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Busche, Vincent; Sargisson, Rebecca J.

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The Long and the Short of It: Do Psychological Variables Predict Intentions to Reduce the Impact of Air Travel?

Vincent Busche and Rebecca J. Sargisson

Abstract

Air travel is a major contributor of CO₂ emissions, and the aviation industry, along with the number of passengers on commercial aircraft, continues to grow. Thus, it is important to investigate ways to reduce the impact of flying on the environment. According to the low-cost hypothesis, psychological variables, such as attitudes and subjective norms, ought to be better predictors of low-cost, as opposed to high-cost, behaviors. The underlying hypothesis is that with increasing costs, represented by short- vs. long-haul trips, psychological variables from the theory of planned behavior would be less predictive of intentions to reduce the environmental impact of one's air travel. An online questionnaire was used to collect data from a convenience sample of 134 participants. Theory of planned behavior variables predicted intentions to reduce the impact of flying in relation to short- and long-haul trips equally well, as indicated by the overlapping 84 percent confidence intervals of R^2 from two multiple regression analyses. However, there was some evidence that people with strong intentions to reduce the impact of their travel planned to fly less on an upcoming trip than those with weak intentions. The ABC model offers a potential explanation for these findings.

Keywords: ABC model, air travel, attitudes, low-cost hypothesis, subjective norms, theory of planned behavior

Introduction

Pro-environmental behavior is urgently needed, given the alarming temperature increase of our planet,¹ and the consumer can play an essential role.² However, not all consumer domains are showing an increase in environmentally-friendly behavior. The aviation industry reports an almost eight-fold increase in passengers in the past 40 years³ and it is estimated that this number will grow by 4.6 percent annually until 2038.⁴ Although emission averages from other modes of transport vary, they consistently perform better than passenger planes. Using average passenger counts, the European Environment

Agency estimated the carbon dioxide emission of planes to be 20 times higher than that of trains and four times higher than buses.⁵ Therefore, it is important to understand how people can be motivated to reduce their air travel.

Despite its apparent environmental impact, flying as a target behavior has received little attention in the psychological literature. Through market research, however, Mason found that the rise of low-cost airlines has led to a trend of shorter but more frequent leisure flights.⁶ Relatedly, 63 percent of participants in U.K. market research indicated that they would reduce their air travel if the cost were to

increase by £50.⁷ Thus, research indicates a relationship between flying behavior and pricing strategies.

The Theory of Planned Behavior (TPB)^{8,9} is based on the assumption that behavior results from intentions—the degree to which people are willing to try to perform a certain behavior and the amount of effort they want to exert.¹⁰ Intentions, in turn, are predicted by attitudes (evaluating the degree to which behavior is considered positive or negative), subjective norms (one's perception of what significant others may think about the behavior), and Perceived Behavioral Control (PBC) (an indicator of the achievability of the behavior).¹⁰

The TPB is one of the most prominent theories in social psychology and has been used to predict a variety of travel behaviors, such as the use of cars,¹¹ public transport,¹² and long-distance train travel.¹³ (See also Lanzini and Khan for a meta-analysis.¹⁴) Davison, Littleford, and Riley conducted one of the few studies related to air travel using the TPB.¹⁵ They used subjective norms, PBC, and attitudes toward flying to predict intentions to pay for emission offsets, to reduce flight dependency, and to select alternatives to flying. The TPB may therefore offer important insights into what motivates people to reduce their air travel.

Alternatives to flying involve high contextual barriers, such as money, time, or comfort. For example, taking a trip to another country is typically much faster, cheaper, and more convenient by air than by land or sea. According to the low-cost hypothesis,¹⁶ psychological variables, such as environmental concern, attitudes, and subjective norms, should be most predictive of behavior when behavioral or economic costs are low. If a behavior is easy to perform, psychological variables will influence whether a person engages in that behavior.

In high-cost situations, external factors are more influential because external pressure will inhibit attitudes, and, hence, behavioral intentions.¹⁶ When costs are high, people are less likely to behave in line with their beliefs and attitudes because it is too costly to do so. In the context of the TPB, attitudes and subjective norms should be less predictive of intentions to reduce one's environmental impact when costs are high.

This study tested the ability of the TPB to predict people's intentions to reduce the environmental impact of

their air travel in the context of short- and long-haul flights. There is some evidence that people are more concerned about, and more willing to reduce, short-haul flying than long-haul flying.¹⁷ The costs for acting pro-environmentally should be perceived to be higher for long-haul trips because it is more costly to reduce the impact of flying long distances (for example, alternative modes of transport take longer than for short-haul travel, involving potentially numerous trip-legs, and the cost of offsetting carbon emissions is higher). Therefore, the authors hypothesized that attitudes and subjective norms would be more predictive of intentions to reduce the environmental impact of flying for short-haul flights than for long-haul flights. PBC scores were used to determine whether the reduction of long-haul flights was indeed perceived to include higher costs than that for reducing short-haul flights.

Method

Participants

A snowball sampling method was used to recruit a total of 133 participants, 84 women, 49 men, and one person of nonbinary gender. An online questionnaire link was shared on social media platforms with a request to share it further. The mean age of respondents was 27, 95 percent confidence interval (CI) [24.8, 28.0]. Students comprised 75 percent of the respondents; the rest were mostly working and six were unemployed. The majority (60%) of respondents were German; 20 percent were Dutch, and 20 percent were other nationalities.

Materials and Design

Within the context of a larger questionnaire, measurements were made

for: intention to reduce the environmental impact of flying for short- and long-haul trips; environmental attitudes toward air travel; subjective norms toward air travel; and PBC to reduce the environmental impact of flying (see Appendix A for all scales). Scales from Davison and colleagues were adapted for measuring attitudes, subjective norms, and PBC for a non-British context.¹⁵ Intentions to reduce environmental impact of flying include, for example, paying to offset carbon emissions or choosing a more environmentally-friendly airline, and were therefore operationalized more broadly than simply as "reducing the amount of air travel," to cover a broader spectrum of more environmentally-friendly air travel behaviors and their implementation, which should be suitable for a wider range of people.

The intentions scale by Davison et al.¹⁵ was amended to apply to two conditions; short- and long-haul flying. Short-haul flights were operationalized as trips inside the participant's country or trips that would take up to 15 hours by car. Long-haul flights were operationalized as trips outside the participant's country or that would take more than 15 hours by car.

Finally, the scale for PBC was adapted according to the compatibility principle, which states that predictor and target variables should overlap as much as possible conceptually.⁹ For example, attitudes toward the environment are less likely to be a good predictor for recycling than attitudes toward recycling. Thus, two types of PBC were included in the questionnaire to account for the two types of intentions toward flight reduction. Scales for subjective norms and attitudes toward flying were not changed because it was assumed that they do

not differ extensively between long- and short-haul flights. All items were scored on 5-point scales ranging from 1 = strongly disagree to 5 = strongly agree, and in the case of intentions from 1 = very willing to 5 = very unwilling.

Finally, to see whether intentions translated into behavior, participants who indicated that they were going on vacation over the summer (the questionnaire was administered in June 2019, shortly before the summer), were asked which mode of transport they planned to use.

Instruments

The items in each scale were averaged. The two outcome variables—intentions to reduce environmental impact of air travel for short-haul trips and for long-haul trips—each contained five items ($\alpha = .77$ and $\alpha = .72$). The predictor variables were: environmental attitudes toward air travel (4 items; $\alpha = .61$; the item “it is easy for people to reduce their air travel if they really want to” was removed, as it was assumed to overlap with the concept of PBC); subjective norms (4 items; $\alpha = .71$); and PBC to reduce environmental impact for short-haul (3 items; $\alpha = .79$) and long-haul (3 items; $\alpha = .66$) trips.

Data Analysis

Two multiple regression analyses were run. In the first, attitudes, subjective norms, and PBC for short-haul trips were used to predict intentions to reduce environmental impact of air travel for short-haul trips. The same analysis was run in relation to long-haul trips.

To test the hypothesis that attitudes and subjective norms become weaker predictors with increasing costs, the 84 percent confidence interval of R^2 of the long-haul model was com-

pared with the 84 percent confidence interval of R^2 of the short-haul model. The 84 percent confidence interval was selected because it comes closest to a level of significance of $p = .05$.¹⁸ If the overall variance explained in the long-haul condition was significantly smaller than in the short-haul condition, the hypothesis would be supported.

Intention scores for both short- and long-haul trips were assigned to one of two groups: low intention (scores from 1 to 3 on the intention scale) and high intention (scores from 3.01 to 5) to reduce environmental impact of flying. A chi-square test was run for each mode of transport to determine whether people with high intentions to reduce the environmental impact of their air travel were significantly more likely to use alternative modes for short- and long-haul trips.

Results and Discussion

This study investigated the relationship between the psychological variables in the TPB and behavioral or economic costs in the context of travel behavior. To test whether participants perceived reducing the environmental impact of their long-haul flying to be more costly than their short-haul flying, the mean of both PBC scales was compared. Mean PBC scores for reducing environmental impact for short-haul trips, $M = 3.67$; 95% CI [3.51, 3.83], were significantly higher than for long-haul trips, $M = 2.39$; 95% CI [2.24, 2.39]; $t(134) = 11.44$, $p < .001$, $d = 1.40$, providing some evidence that the participants perceived long-haul trips to be more behaviorally costly than short-haul trips.

To test the hypothesis that attitudes and subjective norms would become

better predictors of intentions to reduce the environmental impact of air travel as perceived costs decreased, two multiple regression analyses were run to see whether the regression models resulted in a significantly higher variance accounted for (R^2) for short-haul versus long-haul trips. Data met all parametric assumptions. As can be seen in Table 1, both regression models produced reasonably high R^2 values, but the explained variance was not significantly different in the two models, as indicated by the overlapping 84 percent confidence intervals of the R^2 for short-haul (84% CI [.27, .52]) and long-haul intentions (84% CI [.19, .43]). All independent variables of the TPB significantly predicted intentions to reduce the environmental impact of flying for short-haul trips. For long-haul trips, attitudes and subjective norms were significant predictors, but PBC was not.

As expected, attitudes were a better predictor of intentions to reduce the impact of short-haul flights than for long-haul flights (as seen by the larger β value in Table 1). However, subjective norms, contrary to the hypothesis, became a better predictor as perceived costs increased. In addition, for both long- and short-haul trips, subjective norms and attitudes were significant predictors, and the overall explained variance of both models was similar.

Overall, people with high intentions to reduce the environmental impact of their short-haul trips were significantly more likely to report that they planned to travel by car on their upcoming summer vacation than people with low intentions: $\chi^2(1) = 10.26$, $p < .001$, $V = .32$. Trips planned by car did not differ significantly for people with low and high intentions to reduce the impact of their

Table 1. Results of the Multiple Regression Analysis

	β	t	p	95% CI		R^2	F	df	p
				Lower	Upper				
Short-haul:						.39	28.00	130	< .001
Attitudes	.47	5.48	< .001	.30	.64				
Subjective norms	.23	2.94	.004	.08	.39				
PBC	.14	2.14	.04	.01	.27				
Long-haul:						.31	19.81	130	< .001
Attitudes	.33	3.86	< .001	.15	.49				
Subjective norms	.32	4.00	< .001	.16	.48				
PBC	.08	1.13	.26	-.57	.21				

long-haul trips: $\chi^2(1) = 1.88, p = .17, V = .14$. People with high intentions to reduce the impact of their travel were significantly more likely than respondents with low intentions to report that they planned to use the bus or train for short-haul trips: $\chi^2(1) = 17.31, p < .001, V = .41$, and for long-haul trips: $\chi^2(1) = 4.92, p = .027, V = .22$. For plane use, no significant difference was found between people with low and high intentions for short-haul: $\chi^2(1) = 1.03, p = .31, V = .10$ or long-haul: $\chi^2(1) = 1.03, p = .31, V = .10$ trips.

These results conflict with the findings of Diekmann and Preisendörfer,¹⁹ who demonstrated a stronger effect of environmental attitudes on behavior in low-cost compared to high-cost situations. Yet, these results support the work of Davison and colleagues¹⁵ by finding support for all predictors of the TPB. Furthermore, these results align with those of Hunecke et al.,²⁰ who found personal norms to be predictive of behavior in low-cost and also in high-cost situations.

One straightforward explanation for the non-significant difference between the two models in this study could be that the differentia-

tion of short- and long-haul trips did not reflect actual differences in perceived costs (behaviorally and economically). However, PBC scores for both groups differed significantly, indicating that barriers were perceived to be higher for the long-haul condition.

Given the weight of evidence, it is unlikely that increasing costs does not affect behavior. The low-cost hypothesis, as investigated in this study, predicts a negative linear relationship between costs and psychological constructs. Recent evidence on acceptability of car-reduction policies, however, showed that personal norms were only predictive of behavior when costs were moderate,²¹ which is more in line with the ABC model.²² The ABC model suggests that in very low-cost situations, everyone performs the behavior regardless of their norms and attitudes, whereas in high-cost situations, nobody feels able to do so. Only in moderate-cost situations is behavior expected to be influenced by psychological variables, thus, the model predicts an inverted U-shaped instead of a linear relationship. The ABC model may give insights into these results. If participants perceived short-haul

trips to be somewhere between not costly and moderately costly, and long-haul trips somewhere between moderately costly and very costly (so they would position themselves on both tipping points of the U-curve), subjective norms and attitudes could predict intentions equally well.

Despite the rejection of the main hypothesis, one strong finding of this study is that all TPB variables clearly predicted intentions to reduce the environmental impact of air travel. In both cost conditions, attitudes, and subjective norms were the more important predictors (according to their standardized coefficients, β , see Table 1), which emphasizes the general strength of psychological variables in predicting behavioral intentions, even in high-cost situations. Additionally, participants with high intentions to reduce their environmental impact were more likely to use the bus or train for their upcoming summer vacation. Regarding plane use, however, no significant difference between the two intention groups was found. The link between intentions and behavior suggested by the TPB is thereby only partially supported and requires further investigation.

The study data were correlational and therefore do not allow for causal inferences. Additionally, as with every self-report measure, but especially in the context of environmental behavior, this data may have been subject to a social-desirability bias. Second, a convenience sample was used, which limits the external validity of the findings. Third, although the study only included respondents who indicated that their summer plans were fixed, no direct measure of behavior for the participants' upcoming summer vacation travel was obtained.

Finally, improvements could be made to the measure of contextual factors. Future researchers are advised to use more than two cost conditions to model the inverted U-shaped relationship between costs and psychological variables proposed by the ABC model. This could be achieved, for example, by specifying a range of trip distances. In addition, more research on flight reduction generally, and as a target variable with a behavioral measure that is based on observation, is needed to compare the relative importance of all TPB predictors. Field research at airports, with participants at gates to different destinations (different cost-conditions) may be informative here.

Conclusion

No clear support for the low-cost hypothesis was found. However, the study showed that attitudes and subjective norms are both highly predictive of intentions to reduce the environmental impact of one's air travel in both low- and high-cost situations. Together with PBC, the theory of planned behavior appears applicable for air travel behavior. Thus, apart from discussing policies based on monetary incentives such

as the CO₂ tax, politicians and policy advisors should not underestimate the strength of psychological variables as intervention tools, even for seemingly costly behaviors.

Author Disclosure Statement

No competing financial interests exist.

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Address correspondence to:

Rebecca J. Sargisson

University of Groningen

PO Box 72

9700AB Groningen

The Netherlands

E-mail: r.j.sargisson@rug.nl or

sargisson@waikato.ac.nz

Appendix A

The following scales were adapted from Davison et al.¹⁵ Exceptions are labeled.

Intentions to Reduce Environmental Impact for Short-Haul [Long-Haul] Trips
The following questions refer to <i>short-haul</i> [long-haul]* trips. Think about <i>short-haul</i> [long-haul] trips as trips within your country or to a bordering country [destinations far outside your country]. So, for a trip that would take up to [at least] 15 hours by car: How willing are you to:
fly in the next 12 months?
pay to offset the carbon emissions from my flight(s)?
pay more to fly a less polluting airplane?
choose a more energy-efficient airline?
choose to travel by train or bus rather than fly?

*Words in italics were used for the short-haul items; the same items were used again with the words in brackets replacing the words in italics for long-haul trips.

Notes: Measured on a 5-point Likert-scale: 1 = very willing, 2 = willing, 3 = neither willing nor unwilling, 4 = unwilling, 5 = very unwilling

Environmental Attitudes toward Air Travel
Please indicate to what extent you agree with the following statements:
Air travel is a significant contributor to climate change.
Passengers should pay more to fly because of the negative environmental aspects of aviation.
It is easy for people to find an alternative to flying if they really want to.*
Experience of different cultures and destinations is more important than saving natural resources.
The media tends to overstate the effects of climate change.

*removed, see “Methods-Instruments” for more information.

Notes: Measured on a 5-point Likert-scale: 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree

Subjective Norms
Please indicate to what extent you agree with the following statements:
My friends try to reduce the amount of flights they take.
When other people around me reduce their air travel, I feel I should too.

Subjective Norms
People who are important to me think that I should reduce my air travel.*
People who are important to me would support me in reducing my air travel.*
My friends try to reduce the amount of flights they take.

*adapted from Haustein and Hunecke²³

Notes: Measured on a 5-point Likert-scale:

1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree

Perceived Behavioral Control to Reduce Environmental Impact of Flying
Please indicate to what extent you agree with the following statements:
I find reducing long-haul flights is convenient.
I find reducing long-haul flights is easy.
I find reducing short-haul flights is convenient.
I find reducing short-haul flights is easy.
Using the train or bus instead of the plane for long-haul trips is easy for me if I want to.*

*adapted from Haustein and Hunecke²³

Notes: Measured on a 5-point Likert-scale:

1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree