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# Do social norms regarding carbon offsetting affect individual preferences towards this policy? Results from a stated choice experiment

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ABSTRACT

This study investigates the idea that people's willingness to offset flight-related carbon emissions is a function of the collective participation rate, which can be regarded as a social norm, towards carbon offsetting. Additionally, we reveal people's preferences toward two other environmental policies; a baggage allowance and airline eco-efficiency index. A discrete choice experiment is designed and administrated among a sample of air travelers. The results indicate that carbon offsetting generates utility, with people gaining more utility when the collective participation rate is high. Additionally, it was found that the baggage allowance and the eco-efficiency index strongly influenced respondents' airline choices. People also became more sensitivity towards a baggage allowance and the eco-efficiency label, when the collective offsetting rate was high.



## 1. Introduction

Despite continuing improvements in aircraft technology the expected growth of air travel will likely lead to increasing emissions to the environment. To reduce emissions, various polices can be implemented, ranging from measures that focus on airlines – e.g. the European Emission Trading System (EU ETS), to individual-based measures that directly target air travelers, such as voluntary carbon offsetting (VCO) schemes. Since the success of the latter policies depend on the degree of voluntary participation or compliance of passengers, knowledge about people's preferences towards such policies is necessary.

Previous studies that have primarily focused on willingness to pay for carbon offsetting have found that generally people gain utility from offsetting. In practice, however, offsetting rates are generally only in the range of two to ten percent (Gössling et al., 2009; Mair, 2011). This difference may be because people are only willing to contribute if others do as well.[1] Here we test the idea that the collective participation rate in carbon offsetting positively influences passengers' willingness to participate in such schemes. We also look at people's stated preferences regarding baggage allowances and an airline eco-efficiency label.

To achieve this, a choice experiment (CE) is designed and administrated among a sample of air travelers at two Dutch airports. While CEs have advantages as well as disadvantages compared to other valuation methods such as contingent valuation, an important advantage here is that they allow a valuation of several attributes at the same time.

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[1] MacKerron et al. (2009) and Brouwer et al. (2008), for example, find that many people would only be willing to pay or participate if they knew that other fellow passengers would also participate.

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## 2. Airline environmental policies

Three environmental policies are selected for inclusion in the choice experiment.

- *Voluntary carbon-offset*

By implementing a VCO policy, airlines provide an opportunity for passengers to voluntarily offset the carbon emissions associated with their flight. The offsetting costs are usually calculated by multiplying the estimated $CO_2$ emitted during the particular flight by a fixed price per ton of $CO_2$ emissions. The funds raised by offsetting can be used to finance initiatives that are known as 'sink' projects, such as afforestation and reforestation projects, or emissions-saving projects, such as fuel substitution and energy-efficiency projects.

While VCO schemes are increasingly popular by airlines, concerns have been expresses on limited potential and temporary nature of afforestation (i.e. considerable space would needed for an indefinite time to compensate for annual emissions) and the lack of transparency of offsetting schemes due to large differences in existing calculation and accreditation methods (Gössling et al., 2007; Mair, 2011). In addition, VCO schemes have been objected to on moral grounds. Offsetting can be seen as a simple solution to alleviate one's guilt and detract people from "real" solutions like flying less. Nevertheless, well-managed VCO schemes may reduce greenhouse gas emissions, raise public awareness about climate change, demonstrate people's support for environmental measures to policy makers, and (given the flexibility of the voluntary market) help channel investment into innovative and high-risk environmentally beneficial projects (MacKerron et al., 2009).

- *A baggage allowance*

A substantial amount of the payloads of airlines are in the form of passenger luggage. Fuel efficiency and consequently lower emission rates can be achieved by reducing the luggage carried by passengers (Lee et al., 2009). In this respect, Filippone (2008) has estimated that if the baggage allowance is reduced from 20 to 15 kg for a B737-500 flight over 1500 nautical miles, reduction in $CO_2$ emissions would be around 3.5 kg per person; 1.5% of total emissions for each passenger.

- *An airline eco-efficiency label*

Gössling et al. (2009) argue that if environmental efficiency of airlines is determined and communicated to air travelers in a transparent way, passengers may integrate this information in their choice for an airline. There have been some attempts to create a standard airline efficiency indexing system that could be used for the industry. For example, the Atmosfair Airline Index (Atmosfair, 2012) is a recognized labeling system that ranks airlines according to their efficiency using input on the types of aircraft used, seating capacities and load factors. Flybe is an example airline that has adopted eco-labels.

## 3. Methodology

### 3.1. Survey and experimental design

A choice experiment was introduced in which respondents were first asked to imagine taking a transatlantic flight from Amsterdam to New York. Next, the social norm towards carbon offsetting was introduced. Each respondent was randomly assigned to one experimental condition, i.e. one of three collective offsetting rates : 5%, 50% or 90%. Then the choice experiment was introduced with different unlabeled flight options that varied by ticket price and the three environmental policies. Ticket price was varied from €505 to €545 reflecting prevailing airline prices for economy class tickets on the Amsterdam–New York route. For the first policy attribute (i.e. individual carbon-offsetting), three levels were considered: no offsetting of the current flight (0%), partial offsetting (50%) and full offsetting (100%). Respondents were informed that the costs of carbon offsetting were included in the ticket price. For the baggage allowance policy, passengers were offered the chance to carry 10, 15 or 20 kg of luggage free. These weights were chosen based on typical weights provided by airlines for passengers to carry luggage without having to pay any extra charges. For the eco-efficiency index system, a simple labeling system is introduced, whereby airline efficiency varied over three levels: A (green airline), B (average airline) and C (grey airline).

Each respondent was presented with nine choices, and instructed to choose one flight option from each choice set. Ngene software (ChoiceMetrics Pty Ltd.) was used to construct the choice sets useing efficient designs.[2] To generate an efficient design, some preliminary, estimated values of coefficients are required, and these were taken from an earlier pilot study (Araghi, 2012) involving 80 respondents.

[2] Efficient experimental designs are preferred to the traditional orthogonal designs since they minimize the elements of asymptomatic variance–covariance (AVC) matrix resulting in smaller standard errors and increasing reliability of parameters estimated by the outcome of a choice experiment (Bliemer et al. 2009).