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Air safety & security: Traveller perceptions post the Malaysian Air disasters

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ABSTRACT: Air transport is of substantial importance to economies, societies and freedom as it connects businesses and individuals with the world. However, two recent Malaysia Airlines incidents have resulted in even more security measures at airports and have anecdotally changed the security and safety perceptions of the traveling (or no longer traveling) public. Our study investigates for the first time attitudes towards air travel, safety and security and determines empirically if travellers are willing to experience even more invasive security measures in light of these tragedies. Our results suggest that there is a latent demand for air services despite the recent of the Malaysian Airline tragedies. Out of our proposed measures the presence of visible uniformed police creates the greatest feeling of security and it is seen as important to better communicate what security operations do and why it is effective in threat minimisation. We find willingness to pay for avoiding additional incidents both in terms of money and time but respondents are also willing to pay more to speed up the security process. Our results also suggest there is no desire to accept security processes that invade privacy considerably more what is currently practiced. We conclude that with respect to air travel the magnitude of trade-of between personal freedoms for improved security is limited. Travellers appear willing to accept risks, or perceive them as isolated and limited to airlines with inferior safety records and/or destinations with inferior security records.

KEY WORDS: *Airline Security, Preferences, Best Worst, International Travel, Malaysian Air, MH370, MH17*

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1. Introduction

Tourism and travel are important drivers of many economies, and it has been shown that there is a significant correlation between real tourism output and gross domestic product (Office of Travel and Tourism Industries, 2012). Aviation alone supports 58.1 million jobs globally, with 35 million direct and indirect jobs being created through air transport's catalytic impact on tourism. Overall, aviation has a \$2.4 trillion global economic impact (tourism catalytic but also direct, indirect, induced impacts from trade, investment, social cohesion etc.) or in other words as much as 3.4 percent of global GDP are supported by the air transport industry (Oxford Economics and ATAG, 2014). The World Tourism Organisation (UNWTO 2013) predicts that the number of international travellers will grow exponentially to a projected forecast of 1.6 billion travellers per annum by 2020. However, the growth of international travel is contingent on the attitudes that travellers themselves have with respect to how safe air travel is deemed to be. A report conducted by the US Travel Association and Oxford Economics (2010) revealed the significant impacts of 9/11 on the United States. From the period 2000 to 2010 global long haul travel grew 40 percent, whereas overseas travel to the US over the same time period grew by only two percent. It was estimated that the US lost 68.3 million visitors; which resulted in 441,000 job losses and approximately \$800 billion in lost spending, trade and tax revenue.

The decline in travel experienced may be explained by the particular impact that air catastrophes have on the human psyche, irrespective of their travel behaviour. In many countries there are television programs dedicated to the investigation of air crashes, and many people are able to easily recall the relatively few large disasters experienced from Pan-Am Flight 103 (the Lockerbie Bombing) in 1985, to the September 11 attacks in 2001, thru to US Airways Flight 154 landing in the Hudson River in 2009. On March 8th in 2014, Malaysian Airlines Flight MH370 went missing, and is yet to be found. In Australia the event was continually in all forms of news media for over a month (and still is albeit with less frequency). On July 17th Malaysian Airlines Flight MH17 was shot down over Ukraine. Again, this event received significant media attention in Australia.

The recent twin disasters experienced by Malaysian Airlines represent two significant potential impacts on global tourism and both the Malaysian and Australian economies. In 2012, tourism accounted for 14 percent of employment and 16 percent of Malaysian gross domestic product (WTTC 2014). Twelve percent of tourists were from China; a country from whom most of the passengers on MH370 originated. Following this disaster the share price of Malaysian Airlines fell 60 percent down to a value of \$0.04US and the company has been put into full public ownership since then. From an Australian perspective, 27 Australians were on-board MH17, which resulted in concentrated attention on this disaster as well. From an economic perspective, travel to and from Australia is strictly dominated by air travel, the local carrier (Qantas) is an airline (and iconic brand) which trades heavily on their record of safety and, in recent years, the number of in-bound tourists from China exceeds that from the United Kingdom and the United States (Tourism Australia 2013). We argue that the impact of the Malaysian incidents on air travel to/from Australia will potentially have very real impacts on travellers willingness to travel, on their travel choices (destinations, airlines, etc.) and ultimately on their willingness to pay and hence fares.

2. Literature Review

Given that air travel is an important component of international travel behaviour and represents a significant component of global economic activity, interest in the role of security measures in the air travel process has received some attention; particularly in the post-9/11 era (e.g., Fox, 2014). In the context of airports, Blalock et al. examine the impact of post-9/11 security measures, specifically baggage screening and the federalisation of passenger screening, on the demand for air travel (Blalock et al. 2007). Interestingly, they found that baggage screening significantly reduced passenger volume. Recognising the need for a focus on airport security and safety post 9/11 researchers in the UK developed a series of key performance indicators for airports, measuring the relative performance of airport safety and security and the role of facility management in achieving that level of performance

(Enoma and Allen 2007). Importantly they conclude that “airports generate revenue from the facilities they provide so they seek to maximise their potential revenues but must do so with safety and security foremost in the operators' minds.” (p. 296). Along similar lines Stewart and Mueller (2013) undertook risk assessments of aviation security and Cole (2014) showed how threat scenarios can support airport security management. Stewart and Mueller (2014) then used cost-benefit approaches and Monte –Carlo simulations to show that airports are currently too safe from a cost efficiency perspective, a view that is confirmed by Kirschenbaum (2013) who found that airport security does not only increase cost but also significantly reduces airport passenger throughput. Although their sample is likely not representative (leisure travellers attending a Canadian University) Alards-Tomalín et al. (2014) have shown that airport security measures have even the potential to influence passengers' enplanement decisions. Whilst Wu and Mergersen's (2013) findings that suggest that airport management is extremely complex as a result of the various stakeholders (and their objective functions) and the many processes and interactions involved, they highlight (as all other papers on this topic) a need for security management, which is clearly a need that has increased since 9/11 and more recently the Malaysian airline disasters.

In terms of airline passengers perceptions towards flying there is a large body of literature that has researched attributes of passenger choices such as their general willingness to pay for air travel (e.g., Merkert and Beck, 2015), their preferences in terms of particular airlines (e.g., Collins et al., 2012) or more specific items such as in-flight entertainment (Balcombe et al., 2009). Gao and Koo (2014) investigated a range of factors affecting Australian travellers' choice of Chinese carriers, and although they did not look specifically into safety and security issues, it is part of their study given that the reputation for safety of Chinese carriers is not a very good one (Cui and Li, 2015). Fleischer et al. (2012) studied the impact of fear on flight choices and more recently found that providing passengers with safety information (including the how this information is presented) when choosing a flight has an impact on their choice (Fleischer et al., 2015). Koo et al. (2015) take these findings a step further by showing how passengers use safety information, particularly in cases of flight safety risk reduction. Whilst the literature on air and the willingness to pay for general travel safety risk reductions appears to be advanced (e.g., Hensher et al., 2009), there is very little literature on willingness to pay for air safety risk reduction or general preferences of airline passengers towards security threats.

Mumpower et al. (2013) revealed willingness to pay for general terrorism risk management programs, which include but do not focus on aviation specific programs. Chen and Noriega (2004) examined perceptions of safety and security in tourism among a convenience sample of staff and faculty, finding that faculty members were more likely to experience changes in their life, travel decision, and activity choices than students. In the pursuit of increased security, several measures have been implemented that may impinge on the civil liberties of passengers. Much attention has been paid to the role of whole of body scans and the images such a scanner creates. Despite this, it has been found that there is high public acceptance of the device, a high preference for them over pat-downs and if information about the scanning process is presented to passengers there is a high probability that a passenger will voluntarily opt for a scan (Mitchener-Nissen et al., 2012). Likewise, the controversial use of racial profiling at airports has also received significant media attention. While public approval for the use of racial/ethnic profiling to prevent crime is low, in contrast the public is more supportive of the use of racial/ethnic profiling to prevent terrorism (Johnson et al. 2011), however racial and ethnic minorities were less likely than whites to believe that profiling at airports was justified (Gabbidon et al., 2009). However, general support for profiling increases if there is a substantial reduction in delays experienced by other passengers (Viscusi and Zeckhauser, 2003).

Consequently, there is significant interplay between the attitudes of international travellers with respect to air safety and security concerns, their travel behaviour and the subsequent impacts on the global economy. Risk assessments are highly diffuse, reflecting considerable risk ambiguity and people fear highly severe worst case terrorism outcomes (Viscusi and Zeckhauser 2003). The latent concerns for privacy, liberty and security and a distrust of business, government and technology significantly explain

the choice to opt-out of travelling (Daly et al. 2013), though there is some evidence that travellers are willing to trade personal freedoms for improved security (Potoglou et al. 2010).

Our literature review revealed that there is sparse research on this topic and this paper aims to fill this gap. We report on four different data collection processes: attitudinal questions with respect to air security and safety, a best-worst experiment to examine perceptions of how secure different routes/destinations are; a second best-worst experiment to further explore attitudes towards safety and security; and a stated preference experiment to examine security preferences. Our study thus investigates attitudes towards air travel, safety and security and determines if travellers are willing to experience even more invasive security measures in light of these tragedies, interestingly at a time where Australians are more concerned about privacy than ever before (OAIC 2013). All data is collected with respect to air travel. The following section presents the preferred research methodology, along with the extant set of related research methods. Section 3 details the empirical procedure utilised to obtain the requisite choice data for our econometric models. This is followed by the presentation of empirical results. Lastly, the paper offers concluding remarks relating to the results.

3. Survey Design

The data was collected in Australia in August of 2014, following shortly after the MH17 incident in July and Mh370 in March. Respondents began the survey by indicating two broad views about international travel (how frequent an international traveller they perceived themselves to be and whether or not they were excited or nervous about international travel). After completing these questions respondents were encouraged to “imagine that you were about to take an international flight (even if you haven’t done so you can still imagine that you had to).” Following these initial questions, a series of 12 attitudinal questions were asked to ascertain respondents’ thoughts with respect to how they feel about airline and airport security procedures as they currently stand.

Next, respondents were asked to complete a series of best-worst choice tasks, before undertaking a stated preference experiment. We discuss each of these experiments now.

3.1. Understanding destination security

As part of the survey, respondents completed a best-worst experiment in which they were asked to select from amongst a list of countries, the destination they would feel most secure on a plane travelling to, and least secure on the plane travelling to. An example of the best worst task is presented in Figure 1.

Feel MOST secure on the plane to	Destination	Feel LEAST secure on the plane to
<input type="radio"/>	India	<input type="radio"/>
<input type="radio"/>	Saudi Arabia	<input type="radio"/>
<input type="radio"/>	Thailand	<input type="radio"/>
<input type="radio"/>	Russia	<input type="radio"/>

Figure 1: Example Best-Worst Task for Route/Destination Security

Respondents completed six best worst tasks consisting of four destinations drawn from a list of 26 countries. The 26 countries used in the experiment are presented in Table 1. A D-efficient design generated under the assumption an MNL model with zero priors and allowing for both best and worst choices was used to construct the tasks used in the experiment. This design and subsequent designs were generated using Ngene (ChoiceMetrics 2012). The resulting design had 12 choice tasks which were blocked into two sets of six tasks each.

Table 1: Countries for Route/Destination that is Most Secure

Abu Dhabi	Germany	New Zealand	Turkey
Bali	Hong Kong	Pakistan	United Kingdom
Canada	India	Russia	United States
China	Italy	Saudi Arabia	Vietnam
Dubai	Japan	Singapore	South Korea
Egypt	Malaysia	South Africa	
France	Mexico	Thailand	

3.2. Exploring safety and Security preferences

As part of the same survey respondents completed a second best-worst experiment where they were asked to evaluate nine different statements with respect to safety and security. Each statement pertains to a different feature of safety and security threats (such as liquids, levels of scanning or use of biometrics) and each statement has varying levels, typically with respect to how draconian (or not) security measures with respect to each security measure may be. Table 2 provides the nine classes of security statements and the respective levels therein.

Table 2: Security/Safety Statements and Levels for Best-Worst Task

Statements	Statement Levels
Stopping Threats	Airport security is able to stop all threats to flights
	Airport security significantly reduces the level of threats to flights
	Airport security will never eliminate all threats to flights
Time Spent	Airport security should not be increased if it leads to delays regardless of safety/security
	I am willing to spend a little more time in security than I currently do if it will improve safety
	I am willing to spend any amount of time in security if it will improve safety
Screening of People	People should be randomly selected for security screening
	People should be targeted for security screening by authorities
	All people should be selected for security screening
Invasiveness of Security	Pat down and luggage x-ray are sufficient security measures for me to feel secure
	Whole of body scans and luggage x-ray are required security measures for me to feel secure
	I would allow any level security no matter how invasive in order to feel secure
Use of Biometrics	The collection of genetic material is not needed as part of security procedures
	I would permit authorities to collect finger prints as part of security procedures
	I would permit authorities to take retinal scans as part of security procedures
	I would permit authorities to collect any material needed for a DNA sample as part of security procedures
Role of Privacy	My privacy and dignity should be respected during the security process
	I would allow increased security if my privacy and dignity was respected
	Privacy and dignity is irrelevant compared to guaranteeing air security
Carrying of Liquids	Passengers should be able to take more liquids onto flights
	Current allowances for liquids are acceptable
	All liquids should be confiscated no matter the amount

	Pilots / cabin crew / ground staff are adequately screened
Screening of Staff	Pilots / cabin crew / ground staff should have the same security measures as passengers
	Pilots / cabin crew / ground staff should have increased security measures compared to passengers
	Pilots / cabin crew / ground staff should have their mental state assessed before every flight
Use of CCTV	There is no need for CCTV at airports
	CCTV should be installed at all airports
	CCTV should be installed at all airports and images of passengers boarding should be saved

In each task, respondents were shown one of the levels for all nine statements, and were asked to select which of the nine they agreed most with, and which they agreed least with. As with the first best worst experiment, a D-efficient design generated under the assumption an MNL model was used to allocate the levels for the second best worst task the tasks. In generating the design, all attributes were assumed to be dummy coded, and were assigned zero priors. The final design had 12 choice tasks, which were blocked into two sets of six. An example task is given in Figure 2.

3.3. Identifying preferences for security and privacy

Drawing inspiration from Potoglou et al. (2010) and Patil et al. (2014), respondents were also presented with a stated preference experiment aimed at identifying different preferences for levels of security and privacy characteristics in the context of air travel. The stated preference experiment in our study involved asking respondents to imagine they were at an airport for an international flight and then choosing between two different security processes and a third alternative which was to not fly under the security conditions on offer. The two alternative security processes were described using nine different attributes, covering a wide range of relevant levels to encourage respondents to compare and consider a trade-off between the attributes and alternatives. Attributes were selected via review of the extant literature, interviews with airport management of various airports of different sizes within Australia and in-depth interviews and pilot studies with international travellers.

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Section 4: Your Attitudes about Safety and Security
 Set 1 of 6
 We know that it might be hard for you to make a choice, but that is the purpose of the survey!

Agree with MOST	Statements	Agree with LEAST
<input type="radio"/>	I would allow any level security no matter how invasive in order to feel secure	<input type="radio"/>
<input type="radio"/>	There is no need for CCTV at airports	<input type="radio"/>
<input type="radio"/>	Airport security should not be increased if it leads to delays regardless of safety/security	<input type="radio"/>
<input type="radio"/>	Passengers should be able to take more liquids onto flights	<input type="radio"/>
<input type="radio"/>	People should be targeted for security screening by authorities	<input type="radio"/>
<input type="radio"/>	Airport security significantly reduces the level of threats to flights	<input type="radio"/>
<input type="radio"/>	My privacy and dignity should be respected during the security process	<input type="radio"/>
<input type="radio"/>	I would permit authorities to collect any material needed for a DNA sample as part of security procedures	<input type="radio"/>
<input type="radio"/>	Pilots / cabin crew / ground staff should have their mental state assessed before every flight	<input type="radio"/>

Navigation: << >>

Figure 2: Example Best-Worst Task for Security/Safety Statements

The attributes and levels are described in Table 3. It should be noted that where possible each attribute included a level that described the current practice for airport security (as identified by airport management). It should be noted that the time variable was described as specifically the time needed to pass through security screening and immigration (as opposed to the total time required at the airport to check-in, pass security and immigration, and board). We also included a range of relatively large cost increases to air tickets in order to test for potentially large reductions in cost sensitivity given the recency of the Malaysian Air disasters.

An orthogonal design was used initially to construct a pilot survey which was distributed to 61 Master's students at the University of Sydney. The results from the pilot were subsequently used as priors in the creation of a Bayesian D-efficient design. The final design was generated under the assumption of an MNL model and was based on uniformly distributed priors that accounted for the expected directions of the parameters, as determined by the pilot study. The design was generated assuming each attribute would be effects coded, and 500 Halton draws were used in simulating the Bayesian prior parameter distributions. The resulting design had 24 choice tasks which were blocked into were blocked into four sets of six blocks each, meaning that respondents were presented with six stated preference tasks as part of the survey. An example of which is provided in Figure 3.

Table 3: Attributes and Levels for Stated Preference Task

Attribute	Levels
The level of security screening for luggage	X-ray with luggage opened for targeted cases only (current practice)
	X-ray with luggage opened randomly
	X-ray with all luggage opened
The level of physical screening for passengers	Partial pat-down (current practice)
	Thorough pat-down for targeted passengers only
	Thorough pat-down for all passengers
The level of computer-based screening for passengers	Metal detector for all passengers (current practice)
	Whole of body scan for targeted passengers only
	Whole of body scan for random passengers
The level of camera technology used	Whole of body scan for all passengers
	None
	Standard CCTV cameras
The level of identity verification required	CCTC cameras with facial recognition
	Passport (current practice)
	Passport with finger print and/or retinal scan
Average time required to complete security and immigration	Passport with DNA verification (e.g., hair or saliva sample)
	10 minutes
	20 minutes
	40 minutes
Presence of security on-board the aircraft	60 minutes
	No security personnel on-board
	Undercover security personnel on-board flight
Increased cost of ticket to cover security processes	Uniformed security personnel on-board flight
	\$75
	\$100
	\$150
Number of incidents avoided by security process	\$200
	1 every 10 years
	5 every 10 years
	10 every 10 years
	20 every 10 years

4. Methodology

The data format for the two best worst experiments is similar to that of an unlabelled choice experiment. The alternatives, denoted j , in effect reflect a specific position within the task (e.g., top, second from the top, second from the bottom, bottom), whilst the objects, in this case the various statements, are represented as the attributes. For each task, s , two observations are constructed, one reflecting the best choice, and a second pseudo observation representing the worst choice. For the best choice observations, each statement is dummy coded 1 if it is present in alternative, j , or 0 otherwise. For the worst choice task, the variables are simply the negative of the best values (i.e., -1, if the alternative is present or 0 otherwise). For the first best worst task, the 26 destinations are coded into 25 dummy variables, whilst separate dummy codes are generated for each of levels of the nine statements in the second best worst experiment (i.e., each statement has three levels, producing two dummy codes; the total number of dummy codes modelled is therefore 18). As is common practice with such data, the alternative chosen as best was removed from for the second pseudo worst observation.

Section 3: What Security Measures Do You Prefer?
 Set 1 of 6
 Imagine you are at the airport for an international flight.
 Considering the following security processes ONLY, please rank the options from Most Preferred (1) to Least Preferred (3).

Attributes	Option A	Option B	Option C
The level of security screening for luggage	Xray with luggage opened randomly	Xray with all luggage opened	I would choose not to fly under these security conditions
The level of physical screening for passengers	Thorough pat-down for all passengers	Thorough pat-down for targetted passengers only	
The level of computer-based screening for passengers	Whole of body scan for random passengers	Whole of body scan for targetted passengers only	
Level of camera technology used	Standard CCTV cameras	CCTC cameras with facial recognition	
The level of identity verification required	Passport (current practice)	Passport with finger print and/or retinal scan	
Average time required to complete security and immigration	20 minutes	60 minutes	
Presence of security on-board the aircraft	Uniformed security personnel onboard flight	Undercover security personnel onboard flight	
Increased cost of ticket to cover security processes	\$75	\$150	
Number of incidents avoided by security process	1 every 10 years	10 every 10 years	
Ranking (1 = Most Preferred) to (3 = Least Preferred)	<input type="text"/>	<input type="text"/>	<input type="text"/>

Figure 3: Example Stated Preference Task

Given the presence of both satisfaction and importance choices, two utility specifications are present in the current model set up. Let $U_{nsj|b}$ and $U_{nsj|w}$ denote the utility for the best and worst choices associated with alternative j as perceived by respondent n in choice task s , respectively. For both utility functions, a linear in the parameters specification is assumed. In the current paper, we further assume that the marginal utilities for the best and worst choices are symmetrical and that there exist no scale differences between the two choices (see e.g., Rose 2014). Let β_k denote the marginal utility for satisfaction associated with the k^{th} statement or attribute. Alternative specific constants may also be estimated to reflect positional or other order effects that might exist within the data. To account for

possible differences in scale, we estimate a scale parameter for the worst choices, λ_w . The utility functions thus described are provided in Equations (1) and (2).

$$U_{nsj|b} = \sum_k^{K=1} \beta_k x_{nsj} + \varepsilon_{nsj|b}, \quad (1)$$

and utility for worst

$$U_{nsj|w} = \exp(\lambda_w) \left(-\sum_k^{K=1} \beta_k x_{nsj} \right) + \varepsilon_{nsj|w}, \quad (2)$$

and where $\varepsilon_{nsj|}$ are error terms associated with either the best or worst choice questions. Under the assumption that the error terms are extreme value type 1 independently and identically distributed, the probability, $P_{nsj|b}$, that respondent n chooses alternative j as the best in choice situation s is given by

$$P_{nsj|b} = \frac{\exp(V_{nsj|b})}{\sum_{i \in J_{ns}} \exp(V_{nsi|b})}, \quad (3)$$

where $V_{nsj|b}$ represents the modelled or the observed component of utility. The probability for the worst alternative is similarly computed, noting however that there will be one less alternative given that the alternative chosen as best will be removed, as shown in Equation (4)

$$P_{nsj|w} = \frac{\exp(V_{nsj|w})}{\sum_{i \in J_{ns|w}} \exp(V_{nsi|w})}. \quad (4)$$

Given observed choices, $y_{nsj|b}$ and $y_{nsj|w}$ the objective of the researcher is to locate the parameters that best predict those choices. For the MNL model, estimation of the parameters is achieved by maximising the log-likelihood function shown in Equation (5)

$$\text{Log}L = \sum_{n=1}^N \sum_{s \in S_n} \sum_{j \in J_{ns|b}} y_{nsj|b} \ln(P_{nsj|b}) + \sum_{n=1}^N \sum_{s \in S_n} \sum_{j \in J_{ns|w}} y_{nsj|w} \ln(P_{nsj|w}). \quad (5)$$

For the state preference task looking at identifying preferences for security and privacy, a latent class model was used to model the data. Unlike the MNL model, latent class analysis can be used to identify the presence, and number of, segments or classes within the sample (see Kamakura and Russell 1989 or Scarpa et al 2003). To operationalise the model, the analyst assumes the existence of C classes, such that the probability that respondent n belongs to class c is given by

$$P_{nc} = \frac{\exp(V_{nc})}{\sum_{c \in C} \exp(V_{nc})}, \quad (6)$$

where $V_{nc} = \sum_{l=1}^L \delta_{cl} z_{nl}$, represents the observed component of utility related to Equation (6), and δ_{cl} a parameter associated with covariate z_{nl} . For model identification, the parameters, δ_{cl} for one entire

class are normalised to unity.

Conditional on belonging to class c , the probability that respondent n chooses alternative j in choice situation s given becomes

$$P_{nsj|c} = \frac{\exp\left(\sum_{k=1}^K \beta_{k|c} x_{nsjk}\right)}{\sum_{i=1}^J \exp\left(\sum_{k=1}^K \beta_{k|c} x_{nsik}\right)}, \quad (7)$$

where $\beta_{k|c}$ are parameters related to the k th attribute used to describe the j^{th} alternative.

Given observed choices, y_{nsj} , the probability, conditional to belonging to class c , that respondent n is observed to make a sequence of choices of s choice scenarios is computed as

$$P_{n|c}^* = \prod_{s=1}^S \prod_{j=1}^J P_{nsj|c}^{y_{nsj}} \quad (8)$$

In the stated preference task, despite rankings data being collected, we use only the most highly rank alternative to represent the choice indicator, y_{nsj} , in Equation (8).

The log-likelihood function used to estimate the parameters δ_{cl} and $\beta_{k|c}$ is then given as

$$\text{Log}L = \sum_{n=1}^N \ln \left(\sum_{c=1}^C P_{nc} P_{n|c}^* \right). \quad (9)$$

5. Empirical Data

A total of 304 surveys were completed, resulting in 1824 choice observations for each of the best-worst tasks and the stated preference experiment. Overall, as highlighted in Figure 4, 20 percent of the sample view themselves as frequent international travellers, 48 percent as infrequent international travellers and 32 percent do not travel internationally. The majority of respondents (64 percent) indicated that they were excited by the idea of international travel, with 14 percent stating that such travel made them nervous.

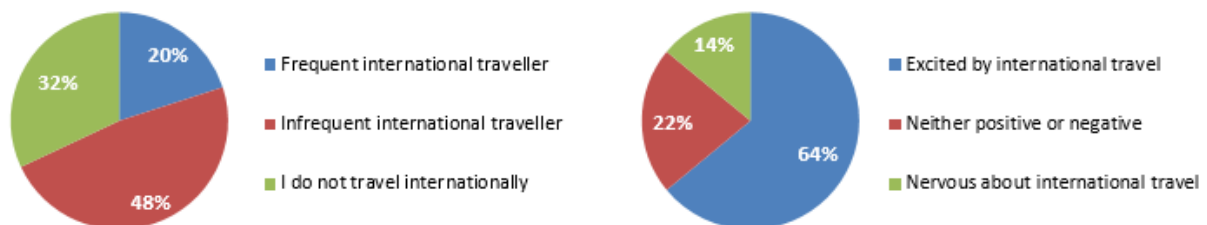


Figure 4: Frequency and Feelings towards International Travel

Only respondents 18 years or older were sampled, thus the average age of 53.0 years (standard deviation of 15.4) is higher than expected, but compares favourably to the average age of 47.6 years for similar individuals in the Greater Sydney region (ABS 2011). The sample has a higher number of male

respondents than expected (61 percent). Ninety-one percent of respondents travel for leisure, with nine percent travelling for business. As highlighted in Figure 5 the majority of respondents travel in on economy class tickets and travel either alone or with their partner.

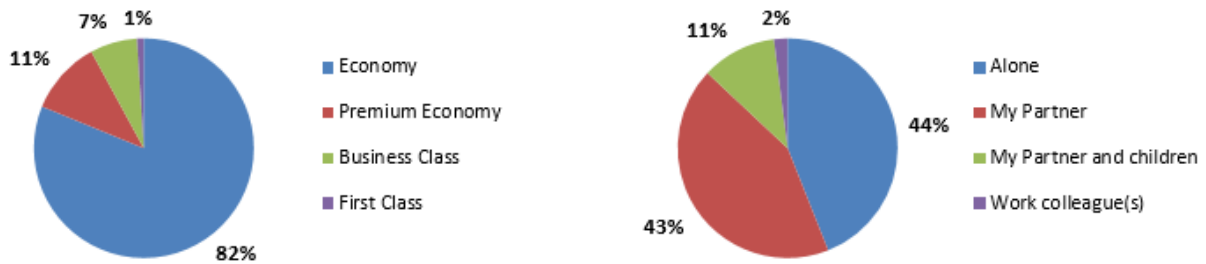


Figure 5: Class of Travel and Travel Partner

6. Study results

6.1. Attitudinal data

Overall respondents indicated a general level of agreement with an overall feeling of safety when travelling on an aircraft, as displayed in Figure 6. It is worth noting however only eleven percent of respondents strongly agree with this statement, indicating that there is perhaps some level of trepidation with respect to international air travel. Interestingly significant, albeit, weak correlations were detected between age ($r = 0.121, sig = 0.035$) and income ($r = 0.137, sig. = 0.026$). As one would expect, international travellers (both frequent and infrequent) report significantly higher average levels of overall safety than non-travellers ($F = 7.138, sig = 0.001$) and those who are excited about international travel, on average, report a significantly higher overall feeling of than those who are neither positive or negative, who in turn are significantly higher than those who are nervous about international travel ($F = 22.123, sig. = 0.000$). There is no significant difference across gender or whether the trip was for business or leisure.

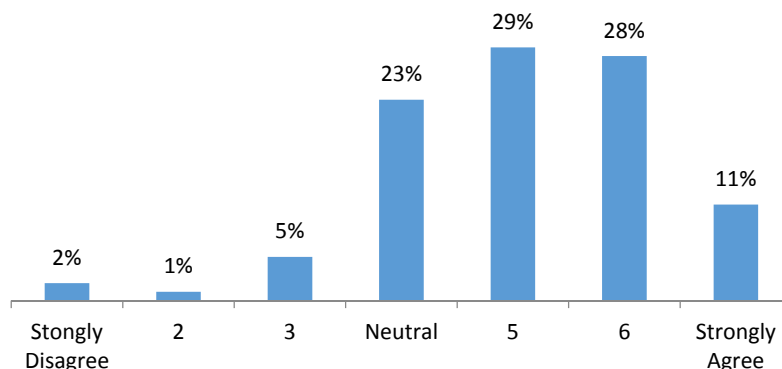


Figure 6: Overall I Feel Safe When On-board an Aircraft

Table 4 provides results for the remaining eleven attitudinal questions. An interesting result in this table is the relatively high number of neutral attitudes (within each statement approximately one quarter of the sample reported neutral attitudes). This is perhaps indicative of a lack of clarity surrounding security

procedures with respect to air travel. The highest level of agreement was toward the presence of visible uniformed police creates a greater feeling of security. Seemingly there is a limit to the number of screening processes that travellers feel are necessary, with the next highest level of agreement being that they should not have to wait to be re-screened between connecting flights. Interestingly there are only relatively moderate levels of agreement that spending time in lines is not a problem, but also only moderate agreement that travellers currently spend too much time in lines. This perhaps indicates that travellers are perhaps happy with how long it currently takes, but on a threshold of not desiring any further time being spent in airports. Overall there is agreement that airlines and authorities do enough to minimise threats from staff and passengers and generally do enough overall to make air travel safe, but the number of travellers who strongly agree to these statements is small.

Table 4: Attitudes towards Air Travel

	Strongly Disagree	2	3	Neutral	5	6	Strongly Agree
Seeing visible Australian Federal Police officers in the airport make me feel more secure	3%	2%	2%	24%	24%	29%	17%
If I am making a connecting flight and have already been screened I should not have to wait to be screened again	5%	1%	8%	26%	20%	21%	18%
I feel that airlines and authorities do enough to minimise threats from staff (pilots/cabin crew/ ground staff)	1%	3%	5%	26%	28%	26%	11%
I feel that airlines and authorities do enough to minimise threats from passengers	1%	4%	8%	27%	28%	25%	7%
I feel that airlines and authorities currently do enough to make air travel safe	2%	4%	8%	28%	27%	23%	8%
I feel that airlines and authorities do enough to minimise mechanical threats	1%	2%	8%	25%	32%	22%	9%
I find that I have to spend too much time at airports waiting in lines	5%	5%	9%	34%	23%	15%	10%
So long as I don't miss my flight, spending time in lines is not a problem for me	4%	5%	11%	24%	33%	13%	10%
Mechanical issues are a significant threat to the safety of my flight	7%	12%	12%	27%	21%	13%	8%
Other passengers are a significant threat to the safety of my flight	4%	10%	13%	39%	20%	8%	6%
Airline staff (pilots/cabin crew/ground staff) are a significant threat to the safety of my flight	21%	24%	19%	22%	7%	5%	2%

Many attitudes differed significantly based on socio-demographic characteristics. Older respondents were significantly more likely to agree that airlines and authorities do enough to minimise threats from staff ($r = 0.137, p\text{-value} = 0.017$) and less likely to agree that staff are indeed a significant threat ($r = -0.239, sig = 0.000$). In a similar vein, older respondents are less likely to agree that mechanical problems are a significant threat to safety ($r = 0.123, p\text{-value} = 0.033$) and more likely to feel that airlines do enough to minimise such threats ($r = -0.123, p\text{-value} = 0.032$). Those with higher incomes are more likely to agree that they spend too much time in airports waiting in lines ($r = 0.133, p\text{-value} = 0.031$). Males have higher average levels of agreement that airlines and authorities do enough to minimise threats from passengers ($t = 2.508$) and mechanical problems ($t = 2.410$), whereas females are more inclined to agree that mechanical issues are a significant safety threat ($t = 4.134$) and while still largely in disagreement, are less likely to disagree that airline staff are a significant threat ($t = 2.135$).

There are a large number of significant differences in average attitudes based on the self-reported frequency of international travel and whether respondents are excited or nervous about such travel. These differences are presented in Table 5; all post-hoc testing was performed using Tukey's HSD. Generally frequent (and to a lesser extent infrequent) travellers report higher average agreement that

airlines and authorities are doing enough to minimise threats, but interestingly report higher agreement that airline staff are a significant threat to safety. Those who do not travel report significantly lower average agreement that too much time is spent in lines at airports and that re-screening should occur. A similar intuitive pattern of results emerges from based on whether respondents are excited or nervous about international travel. Those excited by travel typically report higher average levels of agreement that airlines and authorities do enough to minimise threats to travel. Interestingly, ambivalent travellers report lower agreement that visible policing increases the sense of security.

Table 5: Average Attitudes by Travel Characteristics

	No Travel	Infrequent	Frequent	F-stat. (sig)	Nervous	Neither	Excited	F-stat. (sig)
Seeing visible Australian Federal Police officers in the airport make me feel more secure	---	---	---	---	5.17	4.57	5.41	10.199 (0.010)
If making a connecting flight and have already been screened I should not have to wait to be screened again	4.50	5.08	5.1	4.716 (0.010)	---	---	---	---
I feel that airlines and authorities do enough to minimise threats from staff (pilots/cabin crew/ ground staff)	4.67	5.1	5.31	5.768 (0.003)	4.40	4.69	5.24	10.961 (0.000)
I feel that airlines and authorities do enough to minimise threats from passengers	4.43	4.84	5.19	7.197 (0.001)	4.24	4.43	5.05	9.931 (0.000)
I feel that airlines and authorities currently do enough to make air travel safe	4.41	4.81	5.10	5.649 (0.004)	4.17	4.54	4.93	7.056 (0.001)
I feel that airlines and authorities do enough to minimise mechanical threats	4.79	4.81	5.27	3.871 (0.022)	4.24	4.85	5.05	8.139 (0.000)
I find that I have to spend too much time at airports waiting in lines	3.98	4.56	4.92	8.611 (0.000)	---	---	---	---
Airline staff (pilots/cabin crew/ground staff) are a significant threat to the safety of my flight	2.73	2.78	3.58	4.716 (0.001)	---	---	---	---

Note: Bolded averages are significantly different to non-bolded values.

With respect to differences between business and leisure travellers, business travellers report higher average levels of agreement that they spend too much time in lines ($t = 3.614$), that mechanical issues are a threat to safety ($t = 2.107$) but also that airlines and authorities to enough to minimise these threats ($t = 2.344$), that other passengers are a threat to safety ($t = 2.145$) but also that airlines and authorities to enough to minimise these passenger based threats ($t = 3.221$), and that staff are a threat to safety ($t = 3.178$). Significant differences are also observed based on the recency of the previous international trip, whether it was within the last year or was made a year ago or longer. Those who have travelled internationally within the last year, on average, agree more that they spend too much time in lines at airport ($t = 3.750$), that staff are a significant threat to safety ($t = 4.375$) and that airlines and authorities do enough to minimise mechanical threats ($t = 2.183$) and threats from other passengers ($t = 2.114$).

In line with Potoglou et al. (2010), we use both a “Distrust Index” and a “Privacy Index” to assess attitudes towards privacy (Kumaraguru and Cranor 2005, Louis Harris et al. 1994) and provide an interesting counterpoint to the results from this study. Table 6 presents the results from the “Distrust Index” and Table 7 those from the “Privacy Index”. For comparison the results from the European study (as reported in Daly et al. 2012) are provided in italics. The majority of respondents in this survey disagree with the statement that technology has gotten out of control, with one in four respondents strongly disagreeing with this statement, a higher percentage than those from Europe. More respondents disagree with the statement that governments can be trusted to look after our best interests, but relative to the European results this study indicates that Australian respondents are slightly more trusting of their government. That said, the majority of the sample agree with the statement that voting has no effect on what the government does, with 25 percent agreeing with this statement strongly; this indicates a potentially large disenfranchisement with politics in the Australian context especially when compared

to Europe. Finally, levels trust and distrust of authorities to adequately protect privacy information is split evenly, however the strength of distrust being slightly stronger at the extreme.

Table 6: Distrust Index

Question	Disagree Strongly	Disagree Somewhat	Don't Know	Agree Somewhat	Agree Strongly
Technology has almost got out of control	24% 13%	33% 41%	5% 3%	26% 30%	13% 13%
Government can generally be trusted to look after our interests	20% 32%	30% 35%	5% 3%	39% 26%	7% 3%
The way one votes has no effect on what the government does	13% 6%	24% 49%	4% 12%	35% 26%	24% 6%
In general business helps us more than it harms us	9% 6%	31% 26%	11% 12%	40% 49%	10% 6%
I trust authorities to adequately protect by private information	16% ---	32% ---	6% ---	40% ---	8% ---

Levels of distrust are largely invariant to with respect to socio-demographics. Somewhat counterintuitively, older respondents are more likely to disagree that technology has gotten out of control ($r = -0.113$, $p\text{-value} = 0.048$), however perhaps younger respondents are more aware of how much personal data can be collected via new technology such as smartphones. Females report, on average, significantly higher levels of agreement that technology is out of control ($t = 3.098$). Those who state they are frequent international travellers on average report higher agreement that technology has almost gotten out of control ($F = 4.775$, $p\text{-value} = 0.009$) but that governments can be trusted to look after our interests ($F = 4.568$, $p\text{-value} = 0.011$). Those excited by the prospect of international travel report higher average trust in government ($F = 3.931$, $p\text{-value} = 0.021$) and the helpfulness of business ($F = 3.102$, $p\text{-value} = 0.046$) and in the authorities to protect private information ($F = 4.528$, $p\text{-value} = 0.012$). There are no significant differences based on whether respondents travel for business or leisure, however those respondents whose most recent trip was within the last year have a higher average level of agreement that voting has no effect on government actions ($t = 2.054$).

With respect to privacy concerns, 83 percent of respondents feel that taking action against security risks is important or very important; compared to the European experience however far fewer respondents in this study feel that protecting personal information and defending currently liberties and human rights is very important. In contrast to levels of distrust, privacy concerns were invariant to differences in frequency of international travel, whether such travel made respondents excited or nervous, whether the most recent international trip was within the last year or more than a year ago and whether or not they travel for business or leisure. Privacy attitudes, however did vary significantly with respect to age and income, with old respondents more likely to report that taking action against security risks is important ($r = 0.255$, $p\text{-value} = 0.000$) and that defending current liberties and human rights is not important ($r = -0.147$, $p\text{-value} = 0.010$). Interestingly, respondents with higher levels of income are more likely to find that protecting privacy of personal information is not important ($r = -0.149$, $p\text{-value} = 0.016$) and that defending current liberties and human rights is also not important ($r = -0.147$, $p\text{-value} = 0.038$). On average, females find protecting privacy of personal information significantly more important ($t = 3.109$) than male respondents.

Table 7: Privacy Index

Question	Not at all important	Not very important	Don't Know	Somewhat Important	Very Important
Protecting the privacy of my personal information is	3% 1%	12% 3%	2% 1%	31% 21%	52% 75%
Taking action against important security risks (e.g., terrorism, organised crime) is	1% 1%	4% 2%	2% 1%	10% 17%	83% 79%
Defending current liberties and human rights is	7% 3%	16% 10%	2% 1%	41% 33%	33% 53%

6.1.1. Drivers of Attitude to Overall Safety

Regression analysis was performed to gain greater insight into what influences the perception of respondents that overall they feel safe when on-board an aircraft. Table 8 presents the results of this analysis; the model is significant and accounts for a reasonably high percentage of variation in overall perception of safety. Interestingly the only significant drivers of overall safety are attitudes, with characteristics such as age, income, gender, business or leisure travel and recency of international travel all being insignificant factors.

In the majority of instances the signs of the coefficients are as expected, overall safety increases as individuals agree more that seeing greater numbers of uniformed policy creates a greater sense of security. Respondents who agree that airlines and authorities do enough to minimise threats from staff, passengers and mechanical issues also feel a higher level of overall safety. Likewise, those who report lower levels of agreement that staff, passengers and mechanical issues are concern also feel safer overall. If respondents agree more with the statement that they don't mind waiting in lines so long as they don't miss their flight they also feel significantly safer on-board the aircraft, indicating that perhaps time is not so much an issue if the queuing is as a result of clearly effective security screening.

Interestingly the other time related variables have positive coefficients, indicating that as respondents agree more with the statements that they spend too much time waiting in lines and that if they have already been screened they should not have to wait to be screened again, the higher their overall perception of safety. It is possible however that causality may run in the other direction in that those respondents who feel safer overall are predisposed to view that lining up for long periods of time may be unneeded or inconvenient. That said, one interpretation of these results is that while lining up for security procedures may result in higher levels of overall safety, travellers may feel they are at the limit of their time and that repetitive screening processes may be a disincentive in the long term.

Table 8: Drivers of Perception of Overall Safety

Variable	Par.	(t-stat.)
Airline staff (pilots/cabin crew/ground staff) are a significant threat to the safety of my flight	-0.141	(-3.593)
Seeing visible Australian Federal Police officers in the airport make me feel more secure	0.149	(3.469)
I find that I have to spend too much time at airports waiting in lines	0.126	(3.336)
I feel that airlines and authorities do enough to minimise threats from staff	0.208	(3.313)
If I am making a connecting flight and have already been screened I should not have to wait to be screened again	0.105	(3.046)
I feel that airlines and authorities do enough to minimise threats from passengers	0.165	(2.830)
So long as I don't miss my flight, spending time in lines is not a problem for me	0.11	(2.773)
Defending current liberties and human rights is (importance)	0.102	(2.520)
Mechanical issues are a significant threat to the safety of my flight	-0.09	(-2.342)
I feel that airlines and authorities do enough to minimise mechanical threats	0.127	(2.229)
Government can generally be trusted to look after our interests (agreement)	0.072	(1.816)
Other passengers are a significant threat to the safety of my flight	-0.075	(-1.721)
R²	0.528	

Also of interest is that two attitudes from the distrust index are also significant drivers of how safe travellers feel overall. Respondents who trust the government to look after their interests feel safer overall on-board aircraft. This is perhaps indicative of the trust that passengers who feel safe have in the management of the screening processes employed by the relevant air travel authorities. Respondents who place greater importance on the defending of current liberties and human rights also feel significantly safer overall. There are two possible interpretations of this result. Firstly it could be true that respondents view safe international travel as an important civil liberty (particularly in Australia where almost all international travel involves long haul flights and where screening is substantially more rigorous for international flights compared to domestic flights) and thus the security processes used in air travel ensure such liberty and overall safety. The second interpretation is that those who view the protection of civil liberties as being paramount are perhaps comfortable with travelling because they are prepared to accept greater risk to reduce security screening.

6.2 Perception of Route/Destination Safety

The results of the best-worst experiment designed to identify the routes/destinations that respondents felt most secure travelling to are presented in Figure 7 and Table 9. Note that the countries selected were based on the UNWTO (2014) figures for international arrivals. Australia is excluded as this survey is of Australian residents who cannot fly internationally to Australia. In making comparisons between the perceived security of routes/destinations, Abu Dhabi is set as the base country for which comparisons between other countries are made. Relative to Abu Dhabi, New Zealand is more likely to be selected as the most secure route or destination and Pakistan is more likely to be selected as the least secure. Given that Abu Dhabi is a relatively large hub for travel, 15 countries are perceived to be significantly more secure to travel to than Abu Dhabi. The scale variable for the choice of worst is significant and positive, indicating that respondents are better able to select the least secure route/destination more deterministically relative to the most secure.

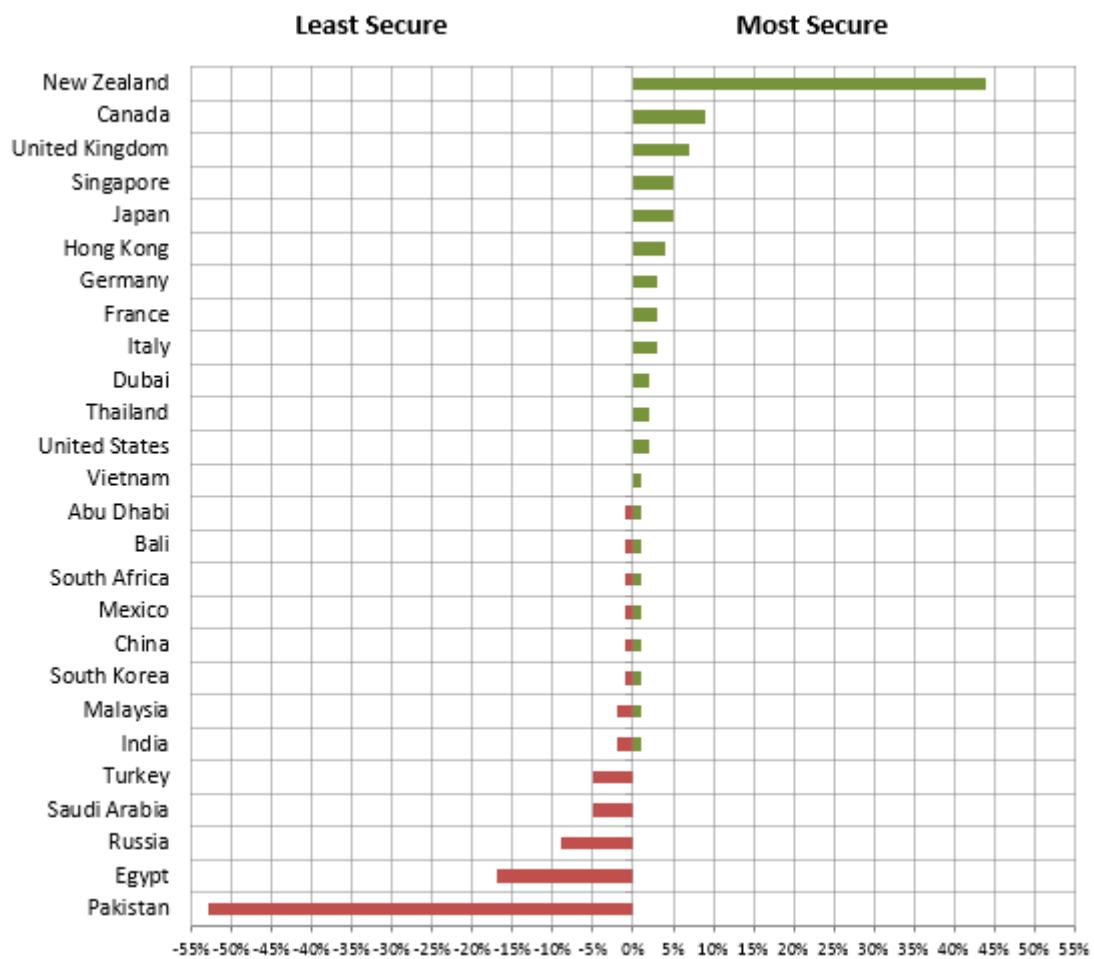


Figure 7: Probability of Being Chosen as Most or Least Secure

Perhaps more intuitive is Figure 7 which displays the probability of destinations being selected as either the most or the least secure. Clearly there are two extremes with respect to the security of the 26 countries. New Zealand is perceived by far to be the safest route/destination with Pakistan the least secure. Canada and the United Kingdom are other destinations that Australian's are more likely to feel secure travelling to, whereas Egypt, Russia, Saudi Arabia and Turkey are destinations that Australian's would feel least secure travelling to on-board a plane. It is interesting to note that Malaysia is not likely to be selected as a least secure destination, indicating that respondents are able to disentangle the troubles of Malaysian Air with the country itself.

Table 9: Most and Least Secure Routes/Destinations

# Obs.	1824
Base LL	-4532.47
Final LL	-4102.521
ρ^2	0.095

Variable	Beta	(Rob. t-rat.)
Scale (Worst)	0.703	(7.10)
New Zealand	4.000	(14.58)
Canada	2.420	(9.25)
United Kingdom	2.100	(7.44)
Japan	1.910	(8.37)
Singapore	1.760	(7.22)
Hong Kong	1.550	(8.91)
Italy	1.440	(6.81)
France	1.420	(6.12)
Germany	1.340	(5.25)
United States	0.999	(4.18)
Thailand	0.653	(3.65)
Dubai	0.615	(2.81)
Vietnam	0.538	(3.57)
South Korea	0.485	(2.26)
China	0.367	(2.71)
Mexico	0.273	(1.29)
South Africa	0.249	(1.01)
Bali	0.179	(0.84)
Abu Dhabi	---	---
India	-0.203	(-1.11)
Malaysia	-0.223	(-1.04)
Saudi Arabia	-0.597	(-2.81)
Turkey	-0.609	(-2.39)
Russia	-0.886	(-4.06)
Egypt	-1.210	(-5.35)
Pakistan	-1.790	(-6.40)

6.3 Attitudes towards Aspects of the Security Process

The results of the second best-worst experiment designed to identify what various aspects of air travel security and screening respondents might agree with most or least are presented in Table 10 and Figure 8. The basis for comparison is that there is no need for CCTV in the security process. It is clear that there are many more attitudes that respondents are significantly more likely to agree with than this. Scale is significant and positive again indicating that relative to the choices of best, respondents select the potential security processes they agree with least more deterministically. The final column in Table 10 labelled *Ref* is the reference for the axis label for that variable in Figure 8. Clearly attitudes toward security are focused around two parts of the process, the use of CCTV and the time that the security process takes.

The statement most likely to be agreed with is that CCTV should be installed at all airports and also often likely to be rated as a process agreed with most is that the CCTV images should be saved. On the other hand, the statement that there is no need for CCTV at airports is far and away the statement that is agreed to least by respondents. Attitudes towards time are similarly strong it that respondents indicate they are likely to agree to spending a little extra time in security if it improves safety, and disagree that security should not be increased if it leads to delays regardless of safety. Relative to other factors, respondents agree that whole of body scans and luggage x-ray are required security measures for them to feel secure and that all people should be selected for security screening. Liquids appear to be a

controversial issue, with statements suggesting that passengers should be able to take more liquids onto flights, and that all liquids should be confiscated prompted the lowest levels of agreement from the set of statements. At the same time there is also considerable disagreement with the statement that current allowances for liquids are acceptable.

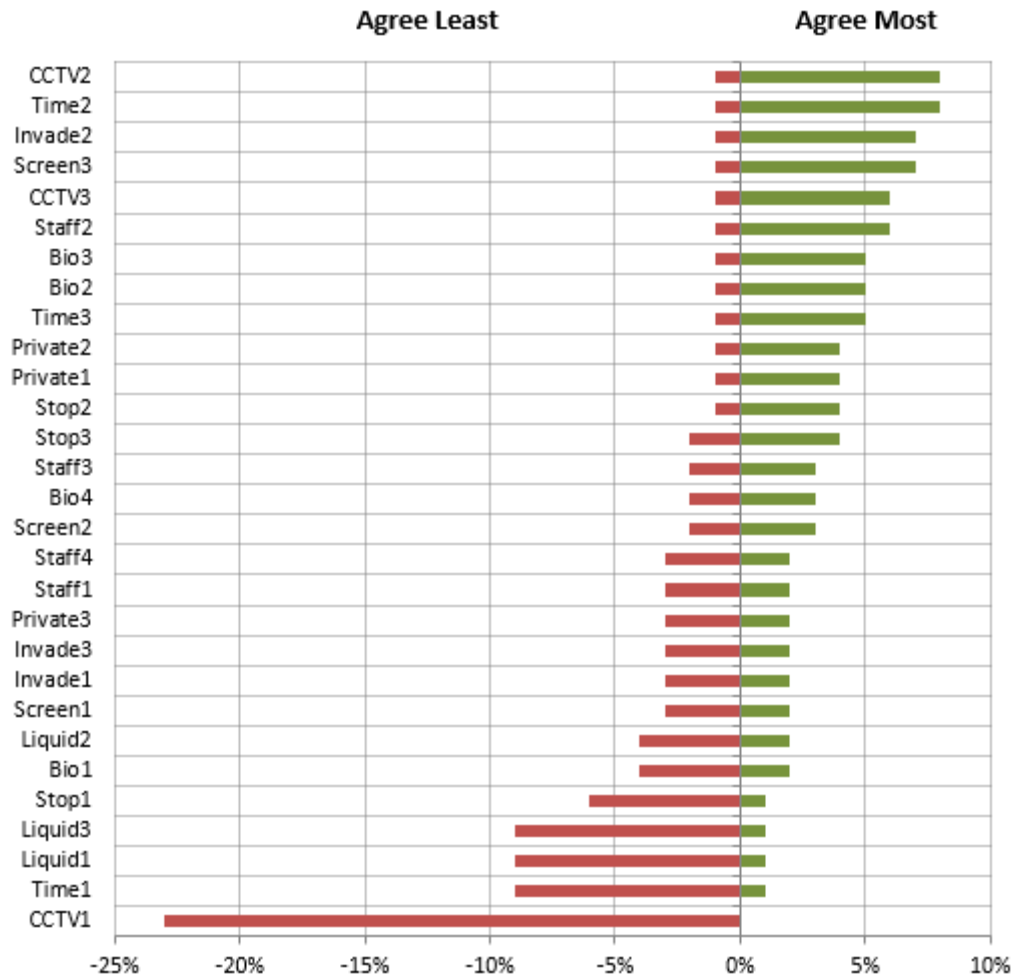


Figure 8: Probability of Agreeing with Statement Most or Least

Other broad results of interest are that respondents are inclined to disagree with the statement that airport security is able to stop all threats, perhaps indicating that there is a level of inherent risk in the travel process that passengers are in general prepared to accept. Privacy concerns are seemingly lost in the middle with no great agreement or disagreement with the difference levels of privacy and dignity given over. Interestingly, and seemingly corroborative of the middling nature of privacy concerns, is that there is no distinct agreement or disagreement with the role of biometrics such as finger printing, retinal scans and even the collection of DNA as part of the security process.

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Table 10: Attitudes toward Security Process Agreed with Most and Least

# Obs.	1824	Base LL	-7800.639	Final LL	-6984.921	ρ^2	0.105	Scale (Worst)	0.831	$t = 7.58$
Statements	Statement Levels						Par.	(Rob. t -rat.)	Ref	
Stopping Threats	Airport security is able to stop all threats to flights						1.42	(7.02)	Stop1	
	Airport security significantly reduces the level of threats to flights						1.33	(7.90)	Stop2	
	Airport security will never eliminate all threats to flights						1.29	(6.88)	Stop3	
Time Spent	Airport security should not be increased if it leads to delays regardless of safety/security						0.974	(6.09)	Time1	
	I am willing to spend a little more time in security than I currently do if it will improve safety						2.42	(13.78)	Time2	
	I am willing to spend any amount of time in security if it will improve safety						1.99	(10.39)	Time3	
Screening of People	People should be randomly selected for security screening						2.00	(11.49)	Screen1	
	People should be targeted for security screening by authorities						0.339	(2.86)	Screen2	
	All people should be selected for security screening						1.28	(9.33)	Screen3	
Invasiveness of Security	Pat down and luggage x-ray are sufficient security measures for me to feel secure						2.11	(10.54)	Invade1	
	Whole of body scans and luggage x-ray are required security measures for me to feel secure						1.13	(8.01)	Invade2	
	I would allow any level security no matter how invasive in order to feel secure						0.197	(1.14)	Invade3	
Use of Biometrics	The collection of genetic material is not needed as part of security procedures						1.83	(8.54)	Bio1	
	I would permit authorities to collect finger prints as part of security procedures						1.16	(6.27)	Bio2	
	I would permit authorities to take retinal scans as part of security procedures						1.21	(6.81)	Bio3	
	I would permit authorities to collect any material needed for a DNA sample as part of security procedures						0.454	(2.18)	Bio4	
Role of Privacy	My privacy and dignity should be respected during the security process						2.73	(12.03)	Private1	
	I would allow increased security if my privacy and dignity was respected						0.0475	(0.33)	Private2	
	Privacy and dignity is irrelevant compared to guaranteeing air security						-0.543	(-3.45)	Private3	
Carrying of Liquids	Passengers should be able to take more liquids onto flights						0.974	(6.40)	Liquid1	
	Current allowances for liquids are acceptable						0.83	(5.31)	Liquid2	
	All liquids should be confiscated no matter the amount						0.125	(0.82)	Liquid3	
Screening of Staff	Pilots / cabin crew / ground staff are adequately screened						2.08	(9.06)	Staff1	
	Pilots / cabin crew / ground staff should have the same security measures as passengers						1.07	(6.15)	Staff2	
	Pilots / cabin crew / ground staff should have increased security measures compared to passengers						0.338	(1.97)	Staff3	
	Pilots / cabin crew / ground staff should have their mental state assessed before every flight						0.0876	(0.48)	Staff4	
Use of CCTV	There is no need for CCTV at airports						---	---	CCTV1	
	CCTV should be installed at all airports						3.37	(15.19)	CCTV2	
	CCTV should be installed at all airports and images of passengers boarding should be saved						3.14	(14.11)	CCTV3	

6.4 Choosing to Travel under Differing Security Regimes

Table 10 provides the results from the latent class estimation of international air travel choices under different combinations of security processes, including the option to not travel at all. Varying numbers of latent classes were trialled, with ultimately three classes fitting the data best. The three classes of differing respondent preferences can be described by the attitudes of overall safety and whether or not respondents are trusting of authorities ability to protect private information (where responses of 4 or 5 on the five point scale are coded as agreement and other scores as disagreement).

Those respondents who are relatively more trusting of authorities are more likely to belong to the “*Trusting*” class, which have significant preferences for choosing to travel, but also find a range of differing security measure to be attractive. This group prefer X-ray procedures which are more intensive than current practice, prefer standard CCTV cameras to none but also have a positive preference for CCTV with facial recognition, for undercover security on flights and for passport checking with finger and retinal scans. This group prefer faster security times and are sensitive to increased costs, but prefer situations where the number of incidents avoided by security measures is higher. The second class of respondents are “*Nervous*” travellers, who report lower feelings of overall safety. As a reflection of this nervousness, this group is equally likely to choose the no travel option as they are one of the travel alternatives. They are cost sensitive, but only marginally dissuaded by longer time spent in security. They prefer higher numbers of incidents avoided and have overt preferences for security on-board flights, in particular uniformed security. The last group of respondents have been labelled “*Status Quo*” travellers, in that they prefer standard CCTV, X-ray with luggage opened for targeted cases as per current practice, invariant between differing passport practices, amount of time taking in security and the number of incidents avoided. They are also cost sensitive with respect to increased ticket costs to cover additional security.

Examining what drives people to select the no choice alternative we asked respondents who selected not to travel why they did so. The predominant responses were that security measures were either cost and/or too time consuming. Based only on these explanations from the respondents who chose not to travel, there is a general feeling that the security process is a public good and they (the passenger) should not be the one to pay for them. A number of respondents elected not to travel when there were “no security cameras to capture incidents”. Again, there was the general sense that security cameras should be used and that camera technology should be improved. Some people didn’t like body scans because of radioactivity, pregnancy or because of small children. In some instances the alternative security processes were deemed “too much of a hassle” or there was “so much invasion of privacy”. Others mentioned thoughts along the line that “Australia doesn't have terrorist threats except for manufactured ones” or that “people are treated on mass as untrustworthy, it is demeaning.”

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Based on the results presented of the latent class model, we compute the amounts respondents are willing to pay for each of the attributes (known as marginal willingness to pay (mWTP) estimates). These are presented in Table 12. The largest mWTP is associated with the presence at airports of CCTV cameras with facial recognition, followed by having undercover security agents on-board aircraft, and then standard CCTV cameras located at airports. Having a uniformed security agent on board flights is valued approximately half that of having undercover security agent present. Respondents were found to also be willing to pay \$7.65 to save an additional minute of time spent clearing security and immigration, and hence \$76.65 to save 10 minutes. Interestingly, the lowest mWTP appears to be associated with avoiding additional incidences. This is surprising as it suggests that respondents prefer security measures that give the appearance of increasing the level of security over measures that actually increase the level of security.

Table 12: Willingness to pay estimates for security and privacy

Attribute	mWTP
X-ray with luggage opened random	\$80.07
X-ray with all luggage opened	\$181.37
Standard CCTV cameras	\$411.24
CCTV cameras with facial recognition	\$524.99
Passport with finger and retinal scans	\$133.87
Undercover security on flights	\$482.35
Uniformed security on flights	\$222.58
Time taken in security	\$7.65
Number of incidents avoided	\$3.91

a limit to the number of screening processes that travellers are willing to endure. This perhaps indicates that travellers are happy with how long it currently takes, but on the threshold of not wanting any more time to be consumed in this process. Overall there is agreement that airlines and authorities do enough to minimise threats from staff and passengers and generally do enough overall to make air travel safe, but interestingly the number of travellers who strongly agree to these statements is small. Those managing air security operations are advised to keep this result in mind and potentially better communicate what they do and why it is effective in threat minimisation.

When looking more globally at whether or not Australians are (dis)trustful or concerned about their privacy, generally Australians report similar levels of (dis)trust to Europe in that there is slightly more distrust than trust. Our results suggest that particular Australians are more disillusioned with governments when compared to other nationalities. With respect to privacy, fewer respondents in this study feel that protecting personal information and defending currently liberties and human rights is very important; a result that is at odds with the OAIC (2013) finding that Australians are particularly concerned about privacy. It should be noted that the OAIC study is more general attitudes of privacy, whereas this study deals specifically with international travel. This suggests that when answering questions of privacy and dignity respondents are doing so in the context of such travel, whereby opting into such travel requires a person to relinquish some degrees of personal freedom. It could also be possible that the twin disasters of MH370 and MH17 have made Australians more willing to accept intrusions to privacy than they were in 2013 or in Europe.

In identifying the drivers of overall feeling of safety on-board aircraft we found that age, gender, travel purpose and income were insignificant, with only attitudes towards various aspects of air travel security being able to predict overall safety. This indicates the airline and airport management should seek to leverage attitudes which are largely consistent across the population as a whole. In other words, messaging or policy actions can be consistent across the population. In particular we recommend that security staff in airports be visible (Australian Federal Police if possible), and that all initiatives be aimed at improving the opinion that authorities are attempting to minimise the threat from staff, other passengers, and mechanical issues.

The route/destination best-worst experiment identifies those destinations that are likely to either maintain (or perhaps pickup business as travellers revert to “safer” destinations) or decline in popularity as travel becomes less secure. In that respect, Australian travellers find New Zealand to be overwhelmingly the safest destination for international travel, perhaps due to the relative proximity and/or the minimal cultural differences. Also due to potential cultural compatibilities Canada and the United Kingdom are also viewed as relatively safe destinations. On the other hand, Pakistan is easily the least safe destination, followed by Egypt, Russia and Saudi Arabia. The Russian result is somewhat surprising given the Sochi Winter Olympics were held in the same year; clearly this did not improve the image of Russia among Australian travellers. Given that Turkey is building one of the world’s largest airports and has intentions on being a hub for international travel (i.e. Turkish airlines connecting Europe with Asia via Istanbul), it is interesting is that Turkey is viewed as significantly less secure than many other destinations. It would be interesting to see if this view is consistent in countries outside of Australia and may be something that those involved in the Turkish infrastructure investment may wish to change. It is also interesting that the United States is not viewed as a particularly secure route or destination.

With respect to the best-worst task to see which security procedures generate the most agreement (from a large range of different protocols with differing levels of invasiveness), there is a sense that that respondents do not see CCTV systems as an invasion of privacy, rather are very necessary for ensuring security in airports, even if it means adding smart software detection such as facial recognition. The experiment also reveals that respondents are happy to spend a little more time in security and in particular, they are also agreeable to spending extra time in security if that additional security measure

does increase time spent. Interestingly the privacy statements (and invasion thereof) illicit no great levels of agreement or disagreement and the same is true for the various levels of increased biometric data collection. This should not be taken as *carte blanche* to dramatically increase security measures, as perhaps respondents find such measure agreeable or disagreeable because they cannot imagine draconian procedures. Lastly, liquids appear to be a controversial issue so we recommend that better communication around this issue is required, or closer investigation as to traveller preferences around liquids is required.

For those unfamiliar with best-worst experiments, they offer a number of advantages over traditional item-based response scales. In particular attributes can be evaluated relative to each other (Lee et al. 2008), replies are more unambiguous as people are generally clearer about the extreme options (Marley and Louviere 2005) and such tasks produce reliable estimates of the relative importance of attributes (Marley et al. 2008). With this in mind our results give a good indication of relative security of routes/destinations and what aspects of security travellers agree with most or least. The scale parameter with respect to the choices of the “worst” alternative is significant in both experiments, perhaps indicating that respondents are more certain about that what they dislike, (i.e. they may be more focused on the negatives rather than the positives). Knowing that travellers focus on what is least secure or security procedures they agree with the least is an important behavioural insight to airlines, airports and authorities charged with air security to note; such bodies would conceivably achieve better results to address the negative perceptions rather than foster positive associations.

The stated preference experiment revealed three broad classes of differing sensitivities towards travelling under different security regimes. One class of respondents who are best termed nervous about flying are seemingly persuaded to travel by the presence of security personal (either uniformed or not) on-board the aircraft. The largest class of potential travellers are those who are trusting of authorities and have relatively higher levels of overall safety while flying. This group are willing to experience a range of security measures, many of which are potentially more invasive than the current systems. The last class is somewhat akin to status quo travellers who seemingly wish to maintain the current levels of security, perhaps because they feel it is sufficient protection.

From an Australian perspective, there is significant willingness to pay for increased measures during passport screening. It was revealed as part the investigation into the disappearance of MH370 that two Iranians on board were travelling on stolen European passports which went unchecked against international databases or any potential biometric information. The resultant controversy surrounding the use of stolen passports is perhaps the reason for this high willingness to verify the identity of the passport holder. Perhaps in response to this willingness, a raft of new security measures were announced in August 2014, with the Australian Federal Government announcing that finger printing technology at the departure and arrival gates will follow the early roll out of e-gates with facial recognition software. Additionally, 80 national security officers will be deployed to every major airport to deal with potential threats, though these security measures are still yet to pass Parliament (Migration Amendment Bill 2015). Seemingly there is support for these measures.

Perhaps most interestingly is the relative magnitudes of the marginal willingness to pay statistics that are calculated from this study. The willingness to pay values for the extant and overt security measures such as X-ray procedures, security personnel, CCTV and more thorough passport protocols are much higher than the willingness to pay to stop one more additional incident over a ten year period. This may indicate the strength opinion among our sample that these measures are needed but also that they are effective, thus there is no need to pay more for stopping incidents (i.e. the current measures do successfully stop incidents such that respondents can see no real improvement to stopping threats). Potentially the concept of stopping one or two additional incidents every ten years maybe compartmentalised as such random or improbable events that they are unlikely to experience it

themselves (perhaps a belief that it will happen to someone else not me) and thus are unwilling to pay a great deal for something they either consider highly unlikely already. Alternatively, the relative recency of the MH370 and MH17 events may have been perceived as the occurrence of two highly rare events within a short span of time, thus respondents may be of the view that the chances of anything happening within the next 10 years is very small. Again, on this point it is worth noting that this survey was collected prior to the Germanwings Flight 9525 and the TransAsia Flight 235. Willingness to pay to avoid incidents may have changed given the density of such events over the last 12 months, although both Germanwings and TransAsia are seemingly the result of staff actions, rather than failures of passenger facing security measures (and to some extent perhaps there is the view that the Malaysian Air disasters are also the result of staff or policy rather than arising from actions of passengers).

Overall we have comprehensively examined the attitudes and behaviours of travellers with respect to security procedures inherent in the process of international travel, contributing to a gap in the extant literature. The final question of the survey asked respondents for general feedback, the overwhelming feeling from those who replied to this question was the relevance of the survey, with comments ranging from “very relevant survey” or “very important issue” thru to “thanks for the opportunity to contribute to such an important research subject in these uncertain times” and “unfortunately this is the world we live in.” We asked respondents about a range of variously invasive measures and have found no strong willingness to accept security processes that invade privacy considerably more what is currently practiced. This is especially poignant in light of how soon this survey was conducted following the Malaysian Air disasters.

Opinion on the security of international travel is diverse. Some respondents stated concerns like “I always feel slight trepidation when flying now simply because of the terrorism hype”, or “I would like to feel safe on a plane but I would not at the moment. I think we must be more like USA”, or “airport security is very important. Anyone decent looking, even an old lady can be carrying drugs etc.”, to “every passenger needs to be thoroughly screened, searched, drug tested before beginning a flight”, whereas other respondents commented “I was a travel agent and I was never unsafe on any flight I took”, or “generally I feel quite safe travelling by plane from an airworthiness, personal safety and security.” While mirroring Potoglou et al. (2010) in finding some evidence that travellers are willing to trade personal freedoms for improved security, we largely conclude that with respect to air travel the magnitude of trade-offs are limited. Either travellers are willing to accept risk, or perceive them as isolated or perhaps limited to airlines with inferior safety records. In conclusion, travellers are willing to accept security as part of the travel process and are seemingly willing to spend a little more time in the process so long as it is effective in increasing safety. We feel there is some scope for authorities to change or increase security measures if needed, so long as it is adequately explained and demonstrably effective.

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