MODELING THE EFFECT OF ENLARGED SEATING ROOM ON PASSENGER PREFERENCES OF DOMESTIC AIRLINES IN TAIWAN

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ABSTRACT

This study focuses on measuring the effect on Taiwanese airlines if they were to enlarge the seating room in airplanes per passengers' preferences. A stated choice experiment is used to incorporate passengers' trade-offs regarding preferred measurements; furthermore, a binary logit model is used to model the choice behavior of airline passengers. The findings show that the type of seat is a major significant variable; price and the airline company are also significant. The conclusion is that airlines should put more emphasis on the issue of improving the quality of seating comfort.

INTRODUCTION

After the deregulation of the airline industry, and due to the expectations of an increased demand, most airlines placed as many seats as possible in each plane. As a result, the seating space for each passenger, including legroom and arm rest room, had to be sacrificed. Consequently, airlines offer poor service when it comes to standards of seating comfort. Airline travelers are becoming more and more concerned about the quality of seating comfort during their journey in the sky, especially during long-haul inter-continental trips.

Based on the results of some reports, the majority of airline passengers consider the legroom, armrest, and personal seating room of their seat to be

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quite important. Business travelers especially viewed the quality of seating room as a critical index in the level of total service of an airline (Toynbee, 1994; Flint, 1995). Alamdari (1999) indicated that airline passengers considered the quality of seating room to be one of the important factors when selecting an airline. Fiorino (1999) stated 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, that are directing a lot of effort into reconfiguring seating and expanding legroom so that they can provide better seating comfort to their passengers (McDougall, 2002).

In Taiwan, some local researches have shown that the quality of seating room is one of the most important factors when travelers select a domestic airline. However, the quality of seat comfort those airline passengers actually receive falls far short of their expectations. It is evident that if an airline would pay more attention to improving seat comfort, the passengers might attach a higher value of total service quality to that airline, and this could very well change their preferences. In other words, the effect of seating environment on a passenger's choice of airline should not be ignored.

In addition, because of the gradual decline in the passenger load factor in recent years and the upcoming competition of high speed rail in Taiwan, it appears the time has come to seriously discuss the policy of passenger-maximization. If airlines are willing to adjust their cabin configuration and decrease the total number of seats, or rather enlarge the seating space of each seat in economy class, they can promote different price strategies and most likely raise their load factor as well as their revenue.

The aim of this study is to explore the change in airline passengers' preferences in situations where service quality (in terms of seating room) has improved by offering an enlarged seat size. It should be noted that, in this study, enlarged seats do not mean increasing the number of business class seats. Enlarged seating capacity could simply mean that the size of the economy class seats is enlarged. The stated choice method (Louviere, Hensher & Swait, 2000) is used to administer an experimental design that includes three variables: seat type, price, and company (airline). Then a binary logit model is used to describe the choice behavior of airline passengers. Though this paper focuses on Taiwan's domestic airline passengers market, the results can also be applied to the marketing practice of international airlines. This is especially true for those domestic airlines in Taiwan that are well prepared to service future routes between Taiwan and Mainland China. The results of this study could provide some suggestions for improvement in passenger service.

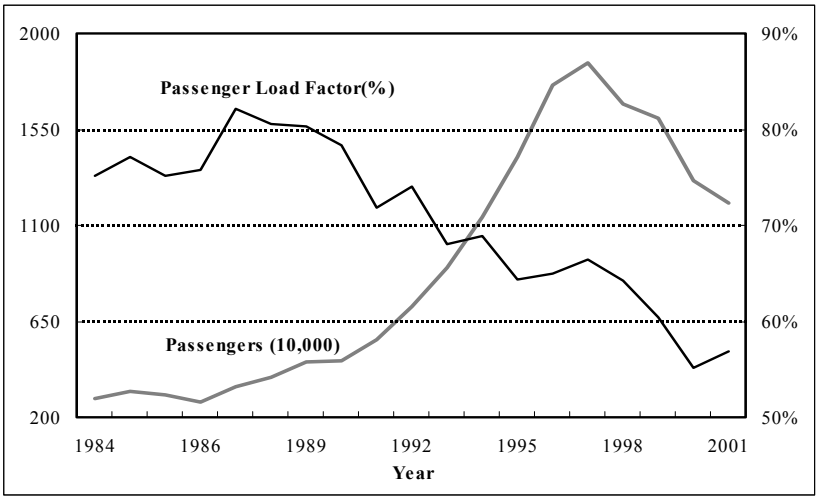
BACKGROUND

Taiwan's Domestic Airline Passenger Market

The airline industry in Taiwan has grown rapidly over the past two decades, especially after its deregulation in 1988. Air transportation in Taiwan services about two percent of intercity traffic. The round trip between Taipei in the north, the political and economical center of Taiwan, and Kaohsiung, the largest metropolitan city of southern Taiwan, is the main element of the domestic airline transportation. In 2001, there were almost four million passengers, 33 percent of Taiwan's domestic air transportation traffic, between Taipei and Kaohsiung.

However, in recent years, due to a combination of drastic expansion of the airline industry, and a slow but steady decline in the economy, the passenger load factor has gradually declined. In 2001, the passenger load factor was only about 56 percent. This trend is illustrated in Figure 1.

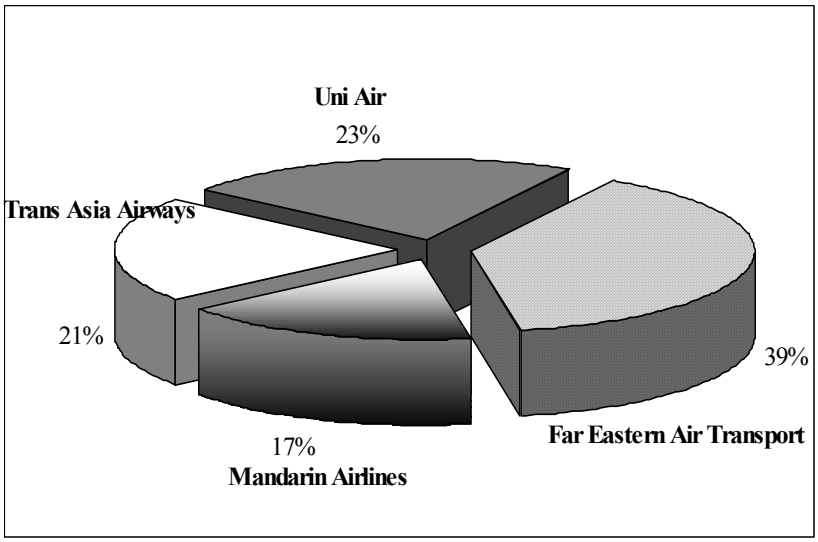
Figure 1. The growth trend of Taiwan's airline passengers market, 1984-2001.



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

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 Figure 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.

Figure 2. Market share for the Taipei-to-Kaohsiung route, among the four domestic airlines in Taiwan, 2001.



Source: Civil Aeronautics Administration. (2002). The Statistic Year Book of Civil Aviation.

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

In addition, these business class seats are frequently used as rewards for frequent flyers, and generally speaking, the load factor of business class seats is higher than that of the economy class seats. Consequently the revenue from business class seats does not do much to help air carriers increase their profit margin. If airlines would rearrange the seating layout in their airplanes, that is to say, if they would increase the number of business class seats or enlarge most, if not all, of the economy class seats, they would improve the service quality by increasing seat comfort, as well as indirectly increasing their load factor and consequently their revenues.

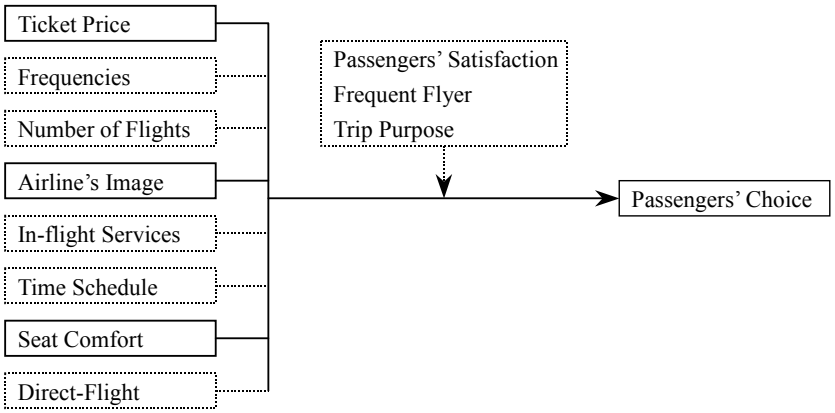
It is evident that Taiwan's domestic airline passengers market is shrinking, and a new marketing strategy is required to induce latent demand. Meanwhile, several studies have indicated that service quality, in terms of cabin seating, is a fairly important factor when airline passengers select an airline. As a result, providing better seating by increasing the length and

width of the seating space should be given high priority. We suggest that the policy of enlarging the seating room could be a new marketing strategy, and its effect on airline passengers' preference of airlines should be further analyzed.

STATED CHOICE EXPERIMENT

There are many factors that affect passengers' choice of airlines, including time schedule, number of flights, frequency, number of direct-flights, airlines' image, punctuality, in-flight services, seat comfort, passengers' attitudes, passengers' purpose for their trip, and passengers' satisfaction with the airlines. (Proussaloglou and Koppelman, 1995; Ghobrial, 1989; Ippolito, 1981). A conceptual framework, as shown in Figure 3, can describe the passengers' choice behavior. However, the effects of seat comfort and the image of the airline are rarely quantified. Hence, the relationships that are presented as solid lines in Figure 3 are the primary concern of this study. Because it is not easy to get the revealed preference data of the effects of these variables on passengers' choice, especially the effect of seat comfort, a stated choice experiment is used to present and analyze the quantified effects of those variables.

Figure 3. The conceptual framework of passengers' choice of airline



We selected three attributes for constructing the stated choice experiment. The attributes and associated levels are defined in Table 1.

Table 1. Three attributes and associated levels of the stated choice experiment of factors that affect passengers' choice of airline

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

The first attribute is the type of seat, which has three levels: 100 percent of the seats on each flight are the same size as market practice, 50 percent of the seats on each flight are enlarged seats (and 50 percent of the seats are standard economy class seats), and 100 percent of the seats on each flight are enlarged seats. The second attribute is ticket price with two levels: same as market average and 10 percent higher than market average. The last attribute is the company name of the airline corresponding to the four airlines in the domestic airline passengers market in Taiwan: Far Eastern Air Transport (FAT), Trans Asia Airways (TNA), Uni Air (UNI), and Mandarin Airlines (MAL).

We viewed the airline that passengers took as a fixed alternative. So the first level of seat type (100 percent seats are the same size as market practice) was eliminated from the experiment. As a result the stated choice experiment contained 16 profiles that were generated from the experimental design of 2 X 2 X 4. The respondents had to finish three choice tasks. The first and second choice tasks asked respondents to choose an airline from the choice set that included two airline alternatives, respectively. One was the airline that the respondents took, and the other was the profile that was selected randomly, without duplication, from the 16 possible profiles. The third choice task asked respondents to choose from the two profiles that were presented separately in the first choice task and the second choice task. That is to say, all respondents faced two alternatives on each choice task.

The main interest of this form of choice game, especially the first two choice tasks in the choice game, was to ask passengers to compare their original choice of airline (with crowded and narrow seats) with the simulated airline (with enlarged seats). This way we could find out the different choice behaviors of passengers in the situation of improved seat comfort. The

choice game experiment was conducted in a questionnaire. 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 gathered for sample descriptive and further analyses.

Locally hired and trained interviewers were assigned to Kaohsiung Airport to interview randomly selected passengers who were going to Taipei. Passengers were interviewed while they were waiting for their flight and asked to participate in a survey; 192 passengers fully completed the survey.

EMPRICAL RESULTS AND DISCUSSION

In this section, we first describe the composition of samples and then analyze the results of the passengers' choice behavior. We constructed a passengers' choice model using the binary logit model. In addition, some conclusions as to the results are drawn here.

Sample Description

The 192 respondents consisted of 60 percent male, and 40 percent female. Most respondents were aged 21 to 30 (51%); followed by those aged 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 the respondents were business trip passengers and 70 percent were non-business trip passengers.

Respondents were asked what class of seat they were taking. The results showed that 88 percent of all respondents were taking economy class seats and 12 percent were taking business class seats. This indicates that the load factor of business class seats is higher than for the economy class seats. Meanwhile, only half of the business class passengers (that is, six percent of all respondents) paid full price.

Furthermore, over 85 percent of the respondents were unhappy with the seating situation currently provided on domestic flights. The major factors leading to their dissatisfaction were nothing more than lack of stretching out space, restrained armrest room, and the feeling of oppression caused by the lower overhead compartments. At the same time, nearly 90 percent of the respondents would prefer an airline with larger and more comfortable seating configuration if their travel time would be double of what it was now.

Factors Affecting the Passengers' Choice of Airlines

After we referenced several studies related to passengers' choice of airline, we listed 10 possible factors affecting the choice behavior. Respondents were asked to rank the first three of these factors using the numbers 1, 2, and 3 to represent "very important," "important," and "less important", respectively. A score of three was assigned to the factor ranked

"very important," a score of two assigned to the factor ranked "important," and a score of one assigned to the factor ranked "less important." The rest of the seven affecting factors that respondents did not have to rank were assigned a score of zero. As a result, the total score of each affecting factor can be calculated.

$$SQ_1 = \sum_{j=1}^{N} SQ_4 \tag{1}$$

In Equation 1, SQ_1 is the total score of affecting factor i, and SQ_4 is the score of affecting factor i that was given by respondent j (total number of respondents are N). The value of SQ_4 could be 3, 2, 1 or 0. Thus we know that the higher the value of factor i(SQ1), the more important factor i is. Thus we can rank the importance of these affecting factors according to each factor's total score value. Table 2 shows the results of ranking the affecting factors according to importance.

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 & Check-in Service	9	7	9
Aircraft Type	10	6	10

From the results shown in Table 2, it is clear that the top two factors affecting passengers' choice of airline are "schedule of the time table" and "safety." The factor of "seat comfort" is ranked fourth by the total number of passengers. Hence, we can say that most passengers seem to give more consideration to the quality of seat comfort than to other affecting factors when they select an airline. Therefore, if air carriers are willing to make more improvements in terms of seating space on their fleet, it might very likely bring some positive benefits in terms of passengers' choice.

Moreover, it also can be seen that the importance ranking of some affecting factors is quite different between business passengers and non-business passengers. For example, the factor of "seat comfort" is ranked third for business passengers, and sixth for non-business passengers. This means that business passengers view the effect of seat comfort on their choice decision as more important than non-business passengers. Also, the factor of "in-flight service" is ranked the last (tenth) for business passengers, and seventh for non-business passengers. This implies that business passengers, due to their characteristics of frequent flying, are not interested in the quality of in-flight service very much. Contrary, business passengers pay more emphasis on "reservation and check-in service" and "aircraft type" than non-business passengers. But the factor of "punctuality" is ranked ninth for business passengers and fourth for non-business passengers. This result is contrary to the expectations that business passengers would put more emphasis on the importance of "punctuality." One possible reason for this may be that business passengers may mostly be frequent flyers and as such are familiar with flight schedule information and realize that the quality of punctuality is actually quite good for market practice.

Analysis of Passengers Satisfaction

The analysis of passengers' satisfaction can tell us the quality of airline services that passengers actually received. Ten service factors were selected and respondents were asked to separately evaluate their satisfaction with these service factors that they received using a 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 the five-point scale sequentially. The scores of each service factor was calculated. The results are shown in Table 3.

The ten service factors presented in Table 3 are slightly different from the ten affecting factors presented in Table 2. "Frequent Flyer Member" and "airlines' 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 below average. Compared to the results of Table 2, it is obvious 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. This will result in positive effects in terms of passengers' satisfaction.

Table 3. Ranking of passengers' satisfaction with service factors received

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

* 5 = very good; 4 = good; 3 = moderate; 2 = bad; 1 = very bad

The standard deviation shown on Table 3 may look high compared to the sample size of our study (192 respondents) but after checking several local reports related to customers' satisfaction analysis and airlines service quality evaluation we found our results were reasonable compared to these local reports.

In addition, each score of service factors per airline was summarized to obtain the total score of passengers' satisfaction with each airlines. Each airline had 48 respondents. The rankings of passengers' satisfaction of Taiwan's domestic four airlines are presented in Table 4.

Table 4. Ranking of passengers' satisfaction with the four domestics airlines in Taiwan, based on passengers' satisfaction scores of 10 service factors

Airline	*Ranking*
Trans Asia Airways (TNA)	1
Far Eastern Air Transport (FAT)	2
Uni Air (UNI)	3
Mandarin Airlines (MAL)	4

The results of Table 4 suggest that Trans Asia Airways (TNA) is the first ranked, implying that most passengers are satisfied with the services offered by TNA. The second ranked airline is Far Eastern Air Transport (FAT). This result seems to be contrary to their market share: FAT dominates the air passengers market with Trans Asia Airways and Uni Air following behind. One may infer that the timetable schedule of FAT is more convenient than other air carriers and that the result relates more to the final choice of the passengers. However, the services provided by TNA, nevertheless received the highest score.

Choice Model

In order to quantify the effects of improving seat comfort on passengers' preference of an airline, a binary logit model is used to construct a passengers' choice model. The variables that were taken into account are shown in Table 5.

Table 5. Variables used to construct a passengers' choice model

Variables	Definition
Price	Dummy variable. If ticket price is 10 percent higher than market average, the value of it is 1; otherwise it is 0.
Seat_Type 1	Dummy variable. If the seat-size is a 50 percent enlarged seat, the value of it is 1; otherwise it is 0.
Seat_Type 2	Dummy variable. If the seat-size is a 100 percent enlarged seat, the value of it is 1; otherwise it is 0.
FAT	Dummy variable. If the company name of the airline is Far Eastern Air Transport, the value of it is 1; otherwise it is 0.
TNA	Dummy variable. If the company name of the airline is Trans Asia Airways, the value of it is 1; otherwise it is 0.
UNI	Dummy variable. If the company name of the airline is Uni Air, the value of it is 1; otherwise it is 0.

In this study, we only take into consideration the variables that show in the stated choice experiment of choice model estimation. All variables used in the model are dummy variables. The value of the "price" dummy variable is 1 if the price is 10 percent higher than market average price and 0 if the price is the same as market average price (reference level). There are two types of seat dummy variables. The value of the "seat-type 1" variable is 1 if 50 percent of the seats on the flight are enlarged seats and 0 if that is no the case. The value of the "seat-type 2" variable is 1 if the 100 percent of the seats on the flight are enlarged seats and 0 if that is not the case (the reference level is the same as in market practice). Finally, the company names of the airlines are set as three distinct dummy variables: "TNA" represents Trans Asia Airways, "FAT" represents Far Eastern Air Transport, and "UNI" represents Uni Air (the reference level is Mandarin Airlines). The results of this choice model are shown in Table 6.

The results in Table 6 signal that all variables are quite significant, although the variable of "seat_type 1" and "UNI" was less significant. At the same time, the probability of coincidence prediction is around 65 percent and

the index of goodness-of-fit is 0.11. This means that the performance of our model is moderately good.

Table 6. Estimated results of passengers' choice model of airlines

Variables	***Coefficients***	***t-value***
Constant	0.270	1.271
Price—Market average price	Reference Level	
Price—10% higher than market average price	-0.949	-6.930
Seat_Type 0	Reference Level	
Seat_Type 1	0.234	1.147
Seat_Type 2	0.508	1.784
FAT	0.535	2.884
TNA	0.681	3.447
UNI	0.203	1.054
MAL	Reference Level	
Samples	576	
Log Likelihood at Convergence	-356.684	
Likelihood Ratio (p^2)	0.11	

The sign of "price" is negative implying that passengers prefer the airline with the lower ticket fare to that with the higher ticket fare. This is identical with normal expectation. The sign 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 earlier inferences: passengers actually view seat comfort as an important factor in their choice decision. In addition, it is noted that the coefficient of "seat_type 1" is smaller than that of "seat_type 2." This means that the effect of 100 percent enlarged seats on passengers' choice is greater than that of the 50 percent enlarged seats. Furthermore, a *t*-test could be used to test if the null hypothesis that these two coefficients are equal is accepted.

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

In Equation 2, $ß_2$ means the coefficient value of "seat_type 2," and $ß_1$ represents the coefficient value of "seat_type 1." According to this equation, the *t*-value is 1.69. This is significant compared to the critical value of 1.645 ($\propto$ = 0.1). This result implies that there is a slightly significant difference between the effects of 100 percent enlarged seats and 50 percent enlarged seats on passengers' choice of airlines.

We know that there were many travelers that rarely benefit from the service of business class seats. But, from the magnitude of the "seat_type 1" and "seat_type 2" coefficients, it is shown that if air carriers can improve seat comfort through enlarging the passenger seats (even if it is not to the extent of a business class seat), and even if only 50 percent of the total seats are enlarged, passengers will show a positive preference to this type of seat and the airlines that offer them.

Finally, the variable of "company name" is significant as well. Here, we can view "company name" variable as a proxy variable of the perception by the passengers of service quality of each airline. It supposes that the higher the satisfaction a passenger receives, the higher the coefficient value of "company name." The finding of Table 6 indicates that "TNA" has the greatest coefficient value. The second and third values of coefficients are "FAT" and "UNI." This implies that passengers who selected TNA would have stronger preferences toward TNA than passengers who selected FAT and UNI. The magnitudes of the "company name" coefficients are in agreement with the passengers' satisfaction with airlines as illustrated in the previous section.

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 airline passengers. These findings indicate that airline passengers prefer airlines that have the largest seats and air carriers should seriously take the seat size and the issue of possible seat rearrangement into consideration.

In addition, ticket price is also a significant affecting variable although most studies, such as Ghobrial (1989), Ippolito (1981), and Yoo and Ashford (1996), indicate that ticket price may not play a significant role in air passengers' choice because there is not much difference in the ticket price between airlines. However, the stated choice experiment was used to show the possible varieties of ticket price, and found that a 10 percent price difference could affect passengers' choice significantly; nevertheless, the cross effects between seat-type and ticket price is not considered here. Generally speaking, airline passengers who pay a higher ticket price should receive a higher quality of seat comfort. That is to say, there is a small 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 variable of "company name" was used to measure the effect of passengers' satisfaction with a specific airline on choice decision. The

findings imply that there is a positive relationship between passengers' satisfaction with a specific airline and choice decision. In other words, the higher the satisfaction passengers receive from a specific airline, the higher the probability that those passengers choose that airline again. Hence, it also can be used to measure the passengers' loyalty to a specific airline.

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

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