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Measuring the effect of aviation safety risk reduction on flight choice in young travellers

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ABSTRACT

More information about safety is becoming more generally available to travellers, but the extent to which passengers use safety information to make decisions about which airlines to take is relatively unknown. This study attempts to examine the extent to which safety information plays a role in travellers' flight choices. Using the stated choice methodology, we modelled how the choice of a flight option is related to factors, including price, schedule, safety, travel time and airline inflight service quality. The study found that, in the context of a young adult college student population, price and safety information emerge as the most important factors influencing airline choices. Interestingly, the study found that most of the potential travellers surveyed, when asked about the factors they consider when making flight choices, do not nominate safety. However, when specific safety-risk information is introduced in the stated choice conditions, respondents considered this factor in making their choices between flight alternatives. This paper contributes towards a more complete understanding of how passengers use safety information and notes how this can be analytically translated into commercial implications for the aviation industry.

1. Introduction

The proliferation of airlines over the last few decades has presented travellers with a broad range of choices of airlines to fly. It has also meant that airlines have had to sharpen their marketing tools in order to attract customers. While aviation is generally perceived to be a safe industry, airlines vary considerably in terms of their safety outcomes (IATA, 2013). The extent to which passengers use safety information to make decisions about which airlines to take is relatively unknown, however. Some assume that safety considerations play a role in passengers' airline decisions and need to be communicated to customers (Levine, 1991), though this may be at a more general level of safety reputation, rather than using specific safety or accident related information. By contrast, instead of safety being a lead factor on which airlines market themselves, others suggest that the lack of information that is readily available to consumers about aviation safety has led to airlines not attempting to differentiate themselves in terms of safety performance. As Savage (2011) argues, in an environment where varying levels of information are available on the safety of specific airlines, airlines would have a difficult time trying to ask people to pay more for increased safety. Several factors may hinder consumers from using safety information (Savage, 2011). For example, a range of biases may affect interpretation of the information, and it is widely known that the manner in which probabilistic safety/risk information is presented can have a major impact on the meaning that is drawn (see Gigerenzer and Edwards, 2003; Gigerenzer et al., 2005; Caponecchia, 2009). Consumers probably do not differentiate between mainstream airlines, but can detect an outlier airline with a notorious reputation (Savage, 2011). Further, attempting to market an aviation organisation on the basis of safety may be "unseemly" and jeopardise the overall perception of safety that the aviation industry as a whole relies upon (Savage, 2011). It is also possible that such a marketing strategy could enhance the risk that consumers would respond very sensitively in the event of a safety incident.[3]

Despite these considerations, more information about safety is becoming more generally available to travellers. An example is the recently released SKYTRAX (2013) global airline rankings, though these rankings do not publish stand-alone safety information on the basis that, "at the present time it is not possible to

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obtain (or to provide) accurate or consistent global reporting about airline safety incidents". Details of aviation incidents are increasingly being shared on social media which may have short term effects on perceptions, or build to a lasting impression of an airline or nation's aviation standards. In this context, understanding whether safety information, if provided to travellers, might influence their airline decisions, is important to discover.

This study is the first in a series that attempts to examine the extent to which safety information plays a role in airline decisions relative to other considerations passengers may make. While perceptions of risk are known to affect people's behaviour and preferences for particular activities, in aviation, little is known about the relative contribution of safety risk information to air travellers' decisions, and the effects of various expressions of risk information to air travellers while they make flight ticket purchase decisions. The study focuses on young travellers as they are a small, but can be an important sector for tourism markets. Young travellers are also interesting from the viewpoint of risk-taking.

One dominant econometric method for assessing the relative importance of different factors on consumer decision-making and choice is discrete choice modeling (DCM). Choice modelling research has been applied to wide-ranging contexts, notably in transport mode choice studies, including flight or itinerary choice. It is standard procedure in choice models to condition the response variable (a dichotomous or polychotomous variable) on parsimonious set of core independent variables or 'attributes'. The attributes almost always involve the generic economic, and readily quantifiable, variables such as price, time and service frequency.

However, study context varies considerably and this contextual differences influence the inclusion and exclusion of other variables (Gao and Koo, 2014). For instance, airline image (Park et al., 2004), seat pitch and width, in-flight entertainment and meal quality (Balcombe et al., 2009), frequent-flyer programs (Lederman, 2007), flight schedules and legroom (Brey and Walker, 2011), on-time performance and schedule delay (Ortúzar and Simonetti, 2008), number of connections and aircraft type (Hess, 2008), nationality of airlines (Yoo and Ashford, 1998), length of stay and cost of living at the destination (Lee et al., 2012), as well as fear-of-flying (Fleischer et al., 2012).

Safety often does not feature in studies of air traveller choice, and surprisingly, there appears to be little formal discussion on the merits and perils of its inclusion or exclusion from analysis. A notable exception in the air transport context is Jou et al. (2008). They defined service quality by indices of comfort, convenience, service attitude and service comprehensiveness, among others, in order to analyse the impact of service quality on passengers' airline choice. The study found that safety, measured in passengers' perception of the "reputation of an airline's flight safety" and "attitude of the flight crew on incident", is an important factor of choice (Jou et al., 2008). Other studies examining passenger perspectives on safety focus on passenger performance with respect to processing and recalling inflight safety information (Chang and Liao, 2008; Molesworth and Burgess, 2013).

Results are contradictory regarding the importance of safety in airline decisions. Surveys attempting to uncover the factors that influence the choice between low-cost and traditional carriers have found that safety ranked 7th and 8th behind other factors in Ireland and Malaysia respectively (O'Connell and Williams, 2005). These findings may have been specific to low-cost carrier decisions compared to traditional carriers. Alternatively, these findings may reflect that safety was presented as an abstract concept: "safety" was nominated by participants as a reason for choosing an airline, as opposed to providing information about levels of safety and examining how this affects decisions. This study examines the latter condition, providing specific safety information about a hypothetical airline, rather than a more global notion of "safety".

Against this background, the aim of this research is to assess what information young travellers use to make decisions about which airline to fly, and the relative importance of those different pieces of information, including safety information. It will explore their willingness to balance competing influences of economics, convenience and safety under different levels of safety risk by using a novel econometric approach, the stated choice method, which has not yet been applied to safety in aviation. It is likely that different sectors of the traveller market differ in their sensitivity to safety in making decisions on which airline to use. Young travellers are of particular interest as young people are well-recognised to be accepting of greater risk than older people (Jonah, 1986; Westaby and Lee, 2003).

2. Method

2.1. Discrete choice models

Most discrete choice models are grounded in random utility maximisation theory (Ben-Akiva and Lerman, 1985). The theory links choice with the factors influencing the choice. It is assumed that a latent construct, namely utility, is ascribed to every available option and that a decision maker chooses an option that yields the highest utility. The sources of utility can be deterministic or stochastic. Depending on what we assume about the behaviour of stochastic unobservable) utility, different choice model results. This 'behaviour' is captured by a chosen statistical distribution. The most general choice model – the mixed logit (ML) – can approximate any choice model given appropriate mixing distributions. The mixed logit model is defined as any model whose choice probabilities can be expressed as (Train, 2003):

$$P_{ij}(\theta) = \int L_{ij}(\beta) f(\beta|\theta) d\beta \tag{1}$$

where $L_{ij}(\beta)$ is a logit choice probability; i.e.,

$$L_{ij}(\beta) = \frac{\exp[V_{ij}(\beta)]}{\sum_{k=1}^{J} \exp[V_{ik}(\beta)]} \tag{2}$$

and $f(\beta|\theta)$ is the density function for β, with parameters θ.

$V_{ij}(\beta)$ denotes the representative utility function for individual i and alternative j. The parameters to be estimated are β, which are the coefficients for the explanatory variables that will be discussed in 2.2. Eq. (1) is open form, while Eq. (2) is closed form. Before the mixing distribution is used to estimate (1), the baseline model (multinomial logit (MNL) – 2) is estimated. The systematic component of the utility function, V_{ij} in (2) is often modelled in a linear additive form and includes attributes of the chosen alternative j and for some cases, individual i's socio-demographic characteristics. Using (2) we can ascribe a meaningful relations between observed choices (coded '0' or '1') and any relevant independent variables. In this first study, we utilise the MNL model.

Due to the compensatory decision rule assumption (i.e., a reduction in utility by one variable can be fully compensated by an increase in utility by another variable), Willingness-to-pay (WTP) information can be earned from the comparison of the coefficients on price variable to other variables. WTP has wide-ranging uses and applications: in a priori assessment of cost recovery for transport infrastructure projects; in the evaluation of environmental impacts; and more recently, the economic value of improving road safety, or as Rizzi and Ortuzar (2003) states, the value (cost) of the *reductions on the probability of a fatal accident* (p. 9). The latter is often assessed utilising the concept, 'the value of statistical