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THE WILLINGNESS TO PAY OF AIR TRAVEL PASSENGERS TO OFFSET THEIR CARBON DIOXIDE (CO_2) EMISSIONS: A PUTRAJAYA RESIDENT CASE STUDY

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Abstract: *Nowadays, demand for air transportation has increased tremendously. The rise in airline flight will increase the amount of carbon dioxide (CO_2) released into the atmosphere. Some countries are developing strategies to reduce CO_2 emissions from aviation, and Malaysia's target is to reduce CO_2 emissions by 45% by the year 2030. Consequently, this study investigated whether Malaysian air travellers are willing to pay for an increase in their travel cost to reduce the carbon emissions from their flight to minimize the environmental impact. Using the contingent valuation method of double-bounded dichotomous choice format and a survey of 250 Putrajaya residents' to gage their willingness to pay (WTP) for airline carbon offsets, where the majority of people travel by airplane, instead of driving cars for a long travel distance. The results reveal that the WTP is RM6.10 per person; income and age were found to have a significant relationship with WTP. Hence, this scheme can be realized if the Malaysian air travellers, especially the respondents from Putrajaya, cooperate by paying extra money for a "Carbon Neutral Fund" to protect and rehabilitate our environment from being polluted by aviation activities. Policy implications of the findings are discussed, encouraging aviation industries and policy makers to implement greater voluntary climate action.*

Keywords: *Contingent Valuation Method (CVM), Willingness to Pay (WTP), Carbon Dioxide (CO_2) Emissions, Airline Carbon Offsets, Air Travel*

Introduction

Climate change is an important worldwide issue, because our Earth is warming. Average temperatures at the Earth's surface are increasing and are expected to continue rising (Environmental Protection Agency, 2016). Malaysia is one of the many countries that contribute to the global warming problem. Evidence of the existence of climate change in Malaysia includes the changes in the rainfall season and the increase in the number of floods. Carbon dioxide (CO_2) emissions are one of the main contributors to climate change; the transportation sector is a major source of CO_2 emissions. Nowadays, many people choose to use airplanes to travel, instead of cars. Time and cost savings is one of the main reasons for this. As such, the popularity of air travel in relation to climate change should not be ignored. This is because of the number of airplane passengers from year to year increases. Rising incomes and lower travel costs have resulted in a boom in air travel (Mayor and Tol, 2010).

The total passenger movements in Kuala Lumpur International Airport (KLIA) has been increased from year to year. In 2004, Malaysian Airport Holding Berhad (MAHB) reported that total passengers' movement in 2004 are 39,430,646 and this number increased to 83,348,003 in 2015. This show that the demand for air transportation are getting increase as one of the reason is the variety of air transport in term of flight destinations. Truly said that almost all locations within Malaysia could be reached by using air transportation within a short period and as many airlines offered for an international destination, more frequency and more demand for a long distance travel. People nowadays travel using air transportation not only for business purpose but also for leisure purpose, and it is getting the increase from year to year. This also can relate to the cost of travel where the price offered is affordable for all level income. Thus, people chose to travel more using air transportation rather than driving or used any road transportation. However, these facilities are expected to be one of the contributors to the air pollution problems and more serious, global warming.

In order to achieve developed nation status by 2020, Malaysia is trying to strengthen and stabilize the country's economy. Malaysia is also trying to address and overcome problems faced by the country, such as global warming and increase in carbon emissions, to become a sustainable development country. As such, Malaysia has a target to reduce CO_2 emissions by 40% by the year 2020, as compared with the 2005 emissions level (Bernama Press, 2009). In order to reach the Malaysian target for 2020. Thus, serious actions have to be taken to reduce carbon emissions.

The main objective of this study is to quantify whether air travel passengers, as a polluter, endorse increases in cost of their travel to reduce the CO_2 emissions from their flights. More specifically, the objective aims to find the determinant for the willingness to pay (WTP) and quantify the value of WTP in reducing CO_2 emissions. The results may lead many aviation industry parties to take serious steps in reducing CO_2 emissions. One way to reduce CO_2 emissions is for governments to make strict policies, such as a fixed total for CO_2 emissions released from aviation. If the aviation industry does not follow the policy, then they should pay money as their punishment. This may be a way to support an action taken to avoid any future climate change problems. Measurements of passenger WTP can also help policy makers. This will help the aviation industry reduce CO_2 emissions by providing them with a budget to encourage the use of alternative fuels (e.g., bio fuels), which produce less CO_2 emissions.

Malaysia Airlines (MAS) and Air Asia is the two main airlines company monopolized in Malaysia. Air Asia is well known as a low cost airfare and MAS is the national carrier of

Malaysia, offering the best way to fly to, from and around Malaysia. Apart from these two companies, there is also another airline available (Malindo Air and Firefly). Malindo Air is a Malaysian premium airline which cooperative pact between the two countries (Malaysia and Indonesia) while Firefly is a partner company with Malaysia Airlines but has a separate management apart from its parent company. However, this study will only focus on two main carriers which are MAS and Air Asia because of the destination offered by this two carriers are widely compared to another two commercial flight, Malindo Air, and Firefly.

Surgenor (2008) reported that an agreement was signed between the Forest Research Institute of Malaysia (FRIM) and Malaysia Airlines (MAS) for a program called 'Towards a Greener Future.' This program promises a contribution in reducing CO_2 emissions and its effects. However, this program is afraid has been failed because until now, MAS did not provide any information or any progress regarding this program. Thus, there is need a research about this program to investigate and understand how passengers reacted thru this such program. On top of that, there should be more policy options given to the aviation industry for restraints about the climate change impacts of aviation (e.g., carbon offset activities which involve cooperation between the airline industry and passengers via a tax on aviation).

Establishing an individual's WTP for carbon emissions reductions would help decision makers take alternative steps to increase individual involvement in reducing environmental impacts (Mehedi Masud et al., 2015). Besides, this study is hoping can help the aviation industry or policy makers to design the effective financial instruments to generate fund for carbon mitigation. To meet this objective, a survey was conducted at Putrajaya Federal Territory, Malaysia. Air travel passengers in Putrajaya were required to live and work in Putrajaya, whether they were government or private sector employees.

The rest of the paper is structured as follows. The next section presents information about pollution from aviation. The third section elaborates on the survey methodology. The fourth section reveals the estimation results and the last section concludes the paper.

Aviation growth and pollution

Commercial airlines and air freight carriers are the dominant air transportation systems in Malaysia (Ong, Mahlia, and Masjuki, 2012). Air pollution is an issue that is difficult to overcome and resolve. This problem is rampant, especially for a developing country. CO_2 is a harmful gas that contributes to air pollution. Increases in CO_2 in the atmosphere occur because of the burning of fossil fuels. These CO_2 increases trap the additional heat in the lower and higher atmosphere and affect the global climate.

Climate change is an important global issue. It impacts the environment, society, and economics. In comparison to the terrestrial sources of emissions, aviation is recognized as having an enhanced global warming effect, due to the altitude at which aircraft fly (IPCC, 1999). This enhanced effect is estimated to be between two and four times the global warming potential of the CO_2 emissions from aviation and as the aviation traffic increase dramatically over the past 40 years (Brouwer, Brander, and Van Beukering, 2008).

As an automobile produces CO_2, and carbon monoxide (CO), so do aircraft. Like many other vehicles, aircraft engines produce CO_2, water vapour (H_2O), NO_X, CO, oxides of sulphur (SO_X), unburned or partially combusted hydrocarbons, also known as volatile organic compounds (VOCs), particulates, and other trace compounds (Federal Aviation Administration, 2005). According to Koutsourakis et al. (2006), CO_2, H_2O and CO are the most

common aircraft emissions, whereas unburned hydrocarbons (HC) and CO are high when the engine is cold. Aircraft emissions of CO_2 represented 2.4% of the total fossil fuel emissions of CO_2 in 1992; this is equivalent to 2% of the total anthropogenic CO_2 emissions (IPCC, 1999). Aviation is thus a significant and increasingly contribute to the global warming. Gössling et al., (2007) come out with three main reasons on why air travel is considered as an importance contributor to the problem of global warming:

i) Those who are travel using air travel for international transport are only a minor (less than 2% of global population).

ii) Emissions from air travel are harmful because they are released at the upper troposphere (0 to 10km from the earth's surface) and lower stratosphere (10 to 50km from earth's surface) and it will give an impact to the ozone generations. Besides, it is worried that the emissions from air travel will keep increase and contribute to global warming up to 9%.

iii) Technological progress in aviation industries is growing at the slowest rate. Potential to use efficient fuel in the aviation industry will take order in the year 2040 (Peeters and Middle, 2006).

Emissions from aircraft cause many health and environmental problems. In terms of environmental impacts, emissions from aircraft, especially CO_2, will harm the atmosphere and cause climate change. The climate impact of aviation is driven by the long-term impacts from CO_2 emissions and the shorter-term impacts from non-CO_2 emissions and its effects (e.g., the emissions of H_2O, particles and NO_X) (Lee et al., 2010). There are many possible ways to overcome the climate change problem. One is that airlines industries should emphasise environmental images to reduce carbon emissions (Hagmann, Semeijn, and Vellenga, 2015).

As in United Kingdom (UK), they have implemented a policy option for controlling the climate change impact of aviation, by let the polluters pay for hypothecated tax on aviation. Individual, business or government can choose to purchase to reduce emissions during their flight in order to maintain 'carbon neutrality' (Brouwer, Brander, and Van Beukering, 2008). Carbon offsetting may include activities such as reforestation, renewable energy and energy efficiency projects (Choi 2015; McKerron et al. 2009; Brouwer, Brander, and Van Beukering, 2008).

Economic Valuation Method

Contingent valuation method (CVM) is one of the methods in non-market goods. CVM has been the most commonly used, directly asking respondents' whether they would be willing to pay for a certain amount of money for non-market goods (Bateman and Willis, 1999). This method is broadly used in areas of economics such as environmental economics and health economics. It also can be applied in estimating both use and non-use values of environmental goods (Mitchell and Carson, 1989). However, nowadays, CVM can also been seen in the area of aviation industry.

The literature provided only a few research that examined the monetary values of carbon offset in aviation sector. Brouwer, Brander and Van Beaukering (2008) found the value of mean WTP among 400 passengers at Amsterdam Schiphol Airport in 2006 are €26.60[1] or RM132.76, in the form of carbon tax. His study also used double bounded CVM questions. Lu and Shon (2012) interviewed 1,339 Taiwanese International travellers using double bounded CVM

[1] Exchange rate €1 = RM4.99

questions. This study found that the value of mean WTP per tonne of CO_2 emissions, with different range because depending on their destination (Asia countries, Europe, North America, and Ocenia). The values are between US$20[2](RM85.83) to US$28 (RM120.16) per person. MacKerron et al. (2009) calculated that the value of offset among British adults was estimated to be £13.2[3] (RM73.32) per person. Study done by Choi (2015) investigate the consumer preferences among Australian for voluntary climate change if the mandatory carbon price is introduced. Results of his study shows that the WTP value gap between without and with the mandatory become substantially reduced (AU$42.24 [4]or RM143.91 and AU$33.45 or RM113.96 per tonne of carbon emissions) when a group of committed travellers were only considered.

Methodology

Study area

This study focused on Malaysia's third and latest Federal Territory, Putrajaya. There are several reasons why Putrajaya is selected, one of which is that most of the time government employees using airplanes to travel for business purpose, especially those with high position. This study have selected a few ministry such as Ministry of Finance (MOF), Ministry of Health (MOH), Ministry of Education (MOE), Malaysian Administrative Modernisation and Management Planning Unit (MaMPU), Department of Statistics Malaysia (DOSM), Accountant General's Department of Malaysia (JANM) and Royal Malaysian Customs Department (KASTAM). The listed ministries have been selected as the sampling targets because only this ministry agreed to cooperate in carrying out this study.

Sampling technique and data collection method

The survey was conducted from January to February in 2014. All of the respondents were Malaysian citizens and our target respondent was the government employee, taken based on the list above. The questionnaires were distributed and collected through face-to-face interviews. Face-to-face interviews are one of the most common survey mode used in any research because complex questions and questionnaire structures are possible (Bateman et al. 2002). Besides, respondent can directly ask enumerator to get a better understanding regarding the questions. Using a cluster sampling technique, we clustered the study area into a specific geographical location (present); and only focus to those with high position (N41 above) We then randomly chose the respondents from the selected sample.

A total of 300 questionnaires were distributed among government employee through a face-to-face meeting. However, of the 300 questionnaires, about 50 questionnaires were unacceptable, resulting in 250 useable questionnaires. The sample size decision was made based on Mitchell and Carson (1989), which required 250-500 for open-ended survey and 500-1000 for a closed-ended survey. Passengers were interviewed face-to-face about their travel behaviour and their WTP for a carbon offset. At first, the detail about carbon offset were explained to the passengers.

Design of questionnaire

The questionnaire had four sections. The first section is a general information about flight experience of each passengers. The second part include a question about passengers'

[2] Exchange rate USD1 = RM4.29
[3] Exchange rate £1 = RM5.55
[4] Exchange rate AU$1 = RM3.41

knowledge regarding emissions from aviation, the adverse effect of emissions and a rating question for strategies to reduce emissions from aviation. The third section focus on the contingent valuation question, included a description of the current situation regarding carbon emissions and the issues discuss, together with an info for payment methods. The contingent valuation questionnaire requires respondents to consider how a change in a good or service that is typically not traded in markets might affect them. Then, the policy change has also been described in detail before respondents are asked to evaluate it (Bateman et al., 2002). Lastly, respondents are asked to make a monetary valuation of the changes in question. The fourth section collected information on the passengers' socio-economic characteristics. Four different version of the questionnaire were prepared, and the difference only at section three, contingent valuation question. These four question will have a four different bid value (starting bid value with 3%, 5%, 7% and 9% increment air fare from current fee).

Carbon offsetting valuation questionnaire

This study is believed will contribute to the body of literature on contingent survey design, employing a double bounded and open-ended elicitation for the valuation. CVM questions were designed to elicit the respondent's WTP. The CVM questions were adapted from Brouwer, Brander and Van Beukering (2008). The initial bid for this study is ranging between 3%, 5%, 7% and 9% increment of air fare every time purchases (considering their answer yes or no). Next they were questioned for WTP for second follow-up bid, to which they can still need to answer 'yes' or 'no'. If respondent answer 'yes' or 'no' to the initial bid, the follow-up bid is higher or lower amount. It is indicate to as double-bounded dichotomous choice question. Respondent need to ask the valuation question, based on the scenario given (explanation about emissions from aviation and the payment technique used). The valuation question are as below:

> *An additional CO_2 in the air is causing environmental change, which could harming on people and the earth. All airline produce CO_2 and one of the way to reduce this emission by investing in project that absorb CO_2 in atmosphere. Additional charges of 3%, 5%, 7%, or 9% will be channelled to the relevant organizations, such as the FRIM, to run the activities accordingly. This extra charge is not imposed by force; it totally voluntary. If there is an additional charge on top of your airfare to support the agency that is responsible to reduce the carbon emissions, would you be willing to pay for this and continue using the airlines?*

Respondent then need to provide a maximum amount of money that they are willing to pay to offset their emission (using open-ended format) on top of the air fare while making a purchase. If respondent are not willing to pay, they have to answer the follow-up question to find their reasons for not willing to pay. Four different version of questionnaire (difference in terms of bid value) were divided equally.

Specification of the model

This study used a logit model to regress the demographic characteristic, which can influence an individual's WTP to reduce CO_2 emissions. The linear equation to determine the WTP is providing by Hanemann (1994):

$$WTP_i = x_i\beta + e_i \quad (1)$$

Where x_i stands for independent variable which indicates passenger income, age, gender, education and many more which are observable. β is a parameter to be estimated with

numerical values. In this study, i represents an individual who participate in this study. WTP_i is a dependent variable of the research. Followed by Hanemann, Loomis and Kanninen (1991), the model formulation are as below:

$$\text{Prob } \{\text{NO}\} \Longleftrightarrow \text{Prob } \{WTP_{max} < BID\} \iff G\ (BID;\ \theta) \quad (2)$$

$$\text{Prob } \{\text{Yes}\} \Longleftrightarrow \text{Prob } \{WTP_{max} > BID\} \iff 1\text{-}G\ (BID;\ \theta) \quad (3)$$

Where, BID is the proposed price bid, WTP_{max} is the maximum amount of willingness to pay and $G\ (BID, \theta)$ is the cumulative distribution function of WTP. The above equation explained that if the proposed price bid is higher than respondents' willingness to pay, then respondent are not willing to pay for that amount. Otherwise, if the price bid below than their maximum willingness to pay amount, the probability of saying "yes" for that answer is there. These equations are based on the response of consumer towards program and the decision on random utility. Thus, it can be defined as equation (Flachaire and Hollard, 2005):

$$c_i = 1; \text{ if } WTP_{max} > BID \quad (4)$$

$$c_i = 0; \text{ if } WTP_{max} < BID \quad (5)$$

Where c_i = 1 represents the passenger *i* would say "yes" to the proposed price bid and responses "no" to the question when c_i = 0.

The detail of the model is as below:

$$WTP = \beta_0 + \beta_1 bid + \beta_2 age + \beta_3 edu + \beta_4 gend + \beta_5 job + \beta_6 inc + \varepsilon \quad (6)$$

where:

WTP = Probability of saying "Yes" or "No" to offer price (dependent variable)

bid = Bid for carbon offset price expressed in Ringgit Malaysia (RM)

age = Age of respondent in year

edu = Respondent's higher education

$gend$ = Gender of respondent

job = Respondent's occupation

inc = Respondent's monthly income expressed in Ringgit Malaysia (RM)

The model shows above can be illustrated by the theoretical framework proposed for this study.

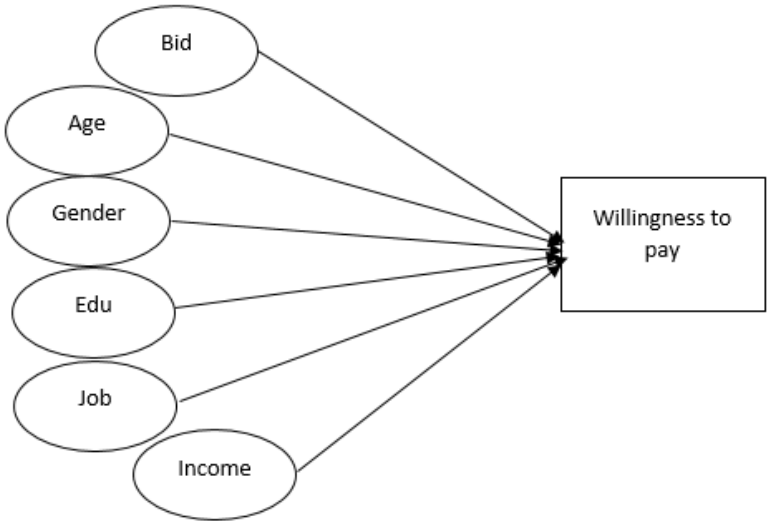

Figure 1: Conceptual framework of study

The conceptual framework in Figure 1 shows the relationship between independent and dependent variable of study. Independent variable bid, age, gender, education, job and income have a direct relationship and affect willingness to pay. However, to calculate the value of willingness to pay, based on method provide by Cameron (1988), the estimation of mean WTP can be derived as below:

$$WTP = \frac{\beta_0 + \sum_{i-2}^{n} \beta_i x}{-\beta_1} \quad (7)$$

Where β_0 is estimated constant, β_1 is the coefficient for the price bid, and β_i is the coefficient for socio-economic characteristics of respondents. Table 1 presents the theoretical expectation of the explanatory variables. In this research, from the listed variables in equation (6), five variables are expected to have a positive signs, namely age of respondent, respondents' higher education, gender of each respondent, respondents' occupation and respondents' monthly income, these variables are expected to have a positive relationship with the respondents' willingness to pay decision. However, variable bid for carbon offset price is expected to have a negative relationship with a willingness to pay because usually when the bid price increase or getting higher, the respondent will choose not to pay because some may not afford to pay the higher bid price.

Table 1: The expected sign of the explanatory variables

Variable	Expected Sign	Explanation
Bid price	-	A bid price is expected to have a negative impact because when the price of bid increase, passengers are not willing to pay because it will reduce the income of passengers.
Age	+	As passenger are getting older, they will pay more for carbon offset, which they are more concern and aware about the importance to take care of the environment for today and future generation. Thus, the expected sign will be positive.
Edu	+	A passenger with a high level of education are more aware and responsible towards the environment and

		they are willing to pay for extra money to take care of the environment. The expected sign is positive.
Gender	+	Females will pay more for carbon offset and are more sensitive towards environment compared to male because female will be more worried about their children future and environment. The expected sign for this variable is positive.
Job	+	A passenger who holds a high position in a job will pay more for carbon offset because they travel more using air transportation. The expected sign for this variable is positive.
Income	+	As the income of passengers increases, they are willing to pay more because they might have a higher level of education and holds a high position in a job, thus making them feel more responsible towards the environment. Thus, the expected sign for income variable is positive.

Results

A total of 300 questionnaires were distributed, and 250 responses were retained for analysis. The proposed independent variable was assessed for reliability and convergent validity. Convergent validity was supported because all factor loadings are significant and exceeded 0.50 (Fornell and Larcker, 1981). Besides, the independent variables show the reliability values almost exceeded the threshold of 0.7, which are 0.69 indicating that all constructs were reliable.

The socioeconomic characteristics of respondents

Table 2: Socio-economic Characteristics of respondents (n=250 respondents)

Variables	Group	Frequency	Percentage (%)
Gender	Male	126	50.6
	Female	123	49.4
Race	Malay	215	86.3
	Indian	15	6.0
	Chinese	17	6.8
	Other	2	0.8
Age	25 and below	10	4.0
	26-35	137	55.0
	36-45	66	26.5
	46 and above	36	14.5
Education level	Some high school	48	19.3
	High school diploma	71	28.5
	Bachelor's degree	116	46.6

	Master's degree	14	5.6
	PhD degree	0	0
Employer	Government	245	98.4
	Semi-government	3	1.2
	Private	1	0.4
	Self-employed	0	0
Monthly income	RM1000 and below	29	11.6
	Between RM1001-RM2000	21	8.4
	Between RM2001-RM3000	49	19.7
	Between RM3001-RM4000	90	36.1
	Between RM4001-RM5000	50	20.1
	RM5001 and above	10	4.0

Table 2 reports the descriptive statistics for the main socioeconomic characteristics of the passengers. The gender distribution of the sample was 50.6% male and 49.4% female. The majority of respondents aged between 26 and 35 years. In this study, 86.3% of the respondents are Malay, followed by 6.8% Chinese, 6.0% Indian and 0.8% other. Most respondent's (46.6%) held a bachelor's degree; 28.5% had a high school diploma, 19.3% had some high school education and the rest, 5.6%, had a master's degree. Most respondents were government servants (98.4%); the rests were semi-government (1.2%) servants and people that work in private industry (0.4%). Government servants in Putrajaya are granted residence in Putrajaya.

The level of monthly income was set at below RM1,000, between RM2,001 and RM2,000, between RM2,001 and RM3,000, between RM3,001 and RM4,000, between RM4,001 and RM5,000 and RM5,001 and over. The results show that most respondents fell into an income of between RM3,001 and RM4,000 (36.1%). This was followed by 20.1% that earned between RM4,001 and RM5,000; 19.7% received between RM2,001 and RM3,000; 11.6% earned below RM1,000 and 4.0% earned the highest income level, RM5,001 and above. This result illustrates that the largest proportion of respondents were in the category of earning between RM3,001 and RM4,000. This situation may be related to the level of education among the respondents.

Respondents knowledge about aviation emissions

According to the results, only 8.4% of respondent knew about emissions from aviation. 91.6% of respondents did not have any idea about emissions from aircraft. Some of passengers think that airlines itself should responsible for any emissions during travel because emissions should be related to the maintenance of the aircraft. Some would said that government should responsible for the emissions from aviation because government should impose a policy regarding emissions from aircraft and charge the airlines regarding this problem. Besides, when asking about carbon offset, almost all respondent did not have any idea about this program and will think whether will participate or not with this program.

Empirical results of logit model

The empirical study is based on econometrics techniques using logit models. The data is analysed using Stata Version 11. The value of 0 is given to respondents who rejected the idea of interest in regression. 0 is used to code answer for "no" to the question of "Are you willing to pay for extra RM*X* to reduce carbon emissions from your flight?" Then the value of 1 is for "Yes" answer if respondent accepts to pay more for the offer.

Table 3: Choice of Bid Price

First Bid Price		Second Bid Price	
No	Yes	No	Yes
124	125	145	104

Table 3 shows the distribution of the bid price (first and second bid price) among respondent. The first and second bid price consists of two answer which is "yes" and "no" answer. About 125 respondents chose to answer "yes" for the first bid price while 124 are not willing to pay at first bid price (answer "no"). As the bid question, if respondent answer "yes", then will be asked for the next higher value and if they answer "no" for the first bid, then the next value will be lower. The next value or the second bid price will be asked accordingly and for this question, half of respondent chose to answer "no" and only 104 answers "yes" for the second bid. This can be concluded that respondent are not willing to pay more when the price of bid increase or decrease (second level of a bid).

Table 4: Results of Logit Model

Variables	Coefficient	Standard Error
Constant	0.717	1.232
Bid price	-0.122	0.061**
Income	0.449	0.137***
Gender	-0.054	0.270
Age	0.402	0.229*
Education	-0.047	0.164
Job	0.683	0.839
Log Likelihood	-164.657	
Chi squared	15.87	
Pseudo R squared	0.046	

Table 4 demonstrates the determinants of WTP by using double bounded dichotomous choice. This regression included socioeconomic characteristics such as age, gender, occupation, education and income level of respondents. The results show that not all of independent variable in this study is significant with WTP. The significant variables in this consist only variable income and age, while the insignificant variables which do not have the impact on WTP are gender, occupation, and education. The price bid variable has a negative sign and statistically significant at 5% as predicted. This showed that when the price bid increase, there will be a decreased number in passengers' willingness to pay.

Passengers' income is a significant determinant in this study (significant at 1%) with a positive sign. As expected based on economic theory, WTP is significantly influenced by passengers' income as the more someone can pay, the higher the probability that someone responds positively to the presented bid amount (Brouwer, Brander and Van Beukering, 2008). Other than variable income, age also shows a significant result with WTP at 5%. When age increases, people are WTP more. Perhaps this is because they think they need to contribute to counterbalance the carbon since it is imperative for them to ensure that the next generation will feel the same air just what we have today because air pollution causes thousands of illness and can damage trees and plant. Besides, older people are more concerned about climate change than younger people. Study by Grønhøj and Thøgersen (2009) state that as people grow older, they become more by showing a pro-environmental behaviours, which becomes apparent in actions such as buying environmentally products, recycling and making an effort to save electricity. Most old-age respondents in Putrajaya have held high positions. Young respondents tend to save their money for the future rather than spend it for a carbon offset.

Moreover, in this model, the chi-squared is 15.87%, and the value of Pseudo R squared are 0.046. The R square value describes an indication of how much dependent variable explains by the model. A log-likelihood ratio index is used to test the overall goodness of fit for the model and the value of it for this study reported are 164.66.

Willingness to pay estimation

Based on estimation of willingness to pay (WTP) value, the calculated of WTP is the highest at RM8.19 and the lowest is RM4.00. The computed mean WTP for this study is RM6.10 per person. This value can be explained as passengers are willing to pay RM6.10 extra on top of the airfare while purchasing the ticket, to offset the emissions during their travel. This additional cost is completely voluntary; it allow passengers to make a personal choice whether to pay or not to pay. Thus, the money collected will be donated to support the Carbon Offset Program such as reforestation, install some renewable energy sources for example solar energy and wine turbine power, and apply energy efficiency which all of this can reduce carbon emissions.

Estimation of passengers' willingness to pay to offset carbon emissions can be referred to equation (4), followed method provided by Cameron (1988).

$$WTP = \beta_0 + (\beta_{inc} * inc + \beta_{age} * age)]/-(\beta_{bid})$$

Where, β_{inc} , β_{age} , and β_{bid} referred to the estimated variables for passengers' income, age of passengers' and the bid price. Thus, the value for mean willingness to pay are estimated using the above equation. RM6.10 per person or per passengers for logit model of this study.

Conclusion

This study evolved from the carbon offset program through the aviation industry. CVM can help estimate a value of satisfaction and a willingness of a respondent, as a passenger of an airplane, to contribute to offset CO_2 emissions. The benefit of this study is that people will start to become aware about airplane emissions and how important it is to control. This is because emissions from airplanes contribute to the universal problem of global warming and climate change. Thus, with this study, people may know more about why they need to involve themselves in such a carbon offset program.

The non-market valuation CVM will help determine the value respondents are WTP to offset CO_2 emissions. Besides, by using the econometric equation of the interval approach, people

will understand more about what determinants effects WTP. Perhaps WTP can be applied to a real situation. This is valuable, because people will understand and put or fix a value from this study to the real world. The results show the value of the bid and which bid is significant with the correct expected sign, which is a negative sign.

The results show that bid, income and age are significant. Other attributes were not significant. People are still not aware about CO_2 emissions from the aviation industry. The mean WTP was RM6.10 per person. This amount shows that people are WTP for a carbon offset of RM6.10. Income is significant with a positive sign. The higher the income, more respondents are willing to pay for carbon offset. Besides, age variable also shows the positive and significant result with WTP. The older respondent is more willing to pay compared to younger, because the older started to aware and concern about the importance to take care of the environment, for current and future generation. However, most respondents were not aware about the importance of controlling and reducing CO_2 emissions, especially from airplanes. Respondents did not have extensive knowledge of the emissions from aviation; these emissions mostly affect GHG. There are a variety of techniques that can be used by the government or by the aviation industry to create awareness about the importance of the environment to everyday life.

An awareness campaign can be conducted either by the government or the industry itself. The government can use social media as a medium to spread an awareness campaign by using Facebook, Twitter or Instagram. Passengers can learn about this on the plane. The airline can provide consolation to passengers who are willing to engage in awareness campaigns. The government should also engage with strategic partners to assist in efforts to better the environment. Besides, the airlines' industry itself should indicate the action that has been taken to reduce or to overcome with the greenhouse gas emissions problem, for example, use the environmental technology or by implementing any sustainable ways among their crew.

Further action can be implemented by extending the case study. It can be done at widely by focusing on one state or also can be the whole Malaysia. Besides, the study will be more significant if the study is done by selecting one airline instead of choosing the entire aviation industry. Last but not least, future models should include more attributes for determining the WTP.

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