

**Modeling the effect of enlarged seating room on passengers' preferences  
of domestic airlines in Taiwan**

**Jin-Long Lu**

[jin@mail.cju.edu.tw](mailto:jin@mail.cju.edu.tw)

**Li-Non Tsai**

[lufthansa777@hotmail.com](mailto:lufthansa777@hotmail.com)

Department of Aviation and Maritime Management  
Chang-Jung Christian University  
396, Chang-Jung Rd., Sec. 1, Kway-Jen,  
Tainan, Taiwan, 711, R.O.C.  
Tel: 886-6-2785123 ext 225

**Abstract**

This study addresses the need for measuring the effect of enlarging seating room in airplane on passengers' preferences of airline in Taiwan. The results can assist Taiwan's domestic air carriers in better understanding their customers' expectations. Stated choice experiment is used to incorporate passengers' trade-offs in the preferred measurement, and three major attributes are taken into account in the stated choice experiment: (1) type of seat (enlarged or not), (2) price, and (3) brand names of airlines. Furthermore, a binary logit model is used to model the choice behavior of air passengers. The findings show that the type of seat is a major significant variable; price and airline's brand are also significant as well. It concludes that air carriers should put more emphasis on the issue of improving the quality of seat comfort.

**Keywords:** Passengers' preference, Enlarged seating room, Stated choice experiment, Binary logit model.

## 1. INTRODUCTION

After the deregulation of air transportation market, and due to expectations of increasing demand, most airlines place as many seats as possible in each plane. As a result, the seating space for each passenger, including legroom, arm rest room, and so on, was sacrificed. Consequently, airlines offer a poor standard of passenger comfort service. However, air travelers are concerned about the service quality of seating comfort during their journey in the sky, especially for long-haul trips.

Based on the results of some reports, most airline passengers considered the seat legroom, armrest space, and personal seating room to be quite important. Especially for business travelers, they viewed the quality of seating room as a critical index of the total service quality of airlines (Toynbee, 1994; Flint, 1995). In the study of Alamdari (1999), the author also indicated that airline passengers considered the quality of seating room as one of the important factors when selecting an airline. Fiorino (1999) revealed that the uncomfortable seating configuration in coach class is the root of much passenger discontent. Hence, there are more and more airlines, including United Airlines, American Airlines, British Airways, Virgin, and Singapore Airlines, etc., that direct a lot of effort into reconfiguring seating and expanding legroom so that they can provide better seat comfort to passengers (McDougall, 2002).

In Taiwan, some local researches also showed that the service quality of seating room is one of the most important factors when travelers select a domestic airline. However, the quality of seat comfort that air passengers actually received falls far behind their expectations. Obviously, it can be seen that if airlines in Taiwan pay more attention to improving seat comfort, the passengers may attach higher values of total service quality to an airline, and might change their preference. In other words, the effect of a seating environment should not be ignored when passengers choose an airline.

What is more, due to the gradual decline in passenger load factor in recent years, it appears to be the time to discuss the policy of passenger-maximization thoroughly. In other words, if airlines can decrease the total seat numbers by adjusting the cabin configuration, or rather, enlarging the seating space of each seat, and promote different price strategies, they will probably raise the load factor as well as revenue. The aim of this study is to explore the change in air passengers' preferences, in a situation where service quality has improved (in terms of seating room), through enlarging the size of seat. Stated choice method (Louviere, *et al.*, 2000) is used to administrate an experimental design, that includes three variables (attributes): passenger seat type, price, and brand (airline). Then a binary logit model is used to describe the choice behavior of air passengers. Though the focus of this issue is on Taiwan's domestic air passengers market, the results also can be

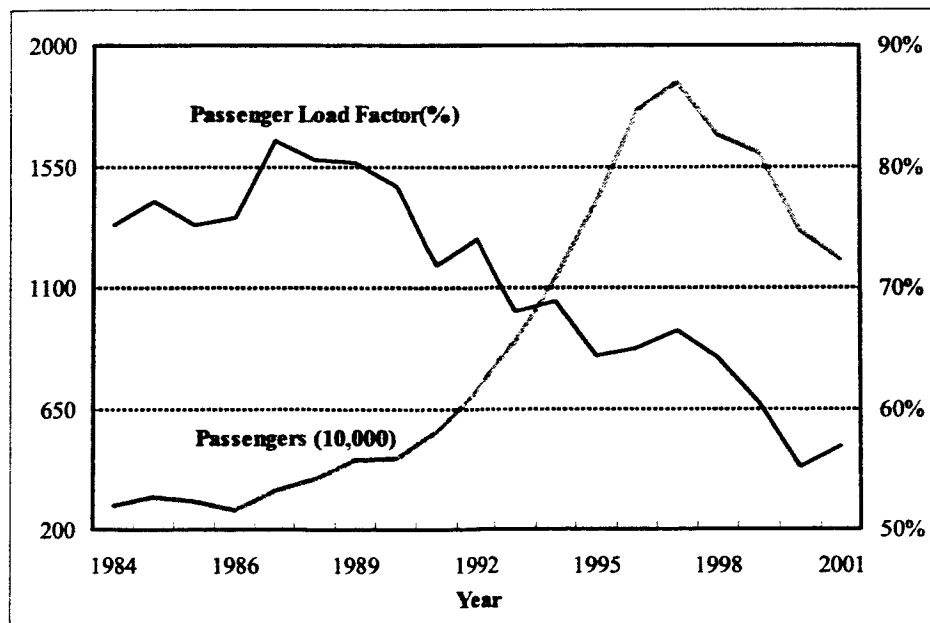
applied to the marketing practice of international airlines. Especially those domestic airlines in Taiwan that are well prepared to service the route between Taiwan and Mainland China. Thus the result of this study could provide some positive suggestions for an improvement in passenger service.

This paper is organized as follows: Section 2 describes the background of Taiwanese Domestic Air Passenger Market. Section 3 introduces the stated preference experiment strategy of this study. Section 4 presents and discusses the results of empirical analysis. Finally, Section 5 offers brief concluding comments.

## 2. BACKGROUND – Taiwan’s domestic air passengers market

The air transportation market in Taiwan has grown rapidly over the past two decades, especially after deregulation in 1988. Air transportation in Taiwan services about two percent of intercity traffic. Among them, passengers who make a round trip between Taipei, the political and economical center of Taiwan, and Kaohsiung, the biggest metropolitan city of southern Taiwan, is the major element of air transportation. In 2001, there were almost four million passengers, 33 percent of Taiwanese air transportation traffic, between Taipei and Kaohsiung.

However, in recent years, due to drastic expansion and the falling economic environment, the passenger load factor has gradually declined. In 2001, the passenger load factor was only about 56 percent. The trend described above also can be observed in Fig. 1.

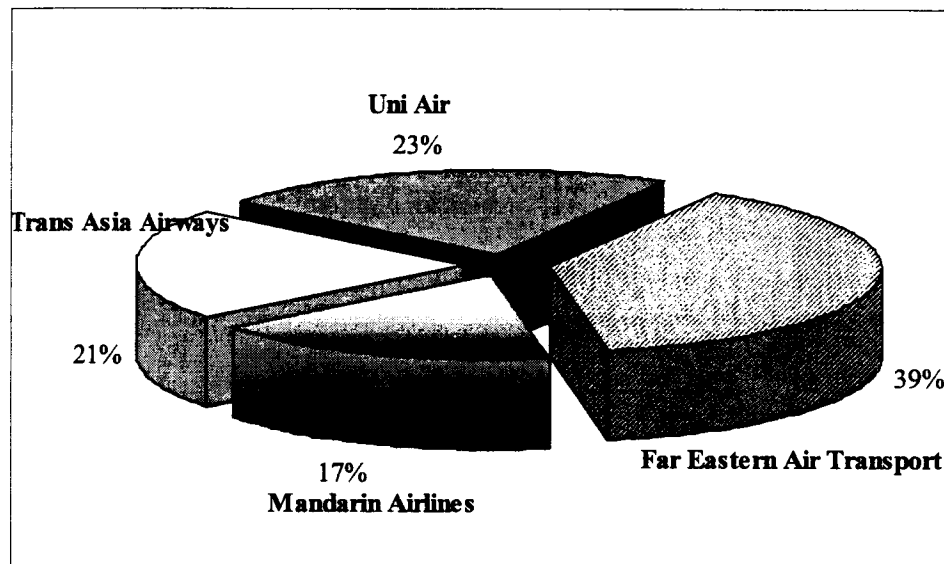


Source: *The Statistic Year Book of Civil Aviation, Civil Aeronautics Administration (C.A.A.), 2002.*

Fig. 1. The growth trends of the air passengers market in Taiwan.

At present, there are four domestic airlines in Taiwan: Far Eastern Air Transport, Trans Asia Airways, Uni Air, and Mandarin Airlines. Their individual market share of the Taipei-to-Kaohsiung route is shown in Fig. 2. The figure shows that Far Eastern Air Transport dominates the air passengers market on this route, with Trans Asia Airways and Uni Air following behind.

These four domestic airlines provide two classes of cabin configuration, business class and economic class. However, the number of seats on business class is no more than 12 (only about five percent of total seats on each plane). That means that only 12 passengers actually sit in business class on each flight, some times even fewer. Thus nearly 95 percent of domestic passengers have no choice but to sit in the very crowded economy class seats.



Source: *The Statistic Year Book of Civil Aviation, Civil Aeronautics Administration (C.A.A.), 2002.*

Fig. 2. The market share: The Taipei-to-Kaohsiung route

Moreover, these business class seats are frequently used as rewards for frequent flyers. Hence, the revenues from business class seats do not do much help to these air carriers.

In short, Taiwan's domestic air passenger market is undoubtedly shrinking. It is necessary to promote new marketing strategies to induce latent demand. Meanwhile, several studies also indicate that the service quality, in terms of cabin seating, is a fairly important factor when air passengers select an airline. As a result, strengthening the service

quality of cabin seating, such as stretch out length; and expanding the width of seating space, should be given a higher priority. Consequently, it is suggested that the policy of enlarging seating room could be a new marketing strategy, and its effects on air passengers' preference of airlines should be analyzed.

### 3. STATED CHOICE EXPERIMENT

There are many factors that affect passengers' choice of airlines: time schedule, number of flights, frequency, number of direct-flights, airlines image, punctuality, in-flight services, seat comfort, passengers' attitudes, passengers' purpose of trip, and passengers' satisfaction with the airlines, etc. (Prousaloglou and Koppelman, 1995; Ghobrial, 1989; Ippolito, 1981). A conceptual figure, shown in Fig. 3, can describe passengers' choice of behavior. However, the effects of seat comfort and airlines' image are rarely quantified. Hence, the relationship that is presented as solid line in Fig 3 is the major concern of this study. Due to lack of revealed preference of seat comfort for market presence, a stated choice experiment is used to present a choice game and analyze the quantified effects of those variables.

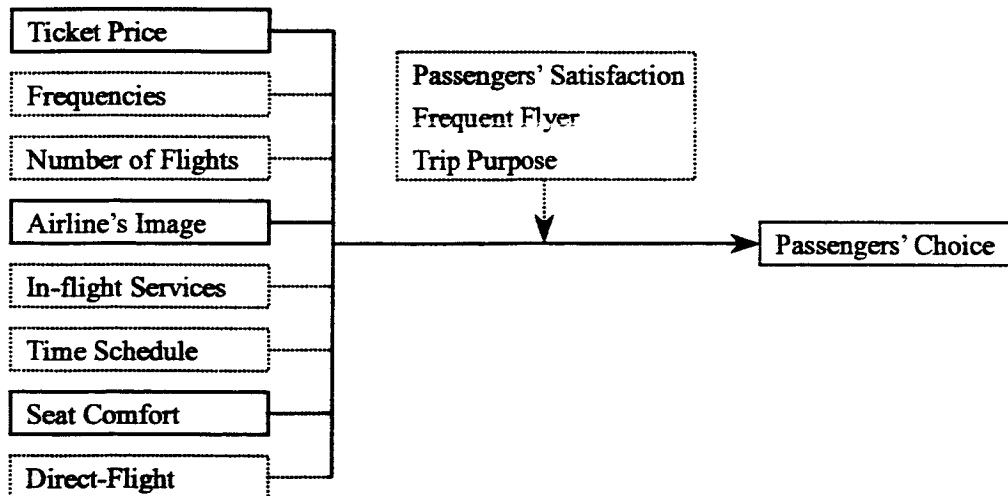


Fig. 3. The conceptual framework of passengers' choice of airlines

Let us first define the attributes and associated levels in the stated choice experiment. Here, we selected three attributes in constructing the stated choice game. The attributes and associated levels are shown in Table 1.

Table 1. Three attributes and associated levels used in the study

Variables	Levels
Seat-Type	(1) The seat-size is the as same as the market practice. (2) 50 percent of total seats are enlarged seats. (3) 100 percent of total seats are enlarged seats.
Price	(1) 10 percent higher than market average. (2) Market average.
Brand	(1) Far Eastern Air Transport. (2) Trans Asia Airways. (3) Uni Air. (4) Mandarin Airlines.

The first attribute is the type of seat, and has three levels: (1) the size of seat is same as market practice and, (2) 50 percent of total seats given on each flight are enlarged seats (the rests are the same as on the standard economic class seat) and, (3) 100 percent of total seats given on each flight are enlarged seats. The second attribute is ticket price with two levels: (1) 10 percent higher than market average and, (2) same as market average. The last attribute is the brand name of airline. As there are four airlines in the domestic air passenger market in Taiwan, four levels of brand name attribute are given as follow, (1) Far Eastern Air Transport (FEAT), (2) Trans Asia Airways (TAA), (3) Uni Air (UA), and, (4) Mandarin Airlines (MAL).

In here, we viewed the alternative represented the airline that passengers originally took as an independent alternative. So the first level of Seat\_Type was eliminated from experimental design. That is, the stated choice experiment contained 16 profiles that were generated from the experimental design of  $2 \times 2 \times 4$ . The respondents had to finish three choice tasks. The first choice task and the second choice task both asked respondents to evaluate the airline that they took originally, and one profile that selected randomly from 16 profiles, respectively. The third choice task asked respondents to evaluate the two profiles that were presented separately in the first choice task and the second choice task. That is, all respondents faced two alternatives on each choice of the game.

The choice game experiment was conducted in a questionnaire, and respondents were randomly selected from the air flight route of Kaohsiung-to-Taipei. In addition to the choice game, socio-economic status and demographic information were also gathered for sample descriptive and further analysis.

Locally hired and trained interviewers were assigned to Kaohsiung Airport, and randomly selected passengers who were going to Taipei, for interviewing. Passengers were interviewed while they were waiting for the flight that they were going to take, and asked to participate in a survey; 576 passengers fully completed the survey.

## 4. EMPIRICAL RESULTS AND DISCUSSION

In this section, we first describe the composition of samples and then analyze the results about passenger choice behavior. We constructed a passenger choice model by the use of binary logit model. Some discussions about the results found are also drawn here.

### 4.1 Sample Description

Among all the respondents, 60 percent were male, and 40 percent were female. Most respondents were at age 21 to 30 which made up 51.4 percent of all samples; followed by those at age 31 to 40 and 41 to 50. In addition, about 70 percent of all respondents were college or graduate school graduates. Furthermore, almost 30 percent of all respondents were business trip passengers, and 70 percent of all were non-business trip passengers.

Respondents were also asked what class of seat they took / were taking. The results showed that 88 percent of all respondents took economic class seats, and 12 percent of respondents took business class seats, meanwhile, only half of business class passengers (that is six percent of all respondents) paid full price.

Furthermore, over 85 percent of the respondents were unsatisfied with the seating situation currently provided on domestic flights. The major factors leading to their dissatisfaction were nothing more than lack of stretch out space, strained arm rest room, and the oppression caused by those lower overhead compartments. On the other hand, nearly 90 percent of the respondents would prefer an airline with larger and more comfortable seating configuration if their travel time became twice as the present time.

### 4.2 Affecting Factors on the Passengers' Choice of Airlines

After we referenced several studies related to passengers' choice of airline, we listed 10 possible affecting factors on choice of behavior. Respondents were asked to rank these factors using the numbers 1, 2, and 3 to represent 'Very important', 'Important', and 'Less important'. Then a score of three was assigned to 'Very important', two to 'Important', and score of one to 'Less important'. As a result, total score of each affecting factor and rank the importance of these factors can be calculated. Table 2 was the result of importance ranking of affecting factors.

Table 2. Importance of affecting factors on passengers' choice decision

Affecting Factors	Importance Ranking		
	Total	Business Passengers	Non-Business Passengers
Schedule of Time Table	1	2	1
Safety	2	1	2

Ticket Price	3	4	3
Seat Comfort	4	3	6
Airlines Image	5	5	5
Punctuality	6	9	4
In-Flight Service	7	10	7
Frequent Flyer Member	8	8	8
Reservation and Check-in Service	9	7	9
Aircraft Type	10	6	10

From the results showed in Table 2, it is clear that the top two factors affecting passengers' choice of airline are 'Schedule of Time Table' and 'Safety'. The factor of 'Seat Comfort' is ranked fourth by the total number of passengers, third for business passengers, and sixth for non-business passengers. It means that business passengers view the effect of seat comfort on their choice decision as more important than non-business passengers. Also, most passengers give more consideration to the quality of seat comfort when they select an airline. Therefore, if air carriers are willing to make more improvements in terms seating space on their fleet, this may bring some positive benefits in terms of passengers' choice.

Moreover, it also can be seen that the importance ranking of all affecting factors is quite different between business passengers and non-business passengers, especially for the factor of 'Punctuality'. It is ranked ninth for business passengers and fourth for non-business passengers. This result is different from expectations that business passengers would put more emphasis on the importance of 'Punctuality'. One possible reason of that is business passengers may mostly be frequent flyers, so they are familiar with flight schedule information, and realize that the quality of punctuality is quite good for market practice.

#### 4.3 Analysis of Passengers Satisfaction

The analysis of passengers' satisfaction can help us know the quality of airline services that passengers actually received. Ten service factors were selected and respondents were asked to separately evaluate their satisfaction of these service factors that they received by the use of five-point scale: 'Very good', 'Good', 'Moderate', 'Bad', and 'Very bad'. Next, five different scores were assigned, from a maximum of five to a minimum of one, to represent five-point scale sequentially. After calculating the total scores of each service factor, the results are shown in Table 3.

Table 3. Ranking of passengers satisfaction of service factors



Service Factors	Ranking	Mean Score	Standard deviation
Reservation and Check-in Service	1	3.67	0.61
Flight Attendant Service	2	3.57	0.69
Safety	3	3.39	0.77
Punctuality	4	3.27	0.74
Responsible for Complaints	5	3.24	0.57
Schedule of Time Table	6	3.21	0.68
Aircraft Type	7	3.12	0.62
Ticket Price	8	2.90	0.74
Seat Comfort	9	2.86	0.78
In-Flight Catering Service	10	2.82	0.74

The ten service factors presented in Table 3 are a little bit different from the ten affecting factors presented in Table 2. 'Frequently Flyer Member' and 'Airline Image' are deleted from the set of affecting factors, and the service factor of 'Responsible for Complaints' is added. The affecting factor of 'In-Flight Service' is divided into two: 'Flight Attendant Service' and 'In-Flight Catering Service'.

A study of the results of Table 3 shows that the service factor of 'Seat Comfort' is ranked far behind the other eight service factors. Also, its mean score is 2.86, indicating that the service quality that passengers received was under average. Compared to the results of Table 2, it obviously implies that there is a service gap between passengers' expectation and what is received. Again, it can be seen that the improvement of the quality of seat comfort should be advanced to the most important place. As a result, there will be positive effects in terms of the passengers' satisfaction.

In addition, each score of service factors segmented by airline, is summarized, to obtain the total scores of passengers' satisfaction with the airlines. The rankings of Taiwan's domestic four airlines are presented in Table 4. The results of Table 4 suggest that Trans Asia Airways (TAA) is the first ranked, implying that most passengers are satisfied with the services offered by TAA. The second ranked airline is Far Eastern Airline (FEAT). TAA and FEAT made up almost 60 percents of total air traffics in the route of Taipei-to-Kaohsiung in 2002.

Table 4. Ranking of passengers' satisfaction with airlines

Airlines	Ranking
Trans Asia Airways (TAA)	1
Far Eastern Air Transport (FEAT)	2
Uni Air (UA)	3

#### 4.4 Choice Model

In order to quantify the effects of improving seat comfort on passengers' preference of airline, a binary logit model is used to construct a passenger choice model. The variables that were taken into account are shown in Table 5. Among them, there are the types of seat as two dummy variables: Seat-Type 1 represented the level of 50 percent enlarged seats, and Seat-Type 2 represented the level of 100 percent enlarged seats (the reference level is same as market practice). Also, the brand names of airlines are set as three dummy variables: TAA represented Trans Asia Airways, FEAT represented Far Eastern Air Transport, and UA represented Uni Air (Reference level is Mandarin Airlines). The results of this choice model are shown in Table 6.

Table 5. The definition of variables

Variables	Definition
Price	Quantified variable. Ticket Price (Unit: 1,000 NT\$)
Seat_Type 1	Dummy variable. If the seat-size is 50 percent enlarged seats, the value of it is 1, otherwise is 0.
Seat_Type 2	Dummy variable. If the seat-size is 100 percent enlarged seats, the value of it is 1, otherwise is 0.
FEAT	Dummy variable. If the brand name of airline is Far Eastern Air Transport, the value of it is 1, otherwise is 0.
TAA	Dummy variable. If the brand name of airline is Trans Asia Airways, the value of it is 1, otherwise is 0.
UA	Dummy variable. If the brand name of airline is Uni Air, the value of it is 1, otherwise is 0.

The results in Table 6, signal that all variables are quite significant, although the variable of UA was less significant. However, the index of goodness-of-fit of this model is weak. The value of likelihood ratio is only 0.05.

Table 6. Results of passengers' choice model of airlines

Variables	Coefficients	t-value
Constant	0.786	4.184
Price (1,000 NT\$)	-0.568	-2.457
Seat_Type 0	Reference Level	
Seat_Type 1	0.724	3.585
Seat_Type 2	1.233	4.631
FEAT	0.381	2.159
TAA	0.620	3.287
UA	0.294	1.575

MA	Reference Level
Samples	576
Log Likelihood at Convergence	-379.302
Likelihood Ratio ( $\rho^2$ )	0.05

The sign of price is negative implying that passengers prefer the airline of lower ticket fare to that of higher ticket fare. The sign of dummy variables of Seat\_Type 1 and Seat\_Type 2 are positive indicating that there are positive effects of enlarged seats on passengers' choice of airline. This result supports inferences before: that passengers actually view seat comfort as an important factor on their choice decision. In addition, it is noted that the coefficient of Seat\_Type 1 is smaller than that of Seat\_Type 2. It means that the effect of 100 percent enlarged seats on passengers' choice is greater than that of 50 percent enlarged seats. Furthermore, *t*-test could be used (see the following equation) to test if the null hypothesis that these two coefficients are equal is accepted.

$$t = \frac{\beta_2 - \beta_1}{\sqrt{\text{Var}(\beta_1) + \text{Var}(\beta_2) - 2\text{Cov}(\beta_1, \beta_2)}} \quad (1)$$

In the equation (1),  $\beta_2$  means the coefficient value of Seat\_Type 2, and  $\beta_1$  represents the coefficient value of Seat\_Type 1. According to this equation, the *t*-value is 3.216. It is significant compare to the critical value of 1.96 ( $\alpha = 0.05$ ). This result implies that the effect of 100 percent enlarged seats on passengers' choice of airline is significantly different from that of 50 percent enlarged seats.

Finally, the variables of brand names of airlines are also significant. The variable of TAA that represents Trans Asia Airways has the greatest coefficient value. The second and third values of coefficients are FEAT and UA. It implies that passengers who took TAA would have stronger preferences toward TAA than passengers who took FEAT and UA. These factors are in concord with the passengers' satisfaction of airlines that was illustrated in the previous section.

## 5. CONCLUSION

In this research the effect of enlarged seats on passengers' preferences of airline was measured, it has been shown that enlarged seats do affect the choice decision of air passengers. These findings indicate that air passengers would like to choose the airlines that have the most enlarged seats, and air carriers should take the issue of seats rearrangement into consideration.

In addition, price is also a significant affecting variable. Although most studies, such as Ghobrial (1989), Ippolito (1981), and Yoo and Ashford (1996), etc., indicate that ticket price may not play a significant role in air passengers' choice, because there is not much difference in ticket price between airlines. However, a stated choice experiment was used to show the possible varieties of ticket price, and found that ten percent price range could affect passengers' choice significantly; nevertheless, the cross effects between seat-type and ticket price is not considered here. Generally speaking, air passengers who paid higher price should receive higher quality of seat comfort. That is, there is a little positive relationship between seat-type and price. In this study, it is supposed that any relationship between seat-type and price does not exist. Therefore, there is no analysis of the cross effect between enlarged seats and ticket price. This should be taken into consideration in a future study.

Finally, the variables of brand names were used to measure the effect of passengers' satisfaction with the airlines on choice decision. The findings imply that there is positive relationship between passengers' satisfaction and choice decision. In other words, the higher satisfaction passengers receive from a specific airline, the higher probability passengers choose that airline again. Hence, it also can be used to measure the passengers' loyalty to specific airline.

In spite of this, the study focuses on the passengers group in Taiwan, the findings of this study could also be applied to the international air market. It has been found that there are several international airlines that are gradually improving seat comfort in their airplanes. The usual way of upgrading the quality of seat comfort is by enlarging the seating room. Through this study, it may be concluded that enlarged seats could be an efficient marketing strategy.

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