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MEASURING CAR DRIVERS' WILLINGNESS TO PAY FOR IMPROVED INTERCITY TRANSPORTATION SERVICE: A CASE STUDY IN LIBYA

MANSSOUR A. ABDULASALM MISKEEN[1], MUHAMAD NAZRI BORHAN[2,*], AHMED MOHAMED ALHODAIRI[3], AMIRUDDIN ISMAIL[2], RIZA ATIQ RAHMAT[2]

[1]Department of Civil Engineering, Faculty of Engineering and Technology, Sabha University, P.O. Box: 68 Brack – Alshatti, Libya
[2]Sustainable Urban Transport Research Centre (SUTRA)/ Department of Civil & Structural Engineering, Faculty of Engineering and Built Environment, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor, Malaysia
[3]Department of Architecture and Urban Planning, Faculty of Engineering and Technology, Sabha University, P.O. Box: 68 Brack – Alshatti, Libya
*Corresponding Author: mnazri_borhan@ukm.edu.my

Abstract

The current study investigates solutions to optimize the intercity highway network and to facilitate the understanding of the transport mode of Libyans, according to the proposed transport policies, in terms of reducing car usage for intercity trips. In this study, different models namely the logit and spike models are applied to estimate the mean of the willingness to pay (WTP) value for some proposed policies in order to be able to compare the results from each policy and analyses to what extent that each was regarded as suitable for our data characteristics. A large number of respondents were unwilling to pay any money for the different proposed policies on transportation. Therefore, the Spike model was used to avoid errors in estimation and create a WTP pricing model for the different proposed policies on transportation. The overall results indicate that the spike model outperforms the logit model significantly.

Keywords: Transport policy measures, Contingent valuation, Willingness-to-pay, Spike model, Libya.

1. Introduction

Similar to many other countries, Libya has been enduring significant economic development, especially in manufacturing and service sectors, predominantly

Abbreviations	
CVM	Contingent Valuation Method
LYD	Libyan Dollar
WTP	Willingness to Pay

located in the urban centres. As expected, this economic development has triggered the appropriate drive towards the manufacturing, organizational, and other pursuits in the urban centres; moreover it has created avenues for a lot more career opportunities and greater earnings, and prosperity, and as well as general wellbeing. This probable prospect of prosperity and well fare has encouraged a lot of individuals to travel into the cities; nevertheless, this migration and the natural population growth have caused higher urbanization. According to Srinivasan et al. [1] the travel behaviour of people can be determined by the factors such as: all-round revenue development, the transforming life-style and family features, accessibility of assorted amenities, modifications of travel environment- all of which have been regarded as crucial variables for identifying the travel behaviour of people. A significant impact of the economic growth is the higher personal vehicle ownership and usage. The enhanced urban development and vehicular growth has escalated the general travel requirement, and in the majority of urban centres, it has even exceeded the current potential of infrastructure facilities [2].

Specifically, the existing metropolitan transport system has been experiencing few critical issues, encompassing societal, environment, and financial attributes. Transportation utilizes a huge proportion of energy, land and other resources, which eventually impacts the encompassing ecosystem, and affects the life and time of people. If the existing developments have offered the flexibility for the metropolitan transport, then the requirements of future generation will be affected; nevertheless, it is not possible to deny the requirement of the lasting growth in the transport sector; where, sustainable development satisfies the requirements of the existing population without diminishing the potential of future generations in terms of meeting their personal needs [3, 4]. According to Goulias [5] the lasting development ought to consider the following three key elements of sustainability, i.e., economic, environmental and cultural sustainability. As of now, in the metropolitan transport sector, the above described standards seem to be a challenging task as far as accomplishment is concerned. Consequently, it is essential to have environmental-oriented transport plans for promoting considerable changes in the transport sector to accomplish endurance. Hence, the policy of the government motivates people to use better mode of intercity transportation.

The goals of these policies are to render the requirement, so that the needs for transport for the present and the future generations can be met continually, while restricting the transport-related facades. The basic concept of these policies is to modify the way of traveling, and to fulfil the goals of sustainability. Considering the lack of resources, the government must understand the influences of the policies to be implemented, to ensure the effectiveness of the investment. In recent times, the contribution of the travel demand model has begun to gain attention, as it is a decision support tool for forecasting the travel demand and its consequences under distinct scenarios [6]. Consequently, the present study is aimed at ascertaining the extent to which the Libyan drivers are willing to pay, based on the evaluation of the sustainable transportation policies, and the proposed further improvements deemed possible. It is essential to form a proper understanding of the drivers' willingness to pay (WTP) for sustainable transportation policies and logistics strategies, and as the policy carries the features of a non-market good, we have implemented the contingent valuation method (CVM) to create the scenario prices for the drivers' WTP.

It is significant that there is a lack of studies on policy rate implications, where the drivers are WTP. Most of the earlier studies employed the traditional logit or probit models for estimating the impact of the transport charge policy on car driver's behavior [7-11]. The WTP has been described as the amount of money a driver is willing to pay towards his well-prepared engagement in the policy of using the intercity transportation system. As the rule-breaking behaviour is a non-market product, it cannot be exchanged through market components for establishing its financial value. The contingent valuation technique is one of the extensively used approaches to assess non-market goods, which has benefits in evaluating the value of non-market goods in the transformation of the value of goods, mainly via questionnaires or interviews. The contingent valuation approach seeks the participants to individually ascertain the dollar value of non-market goods, and determine the highest possible amount the participants would be willing to pay for a given product.

The CVM has been considered beneficial in several domains for measuring the importance of non-market goods [12, 13]. Few researches have utilized the logit or probit models for calculating the WTP [14, 15], which can produce the model estimation errors, by obtaining a great number of zero WTP responses. As a result, a lot of studies have used the spike model, proposed by Kristroem [16] for effectively addressing zero WTP problems.

Theory of the spike model

It is noteworthy that there is a lack of studies on the WTP for the intercity transportation policy, especially on the willingness to pay for an intercity bus and airline. Furthermore, in terms of usefulness, the evaluation of the respondents' WTP for non-market goods by the CVM is more precise. Consequently, in this present research, we had used the CVM approach to design the WTP scenarios in the questionnaire. Nevertheless, for the model estimation, when samples contain too many zero WTP responses, the conventional model estimation might lead to the negative WTP, and subsequently causing estimation errors. The typical CVM approach, which is evaluated by the bivariate probability models (e.g. logit and probit bivariate models), might produce the estimation error, especially, in the case of higher percentage of zero WTP responses. As the consequence, we had made use of the spike model, which is more ideal when it comes to estimating the WTP. In this study, we had executed the spike model [16], as it is the most commonly adopted technique to resolve the problems involving zero responses in the contingent valuation. Our consideration has been on all variables in the problem identical to Kristroem [16] for purposely following his research. The spike model has been based on the random utility theory. The model permits zero WTP in its estimation and it is able to remove the abnormality of a negative WTP. The questionnaire used in this research takes close guidance from the CVM approach of the data collection, and probes into the respondents' WTP.

For using the spike model, if the bid A_1 offered in the questionnaire is not more than the willingness to pay value (willingness to pay ≥ A_1); the implication is that the drivers will pay the amount (A_1)in the new state, and this can be derived as:

$$Pr(Yes) = Pr(willingness\ to\ pay\ \geq\ A_1) = 1 - G(A_1) = F_\varepsilon(\Delta V(*)) \quad (1)$$

where, G (A_1)is the cumulative distribution of the respondent who does not have the willingness to pay the amount A_1. The domain of the cumulative distribution function can be expressed as such:

$$G(A_1) = \begin{cases} 0, & if\ A_1 < O \\ P, & if\ A_1 = O \\ F(A_1), & if\ A_1 > O \end{cases} \quad (2)$$

The expected willingness to pay can be further derived as follows:

$$E(willingness\ to\ pay) = \int_0^\infty (1 - G(A_1)dA - \int_0^{-\infty} (G\ (A_1))dA_1 = \int_0^\infty (F_\varepsilon\ (\Delta V(*)))dA - \int_0^{-\infty} (1 - F_\varepsilon\ (\Delta V(*)))dA \quad (3)$$

where p belongs to (0, 1), and F (A_1) is a continuous and increasing function where the F (A_1 = 0) = p and $lim_{A_1 - \infty}$ F (A_1) = 1. The maximum likelihood function for the sample is then given as in the following:

$$L = \sum_i^N M_i\, W_i \ln\big(1 - \mathrm{G}(\mathrm{A}_1)\big) + \sum_\mathrm{i}^\mathrm{N} \mathrm{M_i}\ (1 - W_i) \ln\big(\mathrm{G}(\mathrm{A}_1) - \mathrm{G}(0)\big) + \sum_\mathrm{i}^\mathrm{N} (1 - M_i) \ln\big(\mathrm{G}(0)\big) \quad (4)$$

where, M indicates whether or not the willingness to pay is greater than 0, if car users reject a series of bids it will generate a willingness to pay which is not more than 0. Another W is defined by whether or not the willingness to pay is greater than the bid A_1, as Eq. (8) and (9) have calculated, respectively:

$$M = \begin{cases} 1, & willingness\ to\ pay\ > 0 \\ O, & otherwise \end{cases} \quad (5)$$

$$W = \begin{cases} 1, & willingness\ to\ pay\ > A_1 \\ O, & otherwise \end{cases} \quad (6)$$

It can be further expressed as:

$$F_{\mathrm{WTP}}(A_1) = \begin{cases} 0, & if\ A_1 < 0 \\ [1 + \exp(\alpha)]^{-1}, & if\ A_1 = 0 \\ [1 + \exp(\alpha - \beta A_1)]^{-1}, & if\ A_1 > 0 \end{cases} \quad (7)$$

where, α (constant) is the marginal utility of improving travel conditions after the adoption of the proposed policy, β is the marginal utility to pay for the improvement achieved. The amount that users are willing to pay (WTP) can be obtained as the following:

$$E(\text{willingness to pay}) = \int_0^\infty (1 - G\ (A_1))dA_1 - \int_0^{-\infty} (G\ (A_1))dA_1 = \int_0^\infty \left(\frac{\exp(\alpha - \beta A_1)}{1 + \exp(\alpha - \beta A_1)}\right) dA_1 = \frac{1}{\beta}\left\{\lim_{A_1 \to \infty}(-\ln[1 + \exp(\alpha - \beta A_1)] + \ln[1 + \exp(\alpha)])\right\} \quad (8)$$

The expected price users are WTP can be derived as $A_1 \rightarrow \infty$ and this is shown as:

$$E(willingness\ to\ pay) = \frac{1}{\beta}\ln[1 + \exp(\alpha)] \quad (9)$$

The spike value can be defined as following the equation by setting $A_1 = 0$.

$$\text{Spike} = \frac{1}{1+\exp(\alpha)} \quad (10)$$

2. Methods

The questionnaires were designed to collect the required information from the respondents for research purposes. The questionnaire comprised of four parts: the first part focuses on the demographic information of the respondents; the second part focus on the travel features of respondents; the third part investigates the activities and willingness of respondents with regard to the payment for using the intercity bus and airplane; and the last part of the questionnaire involves the cases regarding the presumptions of the intercity bus and airplane price and discount.

Basically, the CVM method was chosen for measuring the willingness of drivers to pay for the proposed transport policy. Particularly, the respondents were asked to respond towards the changes in the travel environment, depending on the following measures: (i) minimizing the line-hull travel expense for airplane and intercity bus, and (ii) minimizing the access/egress travel expenses for airports and intercity bus stations.

In the current study the car users were asked about the bidding of some proposed cost decrease policies, such as reducing airplane and intercity bus travel costs, reducing the access and egress travel costs for the airports and intercity bus stations. The respondents were asked to complete the questionnaires and submit them to the officials in charge of the survey areas. Respondents were made known of the survey's purpose, and, while gathering the data, all reasonable efforts were exercised to avoid any potential bias. Then, the data were studied using the SPSS for the descriptive analysis and R software for solving the spike model equations and estimating α and β, as well as for calculating the expected willingness to pay and the spike value.

3. Results and discussion

3.1. Data analysis

As indicated by the survey results, out of the 338 respondents, 86.7% were male (293 respondents); whereas only 45 female respondents have answered the survey (or 13.3%). Furthermore, 92.9% of the respondents (314 persons) were Libyan citizens; and the remaining 7.1% were foreigners (24 persons) working in companies or corporations in Libya. In terms of age, the respondents' age range was from 20 years old to above 60 years old; where 32.8% were in the age group of 21 to 30 years old; 21.6% were in the age group of 31 to 40 years old; 21.3% were in the age group of 41 to 50 years old; around 17.2% were in the age group of less than 20 years old; and only 7.1% of the respondents were in the age group of 51 to 60 years old.

Tables 1 to 4 show the general results obtained from the total sample according to different proposed transportation policies. The willingness to pay for a proposed transport policy of reducing the intercity transport travel cost varies among the drivers that have different travel costs. Therefore, in this study, the proposed policy of reducing the intercity transport travel cost is segmented into four strategies: (i) reducing the line-hull travel cost for the intercity bus, (ii) reducing the access/egress travel cost for the intercity bus stations, (iii) reducing the line-hull travel cost for airplane, and (iv) reducing the access/egress travel cost for airports. The results have shown that, majority of the respondents are not willing to pay the proposed bid price to improve the intercity transportation system; however, the situation got better when the excluding protest response samples were employed, because, a high proportion of zero responses has been labelled as protest. Nevertheless, in all situations it is possible to monitor the negative and significant statistically relationship between the reduced bid prices and the increased willingness to pay.

According to the intercity travel operating companies (bus and local airlines) in 2010, the price of intercity bus line-hull travel cost (ticket cost) was 50 LYD, and access and egress costs of intercity bus stations was 30 LYD. Furthermore, the current price of the airplane line-hull travel cost (ticket cost) is 90 LYD, and the access and egress costs of airports is 50 LYD. The willingness-to-Pay (WTP) of car drivers for reducing the intercity bus line-hull travel cost and access/egress travel costs for intercity bus stations are shown in Tables 1 and 2, respectively. Most car drivers are willing to pay 32.5 LYD (18.3%) and 19.5 LYD (17.2%) for reducing the intercity bus line-hull travel cost and intercity bus stations access/egress travel cost, respectively. Moreover, a large number of respondents were unwilling to pay for the proposed policies for reducing the intercity bus line-hull travel cost. 48.8% of respondents answered that they are unwilling to pay at all or their WTP would be zero for reducing the intercity bus line-hull travel cost and 43.8% of respondents answered that they are unwilling to pay at all in order to reduce the intercity bus stations access/egress travel costs.

Furthermore, the WTP of car drivers for reducing the airplane line-hull travel cost and reducing access/egress travel costs for airports are shown in Tables 3 and 4 respectively. The majority of the car drivers (25.1%) are willing to pay 58.5 LYD to lower the airplane line-hull travel cost; and 24.9% are willing to pay 32.5 LYD to lower the airports access/egress travel costs. What is found to be striking is the fact that a non-negligible portion of the sample is not willing to pay to use the intercity transport system (greater than 48% for reducing the intercity bus line-hull travel cost, and 43% for reducing the intercity bus stations access/egress travel cost), and (around 42% for reducing the intercity bus line-hull travel cost and around 46% for reducing the intercity bus stations access/egress travel cost); albeit, this situation is deemed common in this context. Also notably is that the average WTP values (Tables 1 to 4) calculated from samples are overweighed by the zero WTP samples, which could lead to the inconsistent patterns with the expected WTP values estimated from the Spike models. These results have propelled us to adopt the spike model proposed by Kristroem [16] to determine car drivers' willingness to pay under the proposed policy.

Table 1. WTP rate for reducing intercity bus line-hull travel cost.

Reduction rate	A(Bid)	Frequency	Percent	Valid Percent	Cumulative Percent
0		165[a]	48.8	48.8	48.8
15%	42.5 (LYD)	14	4.1	4.1	53.0
20%	40.0 (LYD)	20	5.9	5.9	58.9
25%	37.5 (LYD)	26	7.7	7.7	66.6
30%	35.0 (LYD)	51	15.1	15.1	81.7
35%	32.5 (LYD)	62	18.3	18.3	100.0
Total		173	100.0	100.0	

Note: [a] Frequencies of zero WTP or not WTP at all for reducing the intercity bus line-hull travel cost

Table 2. WTP rate for reducing the intercity bus stations access/egress travel costs.

Reduction rate	A(Bid)	Frequency	Percent	Valid Percent	Cumulative Percent
0		148[a]	43.8	43.8	43.8
15%	25.5 (LYD)	14	4.1	4.1	47.9
20%	24.0 (LYD)	38	11.2	11.2	59.2
25%	22.5 (LYD)	36	10.7	10.7	69.8
30%	21.0 (LYD)	44	13.0	13.0	82.8
35%	19.5 (LYD)	58	17.2	17.2	100.0
Total		338	100.0	100.0	

Note: [a] Frequency of zero WTP or not WTP at all for reducing the intercity bus stations access/egress travel cost

Table 3. WTP rate for reducing the airplane line-hull travel cost.

Reduction rate	Cost after reduction	Frequency	Percent	Valid Percent	Cumulative Percent
0		143[a]	42.3	42.3	42.3
15%	76.5 (LYD)	6	1.8	1.8	44.1
20%	72.5 (LYD)	14	4.1	4.1	48.2
25%	67.5 (LYD)	26	7.7	7.7	55.9
30%	63.5 (LYD)	64	18.9	18.9	74.9
35%	58.5 (LYD)	85	25.1	25.1	100.0
Total		338	100.0	100.0	

Note: [a] Frequency of zero WTP or not WTP at all for reducing the airplane line-hull travel cost.

Table 4. WTP rate for reducing airports access/egress travel costs.

Reduction rate	Cost after reduction	Frequency	Percent	Valid Percent	Cumulative Percent
0		156[a]	46.2	46.2	46.2
15%	42.5 (LYD)	7	2.1	2.1	48.3
20%	40.0 (LYD)	12	3.6	3.6	51.8
25%	37.5 (LYD)	23	6.8	6.8	58.6
30%	35.0 (LYD)	56	16.6	16.6	75.2
35%	32.5 (LYD)	84	24.9	24.9	100.0
Total		338	100.0	100.0	

Note: [a] Frequency of zero WTP or not WTP at all reducing airports access/egress travel costs

3.2. Model estimation

Tables 5 and 6 presented the approximated outcomes of the Logit and spike models for the WTP price for the recommended policy, where Tables 5 and 6 present the standard value acquired for the spike model evaluation and approximated outcome for the WTP outcome with regard to the proposed transport policy of minimizing the intercity bus line-hull travel cost and the travel cost of the access/egress intercity bus stations, respectively. The spike is defined here as the value $F_{wtp}(X) = 0$, i.e. the probability that WTP is equal to zero. Set X to zero in Equation 16 to get the spike as $1/[1 + \exp(\alpha)]$. By including the estimated value of α, a spike which is more or less equal to 0.651 in terms of minimizing the intercity bus line-hull travel cost, and 0.625 for the cost of intercity bus stations access and egress travel is unraveled. This is very near to the observed fraction of people who refused to pay.

In Table 5, the popular simple logit model gives an estimated mean WTP of about -3.88 LYD for the intercity bus line-hull travel cost (one-way ticket cost). Furthermore, for the policy of reducing the access and egress travel costs for the intercity bus stations, the logit model gives an estimated mean WTP of about -3.73 LYD as shown in Table 6. Using this function, one possible conclusion is that the mean WTP is negative. The spike model throws some light on the actual distribution of the damages in a very engaging way. The spike models have verified that the probable amount of money that the Libyan automobile drivers are willing to pay is 14.80 LYD for the intercity bus line-hull travel cost (one-way ticket cost), and LYD 8.0 for the intercity bus stations access/egress travel costs as illustrated in Tables 5 and 6, respectively.

Tables 5 and 6 further present the estimated spike models based on the intercity bus travel cost category (line-hull travel cost and access/egress travel costs). Results show that both tow models are tested significantly. The spike models to illustrate the scenario bid variable, have assumed that when the scenario price for the intercity bus line-hull travel cost and intercity bus stations access and egress costs is mitigated, the scenario bid (reducing the intercity travel cost) correlates in a negative manner with car drivers WTP, further suggesting that a higher scenario price lowers the driver’s tendency to pay for the intercity bus ticket cost and intercity bus stations access/egress travel costs. Contrastingly, if the scenario prices are declined to a particular level, the incidence of people willing to pay will be bound to increase.

Furthermore, for the policy of reducing the domestic air transport travel cost, the travel cost was also divided into two components. The first part is the line-hull travel cost (ticket cost for one way) and the second part is the access/egress travel costs (i.e. access cost is the cost to get to the airport and egress cost implies to get to the final destination from the terminal airports). The estimated results of the Spike and Logit models for the car driver’s WTP price for reducing the airplane line-hull travel cost (ticket cost) and access/egress travel costs of airports are presented in Tables 7 and 8, respectively. For the policy of reducing the airplane line-hull travel cost (one way ticket cost) and airports access/egress travel costs, we obtained the spike values of 0.640 for minimizing the cost of airplane line-hull travel, and 0.623 for reducing the airports access and egress travel costs.

The Logit model supplies an estimated mean WTP of about – 5.01 LYD for the airplane line-hull travel cost (one-way ticket cost), and also the logit model offers an estimated mean WTP of about -4.85 LYD for lowering the costs of the airports access and egress. Through this function, we can sum up that the mean WTP is negative. The spike model depicts the actual distribution of the damages in a very fascinating way. The spike models have confirmed that, the average reduction of the line-hull travel cost of airplane, and access/egress travel costs of airports that car drivers are WTP, as extracted from the simple spike models, are LYD 39.50 ≅ LYD 40 and LYD 14.68 ≅ LYD 15, respectively.

Table 5. Estimation results of the logit and spike models of WTP for reducing intercity bus Line-hull travel cost.

	Logit model			Spike model		
Variables	**Estimate**	**S.E.**	***t*-value**	**Estimate**	**S.E.**	***t*-value**
Constant (α)	4.9104	3.707	0.534	-0.624	0.038	-11.45***
Scenario price bid (β)[a]	-1.265	1.621	-2.300**	-0.029	0.017	-11.21***
Spike value				0.651		10.13***
Mean WTP (LYD)	-3.88			14.8		
Wald statistic	26.49*			44.38***		
No. Observations	338			338		

Note: [a] The unit is LYD 1.0 = USD 0.80 at the time of the survey. The mean WTP is given by α/β logit model and $\frac{-1}{\beta}\ln[1+\exp(\alpha)]$ in the spike model. Significance level: **p<0.05*; ** *p<0.01*; *** *p<0.001*

Table 6. Estimation results of the logit and spike models of the WTP for reducing intercity bus stations access/egress travel costs.

	Logit model			Spike model		
Variables	**Estimate**	**S.E.**	***t*-value**	**Estimate**	**S.E.**	***t*-value**
Constant (α)	4.456	2.232	0.390	-0.513	0.039	-12.32***
Scenario price bid (β)[a]	-1.193	1.137	3.540**	-0.058	0.012	-13.12***
Spike value				0.625		9.52***
Mean WTP (LYD)	-3.73			8.06		
Wald statistic	20.23*			38.92***		
No. Observations	338			338		

Note: [a] The unit is LYD 1.0 = USD 0.80 at the time of the survey. The mean WTP is given by α/β logit model and $\frac{-1}{\beta}\ln[1+\exp(\alpha)]$ in the spike model. Significance level: **p<0.05*; ** *p<0.01*; *** *p<0.001*

Tables 7 and 8 further present the estimated spike models according to the airplane travel cost category (line-hull travel cost and access/egress travel costs).

Results demonstrate that both models are tested significantly. It has been expected that the higher the travel cost rate offered, the fewer drivers are willing to pay. The model results showed further that the scenario price variable is significant and that its negative notation is harmonious with the expectations. A higher scenario price would lower the driver’s tendency to pay for the airplane ticket cost and access/egress travel costs.

Precisely, examining the various proposals of reduction has led to the exposure to some significant distinctions, for the purpose of illustrating the scenario bid variable, assuming that when the scenario price for the intercity transport travel cost is minimized, the proportion of the scenario bid (travel cost) variable correlates negatively with car drivers' WTP. It indicates that a higher scenario price lowers the driver’s tendency to pay when he or she uses the intercity bus and airplane. The results indicate that in such a scenario of the intercity transport travel cost minimized to 14.80 ≅ 15 LYD for the intercity bus line-hull travel cost (one way ticket cost), 8 LYD for the intercity bus stations access/egress travel costs, 39.50 ≅ 40 LYD for airplane line-hull travel cost (one way ticket cost), and 14.68 ≅ 15 LYD airports’ access/egress travel costs, it would clearly increase the demand for the airplane and intercity buses, especially among those with lower income. For the policy of reducing the intercity bus and air transport travel costs, all the prices point from the spike models which are much lower than the actual sales price of the intercity transport travel cost (intercity bus and air transport). Therefore, the transport operating companies and government departments concerned should revise the intercity transport cost to help materialize the execution of the policy.

The outcomes of spike models have exposed that, a minimized scenario price has been negatively related to the WTP for all proposed policies examined. Our finding has further implied that, minimizing travel prices of the intercity transport, to some extent, might be efficient in minimizing private car usage, and maximizing the rate of using the intercity transportation system (bus and airplane).

Consequently, what we can conclude is that the information at zero decreases the standard error of the mean in this application, rather drastically. In other words, the standard error in the Spike model is slightly lower than that of the Logit model. These results have backed the application of the Spike model very strongly when estimating WTP. As Hanemann and Kristroem [17] mentioned, this result can be interpreted as indicating that a conventional analysis with the truncation of the integral at zero provides a sensible approximation to the Spike model. It should be stressed, nonetheless, that without information at zero the integral that should be truncated at this point when computing the mean WTP is still vague. Moreover, the mean formula for the Logit model has an ambiguous interpretation and inconsistent logic, and hence it is characteristically ad hoc [18]. This is reasoned by the fact that the formula is derived from permitting the WTP to be negative, and then integrating over the positive range of the employed distribution. Thus, the Spike model is confirmed to be more appropriate.

As mentioned earlier in this paper, prior studies have used the Logit or probit models for establishing (WTP) which excluded respondents who were not willing to pay from their model analysis [7-9], which in our opinion is not as strong as this research in terms of the methodology as well as where the Libyan government is concerned, and this finding has somehow complementary to their results.

Table 7. Estimation results of the logit and spike models of WTP for reducing Airplane Line-hull travel cost.

	Logit model			Spike model		
Variables	**Estimate**	**S.E.**	***t*-value**	**Estimate**	**S.E.**	***t*-value**
Constant (α)	4.694	1.048	0.290	-0.573	0.383	11.59***
Scenario price bid (β)[a]	-0.937	0.621	-5.280**	-0.011	0.003	-11.46***
Spike value				0.640		10.63***
Mean WTP (LYD)	-5.01			39.50		
Wald statistic	22.69*			56.34***		
No. Observations	338			338		

Note: [a] The unit is LYD 1.0 = USD 0.80 at the time of the survey. The mean WTP is given by α/β logit model and $\frac{-1}{\beta}\ln[1+\exp(\alpha)]$ in the spike model. Significance level: *$p<0.05$; ** $p<0.01$; *** $p<0.001$.

Table 8. Estimation results of the logit and spike models of WTP for reducing Airports access/egress travel costs.

	Logit model			Spike model		
Variables	**Estimate**	**S.E.**	***t*-value**	**Estimate**	**S.E.**	***t*-value**
Constant (α)	4.154	0.871	0.240	-0.503	0.044	-11.29***
Scenario price bid (β)[a]	-0.667	0.227	-2.940**	-0.032	0.018	-11.52***
Spike value				0.623		13.43***
Mean WTP (LYD)	-4.85			14.68		
Wald statistic	8.64*			42.89***		
No. Observations	338			338		

Note: [a] The unit is LYD 1.0 = USD 0.80 at the time of the survey. The mean WTP is given by α/β logit model and $\frac{-1}{\beta}\ln[1+\exp(\alpha)]$ in the spike model. Significance level: *$p<0.05$; ** $p<0.01$; *** $p<0.001$

There are two interesting observations that have been able to be developed from the study results. Firstly, this study used the CVM question format with the spike model to deal with zero WTP data. The application of the CVM with the spike model to our study was an effective strategy, as the Logit model produces negative value of mean WTP estimate, and by contrast, the spike model showed a positive mean WTP estimate. The message of our study is, thus, becoming all the more useful since it clearly portrays the usefulness of the spike model as proposed. Secondly, the results make some useful starting points in understanding the possible indication of the WTP of the improvement of the intercity transport. This study shows further that there is a statistically significant non-market WTP for improvement in the intercity transport. There has been a preliminary indication of the benefits of such improvement, proven to be useable in the conventional cost–benefit analysis. The results can well provide a useful framework for organizing information on the consequences of actions for addressing improvement issues in the intercity public transport. This valuation information should be considered by the intercity public transport system operators as they make any decision at all regarding the many possible improvements in the intercity public transport as well as how much money should be invested at this expense. However, it would be worthwhile to conduct the analysis to get at least a preliminary evaluation of the proposed policies for the government and intercity transport operators' policy alternatives.

4. Conclusion

As a conclusion, car drivers would not mind changing to different modes (such as the intercity bus or airplane) for their intercity travel by lessening their travel costs. Based on this, to further capture the cost rates that drivers with different proposed transportation policies are the WTP, four spike models of each policies category are respectively developed with the influential variables further discussed in detail. Ultimately, we have found that, drivers who generally try to distant themselves from using the intercity bus or airplane are hesitant to pay the intercity bus or airplane travel cost, due to the fact that, these kinds of drivers seek to reduce the travel costs, and consequently they detest anything that works otherwise.

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