. To perform a mediation analysis, the initial model is expanded to account for these possible direct relationships (Table 3). The amount of

mediation - the indirect effect - is equal to the difference between the total effect and direct effect. The direct effect on likelihood of compensating is strongest for perceived consumer effectiveness and lowest for perception of severity. The mediation effect of willingness-to-compensate occurs most strongly for importance.

Please Insert Table 3 Here

Monetary Valuation
Among respondents willing-to-pay, the average reported CO_2 compensation amount was €24 for a short-haul flight and €55 for a long-haul flight. More specifically, percentage of respondents compared to €-amounts on top of ticket price for short-haul are 17%/€10, 15%/€20, 12%/€5, and 11%/€50. For long haul flights: 23%/€50, 12%/€100, 11%/€20, and 9%/€30. Approximately 16% of the respondents were unwilling to pay extra for CO_2 compensation.

6.   Conclusions
This study assessed the influence of consumer-related factors on the willingness of air travelers to compensate for CO_2 emissions, and the likelihood of them actually compensating.

We find first, that someone's perception of the contribution of air travel to climate change was shown to have a significant positive influence on willingness to compensate. Secondly, we do not find a direct link between perceived effectiveness of individual actions and willingness to compensate, which is contrary to the work of Hooper et al (2008) and others. Third, a positive and significant relationship is found between self-perception and willingness-to-compensate. In other words, air travelers who behave in an environmentally conscious manner in areas other than aviation (for instance recycling) appear to transfer this behavior to their air travel; pro-environment behavior seems to be general across domains. Fourth, perceptions about the importance of behaving ecologically have a positive effect on willingness to compensate. Finally, a strong, positive significant effect of willingness-to-compensate on likelihood of compensating is found. Mediation analysis shows that willingness-to-compensate is a strong mediator between the variables and likelihood of compensating, except for perceived consumer effectiveness: perceived consumer effectiveness is a direct predictor of the likelihood to compensate.

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Figure 1. Analytical framework
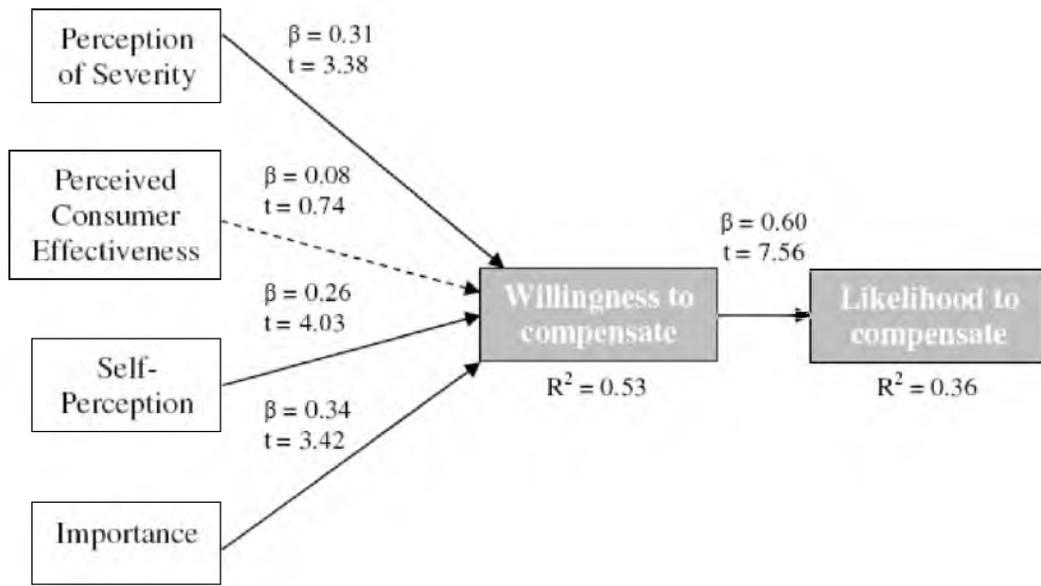
Table 1. Measurement items and item descriptives

Construct	Items	Mean	Std. dev.
Perception of Severity (based on Van Birgelen et al., 2009)	In my opinion, CO_2 emissions from air travel have a serious negative impact on the environment	5.13	1.24
	One of the major causes of environmental damage is CO_2 emissions from air travel	4.17	1.27
		4.79	1.29
	I believe that CO_2 emissions from air travel is a very important environmental issue		
Perceived Consumer Effectiveness (based on Van Birgelen et al., 2009)	When I compensate for CO_2 emissions from air travel, I feel that I am doing something positive for the environment	4.41	1.38
	I believe that my decision to compensate for CO_2 emissions from air travel has a direct influence on the environment as a whole	3.89	1.42
	My choice to compensate for CO_2 emissions from air travel has no direct impact on the environment*	3.84	1.29
Self-Perception (based on Kaiser et al., 1999)	I collect and recycle used paper	5.96	1.29
	I usually buy drinks in returnable bottles	5.11	1.53
	I prefer a paper bag over a plastic bag when shopping	4.87	1.56
	When possible for travel to nearby areas, I use public transportation or ride a bike	4.75	1.67
Importance (based on McCarty and Shrum, 2001))	Compensating for CO_2 emissions from air travel will reduce pollution	4.35	1.23
	Compensating for CO_2 emissions from air travel is important to saving natural resources	4.71	1.12
Willingness to Compensate (based on Oreg and Katz-Gerro 2006)	I am willing to compensate for CO_2 emissions from air travel to protect the environment	4.44	1.52
	I am willing to accept cuts in living standards to protect the environment	4.76	1.11
	I am willing to pay higher (ticket) prices to protect the environment	4.41	1.41
Likelihood of Compensating (based on MacKerron et al. 2009)	I would take up this offer as a leisure traveler	4.16	1.52
	I would *only* take up this offer if part or all of it were paid by my employer*	4.23	1.65
	I would take up this offer if I received extra air miles in return**	3.69	1.63
	I would take up this offer if the airline offered me an *extra* free drink	3.50	1.47

Notes: * Item recoded ** Item omitted due to factor loading < 0.5

Table 2. Construct correlations and descriptives

	(1)	(2)	(3)	(4)	(5)	(6)
(1) Perception of Severity	*0.88**					
(2) Perceived Consumer Effectiveness	0.60	*0.86*				
(3) Self-Perception	0.18	0.29	*0.65*			
(4) Importance	0.53	0.68	0.16	*0.88*		
(5) Willingness to Compensate	0.58	0.57	0.39	0.60	*0.83*	
(6) Likelihood of Compensating	0.43	0.46	0.27	0.42	0.60	*0.72*
Composite Reliability	0.92	0.90	0.74	0.87	0.87	0.75
Average Variance Extracted (AVE)	0.78	0.74	0.42	0.77	0.69	0.52

Note: * Square root of AVE presented on the diagonal

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Table 3. Mediation analysis

Relationship	Total Effect	Direct effect	Mediation
Perception of Severity → Likelihood of Compensating	0.16[†]	0.05[††]	0.11
Perceived Consumer Effectiveness → Likelihood of Compensating	0.23[*]	0.20[*]	0.03
Self-Perception → Likelihood of Compensating	0.17[*]	0.07[††]	0.10
Importance → Likelihood of Compensating	0.23[**]	0.10[††]	0.13

[*] $p < 0.05$; [**] $p < 0.01$; [†] $p > 0.05$; [††] $p > 0.1$