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Research Article

Taiwan Passengers' Willingness to Pay for Air Sleeper Seats

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To provide passengers with a better flight experience and make their journey more comfortable, airlines are diversifying their services to attract more customers. One of these services includes the development of a sleeper seat. A *sleeper seat*, also known as *family couch* in Taiwan, mainly provides a row of 3–4 economy class seats that allow passengers to lie down. Although Taiwan's China Airlines originally offered this service, it stopped due to poor sales; however, other international airlines continue to implement similar services. Regarding previous research exploring air service issues, almost no research has focused on sleeper seats. Accordingly, this article focuses on exploring Taiwanese passengers' willingness to pay (WTP) for the sleeper seat service and the influencing factors. The contingent valuation method (CVM) was used to construct the price scenario of passengers' WTP. To avoid estimation bias and thus provide more reliable results, the spike model was used to estimate passengers' WTP for the sleeper seat service and the influencing factors. According to the results, when considering multiple variables, people were willing to increase the price paid to use parent-child cabins by NTD 11,194, which was about 75% of the original price but lower than the preferential price offered by the airlines, indicating a gap between the amount people were willing to pay and the airlines' pricing. In addition, if passengers were traveling with children or if the passengers had higher flight frequencies and personal incomes, they were willing to purchase the sleeper seat service. However, people who had not experienced the sleeper seat service were unwilling to purchase it. This paper is practical to reflect current aviation industry marketing, and the research results contribute to the existing literature and provide a reference for Taiwan's civil aviation industry when relaunching the sleeper seat service in the future.

1. Introduction

Growing consumer demand has increased the airline industry's need to improve service quality, which has become an important consideration for travelers when choosing an airline. Therefore, service quality is a crucial competitive factor in the aviation industry [1–3]. Among these factors, seat attributes are one of the main items passengers used to evaluate their in-flight experiences [4–7]. Airlines have realized that the demand for upgraded travel experiences brings new opportunities to earn revenue. Hence, to provide passengers with a better flight environment and make their flights more comfortable, airlines are diversifying their business development and launching many service items to attract passengers. For example, for economy class passengers who do not want to spend more money on business class, some airlines (e.g., Emirates, EVA Air, American Airlines, and Austrian Airlines) provide a special class between economy class and business class known as premium economy class. There are also airlines (e.g., Virgin Atlantic, Cathay Pacific, Singapore Airlines, and Lufthansa) that offer special seats where passengers can have extended space (such as first row seats or emergency exit seats), thus allowing passengers to be more comfortable during the flight while increasing the airline's operating income.

However, taking children on a plane is something that most parents approach with trepidation. Traveling with infants and young children over long distances can be especially stressful [8, 9]. Due to economy class seats having a limited reclining capacity and lacking the ability for a passenger to lift the armrest, proper space cannot be created for when children want to lie flat. Air New Zealand foresaw such problems (and business opportunities). It developed a seat option in 2011 to attract these passengers, referred to as the Skycouch [10], which is a combination of three seats in a

row in economy class. For varying combinations of adults and children, passengers can purchase the right combination of Skycouch seats to suit their needs (as shown in Figure 1).

At the end of 2014, China Airlines [11] was the first to receive authorization from Air New Zealand to launch the sleeper seat service on its North American and European routes. The combined price of the sleeper seat service provided by China Airlines at that time depended on how many people would use it (the combination and pricing are shown in Table 1). Although this service won the Leisure Travel Excellence Innovation Award from a famous American travel magazine (*Global Traveler*) in 2015, it stopped selling this product in June 2018 due to poor sales. However, Azul Brazilian Airlines (Sky Sofa), Thomas Cook Airlines (Sleeper Seat), All Nippon Airways (ANA COUCHii), and Lufthansa (Sleeper's Row) have successively launched similar product services using the same design concept, which illustrates that there is still room for the development of this kind of product. Passengers can enjoy lying in the seat space through paid bookings, and the price varies according to the number of people, the season, and different routes. The number of users allowed in each space also varies due to the regulations of different airlines. Most airlines provide additional, exclusive bedding (such as pillows, blankets, and mattresses) for passengers who purchase sleeper seats.

According to the above information, many international airlines are still adopting sleeper seat service, which indicates that this service strategy is still worth exploring. While there is considerable literature studying airline services [2, 12–18], a little to no academic research specifically explores the topic of sleeper seats. To address these research gaps, this study aimed to explore and understand the factors affecting Taiwanese passengers' decisions to purchase sleeper seat service, as well as their willingness to pay (WTP). The results of this study will help provide recommendations regarding pricing and marketing strategies of Taiwanese airlines planning to implement this service again in the future and could also provide a reference for related follow-up research on sleeper seats.

Passengers' behaviors in seat selection are reflected by their perception of the service content. The content of the sleeper seat service, from an economic point of view, has the nature of nonmarket goods. Therefore, based on the random utility model, the price scenario of passengers' WTP was constituted in this study by assuming the contingent valuation method (CVM) in the nonmarket valuation method. When samples contain too many zero WTP responses, the traditional model estimation can result in a negative WTP and cause estimation errors. Some studies have shown that in most zero WTP samples, the price estimation from the spike model is more reasonable [19–23]. Since less than 1% of the people in this study had used sleeper seats, to avoid a high proportion of zero WTP, the spike model was used in this study to estimate passengers' WTP.

The remainder of this study is arranged as follows: Section 2 reviews the related literature. Section 3 describes the questionnaire design, data collection, and the model adopted in this study. Section 4 shows the preliminary data analysis and the estimation results of the models. The last section presents the conclusions and recommendations.

Figure 1: Air New Zealand's Economy Skycouch [10].

2. Literature Review

Several studies on the WTP in the field of transportation focus on environmental protection, carbon reduction, green transportation, and other topics [24–28]. Some research topics focus on exploring the price that passengers are willing to pay to improve the quality of transportation services and safety [29–35]. In addition, there are also research topics on emerging transportation systems or services for which users are willing to pay [36–40]. Most studies use CVM to investigate the travelers' WTP and use the discrete choice model for estimation and analysis. Previous studies have found that respondents are often unwilling to pay. Therefore, when there is a high proportion of observed values limited to zero in the samples, a negative WTP might appear in the estimation results of traditional models and cause estimation errors [22, 41]. Yoo et al. [42] and Bengochea-Morancho et al. [19] pointed out that when there are many samples with zero WTP in the model, it will be impossible to identify whether the WTP is actually zero. It has therefore been suggested to use the spike model, as proposed by Kriström [22], which can overcome excessive cases where the WTP is zero, as this model can obtain a relatively stable result [43]. Some studies have successively adopted the spike model to conduct research on different transport topics.

Concerning green transport and environmental issues, to understand the Korean public's WTP for voluntary carbon offsets (VCOs) from railway travel, Lim and Yoo [44] sought to measure the WTP by applying CVM and the spike model. The study showed that the spike model suited the data well, and the results indicated that consumer demand for VCOs is on the rise; consumers are willing to pay for them. However, the willingness is more dependent on individual concerns and attitudes toward climate change, not their socioeconomic characteristics. On the issue of aviation environmental protection, Jou and Chen [21] conducted a study on the willingness of economy class passengers to pay to compensate for the CO_2 emissions generated during their journey. The study applied CVM to investigate the price air passengers were willing to pay for carbon offset and constructed a spike model to analyze the WTP of economy class airline passengers for the carbon offset. Their research has shown that passengers are more willing to pay for carbon offsets when they realize that the airline's carbon offset policies help reduce carbon emissions. Their study also found that when the spike model was used, the resulting WTP could better represent the WTP for the carbon offset of airline passengers.

On the issue of public transport, since the utilization rate of business class seats in Taiwan High Speed Rail (THSR)

Table 1: Family couch combination and pricing provided by China Airlines.

Combination	3-Person combination 1 adult + 2 children or 2 adults + 1 child	2-Person combination 2 adults or 1 adult + 1 child	1-Person combination 1 adult
Price (NTD/person)	6,000	15,000	30,000
North American routine discount price (NTD/person)	4,800	12,000	24,000
Europe/Canada routine discount price (NTD/person)	3,600	9,000	18,000

Note. Each sleeper seat consists of three connected seats. A "child" refers to a child from two years old (inclusive) to under 12 years old (exclusive). Source: [11].

was low at that time, Jou et [45] employed the double bounded dichotomous choice (DBDC) of CVM to investigate passengers' WTP for THSR business class seats in Taiwan. The results obtained from the study of Jou et al., using the conventional model and the spike model, show that the estimated value of WTP for passengers taking business class seats is much lower than the current THSR price for business class seats. Their article also verified that the application of the spike model is similar to the conventional model when there are a low proportion of zero responses. To provide high-quality public transport, Almselati et al.[46] discussed the willingness of Malaysian people to use and pay for improved public transportation. In their study, many respondents were unwilling to accept any percentage of travel cost or travel time improvements to switch from their private vehicles to public transportation. To avoid underestimation of the results produced by traditional discrete choice models, Almselati et al. used CVM for questionnaire design, and the spike model was calibrated based on the choices made by the users. Their research results showed significant differences in users' perception of traffic attributes. To assess the benefits of a network of bicycle lanes at the city level, Lee et al. [47] used CVM to estimate the WTP of each household in Goyang, South Korea, for additional taxes for three types of bike lanes (dedicated bike lanes, bike paths shared with pedestrians, and cycle tracks). Several modeling methods, including the spike model, were applied in their research. The results indicate that users are willing to pay the most for dedicated bike lanes.

In exploring the issue of driver behavior, Jou and Wang [48] studied the WTP fines for speeding, running red lights, turning right at red lights, and drunken driving violations in Taiwan. The respondents were mostly reluctant to pay the noncompliance fines, so the spike model was used in the model calibration to prevent an overestimation of WTP and provide more realistic results. According to the calibration results, the respondents' previous violation experiences were likely to influence their WTP. In addition, the average utilization rate of the electronic toll collection (ETC) system on expressways in Taiwan at that time was less than 50%, and the public was reluctant to accept the onboard unit (OBU) installation cost at that time. Therefore, Jou et al. [49] wanted to understand the willingness of drivers to pay for an OBU. Since about a quarter of the drivers in Jou's study were unwilling to pay to install an OBU, the authors felt that using a spike model for estimating the WTP was an appropriate approach. Since OBU has the characteristics of a nonmarket commodity, their study also uses CVM to construct the price scenario of the drivers' WTP. The results showed that the price for an OBU that drivers were willing to pay for short and medium distances was still lower than the price at the time. In 2014, Jou and Huang [50] further explored the WTP price for short-distance expressway users who did not pass the tollgate. The study attempted to use CVM and the spike model to estimate the price drivers were willing to pay. The findings showed that the WTP for tolls increased with the travel distance.

As for research regarding air transport, the premium economy is likely to be a sustainable product for airlines in the future. In order to determine how much air passengers are willing to pay to upgrade their economy class seats to a luxury cabin, Kuo and Jou [51] presented a study based on random utility theory combined with CVM, as well as the spike model, to establish a virtual market under different pricing scenarios, thereby providing more realistic results. Considering that travel distance may have an impact on passenger choice, their study specifically incorporated the factor of flight time into the investigation and analysis. Research has shown that flight distance is indeed a key factor in whether travelers are willing to pay extra for upgrades. Using the peak model can avoid the estimation error caused by the great portion of respondents reporting they have no WTP at all. In addition, some airlines have realized the possibility of charging passengers for using traditional counter check-in services to reduce airline operating costs and improve service efficiency. Kuo and Jou [23] explored factors affecting WTP for traditional counter check-in services. Their study established passenger WTP price scenarios using CVM. Considering there may be many passengers who were not willing to pay a service fee, the spike model was adopted to resolve this problem, and the authors estimated single- and multi-variable models to investigate the multiple effects of other variables on the WTP for counter check-in services. The results showed that mid- and long-haul travelers have a much higher WTP than short-haul travelers and that estimates from multi-variable models are more accurate than estimates from single-variable models. In summary, using the spike model to handle WTP

can prevent the overestimation of WTP and thus provide a more reliable result.

3. Methodology

3.1. Theoretical Framework of the Model. This study combined the spike model with CVM to estimate passengers' WTP when deciding whether or not to choose a sleeper seat service. Regarding the model theory and mathematical formulas, this study referred to the description of the model theory studied by Kuo and Jou [51] and Kriström [22]. The utility function of a personal decision's certainty is made up of personal income X, socialeconomic variable Y, and the asset value of the project being assessed Z. Then, it is assumed that the random personal utility function $U(Y, X, Z)$ can be expressed as follows:

$$U(X,Y,Z) = V(X,Y,Z) + \varepsilon_0. \tag{1}$$

However, when the respondents are willing to pay the design amount (M), it means the derivative utility (alternative 1) is higher than the original utility, as expressed by the following equation:

$$V_1(X-M,Y,Z_1) + \varepsilon_1 \geq V_0(X,Y,Z_0) + \varepsilon_0. \tag{2}$$

Here, ε_0 and ε_1 are random variables that are independent and identically distributed and the average expectation is 0. The utility difference of the respondents is $\Delta V(\bullet)$ $(= V_1(X-M,Y,Z_1) - V_0(X,Y,Z_0))$, which can be deduced from (2), and F_ε is the cumulative distribution function of the error item ($\varepsilon = \varepsilon_0$-$\varepsilon_1$). Since WTP is the maximum amount that the respondents can accept, when they are faced with a price scenario (M), if the respondents $WTP \geq M$, it means they are willing to accept this price. The probability function of a respondent accepting (M) can be shown as follows:

$$\Pr(Yes) = \Pr(WTP \geq M) = 1 - F_{WTP}(M) = F_\varepsilon(\Delta V(\bullet)). \tag{3}$$

The expected WTP ($E(WTP)$) can be found using the integration approach, as shown below:

$$\begin{aligned} E(WTP) &= \int_0^\infty (1 - F_{WTP}(M))dM \\ &\quad - \int_{-\infty}^0 (F_{WTP}(M))dM \\ &= \int_0^\infty (F_\varepsilon(\Delta V(\bullet)))dM \\ &\quad - \int_{-\infty}^0 (1 - F_\varepsilon(\Delta V(\bullet)))\mathrm{d}M. \end{aligned} \tag{4}$$

Here, $F_{WTP}(M)$ is the cumulative distribution function of the respondents rejecting the situational price (M). The value range is distributed as shown below:

$$F_{WTP}(M) = \begin{cases} F_{WTP}(M), \text{if} & M > 0, \\ P, \text{if} & M = 0, \\ 0, \text{if} & M < 0. \end{cases} \tag{5}$$

Here, P is (0,1). In this study, the maximum likelihood estimation was used to estimate the parameters. The estimation of the parameters of the spike model can be represented as follows:

$$\begin{aligned} \ln L &= \sum_i^n N_i W_i \ln(1 - F_{WTP}(M)) \\ &\quad + \sum_i^n N_i(1 - W_i)\ln(F_{WTP}(M) - F_{WTP}(0)) \\ &\quad + \sum_i^n (1 - N_i)\ln(F_{WTP}(0)). \end{aligned} \tag{6}$$

Here, N represents the respondents' positive WTP (WTP > 0), while W indicates the WTP of the respondents is greater than the design amount (M), defined as follows:

$$\begin{aligned} N &= \begin{cases} 1, & WTP > 0, \\ 0, & \text{other}, \end{cases} \\ W &= \begin{cases} 1, & WTP > M, \\ 0, & \text{other}. \end{cases} \end{aligned} \tag{7}$$

If the utility function is a linear function, then the utility function equation is $V(X,Y,Z) = \alpha_j + \beta M\,(j = 0, 1)$. When $WTP \geq M$, the change in the utility function is $\Delta V(\bullet) = \alpha_1 - \alpha_0 - \beta M = \alpha - \beta M$, where α is a constant and β is the marginal utility of the accepted bid.

In the calculation of the expected WTP, if $F_{WTP}(M)$ is a logistic probability model, the function $F_\varepsilon(\Delta V(\bullet))$ can be represented as follows:

$$F_\varepsilon(\Delta V(\bullet)) = \frac{1}{1 + e^{-(-\alpha+\beta_M)}}. \tag{8}$$

Integrating (5) and (8) results in the following distribution range:

$$F_{WTP}(M) = \begin{cases} 1/\left(1 + e^{(\alpha-\beta M)}\right), \text{if} & M > 0, \\ 1/(1 + e^{\alpha}), \text{if} & M = 0, \\ 0, \text{if} & M < 0. \end{cases} \tag{9}$$

When the respondents' $WTP \geq M$ and $M \longrightarrow \infty$, the estimated WTP of the respondents will be represented as follows:

$$\begin{aligned} E(WTP) &= \int_0^\infty (1 - F_{WTP}(M))dM - \int_{-\infty}^0 (F_{WTP}(M))dM \\ &= \frac{1}{\beta}\ln(1 + e^{\alpha}). \end{aligned} \tag{10}$$

The spike value is defined as the probability value of the unwillingness to pay, that is, $F_{WTP}(M) = 0$. Therefore, the spike value is based on (9). When $M = 0$, we can obtain

$$\text{Spike} = \frac{1}{1 + e^{\alpha}}. \tag{11}$$

3.2. Questionnaire Design and Data Collection. This study investigated passengers' cognition of the sleeper seat service, as well as their WTP, through a questionnaire, which is divided into three parts. The first part investigated the respondents' personal socioeconomic and travel characteristics, including gender, marital status, whether or not they had children, educational level, age, occupation, personal monthly income, annual household income, flight frequency, the purpose of the flight, who paid for the airline tickets, and whether they were frequent flyer program members. The respondents then received an explanation of the sleeper seat service (including descriptions of sleeper cabin configuration, space, and provision of services). When given that explanation, the respondents learned about the service through the questionnaire content, thus enabling all respondents to complete the subsequent survey questions. The second part of the questionnaire investigated the respondents' cognition of the sleeper seat service. This part was used to determine whether the respondents had heard of or used the sleeper seat service before the interview, as well as if they would be willing to purchase a sleeper seat when traveling abroad with their children. The third part of the questionnaire investigated how much passengers would be willing to pay for sleeper seat service using a scenario as an example for them to consider.

This study used the triple-bounded method with CVM to design the scenario, and the survey methodology was the same as the dichotomous choice method. However, there are many assumptions about the number of price layers in the triple-bounded method, which can reduce the errors caused by choosing the dichotomous choice method to make inquiries and more accurately approximate the respondents' WTP [52]. First, the questionnaire described a hypothetical scenario of the sleeper seat service. The family couch service in Taiwan is only provided by China Airlines, and it is mainly based on North American and European routes, showing that long-haul flights are the focus of the sleeper seat service. Hence, the hypothetical situation of this questionnaire was based on the Taipei-Los Angeles route, with an average flight time of about 11 to 13 hours. For the type of traveler, this study assumed that the respondent faced the situation of one adult with one child. According to the combined price of the sleeper seat service provided by China Airlines (refer to Table 1), a discounted price of NTD 12,000, representing the sleeper seat service price (three seats) set by China Airlines, was taken as the starting price.

Moreover, this price scenario was used as the first layer to ask passengers whether they were willing to accept this price to use the sleeper seat service. Since the original price offered by China Airlines for two passengers to purchase and use the sleeper seat service on the North American route was NTD 15,000, this study took NTD 3,000 (25% of the starting price) as the basic price difference that passengers would be willing to pay in the second layer. If the respondent was willing to accept this extra expense (Y), the respondent would face a bid situation of NTD 15,000 in the second layer; if the respondent was unwilling to accept the price (N) in the first layer, the respondent would face the bid situation of NTD 9,000 in the second layer. Finally, the respondent would answer whether they were willing to accept the amount according to the price situation they faced in the third layer. The minimum or maximum price that air passengers were willing to pay could thus be known according to the respondents' answers. The concept is shown in Figure 2, and Table S1 in Supplementary Materials provides a detailed description of the questionnaire and scenarios.

The target population of this study was departing Taiwanese passengers. Questionnaires were issued at the Taiwan Taoyuan International Airport. Due to the regulations of the Taoyuan International Airport Corporation, the survey could only be conducted in noncontrolled areas, such as departure halls. Therefore, the questionnaire was distributed to the outbound passengers in the departure halls of Taoyuan International Airport Terminals 1 and 2 by convenience sampling. The investigators in this study were all trained before administering the survey questionnaire regarding the following: the investigators asked passengers if they would agree to fill out the questionnaire; if they agreed, paper questionnaires were handed to the respondents and completed without the interviewers' involvement. In addition, during the survey process, according to the status of the respondents, the investigators only assisted the respondents by using neutral phrasing to assist them in responding objectively. The investigators did not interfere or guide the respondents to answer during the investigation. These data collection strategies reduced the impact of interviewer bias on the respondents' responses. All respondents were required to complete all the items on the questionnaire. The criterion for invalid questionnaires was the existence of incomplete answers, such as missing options or repeated checks. A total of 450 questionnaires were distributed from May 1, 2017, to August 31, 2017. All questionnaires were recovered, and there were 446 valid questionnaires after screening. According to the formula developed by Cochran [53], assuming a 95% confidence level, ± 5% precision levels, and $p = 0.05$, a representative sample size would be 385. Therefore, the sample size of 446 in our study was statistically sufficient.

4. Data Analysis and Model Estimation Results

4.1. Descriptive Analysis. According to the data collection statistics shown in Table 2, the proportion of female respondents was relatively high (54.1%), and the majority of the respondents were unmarried (61%). The educational level of most respondents was higher than that of university and college (87.5%), and most respondents were between 21 and 40 years old (74.4%). Regarding occupation, the proportion of service industry employees was the highest (28.7%), followed by business industry employees (22.4%). The highest proportion of personal monthly income was NTD 20,001 to 60,000 (54%), while the annual household income was NTD 750,000 or more (64.8%). Table 3 shows the statistics of the respondents' trip characteristics. According to the average number of flights taken by the respondents in one year, most of the respondents had experienced flights abroad (96.4%), and the purpose of the

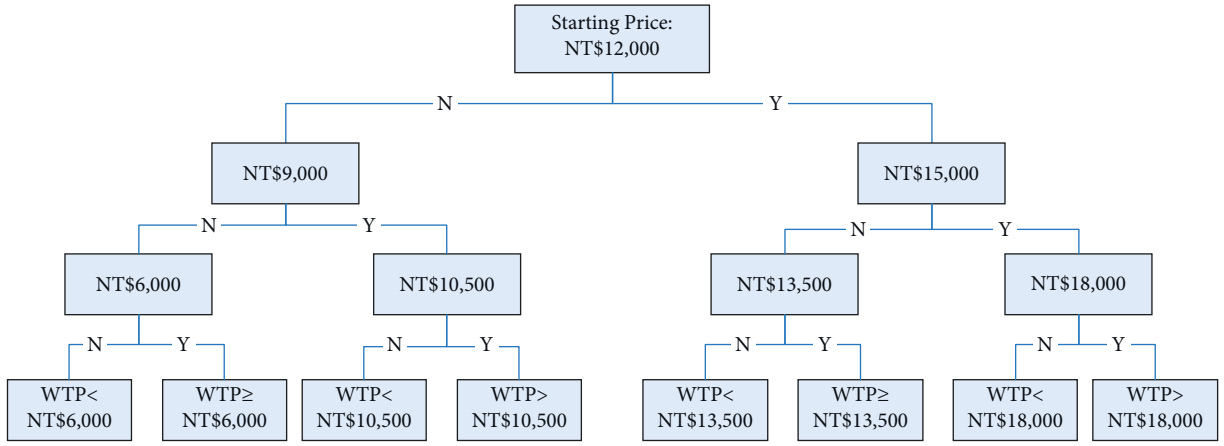

Figure 2: Schematic illustration of WTP. Y means willing to pay; N means not willing to pay.

Table 2: Socioeconomic characteristics data.

Socioeconomic characteristics	Item	Number of samples	Percentage
Gender	Male	205	45.9
	Female	241	54.1
Age	18~20 years old	33	7.4
	21~30 years old	203	45.5
	31~40 years old	129	28.9
	41~50 years old	48	10.8
	51~60 years old	29	6.5
	Over 61 years old	4	0.9
Educational level	Below high (vocational) school	56	12.6
	University and college	334	74.9
	Above postgraduate school	56	12.6
Marital status	Married	174	39
	Unmarried	252	61
Have kids?	Yes	98	22
	No	348	78
Occupation	Agriculture, forestry, and fishery	2	0.4
	Industry	42	9.4
	Business	100	22.4
	Military, civil servant, and teacher	26	5.8
	Service industry	128	28.7
	Student	90	20.2
	Housekeeping management	19	4.3
	Retired and unemployed	3	0.7
	Freelance	36	8.1
	Others	35	3.9
Individual monthly income	NTD 10,000 (including) and below	61	13.7
	NTD 10,001–20,000	43	9.6
	NTD 20,001–40,000	117	26.2
	NTD 40,001–60,000	124	27.8
	NTD 60,001–80,000	48	10.8
	NTD 80,001–100,000	30	6.7
	NTD 100,001 (including) and above	23	5.2
Annual household income	NTD 250,000 (including) and below	28	6.3
	NTD 250,001–500,000	45	10.1
	NTD 500,001–750,000	84	18.8
	NTD 750,001–1,000,000	127	28.5
	NTD 1,000,001 (including) and above	162	36.3

Table 3: Travel frequency characteristics data.

Traveling characteristics	Item	Number of respondents	Percentage
The average number of flights per year (a round-trip is considered once)	First time abroad	16	3.6
	Once	150	33.6
	Twice	119	26.7
	Over 2 times	161	36.1
Flight purpose	Business	66	14.8
	Tourism	312	70.0
	Family visit	30	6.7
	Return home	8	1.8
	School	25	5.6
	Others	5	1.1
Flight class	Economy class	387	86.8
	Premium class	29	6.5
	Business class	24	5.4
	First class	2	0.4
	Sleeper seat	4	0.9
Who pays the ticket fee	Myself	382	85.7
	Company	12	2.7
	Part of the company's subsidy	47	10.5
	Other	5	1.1
Frequent flyer program member	Yes	60	13.5
	No	386	86.5

flights was mostly tourism, accounting for about 70%. However, most of the respondents still chose to fly economy class (86.8%), and only 0.9% used the sleeper seat service. Most respondents paid for their own airline tickets (85.7%), and most of them were not frequent flyer program members (86.5%).

Examining the respondents' understanding and awareness of the sleeper seat service was one of the focuses of this study. The statistical sample of the survey is shown in Tables 4 and 5. Approximately 72.4% of the passengers had never used nor heard of the sleeper seat service, meaning the data showed that most respondents did not know about the sleeper seat service. Only 0.9% of the respondents had used the sleeper seat service. However, for the respondents traveling with children, when they were asked whether they would be willing to purchase the sleeper seat service, 81.2% stated they were willing to purchase and use the service.

4.2. Model Estimation. This study used the spike model to explore passengers' WTP for sleeper seat service. To study the influence of other variables on the WTP of passengers using sleeper seat service, this study estimated both single variables (including the situational price variable) and multi-variate variables. The independent variables to be included in the model were based on the prior knowledge gained from previous studies, most of which included personal socioeconomic and travel characteristics. Therefore, the respondents' awareness of the sleeper seat service was included as an independent variable in this research. The remaining variables in this study were divided into two categories: the variables in the questionnaire and cross variables. This research started with a large number of possible explanatory variables, but not all of the variables were significant. Finally, the variables with significant t-values were kept in the model. NLOGIT v.4.0 software was used to obtain the results.

Table 6 shows the significant variables of the model, and the results of the model calibration are summarized in Table 7. A higher t value indicated a higher significance level, and the positive influence of the numerical value indicated that the respondents were willing to pay extra to use the sleeper seat service. In contrast, the negative influence indicated the respondents were unwilling to pay extra to use the service. All significant influencing factors and positive and negative symbols conformed to prior knowledge. According to the results, when only considering the situational price factor, the WTP for sleeper seat service was NTD 15,307. The price was changed to NTD 11,194 when multiple variables were considered. Whether the variables were single or multiple, the situational price had a negative influence. In the current aviation market, if passengers want better service, they must accept a higher purchase price; however, the higher the service price, the lower the willingness to accept.

Moreover, the assessment results of this research model also found that the respondents were willing and ready to pay a relatively high amount of money to purchase the sleeper seat service. During long-haul flights, the sedentary nature of air travel often makes passengers uncomfortable, especially in narrow economy class spaces, as leg movements are constrained, and passengers cannot stretch out or lay flat. Therefore, when traveling with children, passengers want to give them more space; hence, they are willing to purchase additional sleeper seat service. The coefficient value was negative for couples with an annual income of NTD 500,000–1,000,000 and no children, indicating these travelers were unwilling to purchase additional sleeper seat service. This study inferred that adults flying without children would be less inclined to purchase the sleeper seat

Table 4: Respondents' awareness of the sleeper seat service (1).

Item		Number of Respondents	Percentage
Having heard of sleeper seat service?	Heard of them	123	27.6
	Never heard of them	323	72.4
Understanding sleeper seats clearly?	Completely unclear	340	76.2
	Slightly clear	90	20.2
	Very clear	16	3.6
Having used a sleeper seat service?	Used them	4	0.9
	Not used them	442	99.1
If you go abroad with children, are you willing to purchase a sleeper seat?	Yes	362	81.2
	No	84	18.8

Table 5: Respondents' awareness of sleeper seat (2).

Item		Having heard of sleeper seat service		Understanding sleeper seat clearly			Having used sleeper seat service	
		Never heard of them	Heard of them	Completely unclear	Slightly clear	Very clear	Not used them	Used them
Having heard of sleeper seat service	Never heard of them	—	—	—	—	—	—	—
	Heard of them	—	—	—	—	—	—	—
Understanding sleeper seat clearly	Completely unclear	72.4%	3.8%	—	—	—	—	—
	Slightly clear	0%	20.2%	—	—	—	—	—
	Very clear	0%	3.6%	—	—	—	—	—
Having used sleeper seat service	Not used them	72.4%	26.7%	76.2%	19.7%	3.1%	—	—
	Used them	0%	0.9%	0%	0.45%	0.45%	—	—

Table 6: Significant variables included in the model.

Variables	Explanation	Min.	Max.	Mean
Willingness to purchase sleeper seats with children in accompaniment	If respondents have children, they are willing to purchase a sleeper seat = 1; otherwise, 0	0	1	0.06
Annual household income of NTD 500,000–1,000,000	Annual household income of NTD 500,000–1,000,000 = 1; otherwise, 0	0	1	0.47
Have heard of the sleeper seat service but have not used it	Heard of them = 1; otherwise, 0	0	1	0.27
Are married but without children	Married without kids = 1; otherwise, 0	0	1	0.18
More than two times of flights per year and more than NTD 80,000 of average monthly income	More than two times of flights per year and more than NTD 80,000 of average monthly income = 1; otherwise, 0	0	1	0.03

Table 7: Estimation table of the sleeper seat WTP model.

Variable	Single Variable	Multiple Variable
Constant	1.92 (12.96)***	−0.27 (−0.85)
Price scenario bid	−0.01 (−13.01)***	−0.02 (−1.79)*
Willingness to purchase sleeper seat service with children in accompaniment	—	0.62 (2.11)**
Annual household income of NTD 500,000–1,000,000	—	−0.50 (−2.18)**
Have heard of the sleeper seat service but have not used it	—	−0.68 (−2.64)***
Married but without children	—	−0.78 (−2.22)**
More than two flights per year and more than NTD 80,000 average monthly income		1.92 (4.40)***
Spike (t-value)	0.13 (7.76)***	0.15 (4.58)***
Log-likelihood	422.43	365.13
Wald statistic (p value)	503.07 (0.00)	365.98 (0.00)
Average WTP	NTD 15,307	NTD 11,194
Total samples	446	446

Note: t-values are given in parentheses. *10% significance level; **5% significance level; ***1% significance level.

service due to being relatively more tolerant of long-haul travel. In addition, passengers generally attach importance to airfares [54–56], and the price of sleeper seats is higher than that of economy class. Considering their own economic situations, passengers are relatively reluctant to pay more for the sleeper seat service.

In addition, this study also found that passengers with relatively high flight frequencies and average personal incomes were willing to pay relatively high fees for the sleeper seat service. This result was similar to those of a previous study [57]. Regarding passengers who had heard of the sleeper seat service but had not used it, the calibration result was negative, illustrating that these respondents were unwilling to pay extra for it. This study speculated that when passengers do not know about new services, it will be relatively difficult for these travelers to accept them; thus, they will not adopt them. This conclusion is similar to the views put forth by previous research studies [51, 54, 58]. Based on the above research results, when passengers consider purchasing the sleeper seat service, whether they have used the service, whether they have children, personal flight frequency and income, and the price of the service were important factors affecting the choice of the respondents.

5. Conclusions and Recommendations for Further Research

Taiwan's China Airlines launched the sleeper seat service on its North American and European routes at the end of 2014; however, the service was suspended in 2018 due to poor sales. Therefore, considering that other international airlines continue to offer similar services, this study aimed to explore the factors affecting Taiwanese passengers' WTP for the sleeper seat service from the user's perspective. According to the research and assessment results, considering the socioeconomic variables of people and the characteristics of their trips, the amount that people were willing to pay for the sleeper seat service was NTD 11,194, which was about 75% of the airlines' original price and lower than the preferential price offered by the airlines. This shows that the amount people are willing to pay is somewhat different from the airlines' pricing. As price is one of the important factors to which people pay attention, when considering revenue management and seat control, it is suggested that airlines refer to the results of this study when setting their prices. However, this study found that people's willingness to purchase the sleeper seat service was relatively high (81.2%) when traveling with children, and the amount they were willing to pay was also relatively high. As children easily become uncomfortable due to the relatively small space available in economy class during long-haul flights, passengers traveling with children are willing to pay extra to use the sleeper seat service. Previous studies [59, 60] found that the longer the flight time and the higher the comfort provided by the seats, the higher the possibility of people paying more to travel. This study suggests that in the future, if airlines want to relaunch the sleeper seat service, they can market such services to passengers traveling with children during check-in at the airport or the boarding gate before departure, which can allow airlines to maintain appropriate flexibility in seat control according to the flight sales situation and increase the sales of the sleeper seat service. In addition, to increase people's willingness to purchase such seating, we suggest that passengers who purchase an additional sleeper seat service be allowed to use the airport's VIP room free of charge or board the plane in advance.

However, according to the survey questionnaire responses elicited from Taiwanese passengers in this study, approximately 70% of the respondents had never heard of the sleeper seat service and were completely unclear about its contents. Regarding the less than 1% of respondents who had used the sleeper seat service, the results indicated that people in Taiwan are generally unfamiliar with the sleeper seat service. However, this study found that the respondents were unwilling to purchase the sleeper seat service even when they had heard about it but had not used it, showing that the unfamiliar service content could lead to a low usage rate. Therefore, in the future, if airlines want to promote the sleeper seat service or other new products and services, they should first study and formulate relevant marketing schemes. In addition, multichannel marketing could expose people to a large amount of service information and even strengthen the exposure of sleeper seat information on long-haul routes, thus allowing people to learn about and pay attention to this product. Moreover, it is important for people to actually experience the characteristics of the sleeper seat service to determine its benefits; therefore, this study suggests that people should experience the service through various activities, such as travel exhibitions or physical exhibitions. In addition to enhancing people's awareness of the service, such actions could increase the possibility of future purchases. The results of this study also indicate that the respondents with higher flight frequencies and higher personal incomes had a positive WTP and were willing to use the sleeper seat service with a higher fare increase. Therefore, in future sleeper seat promotions, we suggest that airlines provide relevant information about sleeper seat service during booking or at check-in. In this way, passengers can learn about the service, which could also increase their WTP and the possibility of purchasing this service in the future.

Data Availability

The data presented in this study are available upon request from the corresponding author

Conflicts of Interest

The author declares that there are no conflicts of interest.

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Supplementary Materials

In order to understand the current development of air sleeper seats, this study compared the air sleeper seat service information of various airlines and summarize the Table S1 [10, 11, 61–65]. In addition, this study investigated Taiwanese passengers' WTP for the sleeper seat service through a questionnaire. To see the full details of the questionnaire, please refer to the questionnaire in the supplementary materials. (*Supplementary Materials*)

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