Flying with climate liability? Economic valuation of voluntary carbon offsets using forced choices

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\textbf{ABSTRACT}

This study aims to examine how key aspects of voluntary climate action influence economic values of aviation carbon offsets using an Australian case study, where voluntary carbon offset programs for the aviation sector were active under a carbon tax between July 01, 2012 and July 17, 2014. An online survey was administered during the period using choice experiments. This rare and short-lived Australian experience is useful to gain insights into how individuals respond to the new public policy in terms of the perceived economic value of voluntary offsets for air travel. According to the estimation results, supporters of the mandatory tax policy held a welfare value of voluntary carbon offsets for their domestic flights that is three times larger than non-supporters (i.e., $AU27.83 vs. $AU9.40). It is $AU12.27 on average per ton of carbon offsets per person for domestic flights and $AU0.92 for international long-haul flights. The findings endorse that individuals seem to attach personal responsibility for carbon emissions (i.e. climate liability or carbon conscience) to frequent domestic flights, but not so much to intercontinental flights. Furthermore, reported flight frequencies by respondents did not place any significant impact on economic values of voluntary carbon offsets in both domestic and international frameworks. A coupled approach between forced choices and certainty responses was adapted, where no-choice options were retrieved, potentially improving choice experiments. Results suggest that airlines should consider simplifying their carbon offset programs to fixed levels (e.g. £3, £10, and £20 as in the case of British Airways), regardless of geographical boundaries, while governments should promote both mandatory and voluntary climate measures in tandem.

1. Introduction

Australia was a leading example of how market-based mechanisms such as a carbon tax could be implemented nationwide. In November 2011, the Australian government adopted the Clean Energy Future Plan that created incentives to move the nation toward clean energy. A carbon price of AU$23 (about US$23 in 2012) per ton of CO\textsubscript{2} equivalent, as the key component of this Plan, was introduced on July 01, 2012, and was subsequently abolished on July 17, 2014 due to a major political change. During this “unique” period, all domestic aviation activities were subject to a carbon tax or price. An experimental study that was conducted right before the introduction of the price policy found that both the number of aviation travellers paying voluntary carbon offsets and the perceived economic values of the offsets would be significantly reduced due to the new public initiative (Choi, 2015). Although this mandatory price scheme influenced Australian consumers to reduce overall energy consumption by about eight per cent in the first
nine months (Scott and Carr, 2013), it is not clearly known how it affected consumer preferences for voluntary climate action, in terms of valuation.

Voluntary carbon offset programs were introduced in Australia in 2007, as “fly carbon neutral” programs by key airline companies (e.g. Qantas and Virgin Australia). Compared to other international counterparts that showed a low level of participation (i.e. one to two per cent per flight) (Chang et al., 2010; Gössling et al., 2009; McKercher et al., 2010), Australian uptake rates ranged between five and ten per cent of all domestic flights (Commonwealth of Australia, 2009; Qantas, 2011). When Mair (2011) investigated offsetting experiences of 250 Australians in August 2008, about 16 per cent of the respondents stated to have bought offsets to neutralise carbon emissions from their flights at some point, which was much higher than the 5 per cent figure of British respondents.

The relationship between the mandatory public policy and voluntary action might depend on various factors, such as whether individuals support the policy (Choi et al., 2016; Oh and Hong, 2012), how much they share the environmental responsibility in concern (Araghil et al., 2014; Higham and Cohen, 2011), and whether they believe voluntary programs are effective in addressing the problem (Blasch and Farsi, 2014; Choi et al., 2016; Gössling et al., 2009). Willingness to engage in voluntary offsetting is also expected to be influenced by crowding-out effects. These imply that new climate policies to reduce greenhouse gas emissions in combination with mandatory payments may lead to a reduced willingness to make voluntary contributions (Bowles, 2008; Choi, 2015). Contrary to this expectation, however, there is also possibility that crowding-out effects might be limited (Andreoni, 1993; Choi, 2015) or that new economic incentives might even boost individual interests in voluntary action, initiating a “crowding-in” effect (Bowles and Polania-Reyes, 2012; Choi et al., 2016).

Filling the research gap, the current study aims to examine how key aspects of voluntary climate action (i.e. support for a public policy, perceived climate liability, and flight frequencies) influence economic values of aviation carbon offsets using an Australian case study, where voluntary carbon offset programs for the aviation sector were active during the short-lived tax policy between July 01, 2012 and July 17, 2014. An online survey was administered for this paper during the period using choice experiments, and this rare and unique Australian experience might be useful to gain insights into how individuals respond to the new public policy in terms of the perceived economic value of voluntary offsets for air travel. Preferences for governmental provision of public goods might be fundamentally linked to a set of factors that individuals hold for voluntary action. Furthermore, this study is the first in the environmental economics literature that examines the impact of forced choices on welfare benefits using uncertainty responses based on which no-choice options were retrieved in discrete choice analysis. This approach might be useful in reducing the gap between what individuals say in a survey (i.e. stated preferences) and what they actually do in reality (i.e. revealed preferences), showing a potential way to improve choice experiments.

The next section introduces the background information of voluntary carbon offset programs and research hypotheses. Sections three and four describe the theoretical models and how empirical data were collected, respectively. Section five reports the analytical results, and the final section provides some concluding remarks with a discussion of the key findings.

2. Voluntary carbon offsets and research hypotheses

Most voluntary carbon offset programs predominantly impose a uniform pricing system based on how much individuals are responsible for the flight-related emissions on average (e.g. AU$9 per ton of CO₂ equivalent). Consequently, international or intercontinental tourists normally face a relatively higher burden to neutralise their carbon emissions than their domestic counterparts. For instance, environmentally sensitive customers travelling from Sydney to London, who are responsible for approximately 2000 kg of CO₂, need to pay 20 times more than those flying to Brisbane, who are responsible for approximately 100 kg of CO₂. It does not mean that this uniform pricing system is the only way for carbon-neutral flights. For example, British Airways offer three absolute levels of carbon offsets (i.e. £3, £10, and £20) regardless of flight distances and their actual emission amounts (GreenAir, 2011).

Previous studies examined economic values that consumers perceive from making their flights carbon-neutral (i.e. voluntary carbon offsets) using stated preference nonmarket valuation methods. When a contingent valuation (CV) method was applied, for example, the willingness-to-pay (WTP) values per ton of CO₂ emissions per person were estimated to be between about AU$20 and AU$28 (Lu and Shon, 2012), about AU$42 (Brouwer et al., 2008), and AU$30 for domestic flights and AU$10 for international flights (Choi, 2015). Other studies applied the discrete choice modelling technique and reported a mean WTP estimate of £13.2 (about AU$33) (MacKerron et al., 2009) or AU$21.38 (Choi and Ritchie, 2014) per ton of CO₂ reduced in the form of voluntary carbon offsets.

However, limited knowledge is available in the literature about how key aspects or factors of voluntary climate action work particularly when a mandatory mechanism is in place. Neither is it understood well about differing preferences between the policy-relevant domestic flights and other international flights, thus requiring different policy measures. Brouwer et al. (2008) argued that WTP estimates for voluntary carbon offsets might be different between domestic and international (or intercontinental) flights because alternative travel modes are virtually unavailable for the latter. In a similar manner, different levels of climate liability perceived by Norwegian nationals between short-haul (domestic) and long-haul (international) flights were well documented by Higham and Cohen (2011), with more “carbon conscience” or “carbon guilt” attached to the former and “right to travel” to the latter.2

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1 The actual policy context serves as an important factor that makes the survey approach a natural experiment. Nonetheless, the study did not aim to examine direct connections between the tax policy and voluntary carbon offsets.

2 Several expressions were borrowed from Higham and Cohen (2011), describing the extent to which people feel about air travel in terms of climate change, such as “air travel with carbon conscience”, “carbon guilt”, and “climate change liability”. These terms are adopted in a largely similar manner in this paper. “Right to travel” is newly used with the opposite meaning that was described as “unwillingness to forego” air travel by Higham and Cohen (2011). Interested readers are directed to Higham and Cohen (2011).
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