The effect of an eco-label on the booking decisions of air passengers

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Abstract

In the last few years there has been an increasing attempt to find solutions on how to mitigate the environmental impacts of air travel. Behavioral change has hereby been identified as the measure with the most significant impact. One way to encourage behavioral change is the use of eco-labels. Eco-labels have, to date, received scant attention in the aviation industry, and their effect on air travel behavior is still largely unknown. This study explores the effect of an eco-label on the booking decisions of passengers. We conduct a stated choice experiment with 553 air passengers. Our findings show that providing passengers with an eco-label leads to behavioral change, as the label makes them avoid the most polluting flights while it also increases their willingness to pay for less polluting flights. We find, however, that it is environmentally minded passengers who are more likely to select green-labeled flights. In addition, our results show that providing additional information on the purpose and goals of the eco-label is crucial for its adoption, because this added information increases the preference for more environmentally friendly flights significantly. Based on our results, we provide recommendations to the industry and for further research.

Keywords: Eco-label; behavioral change; choice experiment; booking flight; green flight choice; willingness to pay.

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1. Introduction

Air travel is one of the most energy intensive forms of transportation, with huge environmental impacts. Its major impacts are noise, local air pollution, and greenhouse gas emissions, the latter of which has the most significant long-term impact in its contribution to climate change (Green, 2003). While the aviation industry currently accounts for about 2.5% of the total CO_2 emissions worldwide (Lee et al., 2009), it is growing at a very fast rate of about 5% annually, doubling its size every 20 years (Cohen and Higham, 2011; Dubois and Ceron, 2006). Over the past four decades technical improvements were able to compensate for the tremendous growth of the industry, keeping its overall impacts rather constant (Green, 2003; Penner et al. 1999). The efficiency potentials, however, are nearly exhausted because the current technology has reached its maturity (Gössling and Peeters, 2007). In order to achieve significant efficiency gains, new technological solutions such as fully electric aircraft would be needed (Baumeister et al., 2020). According to Epstein and O'Flarity (2019), however, fully electric aircraft won't play a major role in aviation's emissions reductions in the first half of this century. Alternative fuels such as biofuels, hydrogen or synthetic fuels could play an important role in this transition (Dominkovic et al., 2018), however, according to Gnadt et al. (2019) only electric aviation could achieve zero emissions in the long run.

In order to mitigate the environmental impacts of aviation, we should therefore not only rely on technical improvements, but consider other measures as well. In addition to technological changes, there exist other instruments, such as market-based changes or behavioral change (Hares et al., 2010). Market-based changes have been discussed widely in the past decade. Prominent examples of these include emissions trading schemes (e.g., EU-ETS) or the use of carbon offsets. Gössling et al. (2007), however, see clear limitations in market-based approaches such as carbon offsets due to their voluntary nature. Because market-based approaches are limited and the efficiency potentials of current aircraft design nearly exhausted, Davison et al. (2014) as well as Gössling et al. (2007) agree that the measure with the most significant impact on reducing greenhouse gas emissions is behavioral change. Behavioral change refers hereby to any transformation or modification of human behavior. In the context of human's impacts on the environment, Kollmuss and Agyeman (2002) understand behavior change as behavior that seeks to minimize the impacts on the nature and built environment. One approach to encouraging behavioral change is the use of eco-labels (Anderson et al., 2013).

Eco-labels provide buyers with information on the environmental impacts of products (Bratt et al., 2011; Buckley, 2002), giving them the opportunity to compare products based on their environmental performance. On the

buyer side, eco-labels can stimulate more sustainable purchases and change consumption patterns while at the same time motivate producers or service providers to raise their environmental standards (Gallastegui, 2002). While eco-labels have proven successful in many markets and can be found on many products (e.g. Anderson et al., 2013; Ng and Chan, 2020; Sipic, 2017), they haven't yet received much attention in the aviation industry.

Previous studies (Baumeister and Onkila, 2017; Gössling et al., 2009; Hagmann et al., 2015; Lynes and Dredge, 2006) have outlined the importance of making flights environmentally comparable by using environmental indicators. Nevertheless, those studies have failed to show the effects an eco-label could have on the booking decision of air passengers. Gössling et al. (2009) estimated that if environmental information would become available, passengers would be interested in integrating that information into their booking decision. This finding was confirmed by Araghi et al. (2014), who studied passengers' preferences towards an airline eco-efficiency index, showing through a stated choice experiment that such an eco-label had strongly influenced respondents' airline choice. However, while Araghi et al. (2014) were further studying the interaction of the eco-label within the context of a collective carbon offsetting rate, we wanted to study how an eco-label would interact with more concrete product attributes such as ticket price and flight time. Furthermore, we investigated how the eco-label interacts with the environmental mindedness of air passengers and additional information on the eco-label provided prior to booking.

This study aims to deepen current understanding on the effects an environmental label could have on the booking decision of air passengers. By applying a stated choice experiment, the study tests the effect an aviation eco-label had on the booking decisions of passengers. We simulated a real purchase situation in which participants made choices based on attributes shown to them. We added an eco-label as an additional attribute to the booking decision and tested how this new attribute affects the overall booking decision of passengers. This research expands the current knowledge on how sensible the use of an aviation eco-label could be and provides recommendations to the industry.

2. Literature review

Environmental labels or eco-labels define, compile, test, and summarize the environmental performance of products or services and present those to the consumer in the easiest way possible (Buckley, 2002; Gallastegui, 2002; Ng and Chan, 2020). According to Bougherara and Combris (2009, 321), eco-labels "internalise the external effects on the environmental of production, consumption and disposal of products." They can be found among many products and are used in various industries to verify and provide accurate information on the environmental superiority of

particular goods (ISO 14024:1999). Products that carry the eco-label are normally produced in a way that is environmentally less harmful (e.g., made out of recycled material) or are designed in order to minimize the environmental impact during use (e.g., devices that are more energy-efficient). While some eco-labeled products bring consumers direct benefits for their health (e.g., organic food), economic benefits (e.g., Energy Star) or status (e.g., buying an electric vehicle), others address more general environmental issues, focusing on consumers' biospheric concerns such as the FSC label or dolphin-free tuna. Previous studies (Bratt et al., 2011; Houe and Grabot, 2009; Song et al., 2019) have found that eco-labels can have a significant impact on the consumption behavior of individuals, resulting in producers being able to ask for premium prices and gaining competitive advantage over their rival entities. In addition, eco-labels help closing the gap of information asymmetry between consumers and producers over the question of products' environmental attributes (De Boer, 2003; Rex and Baumann, 2007). Finally, eco-labels can stimulate both consumers and producers to behave in a more sustainable manner by encouraging consumers to make more conscious choices towards greener products and motivating producers to offer more such products through the additional benefits that arise from using the eco-label (Hayat et al., 2020; Houe and Grabot, 2009). The aim of eco-labels is to improve environmental conditions through a market-driven approach (ISO 14024:1999).

2.1. Environmentally minded passengers

Previous studies have found that passengers are, in general, aware of the negative environmental impacts of flying but that cutting back on the practice is seen as unacceptable because it would restrict the personal freedom to travel (Becken, 2007; Hares et al., 2010). Young et al. (2014) have detected a so-called 'flying dilemma' among passengers in which an individual's self-concept as a responsible consumer conflicts with the environmental impacts caused by air traveling. However, because flying cannot always be avoided, there are ways to mitigate the environmental impacts through, for example, carbon offsets or the here proposed eco-label. Although carbon offsets have received only a moderate response (Gössling et al., 2009; Hagmann et al., 2015; Wittmer and Wegelin, 2012), the eco-label presented in this article could help air passengers to reduce their environmental impact without compromising their freedom to travel or necessarily making them pay more for mitigating their CO_2 emissions. Nevertheless, as Bratt et al. (2011) stated, eco-labels normally attract more environmentally minded consumers. Those are individuals who are concerned about the environment and who try to reduce environmental impacts through their lifestyle, an attempt which is reflected in the way they consume products and services (Delmas and Lessem, 2017).

Furthermore, van Birgelen et al. (2011) found that consumers who are more environmentally minded in other areas (e.g., recycling) are more likely to transfer this behavior to their air travel. In light of these findings, we hypothesize the following:

H1. Passengers who are environmentally minded will more likely choose flights that are environmentally friendlier.

2.2. Willingness to pay

Eco-labels are often brought up along with price premiums, which producers normally justify with a higher environmental quality of the product (Gallastegui, 2002), such as no use of pesticides in organic farming (Loureiro et al., 2002) or the longer life span and energy savings of LED light bulbs. For less polluting flights, the reduction of greenhouse gas emissions can mainly be achieved through increased fuel-efficiency. Increasing the fuel efficiency is mainly achieved by the employment of latest aircraft technology which, however, requires the constant update of the existing fleet. According to Howe et al. (2013), replacing aircraft before the end of their life cycle can reduce environmental impacts significantly because 99.9% of the impacts stem from the operation phase. Nevertheless, constantly updating the fleet also requires major investments from airlines (Miyoshi and Ibanez, 2016). If airlines would be able to communicate the higher environmental quality of the modern fleet through an eco-label, they might be able to charge a premium price for less polluting flights. This could attract passengers who are concerned about emissions and willing to pay to address this issue. Previous studies on eco-labels have found a willingness to pay a premium for eco-labeled products among consumers such as for food and beverages (Brécard et. al, 2009; Loureiro and Lotade, 2005), household appliances (Ward et al., 2011) or wood products (Tan et al., 2019). We therefore want to study whether an eco-label could create a willingness to pay among air passengers. In terms of testing passengers' willingness to pay more for a less polluting flight, previous studies have mainly focused on carbon offsets. As mentioned previously, the response to carbon offsets has been rather moderate. In a study of passengers' willingness to pay beyond a carbon offset, however, Baumeister (2015) detected a 34% willingness among participants to pay more for a less polluting flight. Therefore, the eco-label could stand for higher quality in terms of reduced environmental impacts. Our second hypothesis is the following:

H2. An eco-label enhances passengers' willingness to pay for environmentally friendlier flight options.

2.3. Interaction with flight time

One of the functions of eco-labels is that they transform credence attributes into product attributes (Thøgersen et al., 2010). As the eco-label proposed here would become a further product attribute, we want to study how the eco-label interacts with existing product attributes of flights. In a similar study, Delmas and Lessem (2017) found that the presence of a wine eco-label actually sent negative signals to consumers, who perceived eco-labeled wines as lower quality. We therefore wanted to find out whether an aviation eco-label would interact positively or negatively with existing product attributes. To this end we focused on the attributes used in the experiment: ticket price and flight time. While the ticket price is either determined by the market or based on bilateral agreements, the duration of a flight depends mainly on the routing, whether the flight is operated non-stop or contains one or several layovers of various lengths. Depending on whether the green-labeled flight requires a shorter or longer flight time, adopting the eco-label might represent a gain or a trade-off for the passenger. Similarly, as in the case of willingness to pay for a green-labeled flight, we wanted to study whether passengers would be willing to make trade-offs for the sake of the eco-label, such as accepting a longer flight time. Therefore, we further hypothesize the following:

H3. Longer flight times enhance passengers' preference for environmentally friendlier flight options.

2.4. Eco-label understanding

With the help of eco-labels, consumers should be able to compare different products or services regarding their environmental performance in the easiest way possible (Ng and Chan, 2020). Nevertheless, the success of an eco-label depends not only on whether it reduces the information and search costs but also on whether the consumer is aware of the eco-label and understands its meaning (Rihn, et al., 2019). Understanding in this regard means how well a consumer can connect the eco-label's message to environmental issues and the actions that need to be taken as a result (Banerjee and Solomon, 2003). Although some passengers might be familiar with eco-labels, they have not yet been used in the aviation industry. Furthermore, there is evidence that eco-labels might cause confusion among consumers concerning the eco-label's goals, credibility, and expected benefits, and this confusion might harm the success and adoption of the eco-label (Leire and Thidell, 2005). Because differences in the environmental performance of flights are not common knowledge (Baumeister, 2017), it might be difficult to communicate this information simply through eco-labels. In addition, Thøgersen et al. (2010) found that such green claims can easily lead to the suspicion

of greenwashing, especially due to the fact that air traveling is not generally perceived to be environmentally friendly. Providing additional information on the eco-label can improve the eco-label's success tremendously especially when consumers hold incorrect perceptions about the environmental impacts (Teisl et al., 2008). In the case of an aviation eco-label, passengers could be provided with additional information on the environmental cause the eco-label addresses (e.g., climate change), how much of a difference it can make to choose one flight over another (see also the example in Figure 1), what kind of environmental impacts are taken into account (e.g., CO_2, NO_x, noise), what kind of methodology was used to classify the different flights and what the different colors used in the label stand for. By providing additional information, passengers could be better made aware of the fact that which flight they choose can make a tremendous difference in terms of its environmental impact and that the eco-label can assist them in making better informed choices. Therefore, in order to create consumer awareness and overcome barriers that hinder passengers' understanding of the new eco-label, which might in turn compromise the eco-label's success, we propose a further hypothesis:

H4. Additional information on the eco-label will increase passengers' likelihood of choosing environmentally friendlier flights.

3. Methods

3.1. Survey design

A stated choice experiment was conducted in which participants were asked to imagine taking a transcontinental flight from Los Angeles (LAX) to New York (JFK). Participants viewed nine choice sets, each containing three flight options, from which they chose one. The option of not flying was excluded from the choices because air travel is the only feasible option to cover such a long distance. Participants were presented with the three attributes shown in Table 1.

Table 1. Attributes and attribute levels.

Attribute	Attribute level
Ticket price	$205
	$225
	$245
Total time	5hr 20min
	6hr 35min
	7hr 50min
Eco-label	Green
	Yellow
	Red

Based on three attributes with three levels each, we got 27 combinations which were randomly assigned into nine choice sets of three choices each. Ticket prices reflected the prevailing airline prices for economy class one-way flights on the Los Angeles to New York route. The total journey time, including stops and layovers, were taken from existing schedules. The times ranged from 5 hours and 20 minutes (equal to a non-stop flight) to 7 hours and 50 minutes, equivalent to a flight with a long layover or a flight with two short stops. In order to avoid bias based on possible earlier experiences, participants were not informed about the location of a stop nor which airline was to operate the flight. Finally, each flight was environmentally rated with an eco-label using a color scheme instead of plain text as recommended by Rinh et al. (2019). The scale of the eco-label ranged from green (an environmentally preferable flight) to yellow (an environmentally neutral flight) to red (a flight that should be avoided). The advantage of this method is that it allowed us to mirror real-world choices while still being able to randomize across product attributes, which would not have been possible with real-world data. In addition, it also allowed us to examine only those product attributes most relevant to our study. On the other hand there are of course also short-comings of this method which have to be acknowledged such as the hypothetical bias that might have influenced the results which might have not occurred when using real-world data.

To keep the environmental ratings realistic, we conducted carbon dioxide emissions calculations for flights based on real data on the Los Angeles to New York route to ensure that all the combinations presented in the experiment could occur in reality. This calculations are based on an earlier study by Baumeister (2017). Depending

on the calculated carbon dioxide emissions, flights were put into three different label categories: green, yellow and red. It was possible that flight options labeled green, yellow, and red could occur among the entire price range as well as in the range of durations, meaning that non-stop flights could be labeled red and flights with two stops could be labeled green. According to Baumeister (2017), who conducted carbon dioxide emissions calculations based on real data, the emissions do not depend on the number of stopovers but much more on the passenger load factors, the amount of seats on the aircraft and the amount of cargo carried on the flight.

For the purpose of studying the eco-label understanding (hypothesis 4), participants were put into two treatment groups. Half of the participants received only brief information on the eco-label, telling them what the different colors stand for. The second group received additional information on what the label stands for, why it is important, what environmental impacts it addresses, the methodology behind it, and the logic of the color scheme. Participants in this group were also presented with a graph (see Figure 1) comparing four non-stop flights on the LAX to JFK route and showing the significance their flight choices can make in terms of environmental impacts. Both groups completed the same survey.

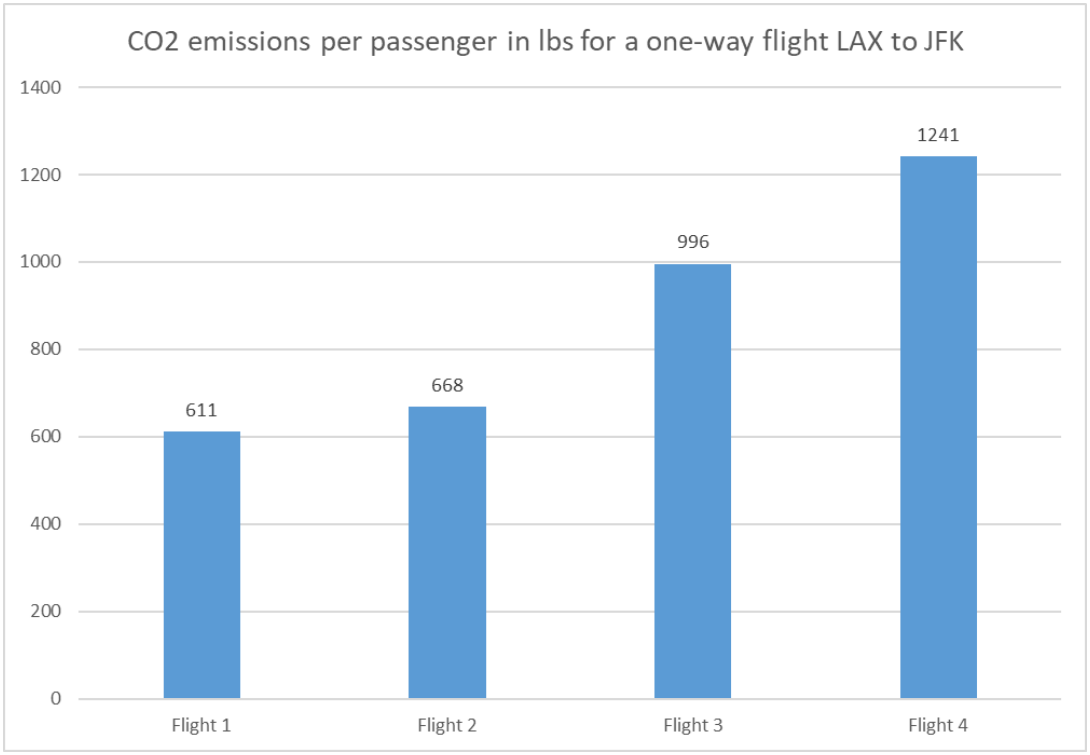

Fig. 1. Example provided to treatment group.

After the nine choice sets were presented, demographic data was collected. Finally, the participants were asked screening questions (see Table 2) in order to determine who the environmentally minded passengers were. Here we followed the approach of Delmas and Lessem (2017) whose screening questions for environmentally minded participants were used as a starting point for developing our own questions.

Table 2. Screening questions for environmental mindedness (Five point Likert scale).

Questions	Mean	Std. dev.
1. How strongly would you rate the importance of the eco-label for the booking choices you made?	2.95	1.14
2. How frequently do you purchase organic products?	2.68	1.21
3. How often do you purchase voluntary carbon offsets when booking a flight?	1.39	0.96
4. How concerned are you about the future state of our environment?	3.30	1.12
5. Are you a member of an environmental organization?	1.88	0.32

3.2. Data collection

Unlike previous choice experiments (Araghi et al., 2014; Hagmann et al., 2015) that have studied the effects of environmental product attributes on the flight choices of passengers with paper-based surveys and at airports, we decided to conduct our study online because this approach came closer to the reality of making booking decisions when buying airplane tickets on the Internet. We recruited our participants using Amazon Mechanical Turk (MTurk). Amazon MTurk is a crowdsourcing Internet marketplace that provides relatively cheap and fast access to human intelligence for performing tasks such as answering questionnaires. Although it is still a rather new recruitment method, Amazon MTurk has received positive reviews in comparisons to traditional methods like paper-based surveys (Berinsky et al., 2012), especially in data quality and reliability (Buhrmester et al., 2011). Casler et al. (2013) even found that Amazon MTurk can, in some instances, be superior to previous methods in, for example, behavioral testing. Participants receive a small compensation for their effort depending on the time and demands of the task. In our study, each participant received compensation of $0.50, which was a slightly above-average fee based on the given task recommended by MTurk. The survey was completed by 617 participants, from which 553 useful answers could be obtained. The main reasons for removing participant's answers were that they did not reside in the United States or have not flown within the last 12 months, which were based on the two questions used for screening participants.

3.3. Evaluation methods

To reflect the environmental friendliness of their choices, participants gained 0 points for making a green-labeled choice, 1 point for a yellow-labeled choice, and 2 points for a red-labeled choice. Therefore, participants' cumulative scores ranged from 0 to 18 points upon completion of nine choice sets. Participants who scored in the top 25% (0–4 points) were considered to have made a green choice, those who scored between 26% and 50% (5–9 points) were considered to have made a yellow choice, and those who were in the bottom category between 51% and 100% (10–18 points) were considered to have made a red choice. A score of less than 4 total points is indicative of a participant's green-labeled choice because one needs to predominantly and consistently choose green-labeled fights despite variations in flight duration and price to maintain a low score in the nine choice-sets of the experiment. On the other hand, participants who scored between 10 and 18 points are categorized into the red-labeled choice group. With a mean score more than 1, these participants have chosen, on average, the yellow-label flight or, worse, the red-label flight in each conjoint choice set. As a result, only those participants that consistently chose green-labeled flights ended up in the top 25% and were considered to have made a green choice. Such group categorization adds to our understanding of travel decisions in different social groups.

Participants' environmental choices served as the dependent variable. To test H1, we first had to determine the independent variable of environmental mindedness. For this purpose, participants were presented with five screening questions (see Table 2). Questions 1, 2 and 4 used a five point Likert scale (1–5), while question 3 had a sixth option (0–6) to accommodate participant's responses in case they had never heard about carbon offset. As Lu and Wang (2018) have shown, the percentage of air passengers who have heard about carbon offset is still low, ranging between 6% and 32% depending on the region. Question 5 allowed only for a binary response (0–1). Scores were assigned to all participants according to their responses using the following equation 1,

$$Participant's\ Score = \sum Participant's\ Responses - 3 \quad (1)$$

where the sum of participant's responses indicated the sum of the value of their responses.

To test H2 and H3, the independent variables were the ticket price and the flight time. For ticket price, participants were assigned value 0 for choosing the lowest price option ($205), value 1 for choosing the middle price option ($225), and value 2 for choosing the highest price option ($245). The variable ticket price is computed as the

sum of the nine choices that participants made. Similarly for flight time, value 0 was assigned to the 5hr 20min option, value 1 for the 6hr 35min option, and value 2 for the 7hr 50min option. Both ticket price and flight time were treated as continuous variables in the analysis. Finally, for H4 we used treatment as an independent variable. We divided participants into two groups, those who had received treatment in the form of additional information on the eco-label and those who had not.

4. Results

Table 3 provides the sample demographics. Although our study was conducted in the United States, we did not aim at representativeness compared with the population as the focus of our study was not on the United States exclusively. When looking at the sociodemographic characteristics of our sample, there are deviations with regard to gender, age, educational level, and annual household income.

Table 3. Summary of the sample.

Variable		%
Gender (*N* = 553)	Male	63.4
	Female	36.6
Age (*N* = 553)	< 24	19.9
	25-34	53.4
	35-44	16.4
	45-54	6.3
	> 55	4.0
Educational level (*N* = 553)	High school	25.8
	Associate's Degree	15.1
	Bachelor's Degree	43.5
	Graduate/Professional Degree	14.3
	Doctoral Degree	1.3
Annual household income (*N* = 553)	<$10,000	6.0
	$10,000-$14,999	6.0
	$15,000-$24.999	12.6
	$25,000-$34,999	13.4
	$35,000-$49,999	19.5
	$50,000-$74,999	19.3
	$75,000-$99,999	12.1
	$100,000-$149,999	8.8
	>$150,000	2.3

As shown in Table 2, more than half of the participants stated that the presence of an eco-label had influenced their booking decision during the choice experiment. The amount of participants who stated that the eco-label had been very important or not important at all in their decision making was almost equal, with about 10% each. The low frequency of carbon offset purchases is also worth noting, where only 18% stated that they had paid for carbon offsets

and only 4% stated that they choose carbon offsets for every flight. Table 4 below provides the results from the hypotheses tested.

Table 4. Hypotheses test results.

Number of observations				553		
Likelihood Ratio Test-Chi-squared Test Statistic				315.44***		
Log-likelihood- Intercept Only				1073.38		
Long-likelihood-Final				757.93		
Pseudo R-square (Nagelkerke)				.51		
Dependent variable	vs. red choice				vs. yellow choice	
Independent variables	yellow choice		green choice		green choice	
	Coefficient	Wald	Coefficient	Wald	Coefficient	Wald
Intercept	-1.40	2.17	-7.26***	46.93	-5.86	60.92
Ticket price	.68***	28.23	.74***	30.52	.06	.53
Flight time	-.20*	5.27	.38***	18.27	.58***	82.08
Environ. Mindedness	.03	.25	.19***	13.29	.17***	20.44
Treatment[a]	-.46	2.27	-.73*	5.08	-.28	1.38

[a] Dummy variable with information provided on the eco-label serving as the reference group.
*** *p*-value < .001; ** *p*-value < .01; * *p*-value < .05.

A multinomial logistic regression analysis was conducted to test the hypotheses. Participants' environmental score served as the dependent variable while ticket price, flight time, and environmental mindedness served as independent variables. H1 suggests passengers who are environmentally minded are more likely to choose flights that are environmentally friendlier. As indicated in Table 4, environmental mindedness does not significantly predict red-labeled choices compared to yellow-labeled choices. However, environmental mindedness is a significant predictor of green-labeled choices when compared to red-labeled choices, and of green-labeled choices when compared to yellow-labeled choices. That is, people who are environmentally minded tend to make green-labeled choices over yellow- and red-labeled choices. Thus, H1 was partially supported. The second hypotheses tested the relationship between ticket price and a participant's environmental choice. The coefficients of ticket price have a positive sign and are significant for yellow-labeled choices in relation to red-labeled choices, and for green-labeled choices in relation to red-labeled choices. Thus, higher prices are more often shown together with greener eco-label in the survey. However, ticket price is not a significant predictor for green-labeled choices when compared to yellow-labeled choices. Therefore, H2 is partially supported.

Next, we examined the relationship between flight time and participant's environmental choice. The coefficients of the variable flight time are positive and significant for green-labeled choices compared to yellow-labeled choices and red-labeled choices. On the other hand, flight time is a negative predictor of yellow-labeled choices in relation to red-labeled choices. The results indicate longer flight time predicts greener eco-label among the participants. Thus, H3 is partially supported. Finally, we looked at the impact of additional information and whether it is associated with the likelihood of making environmentally friendlier choices. As revealed in Table 4, information on ecolabel not provided negatively predicts green-labeled choices over red-labeled choices. Thus, passengers are more likely to make green-labeled choices than red-labeled choices when information on the ecolabel is provided. H4 is therefore partially supported. Table 5 presents a summary of the results for each of the tested hypotheses.

Table 5. Summary of hypothesis test results.

Hypothesis	Independent variable	Support
H1	Environmental mindedness	Partially supported
H2	Ticket price	Partially supported
H3	Flight time	Partially supported
H4	Additional information provided	Partially supported

5. Discussion

5.1. Environmentally minded passengers

The results regarding environmentally minded passengers showed that they were more likely to choose green-labeled over yellow- or red-labeled flights. This finding is in line with earlier studies by Bratt et al. (2011) and Grankvist et al. (2004), who showed that the stronger the environmental concern of their participants were, the more they were affected by information about environmental consequences indicated by an eco-label. Nevertheless, Grankvist et al. (2004) also found that environmentally minded participants were equally affected by negative (red) and positive (green) eco-labels when studying the impact of energy labels on consumer preference. Our study, instead, showed that although their environmental concern might have clearly driven environmentally minded passengers towards the green choice, they no longer carefully considered the differences between the remaining choices once the green choice was not available. Once no green-labeled flights were available did environmentally minded passengers tend to care less, selecting more red-labeled flights than yellow-labeled ones. It can therefore be concluded that an

aviation eco-label would increase the likelihood of environmentally minded passengers choosing green-labeled flight options as long as they are available. However, the question that remains is why environmentally minded passengers did not take into account the differences of the environmental impacts concerning the remaining colors (yellow and red). Choosing a yellow over a red-labeled flight can be as equally important in reducing environmental impacts as choosing a green over a yellow-labeled flight is. Perhaps it is the design of the energy label that was responsible for these choices. Traditionally, eco-labels are only awarded to the products that perform the best environmentally. This aspect is what environmentally minded passengers have most likely been considering in their selection process, so they focused on the green-labeled flights only. However, in line with the recommendations given by Baumeister and Onkila (2017) on the design of an aviation eco-label, we used an energy label in this study. Instead of indicating only the least polluting flights, the energy label provides environmental information on all flights. In order to better utilize the potential of energy labels in general and the proposed aviation eco-label in particular, (green) consumers would need to be better educated about the mechanism of energy labels so that they could take into account all the information an energy label contains.

5.2. Willingness to pay

The results found that the presence of an eco-label does increase the willingness to pay for less polluting flights. Participants showed a willingness to pay for green- or yellow-labeled flights in order to avoid red-labeled flights. This finding complements the study by Baumeister and Onkila (2017), who assumed but could not confirm that air passengers would avoid red-labeled flights once an eco-label was available. Furthermore, this result is also consistent with the idea proposed by Grankvist et al. (2004) where consumers are made to avoid products that lead to the least desirable environmental outcome with the help of negative (red) labels. Even if a product would be the cheapest, the fact that it has a negative (red) label would make it less appealing and it might therefore be driven out of the market. Facing the threat of being driven out of the market (losing the so-called ‘license to operate’) could also motivate those airlines with the lowest environmental performance to make improvements, as indicated by Baumeister and Onkila (2017), and thereby reduce the impact of the entire sector. However, although participants showed a willingness to pay to avoid red-labeled flights, they were not willing to pay more for a green-labeled flight when a yellow-labeled flight was available. This finding is in line with D’Souza et al. (2007), who found that consumers tend to avoid green-labeled products when they are attached to a premium price. This, in return, also means that a green-

labeled flight would not necessarily entitle an airline to charge a premium price for it. In summary, our findings showed that energy labels do not necessarily create a willingness to pay for green-labeled products, but they hold the potential to make consumers avoid the environmentally least desirable choices. This could in turn help to raise industry standards, as shown in the example of the aviation industry.

5.3. Interaction with flight time

When we examined the interaction of the eco-label with flight time, we clearly detected that participants were willing to make trade-offs in longer flight times for the sake of the green label. Furthermore, in the case where no green-labeled flights were available, participants' willingness to make a trade-off for the sake of a less polluting flight remained, as they favored yellow-labeled over red-labeled flights more. This was indeed a surprising finding because a longer flight time means not only a longer duration for the entire trip but also indicates that the passengers have to endure intermediate stops on the way to the final destination, which can result in additional inconvenience such as missed connections or the delay or loss of luggage. Based on the experiment's settings, a longer flight time means an additional 1 hour and 15 minutes to 2 hours and 30 minutes of travel time and one to two intermediate stops. Based on this finding it can be concluded that eco-labels can actually have a positive interaction with existing product attributes. Nevertheless, although the interaction with flight time was positive, it was negative with ticket price. Only when passengers could avoid red-labeled flights were they willing to make a trade-off in paying more for the flight ticket. In contrast to the latest findings by Delmas and Lessem (2017), who confirmed results from previous studies (Dolnicar and Saunders, 2005; Gallastegui, 2002) that eco-labels usually interact negatively with existing product attributes, our study detected a positive interaction. We found that participants were actually choosing green-labeled flights even though it meant a significant trade-off for them in terms of flight time. Only in terms of the ticket price was the interaction was negative.

5.4. Eco-label understanding

As we presented passengers with a new eco-label in a purchase situation where one would not necessarily expect to find one, providing additional information on the eco-label certainly made a difference. Those participants who had received additional information on the eco-label were more likely to choose green-labeled flights over the red-labeled flights. This finding is also consistent with Borin et al. (2011). They found that providing additional

environmental information in combination with product labelling increases the purchase of green-labeled products among a larger percentage of consumers. Furthermore, the finding also complemented an earlier study by Baumeister and Onkila (2017) on aviation eco-labels that discussed the importance of providing additional information to enhance a passenger's understanding of the new label. As their study found, the general public has a negative environmental image of airlines and, in fact, airlines have been criticized in the past for their environmental communication, which is often perceived as greenwashing. Baumeister and Onkila (2017) further found that an eco-label could help airlines overcome the suspicion of greenwashing. However, this would require that the new eco-label is communicated in a transparent and trustworthy manner, which would mean providing users with additional information. It can therefore be concluded that, in order to ensure trustworthiness, it is of paramount importance that consumers are provided with additional information on the content of a newly introduced eco-label. This is even more important when a new eco-label is introduced to an industry that does not necessarily have a good environmental reputation. Otherwise, the new eco-label could easily be perceived as greenwashing and would fail in its initial purpose.

6. Conclusion

This study set out to enhance current understanding regarding the effects an environmental label could have on the booking decisions of air passengers. The study found that environmentally minded passengers would respond to the new eco-label immediately. In fact, environmentally minded passengers were more likely to select green-labeled flights than yellow- or red-labeled ones. Only when green-labeled flights were not available did environmentally minded passengers care less and selected more red than yellow-labeled flights. In addition, when it comes to ticket price our study found that passengers show a willingness to pay more for yellow- and green-labeled flights in order to avoid red-labeled flights. This could send a strong signal to airlines operating red-labeled flights to improve their performance so as to not lose their 'license to operate'. Nevertheless, it would be hard for an airline to charge a premium price for a green-labeled flight as passengers' willingness to pay did not extend that far. Although passengers' willingness to pay for green-labeled flights was low, the study could detect that passengers were willing to make trade-offs for the sake of green-labeled flights in terms of longer flight times. This finding clearly indicated that, alongside existing product attributes, an aviation eco-label could have a positive interaction with existing product attributes. Finally, providing additional information on the eco-label, in the form of what the label stands for, why it

is important, what environmental impacts it addresses, the methodology behind and the logic of the color scheme, turned out to be crucial as passengers who had received this information were more likely to choose green-labeled flights over red-labeled flights. Using an eco-label in the aviation industry could easily be perceived as greenwashing, which is why the new eco-label needs to be communicated in a transparent and trustworthy manner in the form of additional information.

Regarding the theoretical implications, we detected a gap in environmentally minded consumers' decision making because our study found that green consumers are not equally effected by green- and red-labeled product choices, as was previously assumed. Instead, environmentally minded consumers seem to pay less attention to the label color when the green-labeled choice is absent. Furthermore, our study shed some new light on consumer's responses to negative product labels. In particular we could detect a willingness to pay among consumers in order to avoid the least desirable environmental outcomes. Additionally, in contrast to previous studies we were able to show that eco-labels can also interact positively with existing product attributes. To date, the interaction has always been found to be negative. In our study, participants chose green-labeled flights even though it meant a significant trade-off for them in flight time. Finally, our study further emphasized the importance of providing additional information on a newly introduced eco-label in order to enhance consumers' understanding and create trust.

For managerial implications, the findings clearly indicated the positive effects of eco-labels in reducing the environmental impacts of aviation. The use of eco-labels in the aviation industry can therefore be recommended. The results detected a willingness to pay among passengers and to make trade-offs in terms of longer travel times in favor of less polluting flights. In addition, green consumers would primarily choose green-labeled flights as long as they are available. At the same time, passengers would avoid the environmentally least desirable flights, sending a strong signal to those airlines operating the most polluting flights, and thereby raising the industry standard. Finally, our study also highlighted the importance of providing additional information to the consumer when introducing new eco-labels, especially when being introduced into industries with negative environmental reputations.

In terms of limitations, in this study we used only three product attributes, while previous studies have relied on four or five attributes. Further attributes could have included the amount of stopovers, the amount of available seats for a particular price, and the airline or aircraft type. Future research could further examine the interaction of the aviation eco-label with additional product attributes. Another limitation of the study was the selection bias of assuming

that all participants had to fly, as we did not provide a “no flight” option in the experiment. This might have led to an overestimation of the importance of eco-labels and could be subject for further investigations. Finally, the study failed to account for participants’ past flying experience during data collection, so this aspect ended up as random utility. Although we asked participants in a screening question whether they had flown in the past 12 months, and excluded those who had not from the analysis, the difference between more experienced and less experienced passengers was not taken into consideration and might have provided some valuable insights. Studying the effect of an eco-label on the booking decision of different air passenger groups, based on their past experience, could be another subject for further research.

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